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DEPARTMENT OF NURSING

PhD Thesis

Of

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A Supportive care program for patients with heart failure, a Pilot Study

Limassol, 2020

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Πνευματικά δικαιώματα

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PREFACE

Heart failure is becoming an increasingly prevalent problem. Heart failure is a clinical syndrome resulting from other conditions and more frequently after an acute coronary event. Although patients with heart failure have improved outcomes with implementation of evidence- based therapies, ultimately, they experience events impairing their quality of life. Besides optimal therapies, health care professionals must always bare in mind patients' preferences and needs and collaborate with them to develop advanced care planning based on patients' values. Patients must navigate through complex information and treatment choices while experiencing the ramifications of chronic ill health on their lives and not limited to that.

I would love to begin this thesis with sharing a patient- case who participated in our program.

Patient S. has heart failure since he was forty years old after a heart attack. In our first meeting he came with his wife Mrs L. One of his main concerns was the linkage to the hospital and how difficult is to assist emergency help. He explained that when he is far away from the hospital he feels anxious.

Mr. S: I always have with me the reference letter that my cardiologist gave me. You never know what may happen and sometimes symptoms start suddenly.

Mrs L: I prefer not going far away even for holidays, as S. gets very anxious when he feels that we are not close to the hospital, he does not feel safe.

Mr S: Is not exactly like that but yes, I do not feel secure. I had a lot of bad experiences….

Nurse: How about adhering with the treatment? You feel comfort and confident to follow your treatment?

Mr S: Yes, I think I get along quite well. I have to say that my wife helps me with that a lot. I can say that she knows my medication even better than me….

After few months Mrs L got sick and hospitalized for more than a week. We met both of them in the hospital to see how they are going and if the need anything.

Dr S told us: She was always taking care of me and now I have to do it for her. I am not really sure how to do it and if am doing that well….

You begin by serving your own needs. You journey by serving the needs of others. You end by serving the needs of the whole. That's when the journey is compete.

Wallance Huey

This is a pilot study, part of the larger RCT trial "SupportHeart". The coordinator of the trial is Dr. Lambrinou.

ABSTRACT

Introduction:

Long-term conditions, such as heart failure (HF), significantly impact patients and health care systems across Europe. HF has become a major and increasing public health problem worldwide. Despite advances in treatment, the prognosis of HF remains poor, accounting for 10% mortality rate after an acute event and 20-25% of patients will be readmitted within the first month after discharge. Disease management programs for HF are characterized by heterogeneity and different levels of complexity, thus the results regarding the effectiveness of those programs are controversial. There is a need for effective programs that promote the adherence of HF patients to treatment.

The chronic and life-limiting aspects of HF require supportive care: patient-centered care that integrates patient preferences and patient and family needs into the goals of care, manages symptoms to the level of comfort desired, and attempts to reduce the burden of illness for both the patient and his/her family. Based on this model, health care providers have to follow the illness trajectory of each patient and integrate supportive care based on the needs in each time point. Supportive HF care consists of the following four aspects: Communication, education, psychological and spiritual issues and symptom management.

Aim: The present study aspires to evaluate the effectiveness of an individualized supportive care management program in terms of the four different components that comprise supportive care in HF (communication, education, psychological and spiritual issues and self-management). The objectives of this study were to:

a) Determine supportive care needs of HF patients as reported in the literature.

b) Explore Cypriot patients’ identified supportive care needs.

c) Develop and pilot-test a self-management supportive care program for HF patients.

Study design

This was a multi-method study for developing and testing a supportive care management program for HF patients, following the Medical Research Council framework for complex interventions. A sequential exploratory approach was used in order to develop the content of the intervention. The study design consisted of two phases: Phase I: Development and Phase II: Pilot test of the management program. Phase I consisted by four different steps as follow:

1. Systematic review and meta-synthesis and systematic review and meta-analysis. Meta-synthesis conducted to identify what was reported as supportive needs of patients with HF and meta-analysis to identify which supportive care interventions were effective in order to be included in HF management programs. 2. Focus groups took place in order to explore Cypriot patients' needs to determine if the literature reflects their needs or if specific areas are missing. 3. The care needs of patients with HF explored through the literature and focus groups and the research team develop the context of the management program. 4. The intervention was developed based on supportive needs as identified by Cypriot patients.

Phase II

Phase II consisted of a pilot and feasibility study to determine whether the intervention can be implemented in Cyprus, whether it is acceptable to patients, and potential effect on patient outcomes. This information will allow the intervention to be refined, and a randomized controlled trial to be planned and conducted.

Patients were randomly allocated to intervention or control group. Patients allocated in the intervention group received written material in the form of a booklet and the first brief educational session was conducted by the nurse in the bedside of the patient before their discharge.

The intervention consisted by educational sessions once a month including information about the syndrome of HF, pharmacological and non- pharmacological treatment/self-management actions as follow: low- sodium diet, monitor weight, daily fluid volume, breathing more effectively, coughing techniques, quitting smoking, managing fatigue, coping with stress, medication adherence, physical activity, socializing, relaxation, early detection of decompensation signs.

The evaluation of the intervention done using the following questionnaires: 1) The “Self-care of Heart Failure Index”, 2) The “Multidimensional scale of perceived social support”, 3) The “Minnesota Living with Heart Failure questionnaire”, 4) The “Dutch Heart Failure Knowledge Scale, hospital anxiety and depression scale. Furthermore, acute events and deterioration were measured. The influence of treatments and disease management strategies on outcomes measuring readmission rate and mortality. An open-ended question used to assess patient’s satisfaction regarding the perceived support of the supportive care program. Patient and family needs for information, communication, and assistance with care; the extent to which these needs are met assessed using an open-ended question. After the first month of hospital discharge, in three- and six-months period, patients were conducted by telephone call and evaluation was established using questionnaires.

Statistical comparisons were performed using the "Kruskal Wallis Test" for continuous variables, the Chi-Square test for categorical variables and the Fisher’s exact test for categorical variables. Missing values in the scales have been imputed using the multiple imputation algorithm as it was followed an intention to treat analysis. The scales reliability explored using Cronbach’s alpha internal consistency index. For the acute events, survival analysis was performed. Kaplan Meir curves and the log-rank test were utilised to explore the difference between Control and Intervention with regards to the time until the first acute event. Moreover, Cox regression was utilised to quantify the effect of the intervention on the hazard for an acute event while controlling for demographic and clinical characteristics. Statistical analysis was conducted in the statistical software R v.3.6.1

Results:

To develop the intervention of this research program, a sequential exploratory approach was followed. Firstly, a systematic review and meta-synthesis was performed to reveal the supportive care needs of HF patients and then a meta-analysis was undertaken to explore which supportive care interventions seem to be effective as part of HF management programs. To explore the needs of Cypriot patients with HF, focus groups were also conducted using a semi-structured guidance which was developed based on the results of the meta-synthesis and meta-analysis. Based on the process described, researchers developed and pilot-tested the interventional supportive management program.

The pilot study consisted from thirty-five patients with twenty- four patients participating in the intervention group and eleven patients in the control group. The implementation of the intervention lasted for a period of six months. One patient from the control group was lost to follow up and there were three fatal events, all from the control group. The mean age of the patients was 71 years old with no differences between the two groups. Most of the patients were married [30 (86%)] and had family history [17 (49%)].

As measured with MLWHFQ a better HR-QoL was found for both groups in the sixth time period [IG 6th month= 19.8 (21.2)/ CG 6th month= 19 (7.0)], but it was a difference in the social dimension of the HR-QoL favoring the intervention group [IG baseline= 4.8 (4.9) / 1st month=3.3 (3.5) / 6th month =2.8 (3.1)] [CG baseline= 2.3 (1,1) / 1st month=3.4 (2,7) / 6th month =2.7 (2.8)]. Importantly, a difference in the sub-scale of family/significant others indicated where patients in the intervention group followed an increased trend [IG baseline=50.9 (5.4) / 6th month= 52.7 (3.4)] [CG baseline =50.3 (8.9) / 6th month = 49.9 (4.2)]. In the overall scale of Gr9-EHFScB there was no difference between the two groups [IG baseline=37.8 (6.7)/ 1st month=39.9 (4.9) /6th month=40.7 (6.1)] [CG baseline=37.1 (4.5) / 1st month=37.2 (6.4) /6th month=39.0 (1.7)]. The same observed measuring self-care with the SCHFI [IG baseline=65.2(7.3)/6st month= IG= 69.8 (8,2)] [CG baseline= 51.9 (8.5)/6th month= CG =61.0 (7.3)]. Overall, scales demonstrated a satisfactory (>0.70) reliability index.

Survival analysis was performed for a 30, 90-day and 180-day period. The mean number of events per patient in the control group was 0.44 (SD=0.53) and 0.09(SD=0,29) events for the intervention group (p=0.026) in 30 days, 0.78 (SD=0.6) for control group and 0.09(SD=0,29) (p<0.001) events for the intervention group in 60 days and 0.78 (SD=0.6) for control group and 0.32(SD=057) events for the intervention group (p=0.048) in 180 days. The survival of the control group was lower than that of the Intervention's in all three time points; 30 days: (log-rank test, $X^2(1) = 5.7$, p=0.02), 90 days: (log-rank test, $X^2(1) = 12.3$, p<0.001) and 180 days: (log-rank test, $X^2(1) = 6.8$, p=0.009).

Discussion/Conclusion:

Supportive care seems to be a promising concept for HF management programs. There was a great effect in acute events (readmission rate and death), as it was found a reduced risk by 87% for a patient receiving supportive care. Apart from that the pilot study illustrated the effectiveness

regarding multiple outcomes such as HR-QoL and perceived support. As shown from previous research, multicomponent management programs are seemed to be effective. Patients' satisfaction could be achieved when covering their needs. The mechanism by which this is feasible is supportive care; continuing assessment, support and early recognition of decompensation. It is also known that another component of sufficient and successful HF management programs is long term duration which could also be a marker for the value of continuity and long-term support. Thus, a structured program has to be offered to HF patients as part of the health care services.

Keywords: Supportive care, health-related quality of life, heart failure, person-centered care, heart failure management programs

ΠΕΡΙΛΗΨΗ

Εισαγωγή:

Χρόνιες καταστάσεις όπως η καρδιακή ανεπάρκεια (ΚΑ), επηρεάζουν σημαντικά τους ασθενείς και τα συστήματα υγειονομικής περίθαλψης σε ολόκληρη την Ευρώπη. Η ΚΑ είναι ένα μεγάλο και αυξανόμενο πρόβλημα δημόσιας υγείας παγκοσμίως. Παρά την πρόοδο στη θεραπεία, η πρόγνωση της ΚΑ παραμένει φτωχή, με ποσοστό θνησιμότητας 10% μετά από ένα οξύ συμβάν και 20-25% των ασθενών θα επανεισαχθούν εντός του πρώτου μήνα μετά την έξοδο τους από το νοσοκομείο. Τα προγράμματα διαχείρισης της ΚΑ χαρακτηρίζονται από ετερογένεια και διαφορετικά επίπεδα πολυπλοκότητάς, έτσι η αποτελεσματικότητα αυτών των προγραμμάτων είναι αμφιλεγόμενη. Υπάρχει η ανάγκη για αποτελεσματικά προγράμματα για την προαγωγή αφοσίωσης στην θεραπεία.

Η χρόνια και περιοριστική για τη ζωή πτυχή της ΚΑ απαιτεί υποστηρικτική φροντίδα: φροντίδα με επίκεντρο τον ασθενή, που ενσωματώνει τις προτιμήσεις και τις ανάγκες του ασθενή και της οικογένειας του στους στόχους της φροντίδας, διαχειρίζεται τα συμπτώματα στο επιθυμητό επίπεδο άνεσης και προσπαθεί να μειώσει το βάρος της ασθένειας τόσο για τον ασθενή όσο και για την οικογένειά του.

Σκοπός:

Η παρούσα μελέτη φιλοδοξεί να αξιολογήσει την αποτελεσματικότητα ενός εξατομικευμένου προγράμματος υποστηρικτικής φροντίδας όσον αφορά τα τέσσερα διαφορετικά στοιχεία που συνιστούν την υποστηρικτική φροντίδα στην ΚΑ (επικοινωνία, εκπαίδευση, ψυχολογικά και πνευματικά θέματα και αυτοδιαχείριση). Οι στόχοι αυτής της μελέτης ήταν:

α) Να προσδιοριστούν οι ανάγκες υποστήριξης των ασθενών με HF όπως αναφέρεται στη βιβλιογραφία.

β) Να προσδιοριστούν οι ανάγκες υποστήριξης των Κυπρίων ασθενών όπως τις αναφέρουν οι ίδιοι.

γ) Να αναπτυχθεί και δοκιμαστεί πιλοτικά ένα προγράμματος αυτοδιαχείρισης υποστηρικτικής φροντίδας για ασθενείς με ΚΑ.

Σχεδιασμός της μελέτης:

Αυτή ήταν μια μελέτη πολλαπλών μεθόδων για την ανάπτυξη και τον έλεγχο ενός υποστηρικτικού προγράμματος διαχείρισης φροντίδας για ασθενείς με HF, σύμφωνα με το πλαίσιο του Συμβουλίου Ιατρικής Έρευνας για σύνθετες παρεμβάσεις. Χρησιμοποιήθηκε μια διαδοχική διερευνητική προσέγγιση για την ανάπτυξη του περιεχομένου της παρέμβασης. Ο σχεδιασμός της μελέτης αποτελείται από δύο φάσεις: Φάση Ι: Ανάπτυξη και Φάση ΙΙ: Πιλοτική δοκιμή του προγράμματος διαχείρισης. Η φάση Ι αποτελείται από τα παρακάτω 4 βήματα:

1. Συστηματική ανασκόπηση και μετα-σύνθεση και συστηματική ανασκόπηση και μετα-ανάλυση. Η μετα-σύνθεση πραγματοποιήθηκε για να προσδιορίσει τις αναφερόμενες ως υποστηρικτικές ανάγκες των ασθενών με ΚΑ και η μετα-ανάλυση για να προσδιορίσει ποιες παρεμβάσεις υποστηρικτικής φροντίδας ήταν αποτελεσματικές προκειμένου να συμπεριλαμβάνονται στα προγράμματα διαχείρισης ΚΑ. 2. Οι ομάδες εστίασης πραγματοποιήθηκαν για να εξερευνήσουν τις ανάγκες των Κυπρίων ασθενών για να προσδιορίσουν εάν η βιβλιογραφία αντικατοπτρίζει τις ανάγκες τους ή εάν λείπουν συγκεκριμένοι τομείς. 3. Οι ανάγκες φροντίδας των ασθενών με ΚΑ διερευνήθηκαν μέσω της βιβλιογραφίας και των ομάδων εστίασης και η ερευνητική ομάδα ανάπτυξε μέσω αυτών το πλαίσιο του προγράμματος διαχείρισης. 4. Η παρέμβαση αναπτύχθηκε με βάση τις υποστηρικτικές ανάγκες όπως αυτές προσδιορίστηκαν από τους Κύπριους ασθενείς.

Φάση ΙΙ

Η Φάση ΙΙ περιλαμβάνει μια πιλοτική μελέτη για να προσδιοριστεί εάν η παρέμβαση μπορεί να εφαρμοστεί στην Κύπρο, εάν είναι αποδεκτή για τους ασθενείς και να διερευνηθεί η πιθανή επίδραση σε σχετικούς παράγοντες. Αυτές οι πληροφορίες θα επιτρέψουν να βελτιωθεί η παρέμβαση και να σχεδιαστεί και να διεξαχθεί μια τυχαιοποιημένη κλινική δοκιμή.

Οι ασθενείς τυχαιοποιήθηκαν στην ομάδα παρέμβασης ή στην ομάδα ελέγχου. Οι ασθενείς που κατανεμήθηκαν στην ομάδα παρέμβασης έλαβαν εκπαιδευτικό υλικό και η πρώτη σύντομη εκπαιδευτική συνεδρία διεξήχθη από νοσηλευτή παρακλίνεια πριν την έξοδο του ασθενή από το νοσοκομείο.

Η παρέμβαση περιλάμβανε εκπαιδευτικές συνεδρίες μία φορά το μήνα, συμπεριλαμβανομένων πληροφοριών σχετικά με το σύνδρομο της ΚΑ, φαρμακολογικές και μη φαρμακολογικές θεραπείες / ενέργειες αυτοδιαχείρισης: δίαιτα χαμηλή σε αλάτι (χλωριούχο νατρίο), παρακολούθηση βάρους, ημερήσια κατανάλωση υγρών, αποτελεσματικότερη αναπνοή, τεχνικές βήχα, διακοπή καπνίσματος, διαχείριση κόπωσης, αντιμετώπιση άγχους, σωστή τήρηση/λήψη φαρμακοθεραπείας, σωματική δραστηριότητα, κοινωνικοποίηση, χαλάρωση, έγκαιρη ανίχνευση σημείων αντιρρόπησης.

Αξιολόγηση όσον αφορά τα τέσσερα στοιχεία της υποστηρικτικής φροντίδας έγινε χρησιμοποιώντας τα ακόλουθα εργαλεία / ερωτηματολόγια: Έγινε ποσοτική και ποιοτική αξιολόγηση της παρέμβασης χρησιμοποιώντας ερωτηματολόγια και ανοιχτές ερωτήσεις, αντίστοιχα. Χρησιμοποιήθηκαν τα ακόλουθα ερωτηματολόγια: 1) «Self- care heart failure Index», το οποίο αξιολογεί τις γνώσεις των ασθενών και την προσαρμογή τους στη γνώση ως συμπεριφορά υγειονομικής περίθαλψης, 2) “Multidimensional scale of perceived social support”, 3) “Minnesota Living with Heart Failure questionnaire” 4) «Dutch Heart Failure Knowledge Scale» για τις γνώσεις των ασθενών σχετικά με την ΚΑ και 5) «hospital anxiety and depression scale (HADS)» η κλίμακα για το άγχος και την κατάθλιψη. Επιπλέον, έγινε καταμέτρηση για οξεία συμβάντα, επανεισαγωγές στο νοσοκομείο και θνησιμότητα. Η ποιοτική αξιολόγηση έγινε με χρήση ανοιχτού τύπου ερώτησης και αφορούσε την ικανοποίηση των ασθενών σχετικά με την εκλαμβανόμενη υποστήριξη από το πρόγραμμα υποστηρικτικής φροντίδας. Επίσης ο βαθμός στον οποίο ικανοποιήθηκαν οι ανάγκες του ασθενή και της οικογένειας για ενημέρωση, επικοινωνία και βοήθεια με την φροντίδα αξιολογήθηκαν χρησιμοποιώντας ανοιχτού τύπου ερώτηση. Η αξιολόγηση με την χρήση των ερωτηματολογίων έγινε τον πρώτο μήνα μετά το εξιτήριο, σε περίοδο τριών και έξι μηνών.

Οι στατιστικές δοκιμασίες πραγματοποιήθηκαν χρησιμοποιώντας το "Kruskal Wallis Test" για συνεχείς μεταβλητές, το Chi-Square τεστ για κατηγορηματικές μεταβλητές και το Fisher τεστ για τις κατηγορικές μεταβλητές. Οι ελλείπουσες τιμές στις κλίμακες διαχειρίστηκαν χρησιμοποιώντας τον αλγόριθμο πολλαπλού καταλογισμού καθώς ακολουθήθηκε η ‘αρχή της πρόθεσης για θεραπεία’. Η αξιοπιστία των κλιμάκων διερευνήθηκε χρησιμοποιώντας τον δείκτη εσωτερικής συνέπειας της Cronbach alpha. Για τα οξέα συμβάντα, πραγματοποιήθηκε ανάλυση επιβίωσης. Οι καμπύλες Kaplan Meir και το τεστ log-rank χρησιμοποιήθηκαν για να διερευνηθεί η διαφορά μεταξύ των ομάδων ελέγχου και παρέμβασης σε σχέση με το χρόνο έως το πρώτο οξύ συμβάν. Επιπλέον, το μοντέλο Cox-regression χρησιμοποιήθηκε για τον ποσοτικό προσδιορισμό της επίδρασης της παρέμβασης στον κίνδυνο για ένα οξύ συμβάν ελέγχοντας ταυτόχρονα την επίδραση από δημογραφικά και κλινικά χαρακτηριστικά. Η στατιστική ανάλυση πραγματοποιήθηκε στο στατιστικό λογισμικό R v.3.6.1.

Αποτελέσματα:

Για την ανάπτυξη της παρέμβασης του ερευνητικού προγράμματος, ακολουθήθηκε η διαδοχική διερευνητική προσέγγιση. Αρχικά πραγματοποιήθηκε συστηματική ανασκόπηση και μετασύνθεση για να διερευνηθούν οι ανάγκες υποστηρικτικής φροντίδας των ασθενών με ΚΑ και έπειτα πραγματοποιήθηκε μεταανάλυση για να διερευνηθεί ποιες παρεμβάσεις υποστηρικτικής φροντίδας φαίνεται να είναι αποτελεσματικές ως μέρος των προγραμμάτων διαχείρισης ΚΑ. Για να διερευνηθούν οι ανάγκες των Κυπρίων ασθενών με ΚΑ, διεξήχθησαν ομάδες εστίασης χρησιμοποιώντας ημιδομημένο οδηγό ο οποίος αναπτύχθηκε με βάση τα αποτελέσματα της μετασύνθεσης και της μετα-ανάλυσης. Μέσω αυτής της διαδικασίας, αναπτύχθηκε και δοκιμάστηκε πιλοτικά το παρεμβατικό πρόγραμμα διαχείρισης της ΚΑ.

Η πιλοτική μελέτη περιλάμβανε τριάντα πέντε ασθενείς με είκοσι-τέσσερις ασθενείς να κατανέμονται στην ομάδα παρέμβασης και έντεκα ασθενείς στην ομάδα ελέγχου. Η υλοποίηση της παρέμβασης διήρκεσε έξι μήνες. Ένας ασθενής από την ομάδα ελέγχου χάθηκε στην παρακολούθηση και υπήρχαν τρία θανατηφόρα συμβάντα, όλα στην ομάδα ελέγχου. Η μέση ηλικία των ασθενών ήταν 71 έτη χωρίς διαφορές μεταξύ των δύο ομάδων. Οι περισσότεροι από τους ασθενείς ήταν παντρεμένοι [30 (86%)] και είχαν οικογενειακό ιστορικό [17 (49%)].

Όπως μετρήθηκε με το ερωτηματολόγιο MLHFQ, βρέθηκε καλύτερη σχετιζόμενη με την υγεία ποιότητα ζωής και για τις δύο ομάδες στους έξι μήνες [IG 6ος μήνας = 19,8 (21,2) / CG 6ος μήνας = 19 (7,0)], αλλά υπήρχε διαφορά στην κοινωνική διάσταση της υπέρ της ομάδας παρέμβασης [IG baseline = 4,8 (4,9) / 1ος μήνας = 3,3 (3,5) / 6ος μήνας = 2,8 (3,1)] [CG βασική γραμμή = 2,3 (1,1) / 1ος μήνας = 3,4 (2,7) / 6ος μήνας = 2,7 (2,8)]. Υπήρχε διαφορά στις υπο-κλίμακες της αντιλαμβανόμενης στήριξης όπου οι ασθενείς στην ομάδα παρέμβασης ακολούθησαν θετική πορεία στην υποκατηγορία της «οικογένειας / σημαντικοί άλλοι» [IG baseline = 50,9 (5,4) / 6ος μήνας = 52,7 (3,4)] [CG baseline = 50,3 (8.9) / 6ος μήνας = 49.9 (4.2)]. Στη συνολική κλίμακα του Gr9-EHFScB δεν υπήρχε διαφορά μεταξύ των δύο ομάδων [βασική γραμμή IG = 37,8 (6,7) / 1ος μήνας = 39,9 (4,9) / 6ος μήνας = 40,7 (6,1)] [βασική γραμμή CG = 37,1 (4,5) / 1ος μήνας = 37,2 (6,4) / 6ος μήνας = 39,0 (1,7)]. Το ίδιο παρατηρήθηκε για την μέτρηση αυτοφροντίδας με το

SCHFI [βασική τιμή IG = 65,2 (7,3) / 6ος μήνας = IG = 69,8 (8,2)] [CG baseline = 51,9 (8,5) / 6ος μήνας = CG = 61,0 (7,3)] . Συνολικά, οι κλίμακες είχαν ικανοποιητικό δείκτη αξιοπιστίας.

Η ανάλυση επιβίωσης πραγματοποιήθηκε για περίοδο 30, 90 και 180 ημερών. Ο μέσος αριθμός συμβάντων ανά ασθενή στην ομάδα ελέγχου ήταν 0,44 (SD = 0,53) και 0,09 (SD = 0,29) συμβάντα για την ομάδα παρέμβασης (p = 0,026) σε 30 ημέρες, 0,78 (SD = 0,6) για την ομάδα ελέγχου και 0,09 (SD = 0,29) (p <0,001) συμβάντα για την ομάδα παρέμβασης σε 60 ημέρες και 0,78 (SD = 0,6) για την ομάδα ελέγχου και 0,32 (SD = 057) συμβάντα για την ομάδα παρέμβασης (p = 0,048) σε 180 ημέρες. Η ανάλυση επιβίωσης πραγματοποιήθηκε χρησιμοποιώντας την καμπύλη Kaplan-Meir και το log-rank τεστ. Η επιβίωση της ομάδας ελέγχου ήταν χαμηλότερη από αυτήν της παρέμβασης και στα τρία χρονικά σημεία. 30 ημέρες: (δοκιμή κατάταξης, Χ2 (1) = 5,7, p = 0,02), 90 ημέρες: : (log-rank test, $X^2(1) = 5.7$, p=0.02), 90 days: (log-rank test, $X^2(1) = 12.3$, p<0.001) and 180 days: (log-rank test, $X^2(1) = 6.8$, p=0.009).

Συζήτηση/ Συμπεράσματα:

Η υποστηρικτική φροντίδα είναι μια πολύ υποσχόμενη θεωρία για τα προγράμματα διαχείρισης ΚΑ. Υπήρξε μεγάλη επίδραση όσο αφορά τα οξέα συμβάντα (ποσοστό επανεισαγωγής και θάνατος), καθώς φαίνεται ότι μειώθηκε ο κίνδυνος κατά 87% για τους ασθενείς που λάμβαναν υποστηρικτική φροντίδα. Εκτός από αυτό, η πιλοτική μελέτη κατέδειξε την αποτελεσματικότητα σχετικά με πολλαπλά αποτελέσματα, όπως η σχετιζόμενη με την υγεία ποιότητα ζωής και η αντιληπτή/εκλαμβανόμενη στήριξη. Όπως φαίνεται από προηγούμενες έρευνες, τα προγράμματα διαχείρισης πολλών παραγόντων φαίνεται να είναι αποτελεσματικά. Η ικανοποίηση των ασθενών θα μπορούσε να επιτευχθεί όταν καλύπτονται οι ανάγκες τους. Ο μηχανισμός με τον οποίο αυτό είναι εφικτό είναι η υποστηρικτική φροντίδα μέσω της συνεχής αξιολόγηση, υποστήριξης και έγκαιρης αναγνώριση της αντιρρόπησης. Είναι επίσης γνωστό ότι ένα άλλο στοιχείο των επιτυχημένων προγραμμάτων διαχείρισης ΚΑ είναι η μακροπρόθεσμη διάρκεια που θα μπορούσε επίσης να είναι δείκτης για την αξία της συνεχιζόμενης και μακροπρόθεσμης υποστήριξης. Επομένως, ένα δομημένο πρόγραμμα πρέπει να προσφέρεται σε ασθενείς με HF ως μέρος των υπηρεσιών υγειονομικής περίθαλψης.

Λέξεις κλειδιά: Υποστηρικτική φροντίδα, σχετιζόμενη με την υγεία ποιότητα ζωής, φροντίδα με επίκεντρο τον άνθρωπο, πρόγραμμα διαχείρισης καρδιακής ανεπάρκειας

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Abbreviations

ACEI’s= Angiotensin-Converting Enzyme Inhibitors

ACP= Advance Care Planning

ARNI= Angiotensin Receptor Neprilysininhibitor

CFA= Confirmatory Factor Analysis

CG= Control Group

CHF= Chronic Heart Failure

CHFQ= Chronic Heart Failure Questionnaire

CI= Confidence Intervals

COPD= Chronic Obstructive Pulmonary Disease

CPCC= Continuing Person Centered Care

CR= Composite Reliability

DMP= Disease Management Programs

CVD= Cardiovascular disease

ED= Emergency Department

EF= Ejection Fraction

EHFSCBS= European Heart Failure Self-Care Behavior Scale

ESC= European Society of Cardiology

HADS= Hospital and Anxiety Depression Scale

HCP’s= Health Care Professionals

HF= Heart Failure

HFmrEF= Heart Failure middle range Ejection Fraction

HFpEF= Heart Failure preserved Ejection Fraction

HFrEF= Heart Failure reduced Ejection Fraction

HR-QoL= Health Related Quality of Life

IG= Intervention Group

IPAQ= International Physical Activity Questionnaire

KCCQ= Kansas City Cardiomyopathy Questionnaire

LVD-36= Left Ventricular Dysfunction questionnaire

LVEF= Left Ventricular Ejection Fraction

MLWHFQ= Minnesota Living With Heart Failure Questionnaire

MRA’s= Mineralocorticoid/aldosterone Receptor Antagonists

MSPSS= Multidimensional Scale of Perceived Social Support

NYHA= New York Heart Association

PA= Physical activity

PDE-5= phosphodiesterase type 5

PCC= Person Centered Care

QLQ-SHF= Quality of Life Questionnaire for Severe Heart Failure

QoL= Quality of Life

RCT= Randomized Control Trial

SCHFI= Self-care of Heart Failure Index

SD= Standing deviation

SECD= Self-Efficacy for managing a Chronic Disease

WHO= World Health Organization

GENERAL SECTION

1. INTRODUCTION

Chronic diseases make up the largest proportion of diseases and this is expected to increase as a result of an ageing society, putting pressure on the sustainability of health care systems (Bodenheimer et al., 2002). Heart failure (HF) exerts a substantial amount of the healthcare systems' resources, due to the repeated and lengthy re-hospitalizations (Steward et al.,2002). HF has been identified as a disease of exceedingly high death and re-hospitalization rate, mainly within 60 to 90 days after hospital discharge (O'Connor et al., 2010). As the prevalence of chronic heart failure (CHF) increases along with the ageing of populations internationally, it will become increasingly difficult to maintain the quality of care of the certain population (Inglis et al., 2011).

Long-term conditions, such as HF, significantly impact patients and health care systems across Europe (Davis et al., 2015). HF is a clinical syndrome characterized by typical symptoms (e.g. breathlessness, ankle swelling and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema). It is caused by a structural and/or functional cardiac abnormality, resulting in a reduced cardiac output and/or elevated intracardiac pressures at rest or during stress (Ponikowski et al.,2016).

HF has become a major and increasing public health problem worldwide (WHO, 2010). Despite advances in treatment, the prognosis of HF remains poor, accounting 10% mortality rate after an acute event and 20-25% of patients will be readmitted within the first month after discharge (Cooper, et al. 2015; Discroll et al., 2016). The post-discharge period of 30 days is a particularly vulnerable period for decompensation (Solomon et al., 2007; Chun et al., 2012). Okumura et al, (2016) determined that 13.4% of patients needed more intense therapy and two thirds of these episodes were followed to HF re- hospitalization or emergency department (ED) visit within 30 days.

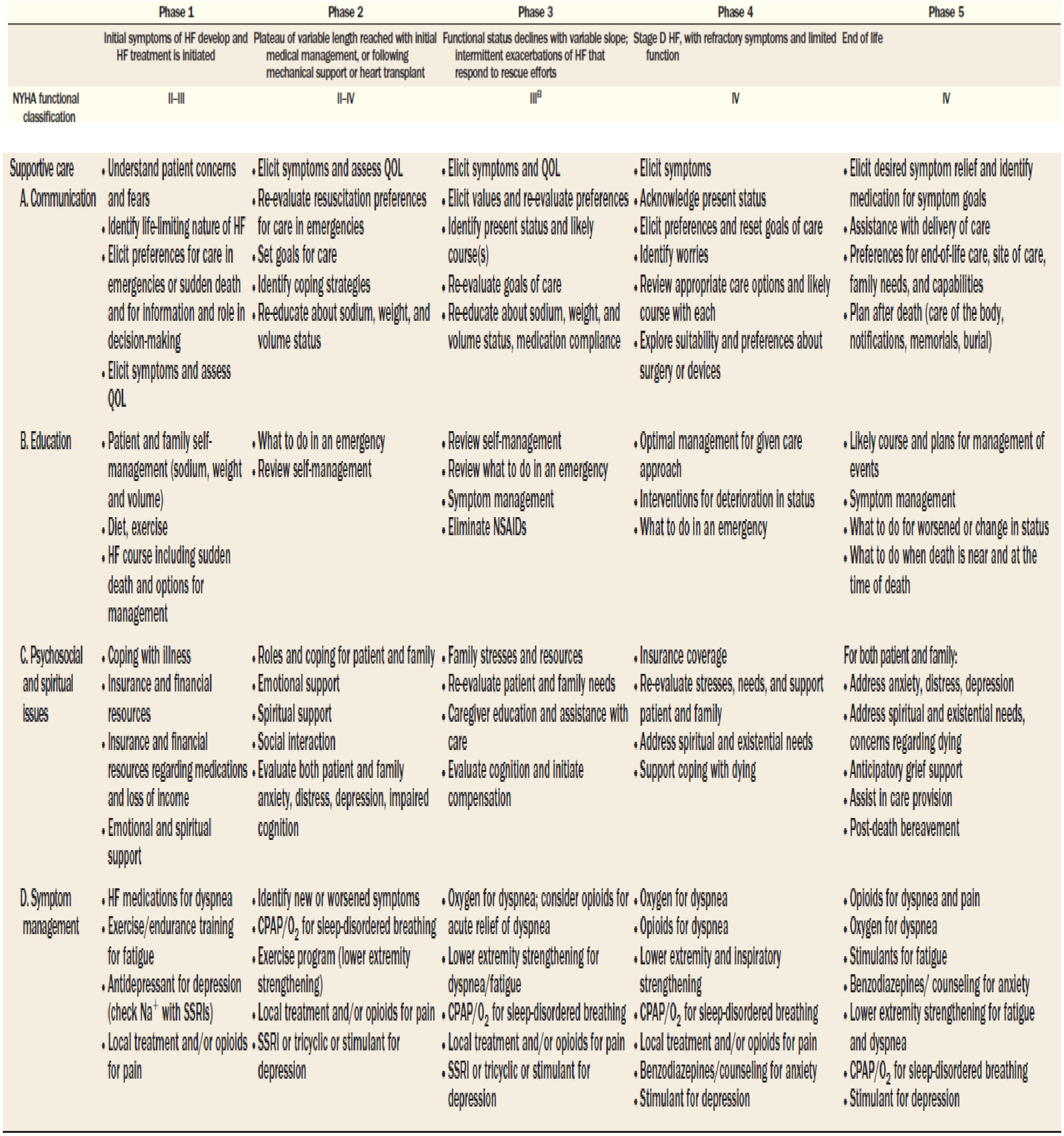
Recently, investigators reviewed the effectiveness of HF management programs on outcomes of survival, improvement of HF patients' quality of life (QoL) and reduction of health-care services use (Krause et al., 2014). Results for nurse-led self- management programs are encouraging, as some of the studies achieved a reduction of 50% in HF re-admissions and of 20% in mortality (McDonald, 2010; Lambrinou et al., 2012).

Disease management programs for HF are characterized by heterogeneity and different levels of complexity, thus the results regarding the effectiveness of those programs are controversial (Gohler et al., 2006; Savard et al., 2011, Lambrinou et al., 2012). The generic components of disease management programs may be applied to define the elements of HF programs as 1) Optimization of treatment prescriptions, 2) Patient and caregiver education including adherence to medication and dietary advice, self-monitoring and interactive relation with the healthcare provider and 3) Ongoing monitoring and quick response to the patient's condition (Kostam., 2011; Savard et al., 2012). There is a need for effective programs that promote the adherence of HF patients to treatment (Pietrabissa et al.., 2015). The absence of patient engagement in self-management is a domain that has been recently indicated to adversely impact the effectiveness of a self-management intervention in HF patients (Stut et al., 2015).

The trajectory of HF makes advanced HF management and supportive care complementary (Goodlin et al., 2004). The chronic and life-limiting aspects of HF require supportive care: patient-centered care (PCC) that integrates patient preferences and patient and family needs into the goals of care, manages symptoms to the level of comfort desired, and attempts to reduce the burden of illness for both; the patient and his family (Beattie and Goodlin., 2008). Supportive care is multidisciplinary holistic care provided in the patient and his family, from the time of diagnosis along with treatment aiming to prolong life and improve QoL, including end of life care (Ahmedzai et al., 2000). The concept of supportive care originates in cancer patients (Ahmedzai et al.,2005). Nowadays, supportive care applies in all chronic life- threatening diseases including HF (Ahmedazai et al., 2000; Beattie and Goodlin., 2008). The Sheffield model which is a multidisciplinary supportive care model was firstly introduced in cancer patients (Ahmedzai et al., 2000) and may be implemented for patients with HF (Beattie and Goodlin., 2008). Based on this model, health care providers have to follow the illness trajectory of each patient and integrate supportive care based on the needs in each time point. (Beattie and Goodlin., 2008). Thus, health care providers avoid a "shift" from supportive care to palliative care; they provide patients with comprehensive HF care (Goodlin et al., 2004; Beattie and Goodlin., 2008). Supportive HF care consists of the following four aspects: Communication, education, psychological and spiritual issues and symptom management (Goodlin et al., 2009).

Supportive care changes according to the patient’s needs. HF disease management and supportive care should not be applied sequentially; rather, both types of care should be offered concurrently, integrated in proportions that incorporate the course of the individual’s illness and patient’s preferences (Goodlin et al., 2004). The amount of supportive care required by the patient may increase as function worsens (Goodlin et al., 2004; Siouta et al., 2016). A “patient-centered, family-focused” structure should frame the approach to care for advanced HF in light of the symptoms and burdens occurring throughout the illness (Goodlin et al., 2004). Supportive care addressing physical, psychosocial or existential distress and strategies to manage and cope with HF should be provided concurrently with evidence-based disease-modifying interventions in comprehensive HF care (McDonagh et al., 2011).

The current PhD thesis is part of a larger project entitled with the acronym “SupportHeart” (Trial ID: NCT04415723) which is a randomized control trial (RCT) study with two groups; the intervention group (IG) and the control group (CG). The former will be educated for HF and will receive evidence-based disease-modifying supportive care interventions using the model of Goodlin et al. (2009) of supportive care in HF patients (Figure 1).



	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
	Initial symptoms of HF develop and HF treatment is initiated	Plateau of variable length reached with initial medical management, or following mechanical support or heart transplant	Functional status declines with variable slope; intermittent exacerbations of HF that respond to rescue efforts	Stage D HF, with refractory symptoms and limited function	End of life
NYHA functional classification	II–III	II–IV	III^{B}	IV	IV
Supportive care A. Communication	• Understand patient concerns and fears • Identify life-limiting nature of HF • Elicit preferences for care in emergencies or sudden death and for information and role in decision-making • Elicit symptoms and assess QOL	• Elicit symptoms and assess QOL • Re-evaluate resuscitation preferences for care in emergencies • Set goals for care • Identify coping strategies • Re-educate about sodium, weight, and volume status	• Elicit symptoms and QOL • Elicit values and re-evaluate preferences • Identify present status and likely course(s) • Re-evaluate goals of care • Re-educate about sodium, weight, and volume status, medication compliance	• Elicit symptoms • Acknowledge present status • Elicit preferences and reset goals of care • Identify worries • Review appropriate care options and likely course with each • Explore suitability and preferences about surgery or devices	• Elicit desired symptom relief and identify medication for symptom goals • Assistance with delivery of care • Preferences for end-of-life care, site of care, family needs, and capabilities • Plan after death (care of the body, notifications, memorials, burial)
B. Education	• Patient and family self-management (sodium, weight and volume) • Diet, exercise • HF course including sudden death and options for management	• What to do in an emergency • Review self-management	• Review self-management • Review what to do in an emergency • Symptom management • Eliminate NSAIDs	• Optimal management for given care approach • Interventions for deterioration in status • What to do in an emergency	• Likely course and plans for management of events • Symptom management • What to do for worsened or change in status • What to do when death is near and at the time of death
C. Psychosocial and spiritual issues	• Coping with illness • Insurance and financial resources • Insurance and financial resources regarding medications and loss of income • Emotional and spiritual support	• Roles and coping for patient and family • Emotional support • Spiritual support • Social interaction • Evaluate both patient and family anxiety, distress, depression, impaired cognition	• Family stresses and resources • Re-evaluate patient and family needs • Caregiver education and assistance with care • Evaluate cognition and initiate compensation	• Insurance coverage • Re-evaluate stresses, needs, and support patient and family • Address spiritual and existential needs • Support coping with dying	For both patient and family: • Address anxiety, distress, depression • Address spiritual and existential needs, concerns regarding dying • Anticipatory grief support • Assist in care provision • Post-death bereavement
D. Symptom management	• HF medications for dyspnea • Exercise/endurance training for fatigue • Antidepressant for depression (check Na^{+} with SSRIs) • Local treatment and/or opioids for pain	• Identify new or worsened symptoms • CPAP/O$_2$ for sleep-disordered breathing • Exercise program (lower extremity strengthening) • Local treatment and/or opioids for pain • SSRI or tricyclic or stimulant for depression	• Oxygen for dyspnea; consider opioids for acute relief of dyspnea • Lower extremity strengthening for dyspnea/fatigue • CPAP/O$_2$ for sleep-disordered breathing • Local treatment and/or opioids for pain • SSRI or tricyclic or stimulant for depression	• Oxygen for dyspnea • Opioids for dyspnea • Lower extremity and inspiratory strengthening • CPAP/O$_2$ for sleep-disordered breathing • Local treatment and/or opioids for pain • Benzodiazepines/counseling for anxiety • Stimulant for depression	• Opioids for dyspnea and pain • Oxygen for dyspnea • Stimulants for fatigue • Benzodiazepines/ counseling for anxiety • Lower extremity strengthening for fatigue and dyspnea • CPAP/O$_2$ for sleep-disordered breathing • Stimulant for depression

Figure 1: The four components of supportive care in HF. (Goodlin SJ et al. Consensus statement: Palliative and supportive care in advanced heart failure. Journal of Cardiac Failure, 2004, 10(3), 200–209).

1.1 Definitions

1.1.1 Supportive care

Supportive care is a holistic view of disease management offered to all patients with chronic or life-threatening illness (Fendler et al., 2005). A multidisciplinary approach is essential for the management of HF including regular re-assessment of patients' goals, values and preferences (Fendler et al., 2005). Provisional planning supports patients to identify the unpredictable deteriorations during their illness and limit feelings of loneliness and dependency that may co-exist (Fitzimons et al., 2007; Fendler et al., 2015).

The trajectory of HF makes advanced HF management and supportive care complementary (Goodlin et al, 2004), even though, the level and type of assistance required of each patient may vary (Zamanzadeh et al, 2013). Supportive care is necessary throughout HF trajectory in order to manage physical, psychosocial issues, and comorbidities to preserve or improve QoL for patients and their families (Goodlin et al., 2004). Supportive care should be responsive in changing patient's needs, especially during times of increased vulnerability, such as after discharge from hospitalization (Okediji, Salako& Fatiregun., 2017). This period of transition from hospital back to home is a period of time when patients may be more uncertain about self-management and in need of increased support to prevent readmissions (Kolhman et al., 2013; Zamanzadeh et al, 2013).

1.1.2 Social support

Social support is a multi-faced concept that positively influences disease-related outcomes in multiple chronic illnesses, including HF. (Hunt, et al., 2012; Zhang et al., 2015). Four types of social support have been found to influence disease-related outcomes in patients with HF, including emotional support, instrumental/tangible support, informational support, and appraisal support (Zhang et al., 2015). According to the framework of House et al (1988) the above concept is one of the three aspects of social support which is the rational content. The remaining two aspects are the social integration and social network. The social integration refers to the marital status, having close relationship with the family and friends and the degree by which the individual participates in different types of groups. The social network cites to the structural properties of social relationships which are measured with specific characteristics as follow: size (number of people), reciprocity (equal exchange between people), and density (degree to which members of the patient's network interact with each other) (Gallagher et al., 2011).

Evidence for the beneficial effects of social support on outcomes of patients with cardiovascular diseases and HF is growing, along with evidence that social isolation and living alone are associated with poor self-care management (Riegel et al., 2006). Structural support or the availability of support through one's social circumstances or social network has been associated with more positive health behavior and health outcomes in general medical populations and in cardiovascular population (Sayers et al., 2008). However, the concept of social support is multifaced and until today, research findings have not established to synthesize nor assess how the various aspects of social support influence self-care management (Zhang et al., 2015). While some studies describe in detail the way that family and friends can support self-care and the development of self-care skills in HF patients, most quantitative studies report no independent effect of social support on HF self-care (Gallagher et al., 2011).

1.2.3. Transitional care

Readmissions occurring within the first month after discharge are potentially preventable as could be related to the previous admission or unmet needs (e.g management of comorbidities) (Feltner et al., 2016). Up to 25 percent of patients hospitalized with HF are readmitted within 30 days (Roger., 2013; Savarese & Lund., 2017). Factors that may help to prevent readmission could be the quality of care during hospitalization, adequate discharge planning, early post-discharge follow-up or improved coordination between inpatient and outpatient health care teams (Feltner et al., 2016). Preventable readmissions can be forestalled by transitional care interventions, which are described as actions designed to ensure that all needs are identified and met, and that there is coordination and continuity of health care as patients transfer from the inpatient setting to outpatient setting or the community (Coleman et al., 2003; Feltner et al.,2016). There is a need to create seamless care systems which will include primary care, hospital and community care (Discroll et al., 2016). Transitional care needs to include the following interventions in combination: home visiting programs, structured telephone support, self-monitoring, outpatient clinic-based interventions, primarily educational interventions and liaison actions with other health professionals that may be needed (e.g psychologist, nutritionist, social services) (Feltner et al., 2016).

1.2.4 Palliative care

Palliative care according to World Health Organization (WHO) has as scope to improve the QoL and HR-QoL of patients and their families facing problems that are associated with life-threatening illnesses, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual(WHO.,2009). The need of palliative care in HF patients has been recognized for over a decade but the provided services are similar to hospice and offered only in the end of life. Recently, palliative care for HF patients is in a more holistic approach, delivered to patients along with other treatments from initial diagnosis to end of life (Hupsey et al.,2009; Hupsey, 2012). Palliative care for heart failure patients has a dual role: treating symptoms and ensuring that patients' treatment plans match their values and goals (Allen et al.,2012; Hupsey, 2012).

HF has a unique trajectory in terms of decline and death. As a result, the prognosis becomes challenging affecting the selection among therapies (Goodlin et al., 2009; Howlett et al.,2010). Even in the last stage of the disease trajectory patient may have "good days" characterized by apparent stability leading in postponing vital decisions (Allen et al.,2012). Prognostication of patient trajectory is not easy; an approach that will be characterized by early and frequent communication and education is needed, close attention to patient needs, symptoms and preferences, as well as periodic re-examination and flexible planning (Howlett et al.,2010). Frequent reappraisal of the clinical trajectory helps to calibrate expectations, guide communication, and inform rational decision-making (Allen et al.,2012).

According to the European guidelines for the management of HF four different components are composed palliative care for HF patients: communication and decision making, education, symptom management and psychological and spiritual issues (Jaarsma et al.,2009; Goodlin et al.,2009). Palliative care has to be provided simultaneously with disease modifying interventions in an effort to manage symptom, psychosocial or existential distress and to identify strategies in order to cope with HF challenging symptoms (Goodlin et al.,2009).

1.2.5 Self-efficacy and self-management

Self-efficacy is defined as a person's belief (confidence) in his or her ability to perform a set of actions; the stronger these beliefs of a person exist, the more likely he or she will initiate and continue activities that aid the attainment of a positive outcome (Fan & Lv, 2014). Self-efficacy for managing a chronic disease (SECD) is patient’s confidence on the management of the different aspects of a chronic disease, such as symptom control, role functioning, emotional functioning and communication with physicians. SECD is an important precondition for successful self-management and behavioral change (Paradis et al., 2010;Fan & Lv, 2014; Knight & Shea, 2014).

According to Orem (2001), self-care is a human regulatory function where people must act for themselves on the basis of deliberation. Self-care as a deliberate action acts to achieve a foreseen result, preceded by investigation, reflection and judgment and to appraise the situation by deliberating choice on what should be done (Orem, 2001). Nurses have a pivotal role to play in fostering patients’ autonomy by facilitating resumption of self-care and supporting self-care agency by providing information and resources that enable patients to make deliberated, self-directed choices which result in carrying out self-care activities (Moser et al., 2007).

Self-care is the cornerstone of HF management. It is comprised of adherence to behaviors, such as maintaining a low sodium diet and medication regimen, as well as symptom monitoring (self-care maintenance) to maintain physiological stability and response to symptoms when they occur (self-care management) (Dickson et al., 2011). Self-care of HF is consisted by two components: self-care maintenance and self-care management. Each process involves specific self-care behaviors aiming to maintain health and well-being (Graven & Grant., 2014; Zhang et al., 2015). According to Riegel and Dickson (2008), self-care involves a naturalistic decision-making process whereby patients make decisions based upon the situation (e.g symptoms and health conditions) (Dickson et al., 2011). Self-care in HF involves the following behaviors: 1. Patients with HF engage in routine self-care maintenance behaviors, such as taking prescribed medications, maintaining fluid volume by limiting dietary sodium intake, participating in health seeking behaviors, and monitoring for common HF symptoms. 2. Patients with HF engage in self-care management such as recognizing HF symptoms, engaging in various strategies to avoid exacerbation of symptoms, such as reducing fluid and sodium intake or taking an extra diuretic, and judging the effectiveness of treatment strategies (Lee et al., 2014).

The most influential factors in developing expertise in self-care management are knowledge and skills about HF and self-care, experience on self-care across common conditions and compatibility of the behavior (Dickson et al., 2011). Co- morbidities makes HF self-care more complicated creating barriers to HF self-care management. There are several direct and indirect barriers. Direct barriers include: the need for disease management knowledge, (e.g adjustment to diuretics in response to increases in daily weight), adherence to regimens that may not be familiar or desirable to the individual, (e.g low-sodium diet restrictions) and different instructions from multiple providers, related to different diseases. Indirect barriers include: functional status limitations related to symptoms, mobility, cognitive impairment and fatigue that impact the individual's ability to have adequate self-care management. Also, psychosocial factors such as attitudes, lack of motivation, self-efficacy, anxiety, depression, and inadequate copying mechanisms and income constraints from ageing or decreased energy (Riegel et al., 2006; Dickson, Buck & Riegel., 2011; Graven & Grant., 2014; Zhanget al., 2015). Older people, those 65 years or more (Knight & Shea, 2014) might have even more difficulties to managing their behaviors of self-care. Co-existing health illnesses, which are common in older people, complicate the treatment plan of an effective self-care management program (Zavertnik et al., 2007). Renal disease, pulmonary hypertension, chronic obstructive pulmonary disease (COPD), sarcopenia and other illnesses that interface with cardiac and vascular changes in older people and consequently transmute HF into a multisystem syndrome (Bowles et al., 2010; Forman, Ahmed, & Fleg., 2013). Although most HF patients report at least one comorbid chronic condition, creating the possibility of barriers to adequate self-care, little is known about how co-morbidity influences HF self-care leading to decompensation (Dickson et al., 2011). Given such intricacy of syndromes in the context of advanced age, medications and other standard components of HF care are intrinsically more hardly applicable. Therefore, medication regimens that would be considered standard and well-validated in younger adults are more likely to cause readmissions, falls, confusion and other multiple consequences in older people. Patients have difficulties differentiating symptoms of HF from co-existing health problems and normal ageing (Zavertnik et al., 2007).

An important component of effective self-care is patients' support. Supporting may meliorate patients' self-care confidence and therefore improve individual's ability to perform self-care at home (Zavertnik et al., 2007).

Patients often find challenging the management of numerous self-care behaviors that require ongoing commitment, alongside copying with comorbidities and daily living (Paradis et al., 2010). Confidence and conviction in performing these self-care behaviors are central factors in facilitating lifestyle changes (Graven & Grant., 2014; Zhanget al., 2015. Thus, improving HF patients’ conviction and confidence, while taking into account their readiness to change, is a promising avenue for enhancing self-care capabilities (Paradis et al., 2010).

1.2.6 Quality of life and Health-related Quality of Life

According to WHO health is defined as a “state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity (WHO, 1947). The definition and concept of QoL is not yet defined in a uniform way, lacks clarity and even creates confusion (Coelho et al., 2005). Although this is the definition used in health and social sciences, scientists adopted a policy of incorporating at least 3 dimensions regarding any scale or index purporting to measure health or QoL. Most importantly, the physical function, mental status and ability to engage in normative social interactions (Post., 2014).

There are a lot and different available definitions for QoL. Patrick and Erickson (1988) refer to QoL as the value assigned to duration of life as modified by impairment, functional status, perception and opportunity influenced by disease, injury, treatment and policy. A working group for QoL by WHO in 1998 referred QoL as “the patients’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (WHO QoL Group., 1998). As there was not a global acceptable definition for QoL, scientists turned in a more practical approach to describe aspects of QoL.

Schipper, Clinch and Olweny (1996) defined HR-QoL as the functional effect of a medical condition and/or its consequent therapy upon a patient. HR-QoL is thus subjective and multidimensional, encompassing physical and occupational function, psychological state, social interaction and somatic sensation.

2. HEART FAILURE- A COMPLEX CLINICAL SYNDROME

The diagnosis of HF can be difficult due to the pleomorphic nature of the syndrome, which contributes to the difficulty in defining and classifying HF. Furthermore, HF manifestations can be ambiguous and the comorbidities that very often co-exist in a profile of a patient with HF, make the syndrome more complex (Rosamond et al., 2012; Ponikowski et al., 2016).

2.1 Pathophysiology

HF can be defined as an abnormality of cardiac structure or function leading to failure of the heart to deliver oxygen at a rate commensurate with the requirements of the metabolizing tissues, despite normal filling pressures (Wijns et al., 2010). The heart's diminished capacity to pump results in symptoms such as generalized edema and/or pulmonary edema, respiratory problems and impaired QoL. Not all patients with HF experience the same symptoms. In recognition of this, the New York Heart Association (NYHA) has developed a classification system based on patients' functional limitations (Paradis et al., 2010). This classification ranges from 1 to 4 and has been used to describe the severity of symptoms and exercise intolerance (Ponikowski et al., 2016).

2.1.1 Heart failure Classification

HF is a clinical syndrome that may result from disorders of the pericardium, myocardium, endocardium, heart valves, or great vessels or from certain metabolic abnormalities. Most prevalent patients with HF have symptoms due to impaired left ventricular (LV) myocardial function (Yancy et al., 2013).

Although, HF may be associated with a wide spectrum of LV functional abnormalities, which may range from patients with normal LV size and preserved ejection fraction (EF) to those with severe dilatation and/or markedly reduced EF. In most patients, abnormalities of systolic and diastolic dysfunction coexist, irrespective of EF (Fonarow et al., 2007; Yancy et al., 2013).

2.1.2 Heart failure classification according to American College of Cardiology (ACC)/ American Heart Association (AHA).

In the American guidelines for the management of HF, there is indicated a classification of HF based on the EF. There are two categories; HFrEF (heart failure reduced ejection fraction) and HFpEF (Heart failure preserved ejection fraction). Although there are various definitions for

HFrEF with left ventricular ejection fraction (LVEF) to fluctuate between ≤35%, <40% and ≤45, HFrEF is defined as the clinical diagnosis of HF and EF ≤40%. The same applies for HFpEF as EF variable classified among >40%, >45%, >50%, and ≥55% (Yancy et al., 2013).

There is a difficulty in the diagnosis of HFpEF due to other potential non-cardiac causes of symptoms suggestive of HF. Thus, there are set the following criteria for the diagnosis of HFpEF: These include a) clinical signs or symptoms of HF; b) evidence of preserved or normal LVEF; and c) evidence of abnormal LV diastolic dysfunction that can be determined by Doppler echocardiography or cardiac catheterization (Vasan & Levy., 2000; Yancy et al., 2013). The classification of HF according to ejection fraction by ACC/AHA is indicated in Table 1.

2.1.3 Heart failure classification of the European Society of Cardiology (ESC).

In the European guidelines there are three different terminology classifications for HF; based on the EF, related to the time course of HF and related to the symptomatic severity of HF (Ponikowski et al., 2016).

The first classification is used more often and is based on the LVEF. Patents with HFpEF are the patients with EF ≥50% and HFrEF is referred to the patients with EF <40%. Patients with an LVEF in the range of 40–49% represent a 'grey area', which is defined as heart failure with midrange ejection fraction (HFmrEF). Patients with HFmrEF most probably have primarily mild systolic dysfunction, but with features of diastolic dysfunction. The classification of HF according to ejection fraction by ESC is shown in Table 2.

HF can also be described based on the symptoms of the syndrome and graded according to the severity of the symptoms with the NYHA functional classification. Chronic HF refers to a patient who have been treated for some time, whereas "stable" HF refers to patients with signs and symptoms of HF who are under treatment and remain unchanged for at least one month. Moreover, the term "de novo" refers to a newly diagnosed patients with acute HF, for instance after myocardial infraction. Lastly, the term "congestive" HF, is a term used in both acute and chronic HF with evidence of volume overload (McCarry et al., 2012; Ponikowski et al., 2016).

Table 1: Heart failure classification according to ejection fraction (ACC/AHA definition Yancy et al., 2013).

Classification	**Ejection Fraction**	**Description**
I. Heart Failure with Reduced Ejection Fraction (HF*r*EF)	≤40%	Also referred to as systolic HF. Randomized clinical trials have mainly enrolled patients with HF*r*EF and it is only in these patients that efficacious therapies have been demonstrated to date.
II. Heart Failure with Preserved Ejection Fraction (HF*p*EF)	≥50%	Also referred to as diastolic HF. Several different criteria have been used to further define HF*p*EF. The diagnosis of HF*p*EF is challenging because it is largely one of excluding other potential noncardiac causes of symptoms suggestive of HF. To date, efficacious therapies have not been identified.
a. HF*p*EF, Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient with HF*p*EF.
b. HF*p*EF, Improved	>40%	It has been recognized that a subset of patients with HF*p*EF previously had HF*r*EF. These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. Further research is needed to better characterize these patients.

Table 2: Classification of HF according to ejection fraction by ESC

Type of HF		HFrEF	HFmrEF	HFpEF
Criteria	1	Symptoms ± signs	Symptoms ± signs	Symptoms ± signs
	2	LVEF < 40%	LVEF 40-49%	LVEF ≥ 50%
	3	-	Elevated levels of natriuretic peptides At least 1 additional criterion: a. Relevant structural heart disease (LVH and/or LAE) b. Diastolic dysfunction	Elevated levels of natriuretic peptides At least 1 additional criterion: a. Relevant structural heart disease (LVH and/or LAE) b. Diastolic dysfunction

Moreover, HF can be classified with the severity of the symptoms, using the NYHA functional classification, which has been used to describe the severity of symptoms and exercise intolerance (Criteria Committee., 1994). The term ‘advanced HF’ is used to characterize patients with severe symptoms, recurrent decompensation and severe cardiac dysfunction. A similar classification is done by the ACC/AHA to describe the stages of HF development based on structural changes and symptoms (Yancy et al., 2013). A parallel indication of NYHA functional classification and ACC/AHA stage classification is indicated in Table 3.

Table 3: HF classification based on symptom severity

NYHA Functional class	ACC/AHA stage
I. No physical limitation	A. At risk of heart disease but no structural disease
II. Slight limitation of physical activity in the form of moderate exertion	B. Structural disease but no prior or current symptoms of heart failure
III. Marked limitation of physical activity in the form of minimal exertion	C. Structural with past or current symptoms of heart failure
IV. Inability to exert because of symptoms of heart failure at rest.	D. End-stage disease (does not respond satisfactory to treatment)

2. 2. Epidemiology

HF is a major public health problem characterized as pandemic affecting at least 26 million people worldwide with increased prevalence (Roger., 2013; Savarese & Lund., 2017). The overall HF prevalence increases significantly with ageing, particularly among patients >64 years. Also, patients with HFpEF are ever increases (Gomez-Soto et al., 2011).

In 2006 the prevalence of HF in Germany was 1.6 % in women and 1.8 % in men, with numbers increasing considerably with advancing age. In Sweden, in 2010, the crude prevalence of HF was 1.8 % and was similar in men and women, but after adjustment for demographic composition the estimated rate was 2.2 %, with a weak decrease in temporal trend in women but not men between 2006 and 2010 (Savarese & Lund., 2017). An overall estimation of the incidence and prevalence of HF is indicated in Figure 2.

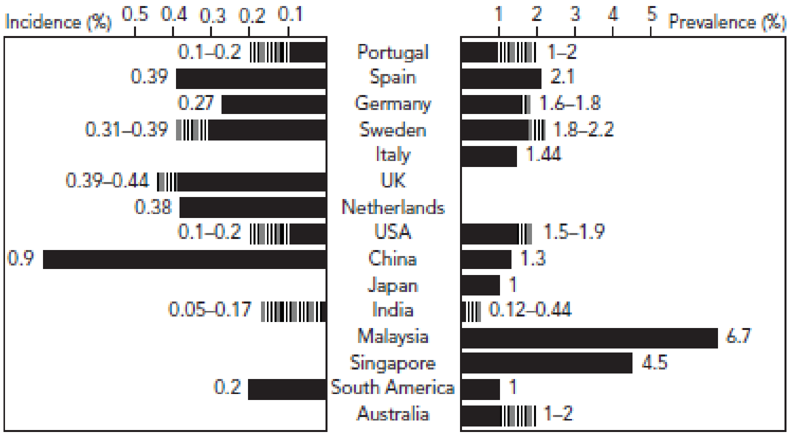


Figure 2: Prevalence and Incidence of Heart Failure Worldwide (Savarese G, Lund LH. Global Public Health Burden of Heart Failure. *Card Fail Rev*. 2017;3(1):7–11. doi:10.15420/cfr.2016:25:2).

Over the past 60 years, the incidence of HF in the USA has stabilized and standardized. Age-adjusted rates are thought to be decreasing. Between 1950 and 1999, the incidence of HF in women from the Framingham cohort reduced from 420 to 327 cases per 100,000 person-years. However, this reduction was not observed for men, whose HF incidence remained at approximately 564 cases per 100,000 person-years (Ziaeian & Fonarow., 2016). In a large cohort study performed in Olmsted Country (Minnesotta, U.S.A), is reported that between 2000 and 2010, the age-adjusted and sex-adjusted incidence of HF declined from 315.8 to 219.3 per 100,000 residents in the Olmsted County cohort, a 37.5% decline over the decade (Gerber et al., 2015).

2.3 Mortality

A diagnosis of HF has previously been described as more ‘malignant’ than cancer, given the comparatively low 5-year survival rates (Ziaeian & Fonarow, 2016). Despite advances in treatment, HF remains a chronic, progressive, and eventually fatal illness (Discroll et al., 2016). After the diagnosis of HF, survival estimates are 50% and 10% at 5 and 10 years, respectively (Roger et al., 2013).

Older people with HF have high mortality rates, with 1- and 5-year mortality rates of 20% and 59%, respectively, among HF patients 65 to 74 years old (Murad et al., 2015). A major contributor of mortality is comorbidity. Some comorbidities and most measures of functional and cognitive impairments are associated with increased mortality (Ruiz-Laiglesia et al., 2014; Murad et al., 2015). Furthermore, some comorbidities were found to be independently associated with all-cause and HF hospitalization; the presence of diabetes mellitus, atrial fibrillation or chronic kidney disease were independently associated with both HF and all-cause hospitalization and with mortality in HF patients (Farre et al., 2017). Moreover, Ruiz-Laiglesia et al (2014) in their study referred that the degree of physical or mental disability, the number of hospitalizations, the number of drugs, the average length of stay and in-hospital mortality were significantly higher in patients with higher comorbidity (Ruiz-Laiglesia et al., 2014).

Mortality for hospitalized HF has improved over the past decade. Between 1999 and 2011, in-hospital mortality decreased by 38%, 30-day mortality by 16.4%, and 1-year mortality by 13.0% for patients with HF in the USA (Krumholz, Normand & Wang., 2014). A large retrospective cohort study conducted in England found that survival rates in patients with HF were 75.9% at one year, 45.5% at five years, 24.5% at 10 years and 12.7% at 15 years, highlighting the same time that age at diagnosis was a significant determinant of subsequent survival (Taylor et al., 2017). In Europe, the Euro Heart Failure Survey compared prognosis in 3,148 patients with HFpEF and 3,658 with HFrEF, reporting higher 90-day mortality in those with HFrEF (12 %) compared with HFpEF (10 %) (Savarese & Lund., 2017). Survival after a diagnosis of HF has shown only modest improvement in the 21st century and lags behind other serious conditions (Savarese & Lund., 2017; Taylor et al., 2017).

2.4 Heart Failure And Comorbidities

HF has become a major cause of morbidity and mortality worldwide, mainly as the result of the ageing of the population and complex non-cardiac co-morbidities affecting other organ systems (Murad et al., 2015). Of those, renal disease, anemia, diabetes mellitus and COPD are the most common, with prevalence of > 20% (Lainscak, et al., 2009). At least 70% of HF patients are over 70 years old. Older patients often have multiple chronic illnesses (comorbidities), which influence their HR-QoL and prognosis and their ability of using resources (Ruiz-Laiglesia et al., 2014). HF is the most common principle diagnosis of disease between people that are 65 years old or more (Zavertnik, 2007). Even the term “HF” contributes to disproportionate age-relation, since “HF” is often diagnosed by non-specific symptoms (fatigue, dyspnea and weakening) and signs in association with a broad spectrum of pathophysiology, that are all common among older people (Forman, Ahmed & Fleg., 2013).

It is rarely for HF to occur alone in a patient's disease profile. In a large national sample of Medicare beneficiaries, 86% of HF patients had two or more non cardiac comorbidities and more than 25% had 6 or more (Dickson, Buck, & Riegel, 2011; Murad et al., 2015). Most common reported co-morbidity conditions are diabetes, hypertension, rheumatoid arthritis, stroke, COPD and renal disease (Dickson, Buck, & Riegel, 2011). Although each of these diseases alone stress the individual, certain comorbidities, such as diabetes and renal failure place the HF patient at higher risk for increased morbidity, mortality and health care costs. Half of HF hospitalizations are due to associated comorbidities, particularly renal insufficiency and diabetes mellitus (Ruiz-Laiglesia et al., 2014). HF involves a complex self-care regimen that includes adherence to prescribed treatment and frequent need for symptom management (Riegel et al., 2009). In light of the prevalence of comorbidity in patients with HF, understanding how a comorbid condition influences self-care behavior among patients with HF is critical (Dickson, Buck, & Riegel, 2011).

2.5 Economic burden of HF

According to Maru et al (2014), the concept of disease management programs started with the expectation that the interventions could be cost-saving when applied to chronic diseases. In addition to the effort made the recent decades, the cost-effectiveness of cardiovascular disease management programs is inconsistent (Maru et al., 2014). HF studies have shown a variety of results regarding the effectiveness and cost savings of HF disease management programs; some studies suggest that disease management improves clinical outcomes and also reduces costs, but others indicate clinical effectiveness, but at higher costs (Miller et al., 2009).

Cardiovascular disease (CVD) is the largest contributor to the chronic disease cluster (Maru et al, 2014). Hospitalization for HF in particular, has a significant socioeconomic burden and HF is the most common reason of hospitalization in older people, exceeding a million admissions per year, both in US and in Europe. The direct mean cost of a single episode of hospital admission for HF in Europe lasts on average 7 days and has been calculated to €3200; an expenditure representing only ward costs, laboratory investigations and medical therapies and excluding invasive diagnostic or therapeutic modalities or hospitalization in Intensive Care Units that might raise substantially the cost (Parisis et al., 2015). Up to 75% of re-hospitalizations for HF have been considered preventable as they have been related to incomplete management of congestion during index admission, incomplete prescription and poor adherence to recommended drug regimens and improper management of cardiovascular and non-cardiovascular comorbid conditions (Farmakis et al, 2015).

Despite knowledge on what kind of behaviors are needed for HF self-care, a comparatively large number of interventions and some encouraging early results and recent systematic reviews indicate that the evidence for the effectiveness of these programs is equivocal (Currie et al., 2014). Although self-care education is a core component of patient management, very few HF patients are able to adequately engage in self-care behaviors. In fact, poor self-care is accountable for up to half of hospital admissions (Dickson, Buck & Riegel., 2011).

There are several factors that may account for this. Despite current guidelines, hospital/service provision of training and staff for HF education is insufficient to meet the existing demands of health care services. Many patients with HF may have impaired cognitive function. This makes learning new self-care skills problematic. Furthermore, some patients with HF are clinically depressed or experience depressive symptoms that can undermine their motivation and ability to adopt new self-care routines. And lastly, knowledge itself may not provide enough impetus and support to negotiate the considerable challenges of initiating and maintaining health behavior change (Stut, et al., 2015).

2.6 Health Related Quality of Life

HF treatment aim is not only to relief symptoms and improve the prognosis of the patient. Health care professionals' (HCP's) key target is to maximize function in everyday life and to achieve the highest possible level of HR-QoL (Juenger et al., 2002; Lewis et al., 2017).

QoL reflects the multidimensional impact of a clinical condition and its treatment on patients' daily lives (Westlake et al., 2002). Patients with HF have markedly impaired QoL compared to with other chronic diseases as well as healthy population (Heo et al., 2009). Moreover, HR-QoL decreases as NYHA functional class worsens (Nieminen et al., 2015).

Furthermore, it reflects the multidimensional impact on patients' daily lives and it is influenced by a multitude of factors derived from the physical, emotional and social situation of the patient (Gallagher, Lucas & Cowie., 2019). Patients with HF experience various physical and emotional symptoms such as dyspnea, fatigue, edema, sleeping and depression (Gallagher, Lucas & Cowie., 2019; Nieminen et al., 2015; Heo et al., 2009). These symptoms limit patients' daily physical and social activities and result in poor QoL. The same time this multidimensional consistency of QoL makes it difficult to be categorized (Nieminen et al., 2015; Heo et al., 2009). Thus, there are disease specific tools measuring HR-QoL as those tools offer valuable information including the perceptions of patients and how HF affects their daily lives (Bilbao et al., 2016). A few HF-specific questionnaires measuring HR-QoL are the following: Minnesota Living With Heart Failure Questionnaire (MLHFQ), the Chronic Heart Failure Questionnaire (CHFQ), the Quality of Life Questionnaire for Severe Heart Failure (QLQ-SHF), the Kansas City Cardiomyopathy Questionnaire (KCCQ) and the Left Ventricular Dysfunction questionnaire (LVD-36).

3. HF- THERAPEUTIC APPROACHES/ CHRONIC HEART FAILURE

Although HF management and therapy has improved considerably in the last decades by the achievements in pharmacological and non-pharmacological treatment, HF still has a poor outcome prognosis, (van der Wal et al., 2010). Patients who are overall compliant with the non-pharmacological recommendations have fewer HF readmissions and fewer days in hospital for HF compared with non-compliant patients (van der Wal et al., 2010). More details for non- adherence are prescribed in Chapter 3.4.

3.1 Non-pharmacological treatment

Non-pharmacological management has a major role in the treatment of HF patients and has found to benefit HF population (Rabelo et al., 2012). The essential component of non-pharmacological management is self-care management that can be achieved through education (Lambrinou et al., 2014). There are some life-style modifications that patients have to adopt in order to remain healthy and avoid acute events.

Fluid and sodium management

Congestion, or fluid overload, is a classic clinical feature of patients presenting with HF (Pellicori et al., 2015). Clinical congestion refers to the presence of signs/symptoms related to elevated intra-cardiac filling pressures. These pressures may begin to increase days till three weeks prior to the development of symptoms or weight gain. Beside from this potential redistribution, true accumulation of fluid due to sodium and water retention secondary to adaptative neurohormonal changes is also in progress (Parinello et al., 2015).

Although guidelines for HF recommend restriction to fluid and sodium intake, this recommendation lacks scientific documentation and in the latest ESC this recommendation stated as ‘avoid excessive fluid intake’ and ‘weight-based fluid restriction may cause less thirst’ (McMurray et al., 2012; Ponikowski et al., 2016). More specifically, the Heart Failure Society of America recommends 2,000–3,000 mg daily sodium intake for patients with the clinical syndrome of HF and preserved or depressed EF, with further restriction (<2,000 mg) for moderate to severe HF and patients with recurrent or refractory volume overload. European Guidelines indicate restriction of sodium intake to <2,000 mg/day in symptomatic patients (Alderman & Cohen., 2012).

Regarding fluid restriction, the recommendation is 1.5–2 liters/day during the initial management of an acute event of HF related with volume overload in symptomatic patients with severe hyponatremia (<130 mEq/L) and in all symptomatic patients demonstrating fluid retention that is difficult to manage despite high doses of diuretic and sodium restriction. More strict fluid restriction is recommended in patients with more severe hyponatremia (serum sodium <125 mEq/L) (Parinello et al., 2015). To implicate these recommendations, patients have to regularly monitor their weight every day and if an increase of around 2 kg occur within 2-3 days, then a treatment titration is needed (Dickstein et al., 2012).

Smoking and alcohol

Smoking increases systolic and diastolic blood pressure, total systemic vascular resistance, pulmonary artery pressure, and pulmonary vascular resistance, all of which are risk factors for HF. Also, is associated with carbon monoxide exposure, increasing oxidative stress which lead to impaired mitochondrial function, inflammation, impaired endothelial function (Kamimura et al., 2018). Endothelial dysfunction and inflammation may affect cardiac structure and function directly (influence on the myocardium) or indirectly (accelerating arterial atherosclerosis and augmented LV afterload). Furthermore, carbon monoxide exposure may cause LV hypertrophy and systolic dysfunction independently of its effect on endothelial function or blood pressure (Bye et al., 2008).

Quit smoking has clinical benefits for patients with HF and health professionals (HP's) should promote and monitor smoking cessation. Past-smokers have 30% lower mortality risk compared to current smokers (Lightwood et al., 2001). Even in patients with established and serious cardiovascular disease, smoking cessation is an effective measure for preventing hospitalization and death (Suskin et al., 2001).

There is confusion regarding dose-adjustment of alcohol and risk factor of cardiovascular disease (Piano., 2017; Djoussé & Gaziano,. 2008). The acute effects of alcohol on the myocardium include a weakening of the heart's ability to contract (negative inotropic effect), it can provoke arrythmias and even artery hypertension (Djoussé & Gaziano., 2008). In the European Guidelines is recommended abstinence in patients with alcohol-induced cardiomyopathy otherwise, two (2) units per day in men or one (1) unit per day in women (one unit is 10 mL of pure alcohol) (McMurray et al., 2012).

Physical activity

HF is characterized by intolerance to exercise, with these patients often experiencing early fatigue and shortness of breath. It was used to advice patients with HF to avoid physical activity (PA). Nowadays, PA has been considered to be an essential part of HF management programs (Sato et al., 2012). PA is considered an integral component of the non- pharmacological management of HF patients as is shown to have substantial physiological and psychological benefits (Fleg et al., 2014). Patients with HF experience discomfort during PA due to symptoms such as dyspnea and fatigue (Alosco et al., 2015). It is recommended to HF patients to exercise (favorably aerobic training) for 20–60 min on 3–5 days per week at moderate-to-high intensity. In deconditioned patients, it is recommended to start low intensity PA and with shorter time (5-10 minutes) and frequency (twice a week). If well tolerated, gradually patients can reach the above recommendation (Piepoli et al., 2011). It is shown that PA reduces depression, a frequent co-morbid condition in HF population and has a positive effect in clinical outcomes (e.g mortality) (Blumenthal et al., 2012). More specifically, the study of Gerber et al (2011) found that active patients after myocardial infarction have half the risk of dying compared with patients not performing PA. Although, the actual mechanism is still unknown, a possible explanation is the linkage of depression with the sympathetic nervous system activity; decreased heart rate variability, increased inflammation, hypercoagulable blood and endothelial dysfunction (Sherwood et al., 2009). All these variables have been found to link to adverse clinical outcomes in patients with HF which are remarkably improved with exercise (Tu et al., 2014).

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Immunization

Immunization is recommended to HF patients as it will help them to avoid viral respiratory infections and/or secondary influenza associated bacterial pneumonia (DaSilva & Rohde., 2018). Influenza infection has been shown to directly depress myocardial contractility via the action of proinflammatory cytokines. Vaccination for influenza and pneumococcal pneumonia represents a potential cost-effective means by which to prevent lower respiratory infection in HF population is prevented (Bhatt et al., 2018).

It is noteworthy to refer that although vaccination is recommended in guidelines this is based more in clinical practice. Evidence show that patients with HF present a blunted response, with reduced humoral and altered cell-mediated responses to influenza vaccine, which may decrease the degree to which those with HF are protected by yearly vaccinations (DaSilva & Rohde., 2018). Nevertheless, a recent large nationwide cohort study indicated that influenza vaccination is associated with a reduced risk of all-cause and cardiovascular death and annual vaccination of patients with HF is associated with a reduced risk of death compared with less frequent vaccination. Also, vaccination earlier in the year may be more protective than vaccination later on (Modin et al., 2019).

Sexuality

Patients with HF may report a decrease in sexual performance, a loss of sexual pleasure or satisfaction, a decrease of sexual interest and a decrease in the frequency of sex (Jaarsma., 2017). In the American guidelines is referred that HF patients with compensated and/or mild HF (NYHA I or II) are capable for sexual activity. Sexual activity is not advised for patients with decompensated or advanced HF (NYHA III or IV) until their condition is stabilized and optimally managed (Levine et al., 2012).

Symptoms like dyspnea and angina rarely appear in patients during sexual activity who not have those symptoms in moderate PA (Kostis et al., 2005; Levine et al., 2012). A large proportion of male HF patients (estimates around 80%) face erectile dysfunction (Hebert et al., 2008). Women refer other types of sexual dysfunction such as decline in sexual interest or desire (Steinke et al., 2010). For men there is treatment for erectile dysfunction; phosphodiesterase type 5 (PDE-5) inhibitors. They are safe and effective in patients with systemic arterial hypertension, stable coronary artery disease, and compensated HF. Although, PDE-5 inhibitors should be used with caution in cases of intermediate cardiac risk and must be avoided in patients with high cardiac risk or patients who are taking nitrates (Jaarsma., 2017). Individualized assessment and recommendation must be offered in patients with HF regarding sexual activity (Levine et al., 2012).

Travel

The cabin pressure and the anxiety that a person can experience during air flight have an effect on oxygen saturation. Thus, is recommended for HF patients to use oxygen during flight if they have a sea-level PaO_2 of 70 mmHg or lower, or with an expected PaO_2 of 55 mmHg or lower during a flight (Ingle et al., 2012; Izabi et al., 2014). Furthermore, pre-flight activities such as carrying heavy baggage through check-in or long walking distance to and from gate areas may result to increased activity that cannot meet (Izabi et al., 2014).

In general, is recommended to all patients with HF to consult their doctors before travelling. Patients must carry a list of their medications using the generic name and dosages for each drug and a brief letter from their physician describing patient's medical problems (Possick., 2007; Izabi et al., 2014). Furthermore, patients with cardiac pacemaker or implantable cardioverter defibrillator could be safely fly and will not be affected by airline metal detectors (Izabi et al., 2014).

3.2 Pharmacological treatment

Angiotensin-converting enzyme inhibitors (ACEIs)

ACEIs have been shown to reduce mortality, morbidity and frequency of hospitalization in patients with HFrEF and are recommended unless contraindicated or not tolerated in symptomatic patients (Pitt et al., 1999). Several trials evaluated the effectiveness of ACEIs such as CONSENSUS (Consensus Trial study 1987) and SOLVD (SOLVD Investigators 1991) and their findings are in linear. ACEIs should be up-titrated to the maximum tolerated dose in order to achieve adequate inhibition of the renin-angiotensin-aldosterone system (RAAS) (Ponikowski et al., 2016).

Beta- blockers

B-blockers as ACEIs must start since the diagnosis of HFrEF is established (Ponikowski et al., 2016). One of the earliest neurohumoral changes in HF is sympathetic activation. Short period sympathetic activation improves peripheral perfusion by increasing heart rate and myocardial contractility (Chatterjee et al., 2013). Thus using b-blocker in the treatment of HF has beneficial effect for the patient as shown in several studies; Cardiac Insufficiency Bisoprolol Study II (CIBIS II), (CIBIS-II Investigators and Committees 1999) Carvedilol Prospective Randomized Cumulative Survival (COPERNICUS) (Packer et al., 2002) Metoprolol CR/XL Randomized Intervention Trial in Congestive Heart Failure (MERIT-HF) (Hjalmarson et al.,2000) and the Study of the Effects of Nebivolol Intervention on Outcomes and Rehospitalisation in Seniors with Heart Failure (SENIORS) (Flather et al., 2005). Beta-blockers should be initiated in clinically stable patients at a low dose and gradually up-titrated to the maximum tolerated dose.

Mineralocorticoid/aldosterone receptor antagonists (MRAs)

Regulation of aldosterone synthesis is regulated by angiotensin-II and by plasma potassium. Spironolactone or eplerenone is recommended in all symptomatic patients with HFrEF and LVEF ≤35% (Packer et al., 2015). Therapy with MRA is effective for the patients in terms of hospitalization and mortality as shown in RCT studies (Pitt et al., 1999; Pitt et al., 2003; Zannad et al., 2011)

All patients with reduced LVEF ≤35% and persisting symptoms despite therapy with an ACEI and a beta-blocker should receive an MRA unless there are contraindications (Zannad et al., 2011).

Diuretics

Loop diuretics are recommended in chronic HF to prevent signs and symptoms of congestion (Ponikoswki et al., 2016). Is generally advised to use the lowest possible dose of diuretics and the dose of the loop diuretic often needs to be adjusted to the individual’s need (Galve et al., 2005; Mullens et al., 2019). The target is to achieve euvolemia and the dose of the diuretic must be adjusted as referred above (Mullens et al., 2019).

Angiotensin receptor neprilysininhibitor (ARNI)

The therapeutic concept of the ARNI is based on the established inhibition of the RAAS and an increase in endogenous natriuretic peptides by blocking their degradation. Inhibition of neprilysin counteracts the neurohumoral activation, which leads to vasoconstriction, sodium retention, and cardiac remodeling, increasing the RAAS-blocking effects (McMurray et al., 2014). Currently the "LCZ696," which is comprised of an ARB (valsartan) and a neutral endopeptidase inhibitor (sacubitril) is used in the treatment of HF. As shown in a large RCT (PARADIGM-HF), ARNI therapy acts in favor of the patients in terms of cardiovascular mortality and hospitalization (McMurray et al., 2014; Packer et al., 2015). Even more recently, in the TRANSITION trial (Pascual-Figal et al., 2018; Wachter et al., 2019) it was shown that therapy with ARNI can be safely initiated after an acute decompensated heart failure episode, even in patients with de novo HF and ACEI/ARB naïve therapy (Wachter et al., 2019; Senni et al., 2020). The mechanism by which sacubitril/valsartan reduces cardiovascular mortality is not fully understood. Although, it has been hypothesized that neprilysin inhibition possibly reduce the risk for fatal ventricular arrhythmias, by reducing myocardial fibrosis and ventricular hypertrophy or attenuating progressive ventricular remodeling (Sokos and Raina., 2020). It is noteworthy to mention that neprilysin inhibition and RAAS blockade have been shown to be renal protective. The synergistic effect of inhibiting neprilysin and the RAAS provides a 32% reduction in the risk of decline in renal function (Bodey, Hopper, Krum., 2015). Those data lead to the conclusion that the beneficial effects of this therapy are related to specific amelioration of HF disease pathways (Sokos and Raina., 2020).

I_f-channel inhibitor

One of the novel therapies of HF in heart rate control. Beta-blockers are used to achieve heart rate control, but up-titration may lead to adverse events (Granger et al., 2003). Ivabradine targets the sinus-atrial node and slows the sinus rhythm through If-channel inhibition. Thus, have to be introduced only in patients with sinus rhythm. The SHIFT trial (Swedberg et al., 2010) have indicated beneficial effect regarding hospitalization and cardiovascular mortality; the use of ivabradine is recommended in the ESC guidelines for patients with HFrEF with sinus rhythm (a heart rate ≥70 bpm) and persisting symptoms despite therapy with an ACEI, beta-blocker and MRA (Ponikoswki et al., 2016).

3.3 Pharmacological treatment of HF patients with preserved EF

Patients with HFpEF are more likely to be older, female, have multiple co-morbid conditions and no drugs have yet been shown to improve morbidity and mortality (Ziaeian et al., 2017). Current recommendations for management of HFpEF are to control cardiovascular and non-cardiovascular comorbidities and use diuretics to manage fluid status (Ponikowski, P., et al., 2016). The primary therapeutic goal is to improve symptoms such as dyspnea or edema; using diuretic therapy. It is noteworthy to mention that hospitalization and mortality in HFpEF patients are frequently due to non-cardiovascular events (Berliner & Bauersachs., 2017). Thus, screening and treating the comorbidities of those patients is vital (Ponikowski, P., et al., 2016).

As applies for HFrEF, lifestyle modification including weight reduction, dietary consumption, physical activity, and cardiorespiratory fitness is associated with reductions in important HF risk factors (Pfeffer, Shah & Borlaug., 2017).

3.4 Adherence to the therapy

Half of the HF readmissions are assumed preventable, identifying poor adherence with recommended self-care as the reason of decompensation (Marti et al., 2013). According to WHO (2003) adherence to the therapy is defined as "the extent to which a patient's behavior in taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider" (WHO, 2003). The concept of adherence is recognizing the patient's right to choose if will follow or not treatment recommendations (Robinson et al., 2008).

Adherence in chronic diseases is a multifactorial issue since several factors may be involved in this behavior. Specifically, five dimensions are found to be related: health system, social/ economic factors, condition-related factors, therapy related factors and patient-related factors (Figure 3) (WHO., 2003). Those factors are shown to have a pivotal role for HF patients as well (da Silva1et al., 2015). Thus, a PCC approach is needed in the design of a study and HPs must take into consideration those factors and in collaboration with the patient in the development of a self-care management program (Lambrinou et al., 2014).

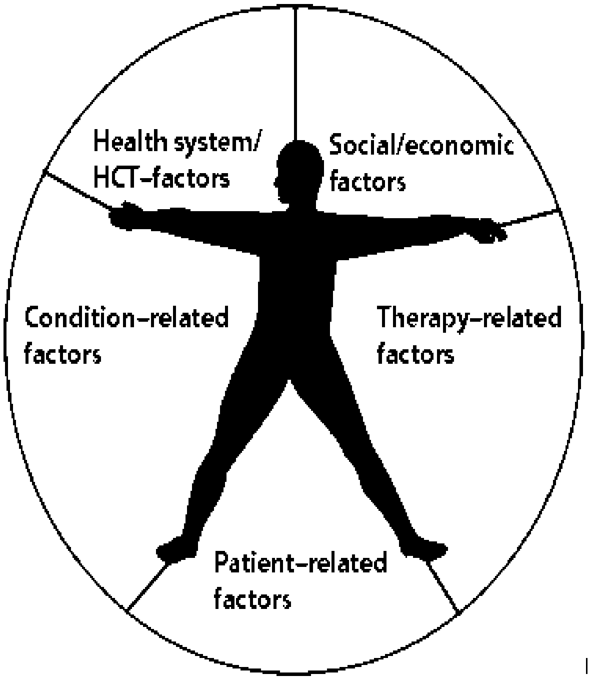


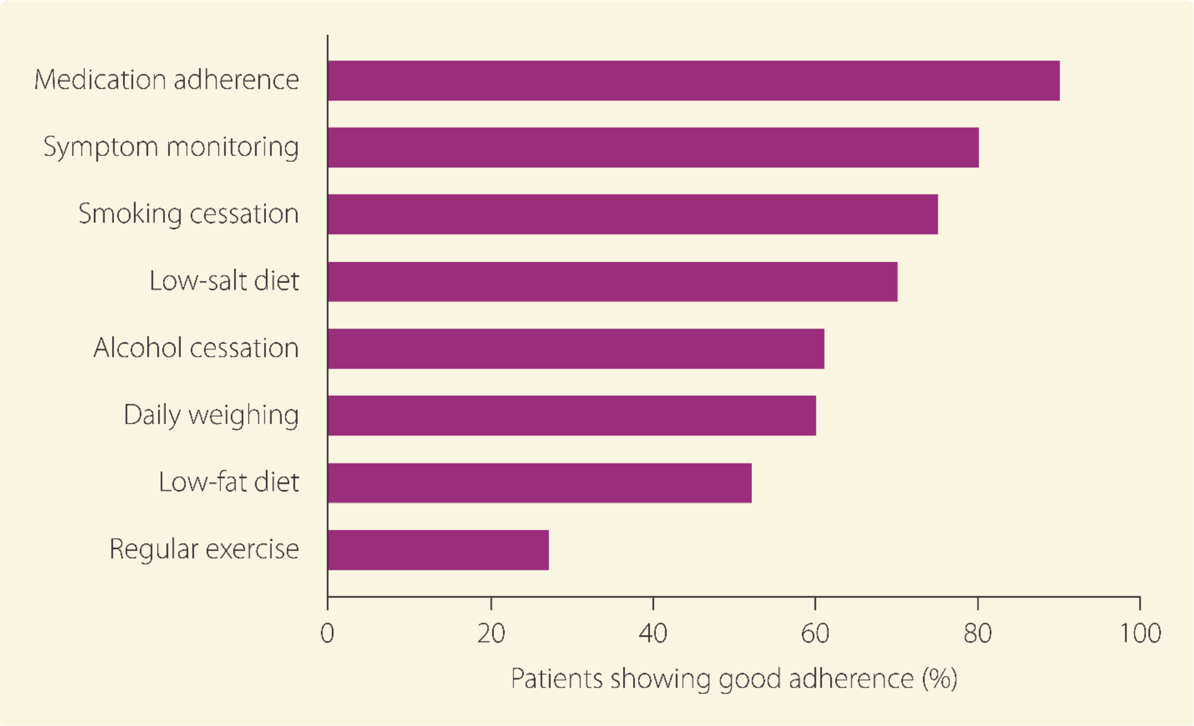
Figure 3: The 5 dimensions of adherence for chronic diseases as stated by the WHO (World Health Organization: Adherence to long-term therapies. Evidence for action. Geneva: World Health Organization; 2003).

Self-care is a complex process and has been found to be an important influence on both medical- and person-centered outcomes in patients with HF. Non- adherence might be related to the complexity of self-care, lack of perceived need for self-care, the long-term character of the behavioral changes needed, and/or due to the lack of motivation (Jaarsma et al., 2017). HF management involves a complex self-care regimen of implementing a number of HF-related practices such as, taking low sodium diet, taking prescribed medications appropriately, keeping physically active, monitoring for symptoms of fluid retention by body weight measurement, and limiting excess fluid intake (Riegel et al., 2009; Seid, Abdela, Zeleke.,2019).

Patients that are aware and well informed of the signs, symptoms and self-care behavior related to HF may perform better self-care than the patients who have ignorance (Seid, Abdela, Zeleke.,2019). As found in two different studies, lower HF knowledge is significantly associated with poor adherence to self-care recommendations (Sewagegn et al., 2015; Matsuoka et al, 2016). In overall, adherence to self- care recommendations remain low and in fact the studies of Seid, Abdela, Zeleke (2019) and Sewagegn et al (2015) estimated a percentage of 22.3% and 17, 4%

respectively. Although, in another study (Marti et al., 2013) the overall adherence found to be greater (35.7%), is still low. Patients adhere more in medication treatment and the struggle more in lifestyle modification behaviors such as exercise and daily weighting (Table 4) (Marti et al., 2013).

Table 4: HF patient's adhere to self-care recommendations. Marti CN, Georgiopoulou W, Giamouzis G, et al. Patient-reported selective adherence to heart failure self-care recommendations: a prospective cohort study: the Atlanta Cardiomyopathy Consortium. Congest Heart Fail. 2013;19:16-24



3.5 Discharge plan

The readmission rate after discharge from hospital is substantially high with up to 50% of patients being readmitted within 6 months (Gheorghiade et al., 2013; Chamberlain et al., 2018). Adding to that, the risk of death is greatest in the early period after discharge (Taylor et al., 2019). These data suggest that increased surveillance in the early post-discharge period after HF admission is fundamental (Leventhal et al., 2011; Moertl et al.,2017). Post-discharge disease management programs have been established to prevent readmissions and reduce mortality and healthcare costs (Moertl et al., 2017).

Discharge planning must be design as soon as the patient is stabilized. It requires physiological assessment of haemodynamic stability and symptoms and assessment of the social environment into which the patient will be discharged (Riley &Masters., 2016). Furthermore, HCP’s must assess patients’ ability and capacity to self-care (Kavalieratos et al., 2017). Only then, an individualized multidisciplinary management plan can be developed, including information and education for medication and lifestyle modification and any plans for involvement of other health or social care services needed (Ponikowski et al., 2016; Riley &Masters., 2016).

4. HEART FAILURE MANAGEMENT PROGRAMS

Although pharmacological therapy has shown to improve outcomes over the last 10–15 years, management programs are needed to optimize care (Ekman et al., 2012). These programs, however, have been very heterogeneous and lack a shared definition of what elements are necessary for improved outcomes (Leventhal et al., 2011). The heterogeneity regards the nature in terms of the models of care they have employed including: multidisciplinary HF clinics, multidisciplinary follow-up without HF clinics, telephone contact, primary care follow-up, home visit programs and enhanced patient self-care. Most of them have used specialist personnel including cardiologists and HF nurse specialists within the multidisciplinary team (McDonagh et al., 2011; Feltner et al., 2014; Moertl et al., 2017).

Even though there are a lot of successful management programs, re-hospitalizations have not been improved and more studies are needed to clarify what components make such a program successful in long term (Kyriakou et al., 2019). It is noteworthy to mention that in a recent review, Healy et al (2019) stated that a disease management program (DMP) must focus on preventative therapies aiming to reduce hospitalizations, proposing that a structured framework between the primary care setting and the DMP is required. Such a protocol will allow a risk stratification of patients accompanied with earlier diagnosis and management (Healy et al., 2019).

4.1 Multidisciplinary team and nurses' role

Delivering multidisciplinary interventions to patients with HF not only reduces hospital admission but also is an effective method for reducing mortality (Holland et al., 2005). The ESC strongly recommends (recommendation class I, level of evidence A) that HF care must be provided in a multidisciplinary manner (Ponikowski et al., 2016) as there is evidence for the effectiveness of these programs regarding mortality, readmission and length of hospital stay (McAlister et al., 2004; Feltner et al., 2014).

A number of RCTs of multidisciplinary managed care versus usual care and meta-analyses indicate a reduction of hospitalization and mortality and improvement in cost-effectiveness (Moertl et al., 2017). Specifically, a systematic review of 29 trials showed that specialized multidisciplinary care in the clinic or non-clinic setting reduced mortality by 25%, HF hospitalizations by 26% and all-cause hospitalizations by 19% (McAlister et al., 2004). A multidisciplinary team must be composed by HF practitioners and experts in allied health professions, including pharmacists, dieticians, physiotherapists, psychologists, primary care providers and social workers who must have close collaboration between them (McDonagh et al., 2011).

As stated in Guidelines the management of HF have to be delivered by a multidisciplinary team that includes a specialist HF nurse (McDonagh et al., 2011; Ponikowski et al., 2016). The role of nurses in the management of HF patients can take many forms dependent on the available sources and services in each country. For instance, nurses can perform home visits, telephone contact, facilitating telemonitoring, running nurse- led clinics, or a combination of those actions (McDonagh et al., 2011; Lambrinou et al., 2012; Clark et al., 2016). Their role expands further than this and HF specialist nurses can also educate other health professionals that are involved in the management of HF patients and patient's family as well (McDonagh et al., 2011; Lambrinou et al., 2012; Albert et al., 2015). Nurse's role also includes providing the patient and family with education, optimizing medication, and monitoring for early indicators of clinical decompensation (Riley et al., 2016).

The HF specialist is the liaison person of HF patients and health care services (Albert et al., 2015). Nurses using a holistic approach care could early identify patients' individual needs and to coordinate care among all HPs (Lambrinou et al., 2018). It is noted that HF nurses specialists have a pivotal role in the management of those patients as they make an important contribution to their care; improving patient's quality of life, decreasing hospital admissions and length of stay (Austin et al., 2012).

Till now it was clear that nurses had a central role in HF patients' management after decompensation, for the period after hospital discharge (McDonagh et al., 2011; Albert et al., 2015). Nowadays, this role expands further and nurses can be responsible during a patient's admission; they can monitor and triage patients, be the key person for communication between and within the HF team, and the patient and/or family, and to coordinate discharge planning (Riley et al., 2016).

4.2 Person -Centered care approach

The WHO and Institute of Medicine at the US National Academy of Sciences have identified PCC as a core ingredient of quality care for the chronically ill patient (Committee on Quality of Health Care in America., 2001; Ekman et al., 2012). PCC highlights the importance of knowing the person behind the patient, as a human being with reason, will, feelings, and needs, in order to engage the person as an active partner in his/her care and treatment (Ekman et al., 2011). Often patient's do not understand their prognosis (Allen et al., 2008) and they overestimate the benefits of life-prolonging treatments (Steward et al., 2010), defying the impact on their QoL. This gap can be addressed by the PCC approach that actively encourages patient involvement in the disease process while recognizing the patient as a 'whole person' (Kane et al., 2017). Giving the patient the opportunity to present her/himself as a person in the form of an illness narrative is the starting point for building a collaborative, equalitarian provider (care and treatment expert)-patient (person expert) partnership that encourages and empowers patients to actively take part in finding solutions to their problems (Ekman et al., 2011). Through PCC patients collaborate with HPs and they are informed about treatment options. Considering patients' preferences, values, beliefs, illness understanding, illness experience and information needs, patients are involved in the decision-making process. This process is part of advanced care planning aiming to encourage patients' engagement and collaboration in goal setting (Brannstrom &Boman., 2014; Blom et al., 2015; Kane et al., 2017).

5. SUPPORTIVE CARE

Supportive care is “the care that helps the patient and people important to them to cope with life-limiting illness and its treatment – from before diagnosis, through diagnosis and treatment, to cure or continuing illness, or death and bereavement” (WHO, 1998). Supportive care is a framework developed and widely used for patients with cancer to conceptualize what type of help cancer patients might require and how planning for service delivery might be approached (Fitch., 2000).

5.1 Development of supportive care

Supportive care as definition first appeared in the 80’s in an effort to address patient’s needs from the side effect and impact of chemotherapy (Senn., 1993; Klastersky et al., 2015). Introducing chemotherapy and radiotherapy, the therapeutic approach for cancer is changing, but the side effects and the prolong of life create other needs to these patient’s, impairing their quality of life (Cancer supportive care., 2008). The term supportive care was proposed as a comprehensive “umbrella” aiming to cover all the needs of cancer patients as illustrated in Figure 4 (Senn et al., 1993).

A year later a supportive care framework was developed by Fitch et al (1994), described as a comprehensive program to meet “patients’ physical, informational, emotional, psychological, social, spiritual, and practical needs during the pre-diagnostic, diagnostic, treatment and follow-up phases” (Fitch 1994). Patients may enter cancer care in different pathways, thus following their unique case supportive care follow their trajectory and address their needs (Figure 5) (Fitch., 2008).

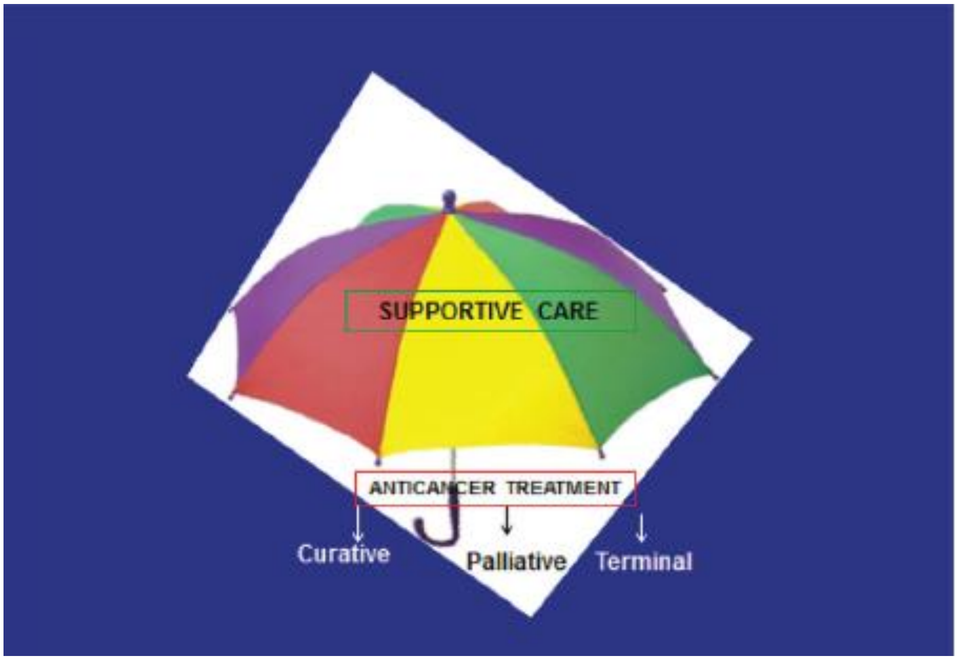


Figure 4: Comprehensive approach of supportive care. (Senn HJ 1993. Quality of life in cancer patients: whose business is it anyway? Support Care Cancer 1:115).

Sometimes other terms as palliative care or terminal cause confusion and the lack of clear definition and holistic use represents a barrier to clinical communication and research, therefore, several reviews conducted to address this lack a clarity (Hui et al., 2013; Hui et al., 2014). To fully understand the concept of supportive care, it is essential to clarify that palliative care (or terminal care) is a part of supportive care, a very important part, mainly concerned the internal and psycho-social part of supportive care (Klastersky et al., 2015). Figure 6 shows schematically the differences between the terms as illustrated in a recent systematic review aiming to clarify the definition of those terms (Hui et al., 2013).

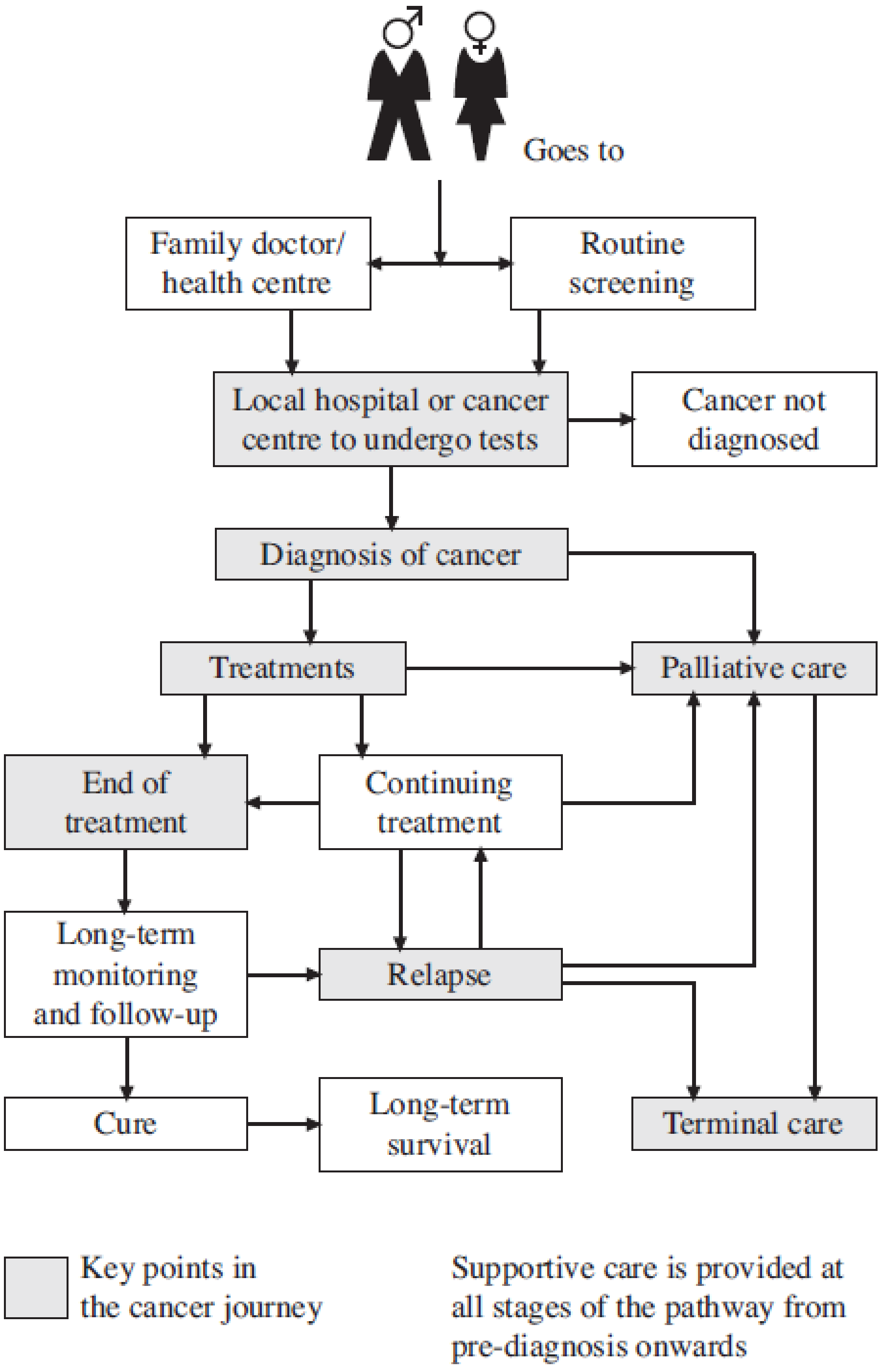


Figure 5: Supportive care pathway based on patient's illness. (Fitch MI. Supportive care framework. Can Oncol Nurs J. 2008; 18(1):6–24).

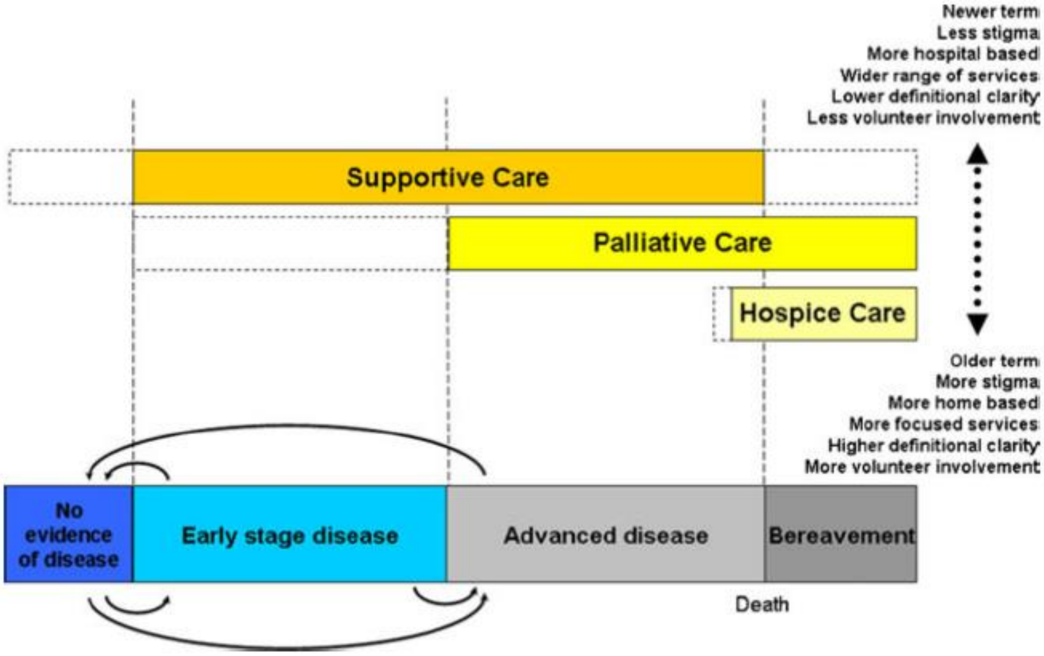


Figure 6: Supportive, Palliative and terminal (hospice) care spectrum. (Hui D, De La Cruz M, Mori M et al (2013) Concepts and definitions for « supportive care », « best supportive care », « palliative care », and « hospice care » in the published literature, dictionaries, and textbooks. Support Care Cancer 21:659–685).

5.2 Supportive care in HF

Supportive care is necessary throughout HF trajectory in order to manage physical, psychosocial issues, and comorbidities to preserve or improve HR-QoL for patients and their families (Goodlin., 2004; Kolhmann et al., 2013). HF patients have unmet needs as they have higher needs regarding daily living (Kolhmann et al., 2013). There is recognition for the benefits of supportive care for patients with HF as this is referred to guidelines (Jaarsma et al., 2009; Ponikowski et al., 2016), although there is little consensus regarding specific practices (Diop et al., 2017). Supportive care is a multidisciplinary holistic care provided in the patient and his family, from the time of diagnosis along with treatment aims to prolong life and improve QoL and into end of life care (Okediji, Salako& Fatiregun., 2017).

HPs must always bare in mind the unpredictable trajectory of the illness. It consists of acute events followed by stabilization, which can last weeks to months (Hupsey, Penrod & Fenstermacher., 2009). Consequently, supportive care must be offered personalized to patients.

HPs must be aware of the unmet needs of each patient with HF in an ongoing process, as the needs of HF patients change rapidly depending on the trajectory of the illness (Murray et al., 2007).

5.3 Supportive care model for heart failure patients- Goodlin model

HF trajectory unlike of the one of cancer, is unpredictable, characterized by acute events and followed be periods of stabilization (Figure 7), making prognosis challenging (Ghashghaei, Yousefzai & Adler.,2016; Hritz et al., 2018). Supportive care is this kind of care needed to meet the ongoing needs of the patients as the needs change according to the passage of time, the evolution of patient's illness, the socio-economic factors (Havranek et al., 2015) (his environment, his abilities, his family and friendly environment (Fry et al.,2016), the country's health care system, the technology and the possibilities of its application in everyday life and in chronic diseases in general (Gee et al., 2015). Supportive care in HF is composed by four different components as descripted by the model of Goodlin et al., (2004); communication, education, symptom management and psychological and spiritual issues (Figure 1). This is in linear with the guidelines of palliative and supportive care in HF followed nowadays (Jaarsma et al., 2009; Sobanski et al., 2019).

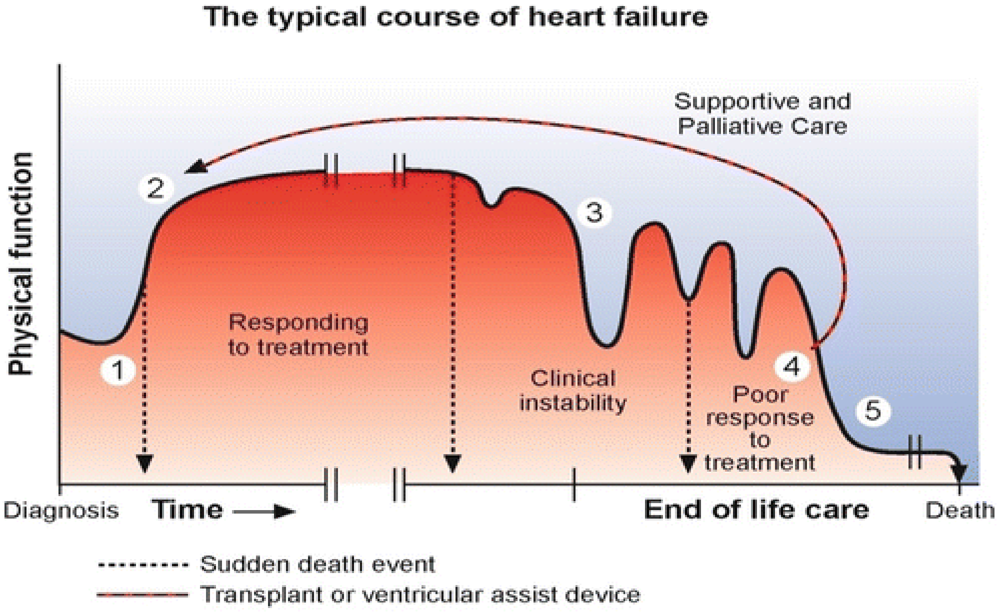


Figure 7: Trajectory of heart failure. (Goodlin SJ et al. Consensus statement: Palliative and supportive care in advanced heart failure. Journal of Cardiac Failure, 2004, 10(3), 200–209).

5.4 The significance of supportive care in heart failure

The nature of HF makes supportive care complementary (Goodlin et al, 2004), even though, the level and type of assistance required of each patient may vary (Zamanzadeh et al, 2013). Supportive care is necessary throughout HF trajectory in order to manage all aspects of health aiming to improve the HR-QoL for patients and their families (Goodlin et al., 2004). Supportive care should be responsive in changing patient's needs, especially during times of increased vulnerability, such as a period after an acute event (Ghashghaei, Yousefzai & Adler.,2016). Through continuing assessment of patient's needs, advance care planning (ACP) can introduced and modify following patient's course to meet his/her goals and values (Sobanski et al., 2019). ACP is "a process that enables patients to define goals and preferences for future medical treatment and care, to discuss these goals and preferences with family and healthcare providers, and to record and review these preferences if appropriate" (Rietjens et al., 2017). Early implementation of supportive care is necessary for patients with HF in order to ameliorate symptoms, carry out the expressed wishes of patients, and provide emotional support for their loved ones (Kolhman et al., 2013; Ghashghaei, Yousefzai & Adler.,2016).

SPECIFIC SECTION

6. METHODS

The following chapter includes all methodology procedures used and undertaken for the establishment of the aims of the study.

6.1 Aim of the Study

Efficient health care systems for the management of chronic diseases in the community may improve clinical outcomes and simultaneously encourage patients to remain healthy. Supportive care, may contribute to empower HF patients for self-care management and providing them with the follow-up and care based on their needs and values through the HF trajectory. To develop the current program an assessment of the supportive needs of HF patients was undertaken, taking into consideration their personal preferences, for instance means of communication and way of exercise as part of the intervention. The present study aspired to evaluate the effectiveness of an individualized supportive care management program in terms of the four different components that comprise supportive care in HF (communication, education, psychological and spiritual issues and self-management). The objectives of this study were to:

a) Determine supportive care needs of HF patients as reported in the literature.
b) Explore Cypriot patients' identified supportive care needs.
c) Develop and pilot-test a self-management supportive care program for HF patients in times 0, 1month and six months.

The main outcome for the pilot study was to explore the difference in HR-QoL among patients receiving supportive care interventions compared to usual care.

The secondary objectives were to investigate the difference between patients receiving supportive care interventions and usual care in terms of:

- Knowledge and their adaption of the knowledge as a health care behavior
- Anxiety and depression
- Perceived social support
- Exercise tolerance (Self-reported measurement)

- Acute events and deterioration (mortality and rehospitalization)
- Needs for information, communication, and assistance with care;

6.2 Hypothesis Testing- Null hypothesis (Ho) and Alternative hypothesis (H1):

Null hypothesis (Ho): There is no difference between patients receiving supportive care intervention and patients receiving standard care in terms of HR-QoL.

Alternative hypothesis (H1): There is positive effect in HR-QoL in patients receiving supportive care interventions compared to patients receiving supportive care.

6.3 Study Design

This is a multi-method study for developing and testing a supportive care management program for HF patients. The Medical Research Council framework for complex interventions was followed for the development of the management program. A sequential exploratory approach was used to test the content of the developed interventions. The following phases of the study were conducted:

6.4. Ethical considerations

This research was established on a voluntary basis for each patient; thus, an informed consent form has been signed from each participant. The form includes a brief description of the research study. After the description of the study the possibility of questions given to the patient. It was also clarified that patient's personal data were used only for the study. In this way, the privacy and confidentiality of the research study is ensured. Every patient was informed that he/she can step-out of the research at any time he/she wishes to and the delivered treatment is not affected in any way, either he/she participates to the study or not. Only the person who will participate in the research could decide and sign the consent form. All procedures were in line with the instructions given by the Data Protection Commissioner for maintaining confidentiality. The study involves no risk or harm to the participants. The investigation conforms to the principles outlined in the Declaration of Helsinki.

Another issue that was handled is respect for the diversity of human society. The body of research which was provided and was available to policy makers, have to reflect the diversity of the population. In order to meet these expectations, demographic and medicine history of the patients was collected.

Approval by the Cyprus Bioethics Committee and the Data Protection Office was sought and granted. License by the Scientific Committee for the Promotion of Research and by the Ministry of Health of Cyprus were also sought and granted. Each hospital's management office, and cardiology departments were informed and given the opportunity to review the study protocol and make suggestions before approvals. Main investigators are also waiting to get a registration number in the database of ClinicalTrials.gov

6.5. Study Development

6.5.1 Phase I Development

1. a) Systematic review and meta-synthesis.

The first step of the study design was competed by conducting a systematic review of qualitative studies in order to determine what has been reported as support needs of patients with HF. The support needs extracted, served as a "guide/assistant" for the next phase (Focus Groups).

b) Systematic review and meta-analysis.

A systematic review and meta-analysis were conducted to identify which supportive care interventions ware effective and what must be included in those programs.

2. Focus groups exploring patients' views on their support needs were also conducted, to determine if the literature reflects their needs or if specific areas are missing. The most important aspects of care identified by patients' questions/aspects were extracted. Two focus groups were conducted. Each focus group should be consisted by 7-10 patients who had not been hospitalized for at least one month.

3. The most frequent support needs of patients with HF in Cyprus were determined from the literature review and the focus groups. Findings served as a guide for the nurses delivering the intervention.

4. The intervention was developed based on the four components identified as essential tailored to address supportive needs as identified by Cypriot patients.

6.5.2 Phase II

Phase 2 is consisted of a pilot and feasibility study to determine whether the intervention can be implemented in Cyprus, whether it is acceptable to patients, and potential effect on patients' outcomes. This information will allow the intervention to be refined, and a randomized controlled trial to be planned and conducted.

6.5.2.1 Sample and setting

Pilot testing of the intervention was undertaken in two public hospitals. The sample of the study consisted of patients over 18 years old, diagnosed with HF (HFpEF or HFrEF), established by a cardiologist. Hospitalized patients were eligible for the study if they: 1) had been diagnosed with HF based on systolic or diastolic dysfunction as diagnosed by a cardiologist, 2) NYHA classification stages I-IV, 3) were able to understand, write and read in Greek language.

The exclusion criteria were HF patients who:1) have refused to take part in the research, 2) had dementia or other severe mental illness that would not allowed them to participate to the study, 3) were transferred to nursing homes after discharge, 4) were not possible to contact them by a phone call and 5) were patients with chronic degenerative diseases (Alzheimer, cancer, etc). The above criteria exclude potential confounding factors.

Sample size: The pilot test included thirty-five patients in total. This sample size will provide an opportunity to evaluate the content of the intervention as the feasibility and the acceptability from the patients prior to planning a clinical trial. The number of patients can characterize as adequate for the purpose as for the same population pilot studies were performed with approximate same number of patients (Flynn et al., 2005; Klompstra et al., 2014)

Follow-up: The follow up period will be six months as this was considered to be a sufficient timeframe to observe the effectiveness of the supportive program.

Initiating a management program by incorporating structured pre-discharge care for patients with HF before patients' discharge is important (Phillips et al., 2005; Yu et al., 2006). Comprehensive discharge planning and transition care are common components of the in-hospital phase of HF disease management programs (Lambrinou et al., 2012). Eligible patients were approached and invited to participate in the study by a member of the research team before hospital discharge. Patient-centred discharge plan was developed during patient's hospitalization taking into consideration the patient's, his family or/ and the caregiver or environment wishes and possibilities. The patient and his family are considered to be essential for exchanging developing a trustful relationship among the "sample" and researchers and the development of a continuing person-centred care (CPCC) program (Andrietta et al.,2011; Ekman et al., 2011). The researcher informed the patient about the following: what the research includes, the purpose of the research and he/she can step-out of the research any time he/she desires. It was highlighted their treatment will not be affected whether they participate in the research or not.

6.5.2.2 Randomized Controlled Trial

The random allocation of subjects is used to ensure that the intervention and control groups are similar in all respects with the exception of the therapeutic measure being tested (Kabisch et al., 2011). The patients were assigned to the intervention and control group with a ration 2:1. Predictability of group allocation was avoided by ensuring that researcher was unaware to which treatment the next patient will be allocated. The random distribution of patients in the two groups was done by a member of the research team who did not participated in the recruitment of the sample. The random allocation was developed using a software program. To predict selection bias, the researcher was blinded regarding the group allocation of the next patient. To achieve this, closed envelopes were used for the recruitment, which the researcher opened after the patient agreed to participate in the research and signed the informed consent form.

"Double blinding" could not be achieved as patients should be informed before signing the consent form to participate in the research. Thus, after opening the envelop, both the patient and the researcher were aware in which group will be the patient.

6.5.2.3 The development of the 'SupportHeart' Program

Patients were recruited from the hospital just before their discharge. Patients were asked to sign an informed consent in order to participate in the research program after they were informed for the context of the research. Patients allocated in the intervention group received an educational booklet material and the first brief educational session was conducted by the nurse in the bedside of the patients before their discharge. This first session aimed to induct the patient in the educational concept and was the begging of a therapeutic alliance.

Then, the nurse conducted the patient forty-eight hours post-discharge, in order to find out how patients are getting along and answer any arisen questions. The first meeting was arranged within a month and patients were educated with the main principles regarding HF. The educational sessions that were scheduled once a month, were approximately two hours long and included information about the syndrome of HF, pharmacological and non- pharmacological treatment/self-management actions as follow: low- sodium diet, monitor weight, daily fluid volume, breathing more effectively, coughing techniques, quitting smoking, managing fatigue, coping with stress, medication adherence, physical activity, socializing, relaxation, early detection of decompensation signs.

An assessment in terms of the four components of supportive care was also established for each patient using the model of Goodlin et al., 2009 for providing evidence-based disease-modifying interventions in supportive care (Figure 1). Patients were asked to identify their communication needs and preferences during the educational sessions, and the nurse interacted with the patient and answer any queries regarding HF syndrome for both HF knowledge and self-management as well as finding along with the patient a sufficient management program. Furthermore, patient’s psychological and spiritual needs were assessed using the hospital anxiety and depression scale (HADS).

During the monthly meetings patients along with researchers assessed the effectiveness of the self-management program, changing or improving the program and discussing issues and things the patient needs concerning their condition and management program. Possible solutions and available services for those issues were referred to the patient. Furthermore, the nurse conducted the patients by phone call, in order to empower them, and discuss with them once a month. The patients had a conduct number of the nurse which could call whenever they want or need to. After the first month of hospital discharge, in three- and six-months period, patients were conducted by phone call and assessment was established using questionnaires.

6.5.2.4 “SupportHeart” -Mechanism of action

Each person has emotional, psychological, social and spiritual needs that fluctuates depend on circumstances, thus persons develop skills to meet these needs (Mashlow 1998; Danesh., 2012).

The illness narrative of HF makes needs' satisfaction more demanding due to the changing nature of needs, the variation of patients' response to everyday living and to unexpected events, along with the complexity of coping behaviors (Goodlin et al., 2004; Fitch et al., 2008; Hritz 2018). HF patients' care needs vary during the course of illness depending on their current state of illness and individual requirements (Klindworth et al., 2015). Through supportive care, HP's offer systematic, holistic assessment and regular monitoring of the patient's physical condition and medication as well as the information needs and psychosocial concerns of patient and care (Boyd et al., 2009). Thus, the close and continuing individualized assessment offered through the supportive care program gives both, patients' and HPs' the capacity of early recognition and action to meet patients' needs according to their preferences and values. Supportive care should be offered following the needs of the patients' in an ongoing process following the illness trajectory (Goodlin et al., 2004; Buck & Zambroski., 2012) and this concept applies to our interventions.

Patients need a therapeutic alliance with HP's in a supportive, continuing relationship. HP's must have the ability to coordinate and plan their care proactively, offer individualized information, and foster self-management (Boyd et al., 2009). The intensive nature of the intervention along with the therapeutic alliance among the patient and the HP's create this supportive relationship through the 'SupportHeart" program. Thus, patients can feel this close manner and trust HP's to communicate more effectively and collaborate with them developing a care plan following the illness trajectory.

Programs for long-term conditions such as HF, need to include a framework that ensures regular review along with a shift in care goals and the services provided as patients' condition progresses meeting patients' needs in each time point (Boyd et al., 2009). The interventions for each patient must be according to each patients' needs, goals, and ways of coping. Coping with life-threatening illness is influenced by an his/her perception of the condition and a series of factors such as socio-economic status, educational background and social support (Fitch et al., 2008). Patients often have different ways of coping even in similar situations; to ensure the effectiveness of an intervention must be in accordance with patient's goals and values (Ekman et al., 2011).These can be feasible through the individualized and close follow-up of the interventional program.

6.5.2.5 Quantitative data

Quantitative data were gathered using the following questionnaires:

a) The Greek version "Minnesota Living with Heart Failure questionnaire" (MLHFQ) which assesses HR - QoL (Rector et al., 1987; Lambrinou et al., 2013)
b) The Greek version "Self-care of Heart Failure Index" (SCHFI), which evaluate patients' knowledge and their adaption of the knowledge as a health care behavior (Riegel et al., 2009)
c) The Greek version "Multidimensional scale of perceived social support" (MSPSS) (Zimet, Dahlem, Zimet & Farley, 1988; Theophilou et al., 2015)
d) The Greek version of the "European Heart Failure Self-Care Behavior Scale" (Gr9-EHFScB) measuring knowledge regarding HF (Jaarsma et al., 2009; Lambrinou et al., 2014)
e) The Greek version of the "Hospital and Anxiety depression scale" (HADS) measuring anxiety and depression (Zigmond &Snaith et al., 1983; Michopoulos et al., 2008)
f) The Greek version of the "International Physical Activity Questionnaire" **(**IPAQ), measuring self-report measure of habitual physical activity. (Craig et al., 2003; Papathanasiou et al., 2009)
g) Measurement of acute events; readmission and mortality.

Description of questionnaires

Minnesota Living with Heart Failure Questionnaire

This questionnaire is a disease-specific questionnaire measuring HR-QoL. Is one of the most widely used questionnaires measuring HR-QoL in HF population and has been translated and culturally adapted into at least 34 languages, demonstrating good psychometric properties (Bilbao et al., 2016). The questionnaire has been developed by Rector et al., (1987) measuring 21 items using a 6-point Linkert scale (0-5), with score ranging from 0-105, with higher scores indicting lower quality of life (Garin et al., 2009). The tool measures scores for two dimensions, physical (8 items) and emotional (5 items). The remain eight items are only considered for the calculation of the total score (Hak et al., 2004; Bilbao et al., 2016). In some cases, during translation and for conceptual validation, researchers end up with a third dimension; the social dimension (Bilbao et al., 2016). This also applies for the Greek version of the MLWHFQ which conducted in 2013 (Lambrinou et al., 2013).

Self-care of Heart Failure Index

This is a 22-item instrument with three scales. The scales are the components consisting HF self-care; maintenance, management and confidence (Riegel et al., 2009). Section A asks patients how frequently they utilize self-care maintenance behaviors to manage HF, section B asks patients how often they have experienced trouble breathing or ankle swelling and section C measures how confident are patients practicing self-management of HF (Riegel et al., 2004). Each scale uses a 4-point self-report response format: 1 (never or rarely), 2 (sometimes), 3 (frequently), 4 (always or daily). Each scale score is standardized to a 0 to 100 range; higher scores indicate better self-care. Authors refer a cut-point of ≥70 on each scale of the tool to judge self-care adequacy. The tool is update and the used form of the tool is the 6th version (Riegel et al., 2009). The questionnaire translated and adopted in order to be used in this research study after the necessary license from the researcher who developed it. More details on the translation and validation of the tool are referred in Chapter 7.1.4.

Multidimensional scale of perceived social support

The MSPSS is a 12- item questionnaire, measuring the perceived adequacy of the available amount of social support from friends, family and significant other/special person. All questions are rated in a seven-point Likert scale; with responses ranging from very strongly disagree (=1) to very strongly agree (=7). The total scores range from 12 to 84, with higher score reflecting higher amount of available social support (Dahlem et al., 1991; Dambi et al., 2018). The questionnaire has good psychometric properties and have been adopted and translated in more than fifteen different languages (Dambi et al., 2018), among them in Greek language as well (Theophilou., 2015). This questionnaire was also checked for the population of HF and found to be is a reliable and valid instrument to measure perceived social support in patients with HF (Chamboulidou et al., 2016; Shumaker et al., 2017).

European Heart Failure Self-Care Behavior Scale

The 9- item European HF Self-Care Behavior Scale (EHFScBS-9) uses a 5-point Likert-type scale with 1 equaling ‘I completely agree’ and 5 equaling ‘I don’t agree at all’, measuring HF-related self-care behaviors. The total score is calculated by summing the ratings for each item.

The total score ranges from 9 to 45 with higher scores indicating poorer self-care behaviors. The EHFScBS-9 have been translated in several languages, displaying sufficient psychometric properties (Kato et al., 2008; Koberich et al., 2013; Vellone et al., 2014), and the Greek version of the tool has acceptable psychometric testing (Lambrinou et al., 2014).

Hospital and Anxiety depression scale

The HADS is a screening questionnaire developed by Zigmond and Snaith (1983) aiming to detect clinically significant anxiety and depressive symptoms in patients (Zigmond & Snaith., 1983). The questionnaire is consisted of two subscales; one measuring anxiety and the other depression, each consisting of 7 items. There are two ways of interpreting the HADS scores; either by comparing an individual's score to normative values obtained from a sample of the general population, or by using cut-off scores that indicate different levels of clinically relevant distress. In the latter way three cut-off levels are used: a score between 8 and 10 indicate a mild case, 11–14 a moderate case and 15 or above, a severe case (Snaith & Zigmond., 1994; Crawford et al., 2001). The Greek version of the questionnaire performed by Michopoulos et al (2008), showing good psychometric properties.

International Physical Activity Questionnaire

PA can be assessed using subjectively or objectively. The subject measure using questionnaires is easier. This questionnaire developed to measure health-enhancing physical activity covering most daily situations. The IPAQ covers four domains of physical activity: work-related, transportation, housework/gardening and leisure-time activity. The questionnaire also includes questions about time spent sitting as an indicator of sedentary behaviour. In each of the four domains the number of days per week and time per day spent in both moderate and vigorous activity are recorded. At work, during transportation and in leisure time, walking time is also included (Craig et al.,2003; The International Physical Activity Questionnaire., 2005). In recent studies, the IPAQ seems to be used most often and it is by far the most widely validated questionnaire at present (van Poppel et al., 2010). The Greek version of the IPAQ found to have acceptable reliability properties, showed high repeatability values for total and vigorous physical activity and good values for moderate and walking physical activity (Papathanasiou et al., 2009).

Statistical Analysis

Baseline comparisons across the control and intervention groups was explored for all demographic characteristics, clinical characteristics, comorbidities, risk factors and Chronic Conditions, and for the scale's dimensions. Statistical comparisons were performed using the "Kruskal Wallis Test" for continuous variables, the Chi-Square test for categorical variables with all expected cell counts >=5, and the Fisher's exact test for categorical variables with any expected cell count <5 (McDonald., 2014). Missing values in the scales have been imputed using the multiple imputation algorithm (Haukoos & Newgard., 2007). However, the multiple imputation was not performed on the instances were more than 50% of the scales' items were missing. Furthermore, the scales reliability explored using Cronbach's alpha internal consistency index. The scales' reliability was explored at the baseline measurements. For the acute events, survival analysis was performed. Kaplan Meir curves and the log-rank test were utilised to explore the difference between Control and Intervention with regards to the time until the first acute event. Moreover, cox regression was utilised to quantify the effect of the intervention on the hazard for an acute event while controlling for demographic and clinical characteristics. Statistical analysis was conducted in the statistical software R v.3.6.1.

6.5.2.6 Qualitative data

Open-ended questions were to assess:

a) Patient values and expectations and the degree to which their preferences are incorporated into the plan of care. Their satisfaction reflects the perceived support of the supportive care program.
b) Patient and family needs for information, communication, and assistance with care; the extent to which these needs were met.

7. RESULTS

The first phase of the research consisted by four steps following sequential exploratory approach in order to shape and develop the intervention.

7.1 Phase I

7.1.1. Description of reviews

Systematic review and meta-synthesis

The systematic review was conducted to identify primary qualitative studies assessing the supportive needs of HF patients as they identify them. The meta-synthesis summarized the main supportive needs and a semi-structured questionnaire was created to be used in the focus groups as a "guide" (Appendix I). The main extracted outcome was what patients describe as important needs and which intervention/assistance was effective for them. The context was qualitative studies including adults with HF who interviewed about their supportive needs. Even though evidence exists for successful management programs that improve HF-related outcomes, such as readmission rate, patients' testimonies may show different results (qualitative studies). So, in order to develop a patient -centred program, it is important to know what are patients' needs based on their perspectives.

Patients' with HF psychological and social needs include empathy, counselling, need of independence, financial and practical help and support to fulfill family and social roles. To meet these psychological needs, they need to repair their sense of self which is disrupted by the syndrome (Goodlin et al.,2004). Patients with HF experience changes on the physical, emotional, cognitive, social, economic and spiritual domain of their lives that can directly affect their HR-QoL. Although the experience of patients living with HF varies; every patient has its individual experience which is unpredictable. At the same time, literature shows that there are common aspects in this experience (Graven &Grant 2014). Even though evidence exists for successful management programs (Liberati et al.,2009) that improve HF-related outcomes such as readmission rate (Garin et al., 2009; Lambrinou et al., 2013), patients' testimonies may show different results (qualitative studies). Qualitative studies have already carried out the explore of patients with HF needs (Aguado et al., 2010; Schulz et al., 2010; Gari et al., 2011; Wang et al.,2015). Although, a qualitative meta-synthesis will give the opportunity to intergrade and synthesize the literature provided and guide clinical practice and future research. In addition, the results of a meta-synthesis can help HP's to develop interventions focusing on patient's true needs and expectations and detect vital aspects of the experiences of these patients that are currently not being addressed.

So, in order to develop a person -centred program, it is important to know what are patients' needs based on their perspectives. This will contribute to the development of person-centred management programs. For people with HF, support, understanding, receiving comfort and being treated as a whole and unique person are vital (Wang et al., 2015; Gari et al., 2011). That could be offered to a patient through supportive care as is the "care that helps the patient and people important to them to cope with life-limiting illness and its treatment – from before diagnosis, through diagnosis and treatment, to cure or continuing illness, or death and bereavement" (Smeulders et al., 2010) aiming to improve their HR-QoL supporting them (Brodie et al., 2008). The aim of the review and meta-synthesis was to identify the needs of HF patients as they describe these themselves.

Two of the researchers undertook an electronic search in the databases of PubMed, CINAHL, PsycoINFO, and EBSCO. The methodological quality of the included articles was assessed using the Consolidated criteria for reporting qualitative studies (COREQ) item checklist. A "thematic synthesis" methodology was used to undertake the meta-synthesis. This method was a three-step process: 1. Free line by line coding of the findings of the primary studies, 2. Free codes extracted were then organized into related areas to build descriptive themes and 3. Analytical themes were developed. After this process, researchers went beyond the systematic synthesis of primary studies and interpreted the findings-results in a critical way. "New" themes were created to combine similar needs emerged for the meta-synthesis. The final themes provided were: continuing person-center care, social support, supportive care, palliative care and self-care management. Also, all discussions among researchers revealed the need for continuing support of the patients in order to be able to cope with the needs raising through the HF trajectory; and that is how the core theme was raised and researchers developed the core theme: 'Wind beneath my wings' (Figure 8).A description and relevance of the core theme and each of the main themes is listed below.

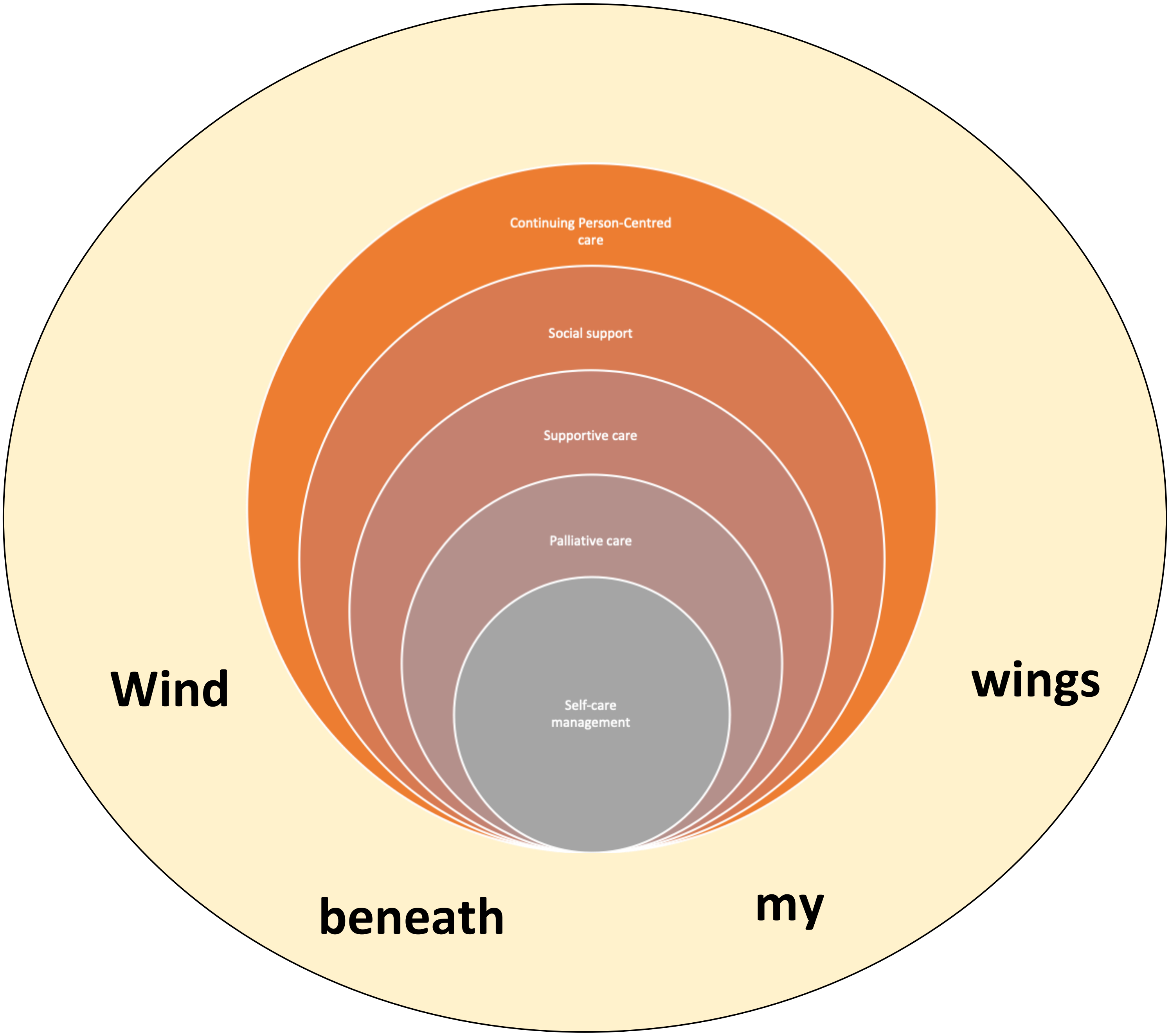


Figure 8. Final themes covering all topics related to patients' with heart failure needs.

Core theme: Wind beneath my wings

Researchers identified the mechanism to meet the needs extracted from the literature review and the meta-synthesis that is continuing empowerment and support and the core theme: ‘Wind beneath my wings’. Results also showed five different categories to cover patents’ needs, interacting with each other: Self-management, palliative care, supportive care, social support and CPCC.

“[…] I would like to know, what the problem is. I would like to know, what treatment I need which one I should emphasize”.

Main themes

Self-care management

Self-care is the cornerstone of HF management. Self-care is comprised of adherence to behaviors, such as maintaining a low sodium diet and medication regimen, as well as symptom monitoring (self-care maintenance) to maintain physiological stability and response to symptoms when they occur (self-care management) (Dickson et al., 2011).

“[…] How to protect myself and avoid risk factors […] As long as I have ways to obtain the information, I hope I can get as much information as I can”

Palliative care

Palliative care for patients with HF has a dual role: treating symptoms and ensuring that patients’ treatment plans match their values and goals (Hupsey., 2012; Allen et al., 2012). According to WHO (2009) palliative care provides care in the relief of pain and other distressing symptoms; affirms life, and regards dying as a normal process; intends neither to hasten nor postpone death and offers a support system to help patients live as actively as possible until they die. This holistic approach also addresses the psychological and spiritual aspects of patient care and supports the family and informal careers during the illness and into bereavement.

“This made me feel sick, uncomfortable. If you see what …Is this your last hour? […]”

Supportive care

Supportive care is necessary throughout HF trajectory in order to manage physical, psychosocial issues, and comorbidities to preserve or improve QoL for patients and their families (Hupsey., 2012). Supportive care should be responsive in changing patient's needs, especially during times of increased vulnerability, such as after hospital discharge.

"[…] it's good when you have someone who looks after you […] I do not want too much care […] too much responsibility"

Supportive care is "the care that helps the person and people important to them to cope with life-limiting illness and its treatment – from before diagnosis, through diagnosis and treatment, to cure or continuing illness, or death and bereavement" (Goodlin et al., 2004).

Social support

Social support is a multi-faced concept that positively influences disease-related outcomes in multiple chronic illnesses, including HF (Hunt et al., 2012; Zhang et al., 2015).

"I don't meet people […] very very lonely. Very very lonely"

"I am worried I do not have someone to live with. I live here alone no one even to make me a cup of tea"

Four types of social support have been found to influence disease-related outcomes in patients with HF, including emotional support, instrumental/tangible support, informational support, and appraisal support (Zhang et al., 2015). Social support distinguishes to informal and formal. The former refers to family members, friends, and neighbors besides while the latter to professionals/ public services (Shiba et al., 2016).

Continuing person-centred care

CPCC is nowadays advocated as a key component of effective illness management (Alharbi et al., 2012; Ekman et al., 2017). Giving the patient the opportunity to introduce her/himself as a person in the form of an illness narrative is the starting point for creating a collaborative, egalitarian provider -patient partnership that encourages and empowers patients to actively take part in finding solutions to their problems (Ekman et al., 2017).

"No, no, nothing about that at all. Just this great stream of medicines, between puffs and pills."

"I suppose they do (explain symptoms) but it hasn't penetrated."

"What they explain (to) me, I forget."

"[…] But who is going to explain it to me so that I understand? I haven't met anyone yet who can do that "

All themes are correlated between them as shown in Figure 8, starting from the self-care management and ending up with a continuing process having the patient in the center. The interpretation of the results of the current meta-synthesis could be explained and seen in two ways: The first way reflects the important role of the person being the protagonist in dealing with his illness having an active role, while the other way reflects that all actions of all the mechanisms of disease control reach the person with HF and his needs.

(The relevant article of the systematic review and meta-synthesis has been revised and re-submitted waiting the reviewers second response/ Appendix I).

Systematic review and meta-analysis

A systematic review and meta-analysis were conducted to assess the effectiveness of supportive care interventions in HF patients in terms of HR-QoL and related outcomes (e.g. depression and anxiety). A systematic search was performed to locate RCTs, that implemented any interventions of supportive care in HF patients. The PICO specification was: Patients, Adults with HF who received supportive care of any kind after their discharge from the hospital. Intervention: Studies including a supportive care intervention of the following aspects: Communication, education, psychological and spiritual issues and symptom management after patient's hospitalization, excluding studies focusing on pharmacological treatments. Control group, Control group patients received the usual care and Outcomes: Effectiveness of supportive care interventions in terms of HR-QoL and related outcomes. The hypothesis was that supportive care interventions will have a positive effect on the HR-QoL of patients with HF.

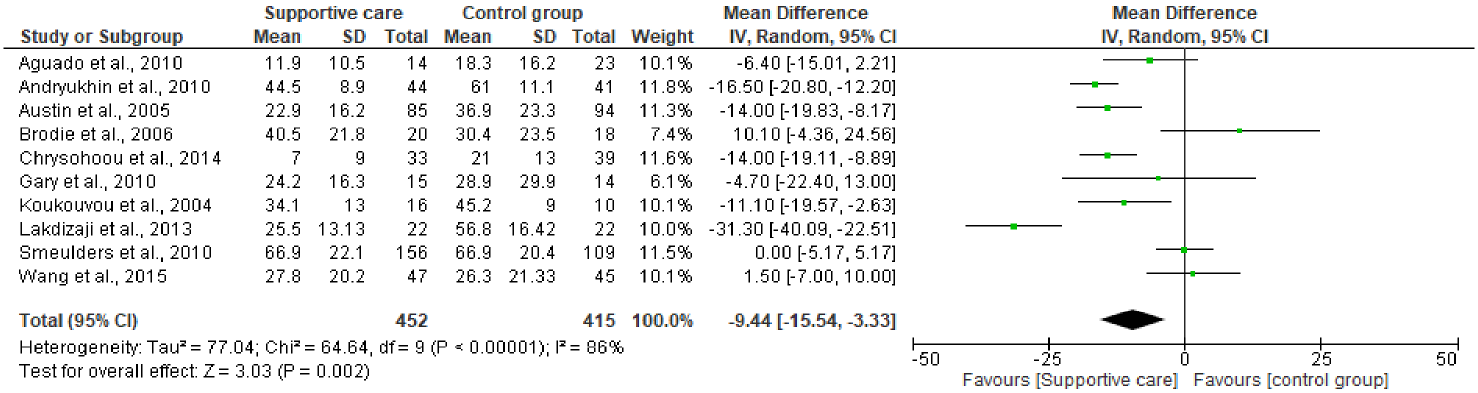
HF patients, do not know much for their condition, they realize their poor prognosis as they experience symptoms of HF. In particular, limitations such as shortness of breath, dizziness, and restrictions in activities of daily living (Klindworth et al., 2015). Thus, they need to discuss their condition, concerns and fears with somebody (Rhodes& Shaw., 1999; Aldred et al., 2005). Instead of that, they are not well informed about their prognosis or supported (Rhodes& Shaw., 1999; Rogers et al., 2000; Aldred et al., 2005). Patients often lack sufficient knowledge about their condition and prognosis. This is mostly due to poor communication between patients and HP's providers (Klindworth et al., 2015).They do not perceive HF as life-limiting illness, even when they have knowledge of HF management (Im et al., 2019).

Nurses may provide individualized supportive nursing care to offer a positive emotional support, enhance the patients' knowledge of self-management and meet HF patients' physical and psychosocial needs through continuing assessment, counselling and education (Goodlin et al., 2009). Supportive care is a holistic view of disease management offered to all patients with chronic or life-threatening illness (Goodlin et al., 2009). Provisional planning, support patients to identify the unpredictable deteriorations in health status and mitigate or reduce the isolation and dependency that might co-occur, in part by procure available resources and support in advance (Fitzsimons 2007; Okediji et al., 2017).

Supportive care has a major role in positive, life-transforming change and allows individuals to have a more positive HR-QoL. The terms 'palliative' and 'supportive' care are often used interchangeably in bibliography; although, there is a different definition for these two terms. Common goal is to improve the HR-QoL of patients who have serious or life- threatening disease and provide them with support (Fitzsimons 2007). Supportive care is a multidisciplinary holistic care provided in the patient and his family, from the time of diagnosis along with treatment aiming to prolong life expectancy and improve QoL and into end of life care (Okediji et al., 2017). It is essential to clarify that palliative care is a part of supportive care, a very important part, mainly concerned the internal and psycho-social part of supportive care (Klastersky et al., 2016). Supportive care includes modifying interventions in an effort to manage symptom, psychosocial or existential distress and to identify strategies in order to cope with HF (Goodlin et al., 2004). Supportive care is composed by the four components of: communication and decision making, education, symptom management and psychological and spiritual issues (Goodlin et al., 2004; Jaarsma et al., 2009).

A search was undertaken in the electronic databases of PubMed, CINAHL and Cochrane by two researchers according to predefined inclusion and exclusion criteria. The methodology assessment of the included studies was conducted using the checklist of CONSORT 2010. Data from each study were collected and meta-analysed using the software program Review Manger 5.3 of Cochrane Library. Effect sizes were estimated between the comparison groups over the overall follow up period, and presented along with confidence intervals (CI). The main outcome was overall HR-QoL among control and intervention groups. The association and different interventions: intensity and complexity of the intervention, duration, behavioral study, multidisciplinary intervention, family support and study design with the HR-QoL, using meta-regression analysis were also investigated.

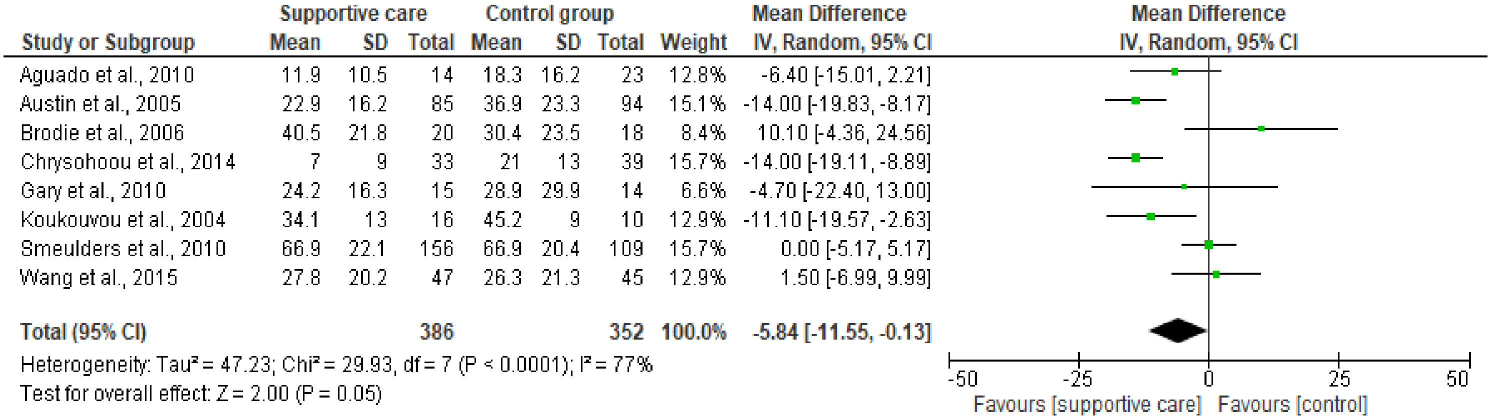
In overall, ten studies found to meet the pre-defined criteria and included in the study. The main study outcome was the effect of supportive care interventions in HF patients in terms of overall HR-QoL, based on the MLHFQ. The observed overall effect indicates a positive effect of supportive care on HR-QoL, and it is statistically significant [MD -9.44, 95% CI (-15.54, -3.33), p=0.002] (Figure 9). A sensitivity analysis excluding two studies (Andryukhin et al.,2010 and Lakdizaji et al., 2013) was performed. The former was not following normal distribution and the second study had quite different outcomes compared to the other studies. After the exclusion of those two studies the effect of supportive care interventions compared to standard care, remained positive and statistically significant [(MD -5.84 95% CI (-11.55,-0.13), p=0.05] (Figure 10). The results of the two dimensions of the questionnaire MLHFQ suggest a positive and statistically significant effect of the supportive care interventions [physical: MD -6.95, 95% CI (12.78, -1.11), p=0.02] (Figure 11), emotional dimension: MD -3.64 95% CI (-6.34, -0.93), p=0.00 (Figure12)]



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Aguado et al., 2010	11.9	10.5	14	18.3	16.2	23	10.1%	-6.40 [-15.01, 2.21]
Andryukhin et al., 2010	44.5	8.9	44	61	11.1	41	11.8%	-16.50 [-20.80, -12.20]
Austin et al., 2005	22.9	16.2	85	36.9	23.3	94	11.3%	-14.00 [-19.83, -8.17]
Brodie et al., 2006	40.5	21.8	20	30.4	23.5	18	7.4%	10.10 [-4.36, 24.56]
Chrysohoou et al., 2014	7	9	33	21	13	39	11.6%	-14.00 [-19.11, -8.89]
Gary et al., 2010	24.2	16.3	15	28.9	29.9	14	6.1%	-4.70 [-22.40, 13.00]
Koukouvou et al., 2004	34.1	13	16	45.2	9	10	10.1%	-11.10 [-19.57, -2.63]
Lakdizaji et al., 2013	25.5	13.13	22	56.8	16.42	22	10.0%	-31.30 [-40.09, -22.51]
Smeulders et al., 2010	66.9	22.1	156	66.9	20.4	109	11.5%	0.00 [-5.17, 5.17]
Wang et al., 2015	27.8	20.2	47	26.3	21.33	45	10.1%	1.50 [-7.00, 10.00]
Total (95% CI)			**452**			**415**	**100.0%**	**-9.44 [-15.54, -3.33]**

Heterogeneity: Tau² = 77.04; Chi² = 64.64, df = 9 (P < 0.00001); I² = 86%
Test for overall effect: Z = 3.03 (P = 0.002)

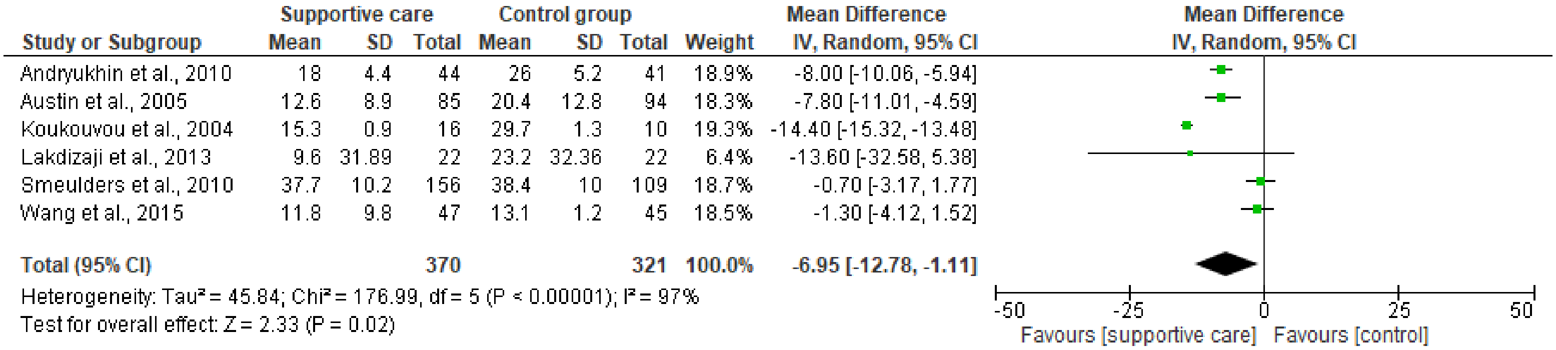
Figure 9: Forest plot of comparison: Quality of life, outcome: MLWHF total score.



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Aguado et al., 2010	11.9	10.5	14	18.3	16.2	23	12.8%	-6.40 [-15.01, 2.21]
Austin et al., 2005	22.9	16.2	85	36.9	23.3	94	15.1%	-14.00 [-19.83, -8.17]
Brodie et al., 2006	40.5	21.8	20	30.4	23.5	18	8.4%	10.10 [-4.36, 24.56]
Chrysohoou et al., 2014	7	9	33	21	13	39	15.7%	-14.00 [-19.11, -8.89]
Gary et al., 2010	24.2	16.3	15	28.9	29.9	14	6.6%	-4.70 [-22.40, 13.00]
Koukouvou et al., 2004	34.1	13	16	45.2	9	10	12.9%	-11.10 [-19.57, -2.63]
Smeulders et al., 2010	66.9	22.1	156	66.9	20.4	109	15.7%	0.00 [-5.17, 5.17]
Wang et al., 2015	27.8	20.2	47	26.3	21.3	45	12.9%	1.50 [-6.99, 9.99]
Total (95% CI)			**386**			**352**	**100.0%**	**-5.84 [-11.55, -0.13]**

Heterogeneity: Tau² = 47.23; Chi² = 29.93, df = 7 (P < 0.0001); I² = 77%
Test for overall effect: Z = 2.00 (P = 0.05)

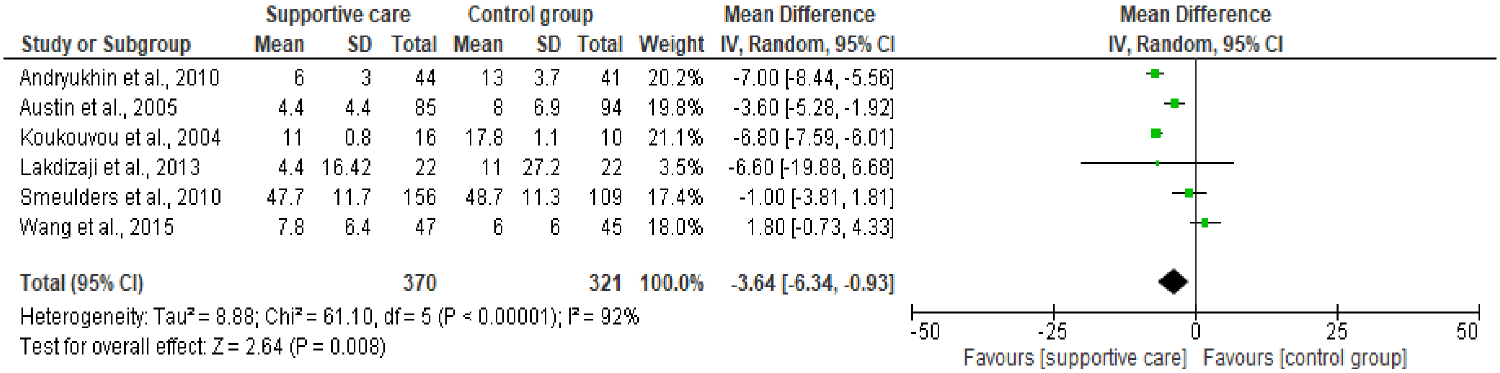
Figure 10: Sensitivity analysis: Outcome QoL total score (Excluding the article of Andrykhiin et al., 2010: not normal distribution and Lakdizaji et al., 2013)



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	18	4.4	44	26	5.2	41	18.9%	-8.00 [-10.06, -5.94]
Austin et al., 2005	12.6	8.9	85	20.4	12.8	94	18.3%	-7.80 [-11.01, -4.59]
Koukouvou et al., 2004	15.3	0.9	16	29.7	1.3	10	19.3%	-14.40 [-15.32, -13.48]
Lakdizaji et al., 2013	9.6	31.89	22	23.2	32.36	22	6.4%	-13.60 [-32.58, 5.38]
Smeulders et al., 2010	37.7	10.2	156	38.4	10	109	18.7%	-0.70 [-3.17, 1.77]
Wang et al., 2015	11.8	9.8	47	13.1	1.2	45	18.5%	-1.30 [-4.12, 1.52]
Total (95% CI)			**370**			**321**	**100.0%**	**-6.95 [-12.78, -1.11]**

Heterogeneity: Tau² = 45.84; Chi² = 176.99, df = 5 (P < 0.00001); I² = 97%
Test for overall effect: Z = 2.33 (P = 0.02)

Figure 11: Forest plot of comparison: Quality of life/ physical dimension, outcome: Physical dimension/ QoL.



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	6	3	44	13	3.7	41	20.2%	-7.00 [-8.44, -5.56]
Austin et al., 2005	4.4	4.4	85	8	6.9	94	19.8%	-3.60 [-5.28, -1.92]
Koukouvou et al., 2004	11	0.8	16	17.8	1.1	10	21.1%	-6.80 [-7.59, -6.01]
Lakdizaji et al., 2013	4.4	16.42	22	11	27.2	22	3.5%	-6.60 [-19.88, 6.68]
Smeulders et al., 2010	47.7	11.7	156	48.7	11.3	109	17.4%	-1.00 [-3.81, 1.81]
Wang et al., 2015	7.8	6.4	47	6	6	45	18.0%	1.80 [-0.73, 4.33]
Total (95% CI)			**370**			**321**	**100.0%**	**-3.64 [-6.34, -0.93]**

Heterogeneity: Tau² = 8.88; Chi² = 61.10, df = 5 (P < 0.00001); I² = 92%
Test for overall effect: Z = 2.64 (P = 0.008)

Figure 12: Forest plot of comparison: Quality of life, outcome: Emotional dimension/QoL.

Meta-regression

To further understand the results of the meta-analysis, a meta-regression analysis was performed using Stata, which revealed that two of the undertaken variables; family support and behavioral therapy were related with the effect size of the studies. Paradoxically, those two variables were found to have an inverse relation with the effectiveness of the intervention regarding HR-QoL.

Meta-regression also showed that studies with higher baseline tend to find larger effects than those with lower baseline levels. Similarly, studies in which participants were more similar, also tend to find larger effects. Both findings were found to be statistically significant and can justify the existence of this relation/finding (Table 5).

Table 5: Explanation of the meta-regression findings for the variables behavioral therapy and family.

	Coef.	St. error	P> I z I
Behavioral	10.63818	6.763371	0.116
Family	18.99095	8.950608	0.034
_Cons	-11.1293	9.882136	0.260

	Coef.	St. error	P> I z I
Baseline	9.599226	4.72426	0.042
Variance	-11.99298	4.698562	0.011
_Cons	10.05473	4.216793	0.017

Although, there was a large heterogeneity among the studies in terms of intensity, complexity and duration of the intervention, the meta-analysis gives a piece of information on how supportive care interventions may affect HR-QoL. However, the optimal characteristics of successful and structured supportive care interventions remain undetermined. The care needs of HF patients still remain unaddressed along with other approaches, maybe more effective than those already used. The full article can be found in Appendix II (Kyriakou et al., 2020 In Press).

7.1.2. Development of the 'guide-assistant' to be used in the intervention.

Based in the results from the systematic review and meta-synthesis, the first version of the 'guide-assistant' was created for identifying the supportive needs of patients with HF. This form of the guide was used in the focus groups in order to extract more details and maybe other aspects of supportive needs as well as were identified by the Cypriot patients. The 'guide-assistant' created based on the results of the meta-synthesis is presented in Appendix III.

After analyzing the results of the focus group, the 'guide-assistant' was re-evaluated, adopting the main themes to be implement in the intervention (second part of the research).

7.1.3. Focus Groups

Patients recruited from available contacts following convenience sampling. One focus group of 8 patients was conducted and the setting was the conference area of the Pancyprian Federation of patients and friends.

The second focus group of consisted by three patients and took place in the Department of Nursing of the Cyprus University of Technology. More patients were scheduled to attend but finally only three of them made it that day.

Prior recruiting patients inclusion criteria for attending focus group, were set: 1) Patients who had been diagnosed with chronic HF based on systolic or diastolic dysfunction as diagnosed by a cardiologist, 2) NYHA classification stages I-IV, 3) the diagnosis had to be established for at least 6 months, 4) should be able to understand, write and read Greek.

The focus groups were led by a nurse using the first version of a 'guide-assistant' as is described below, referring to the most frequent supportive needs of patients with HF. Each of the two focus groups scheduled for approximately one hour and was digitally recorded with the consent of the participants. Field notes were taken as well. Focus groups were transcribed from the audiotapes by a researcher. A hard copy and an electronic copy of each focus group data were given to each member of the team accompanying the audio-taped recording. Each member of the research team independently read all the transcripts of the audiotapes, underlying important statements of the transcript, giving codes. At the second step of the analysis, the same four researchers reviewed together the giving codes and agreed the final codes revealed from the transcript. Finally, researchers collaborated together to cluster the significant statements into major themes. Throughout this process, differences in coding or categorizing of the themes were discussed by the researchers in order to reach consensus. From this process the following themes were revealed covering the needs of patients with HF: '***Self-care-management'***, '***palliative care'***, '***supportive care'***, ***'social support'***, ***'PCC'*** and ***'better health care services'***.

Self-management was developed from the sub-themes of choosing health professionals and self-care actions, palliative care from the sub-themes of fear of death and anxiety and concern. ***Supportive care*** was developed from the sub-themes of interpersonal relationships and mediators, psychological support, multidisciplinary team, information and communication. ***Social support*** was consisted of the subthemes of lack of benefits from services, financial support and social services. ***PCC*** was made up of the sub-themes of recognition of the situation and acceptance, lifestyle modification and education. Lastly, **better health care services** theme was developed from the sub-themes of dissatisfaction of patients with clinical examination and follow-up, insufficient public sector services, time consuming procedures and inadequate care by HP's. Only the last theme was different from the results of the meta-synthesis.

7.1.4 Validation and adaption of the SCHFI in Greek-Cypriot and Greek population

In total, 176 patients participated, of whom 138 (78%) were men and 38 (22%) were women. Most of the patients were married [121 (73%)], 24 (14%) patients were widows, 17 (10%) of them were divorced, four (2.4%) of them were unmarried and 10 patients did not answer. The educational level of 69 (47.4%), 52 (35%) and 12 (8.2%) patients was elementary, secondary, and post-secondary education, respectively. Only 13 (8.9%) patients had higher education and the rest did not indicate their educational level. Considering clinical severity, most of the patient were NYHA class II [52 (39%)] and III [76 (57%)], only 1 (0.7%) patient was NYHA class I and 5 (3.7%) were NYHA class IV.

Translation and equivalence of the Greek version

Permission to translate and use of the English version of SCHFI to Greek language was taken from the main researcher who developed the tool.

All translation processes followed Brislin's (1970) model of translation for maintaining equivalence: two bilingual nurses translated SCHFI from English to Greek language. Afterwards, it was back – translated, blindly by another bilingual nurse from the Greek version to the English language. Comparisons and corrections of the original version and the back – translated version of the SCHFI were made by two bilingual nurses. In addition to comparison between the English and the Greek version of the scale, an expert panel of bilingual nurses from Cyprus, specialized in research, cardiovascular nursing and intensive care topics compared the original version with the Greek version in order to establish semantic equivalency and content validity. Readability of the SCHFI was assessed with three patients who participated in the focus groups, who read and explained each item of the questionnaire. None of them found any difficulties understanding the meaning of each sentence.

Validity and Reliability Assessment

Confirmatory factor analysis (CFA) was performed for assessing the goodness of fit of the original structure for the three dimensions as proposed by the scale author (Riegel et al.,2004). As indicated in Table 6, the original structure of the tool showed to have good adjustment indicators in terms of diagnostic criteria (Construct Validity): TLI (0.97), NFI (0.95), CFI (0.97), GFI (0.98) and AGFI (0.98). The chi-square test was ($X^2(181)=359.4$) with p-value<0.001. Also, RMSE was within an acceptable range [RMSEA=0.07, 95%C.I. (0.06-0.08)] (Hair et al, 2010).

In terms of reliability, the composite reliability (CR) and Cronbach's alpha were performed of each of the three dimensions of the questionnaire:1) Maintenance: The factor score loadings were above the recommended limit (>0.4) with a range of values (0.46 - 0.88). The dimension has a high composite reliability score (CR = 0.89) and Cronbach's a (0.85). 2) Management: High factor loadings (0,79 έως 0,92) were found for all sentences of the dimension except for the sentence *16:«Think of a remedy you tried the last time you had trouble breathing or ankle swelling, how sure were you that the remedy helped or did not help?»* with a loading of 0,26. The composite reliability score (CR = 0.88) and Cronbach's a coefficient (0.80) were high. 3) Confidence: High loadings were observed (0.77 έως 0.96) for all sentences of dimension with high composite reliability score (CR =0.96) and Cronbach's a coefficient (0.93). The Cronbach's a for the whole scale was also found to be high (0.92).

Table 6: Confirmatory factor analysis (CFA) for self-care

Question	**Maintenance**	**Management**	**Confidence**
[1. Weigh yourself?]	0.59		
[2. Check your ankles for swelling?]	0.72		
[3. Try to avoid getting sick (e.g., flu shot, avoid ill people)?]	0.69		
[4. Do some physical activity?]	0.46		
[5. Keep doctor or nurse appointments?]	0.83		
[6. Eat a low salt diet?]	0.88		
[7. Exercise for 30 minutes?]	0.61		
[8. Forget to take one of your medicines?]	0.53		
[9. Ask for low salt items when eating out or visiting others?]	0.77		
[10. Use a system (pill box, reminders) to help you remember your medicines?]	0.47		
[12. Reduce the salt in your diet]		0.88	
[13. Reduce your fluid intake]		0.79	
[14. Take an extra water pill]		0.86	
[15. Call your doctor or nurse for guidance]		0.92	

[16. *Think of a remedy you tried the last time you had trouble breathing or ankle swelling, how sure were you that the remedy helped or did not help?]*		0.26	
[1. Keep yourself free of heart failure symptoms?]			0.77
[2. Follow the treatment advice you have been given?]			0.96
[3. Evaluate the importance of your symptoms?]			0.91
[4. Recognize changes in your health if they occur?]			0.87
[5. Do something that will relieve your symptoms?]			0.92
[6. Evaluate how well a remedy works?]			0.95
Composite Reliability	0.89	0.88	0.96
Cronbach's alpha	0.85	0.80	0.92
Goodness-of-fit			
Chi-Square (df)	359.4 (181)		
p-value	<0,001		
RMSEA	0.07		
90% CI for RMSEA	(0.06 - 0.08)		
TLI	0.97		
NFI	0.95		
CFI	0.97		
GFI	0.98		
AGFI	0.98		

RMSEA, root mean square error of approximation; GFI, goodness-of-fit index; AGFI, adjusted goodness-of-fit index; TLI, Tucker Lewis Index;NFI, normed fit index; CFI comparative fit index. Levels for an acceptable model fit: RMSEA≤0.08,TLI≥0.90;NFI≥0.90,CFI≥0.90.

7.2 Phase II

Phase II is the pilot testing of the intervention developed as prescribed previously. Patients were followed up for a period of six months and evaluation undertaken in the 1st, 3rd and 6th month after recruitment. The crude results are presented below.

The pilot study consisted from 35 patients with 24 patients participating in the intervention group (IG) and 11 patients in the control group (CG). The implementation of the intervention lasted for a period of six months. Only 35 out of 51 eligible patients (68.6%) who were approached were finally enrolled to participate in the study. During the six- month period, one patient stepped-out from the IG and justified his decision as so; he found the procedure fulfilling the questionnaires very tiring. Additionally, one patient from the CG was lost to follow up and three fatal events occurred, all from the CG.

7.2.1 Quantitative data

7.2.1.1 Sample characteristics

The demographic and clinical characteristics of the participants were collected during recruitment. The sample consisted of 29 (83%) male and six (17%) female patients. Incidentally all except of one female patient were allocated in the CG. The mean age of the patients was 71 years old with no differences among the two groups. Most of the patients were married [30 (86%)] and had family history [17 (49%)]. Regarding the educational level six (17%), 13 (37%) and 10 (29%) patients had elementary, secondary and higher education, respectively. All demographic characteristics are shown in Table 7.

The most frequent risk factor from the clinical characteristics was hypertension [18 (51%)], with higher incidence in the control group [7(64%)] than in the intervention [11(46%)]. Similarly, the second more frequent co-existing risk factor was diabetes, which was present in 15 (43%) patients with six (55%) of them being in the CG and nine (38%) in the IG. The most frequent underlying disease was coronary artery disease and/ or arrythmias. For both conditions the greater percentage was found in the IG; 14 (58%) participants had coronary artery disease and 12 (50%) of them had arrythmias. All clinical characteristics are presented in Table 7.

Table 7: Demographic characteristics of participants

Characteristic	Overall, N = 35	Control, N = 11	Intervention, N = 24	p-value*
Age	71 (65, 75)	72 (69, 78)	68 (65, 75)	0.4
Gender				0.007
Male	29 (83%)	6 (55%)	23 (96%)	
Female	6 (17%)	5 (45%)	1 (4.2%)	
Education				0.021
Elementary	6 (17%)	1 (9.1%)	5 (21%)	
Secondary	13 (37%)	4 (36%)	9 (38%)	
Higher	10 (29%)	1 (9.1%)	9 (38%)	
Family status				0.011
Married	30 (86%)	7 (64%)	23 (96%)	
Other	2 (5.7%)	1 (9.1%)	1 (4.2%)	
Family history				0.2
Yes	17 (49%)	3 (27%)	14 (58%)	
No	11 (31%)	4 (36%)	7 (29%)	
History of myocardial infraction				0.3
Yes	11 (31%)	2 (18%)	9 (38%)	
No	9 (26%)	2 (18%)	7 (29%)	

Table 8: Clinical characteristics of the participants

Characteristic	**Overall, N = 35**	**Control, N = 11**	**Intervention, N = 24**	**p-value***
Other chronic diseases				
[Rheumatic disease]				0.8
Yes	1 (2.9%)	0 (0%)	1 (4.2%)	
No	34 (97%)	11 (100%)	23 (96%)	
[Renal Failure]				0.4
Yes	9 (26%)	4 (36%)	5 (21%)	
No	26 (74%)	7 (64%)	19 (79%)	
[COPD]			0.5	
Yes	2 (5.7%)	1 (9.1%)	1 (4.2%)	
No	33 (94%)	10 (91%)	23 (96%)	
[Asthma]				0.2
Yes	3 (8.6%)	2 (18%)	1 (4.2%)	
No	32 (91%)	9 (82%)	23 (96%)	
[Stroke]				0.5
Yes	2 (5.7%)	1 (9.1%)	1 (4.2%)	
No	33 (94%)	10 (91%)	23 (96%)	
Risk factors				
Diabetes				0.2
Yes	15 (43%)	6 (55%)	9 (38%)	
No	10 (29%)	1 (9.1%)	9 (38%)	
Obesity				0.9
Yes	3 (8.6%)	1 (9.1%)	2 (8.3%)	
No	22 (63%)	6 (55%)	16 (67%)	
Hyperlipidaemia				0.5

Yes	12 (34%)	2 (18%)	10 (42%)	
No	13 (37%)	5 (45%)	8 (33%)	
Hypertension				0.15
Yes	18 (51%)	7 (64%)	11 (46%)	
No	7 (20%)	0 (0%)	7 (29%)	
Comorbidities				
Arrythmias				0.14
Yes	15 (43%)	3 (27%)	12 (50%)	
No	14 (40%)	4 (36%)	10 (42%)	
Valvular disease				0.070
Yes	5 (14%)	2 (18%)	3 (12%)	
No	24 (69%)	5 (45%)	19 (79%)	
Myocardiopathy				0.055
Yes	5 (14%)	0 (0%)	5 (21%)	
No	24 (69%)	7 (64%)	17 (71%)	
Coronary disease				0.2
Yes	18 (51%)	4 (36%)	14 (58%)	
No	11 (31%)	3 (27%)	8 (33%)	
Hypertensive cardiomyopathy				0.021
Yes	1 (2.9%)	1 (9.1%)	0 (0%)	
No	28 (80%)	6 (55%)	22 (92%)	
Chronic atrial fibrillation				0.070
Yes	5 (14%)	2 (18%)	3 (12%)	
No	24 (69%)	5 (45%)	19 (79%)	

7.2.1.2 Crude Results

There were some baseline differences between IG and CG; in the depression dimension of the HADS questionnaire the CG had greater level of depression and consequently there was a difference in the overall emotional distress. Furthermore, the social dimension of the HR-QoL was better in the CG compared to the IG. Lastly, there was a difference in the self-care index (SCHFI) dimensions of maintenance and confidence favoring the IG and thereafter the whole self-care score. This was not applied for the questionnaire of Gr9-EHFScB which also measures self-care, where baseline results were in linear for the two groups in all dimensions.

All aspects under investigation were calculated in the first and sixth month after recruitment and the results are presented below accompanied with graphic design (plots). Results are shown with mean and standing deviation (SD). Plots present the mean level [± Standard Error (SE)] of the scale dimensions. All results for each questionnaire at baseline, 1st month and 6th month are shown in Tables 9,10 and 11, respectively.

Minnesota Living with Heart Failure questionnaire

In the first month for the overall scale it was observed better HR-QoL for the intervention group (IG) [baseline =30.9 (21,1)/ 1st month= 25.3 (26.0)] and a decline for the patients in the control group (CG) [baseline =32.7 (21.5) / 1st month= 34.5 (24.6)]. In contrast, a better QoL was found for both groups in the sixth time period [IG 6th month= 19.8 (21,2)/ CG 6th month= 19 (7.0)]. The same route indicated for the sub-scale of the physical dimension [IG baseline=17.3 (11.6)/ 1st month= 15.7 (15.6)/ 6th month = 11.8 (13.4)] [CG=18.6 (15.1) / 1st month= 20.8 (14.4)/ 6th month =9.4 (4)]. Contrasted, for the emotional dimension of the tool both groups followed the same route indicating better results for both timepoints of one- and six-month [IG baseline= 6.5 (6.3)/ 1st month= 4.7 (7.3)/ 6th month = 4.1 (4.7)] [CG baseline = 8(5.5) / 1st month= 6.3 (7.3) / 6th month =3.9 (2.7)]. The most striking feature for the variable HR-QoL was the social dimension where control group had worst HR-QoL in the first month and although they had much better baseline levels compared to the intervention group, they ended-up with the same levels in the six-month period [IG baseline= 4.8 (4.9) / 1st month=3.3 (3.5) / 6th month =2.8 (3.1)] [CG baseline= 2.3 (1.1) / 1st month=3.4 (2.7) / 6th month =2.7 (2.8)] (Figure 13).

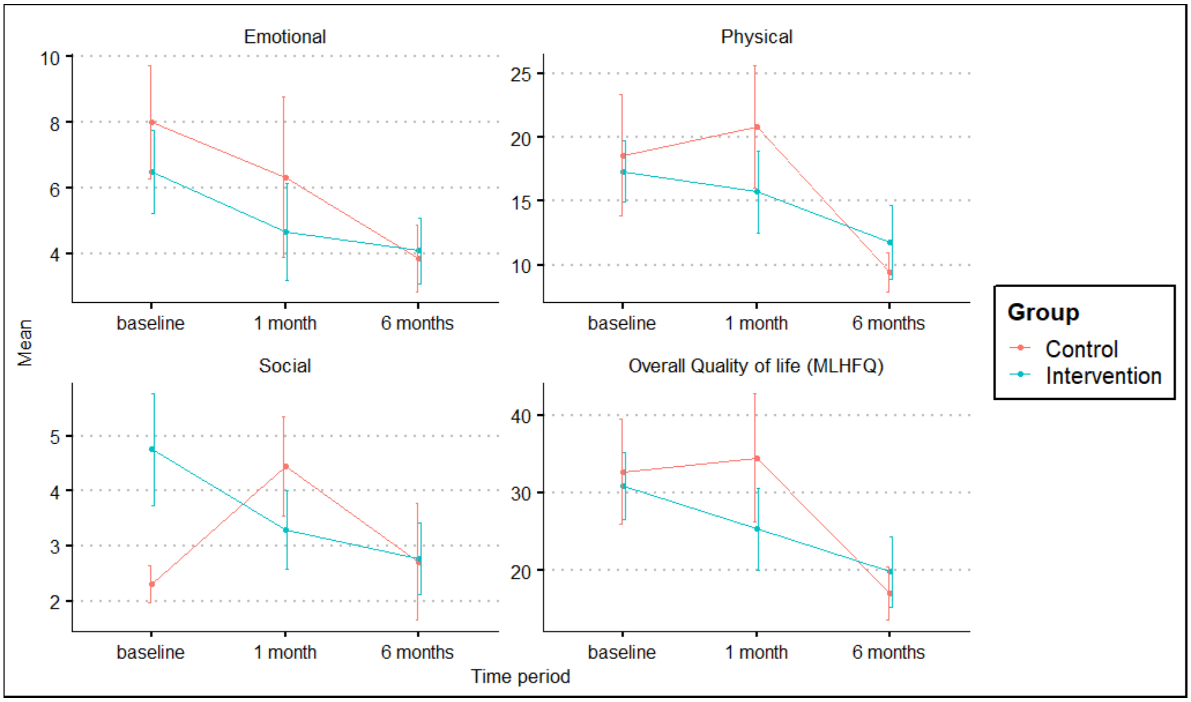


Figure 13: MLHFQ means plot

Self-care of Heart Failure Index

Patients in the intervention group had higher baseline scores in the dimensions of maintenance [IG= 31.2 (4.4) / CG= 23.4 (5.0)] and self-confidence [IG= 19.5 (3.5)/ CG=15.3 (3.0)] and therefore in the overall score of self-care [IG=65.2(7.3)/ CG= 51.9 (8.5)]. It was observed a gradually positive improvement during the 6 -month follow-up period [IG= 69.8 (8.2)/ CG =61.0 (7.3)]. The course in the control group was slightly different as it was indicated a minor improvement for the first month, especially for the dimensions of self-confidence [1st month=19.2(3.4)] / 6th month 18.0 2.8] and maintenance [1st months=31.8 (5.3)/ 6th month=29.3 (3.8)], followed by a small decline in the six -month period. In general, there was no difference between the two groups for self-care (Figure 14).

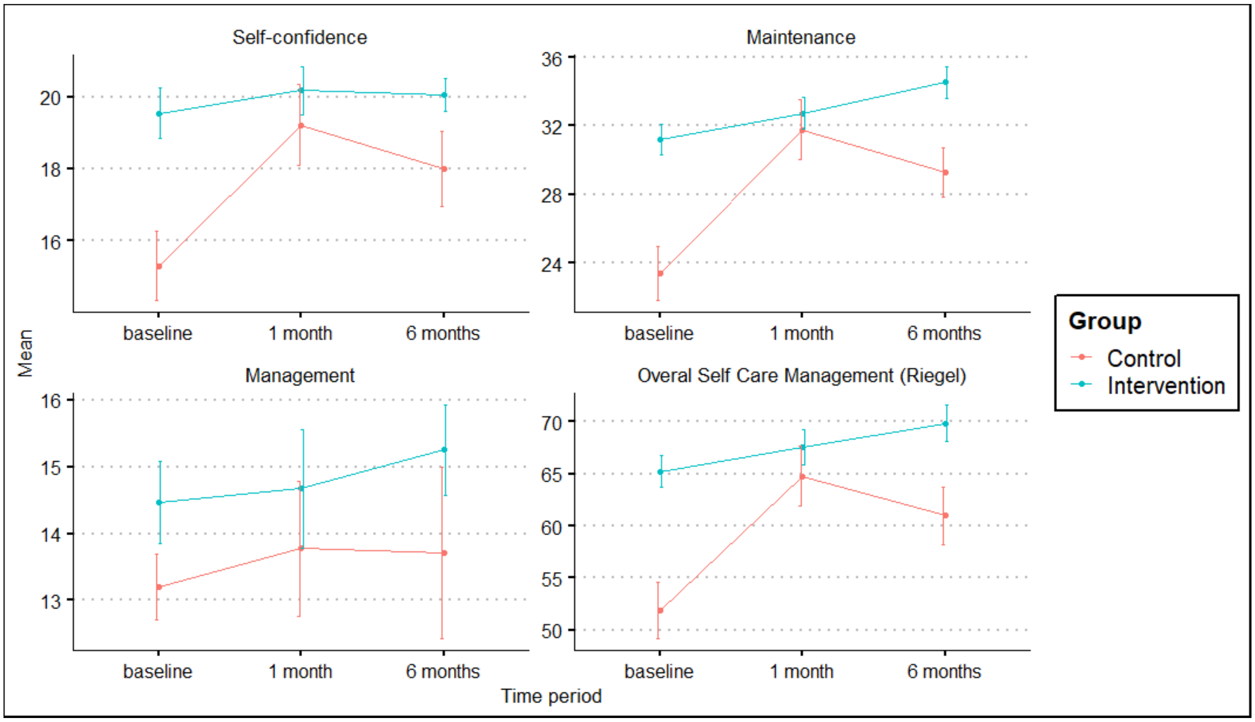


Figure 14: SCHFI means plot

Multidimensional scale of perceived social support

This variable was calculated in baseline and six months. Although there was no difference in overall social support scale [IG baseline= 72.5 (10.0) / 6th month= 75.8 (6.3)] [CG baseline =68.8 (15.4) / 6th month= 72.9 (6.2)], patients in the IG followed an increased trend in the sub-scale of family/significant others [IG baseline=50.9 (5.4) / 6th month= 52.7 (3.4)] [CG baseline =50.3 (8.9) / 6th month = 49.9 (4.2)]. A contrast trend was observed in the CG, following a decline in this dimension. For the sub-dimension "Friends" both groups had better results in the six- month period, with greater growth in the CG [IG baseline=21.7 (6.2) / 6th month= 23.2 (4.8)] [CG baseline=18.4 (8.7) / 6th month=23.0 (2.4)]. There was no difference in the overall social support scale among the two arms [IG baseline= 72.5 (10.0) / 6th month= 75.8 (6.3)] [CG baseline =68.8 (15.4) / 6th month= 72.9 (6.2)] (Figure 15).

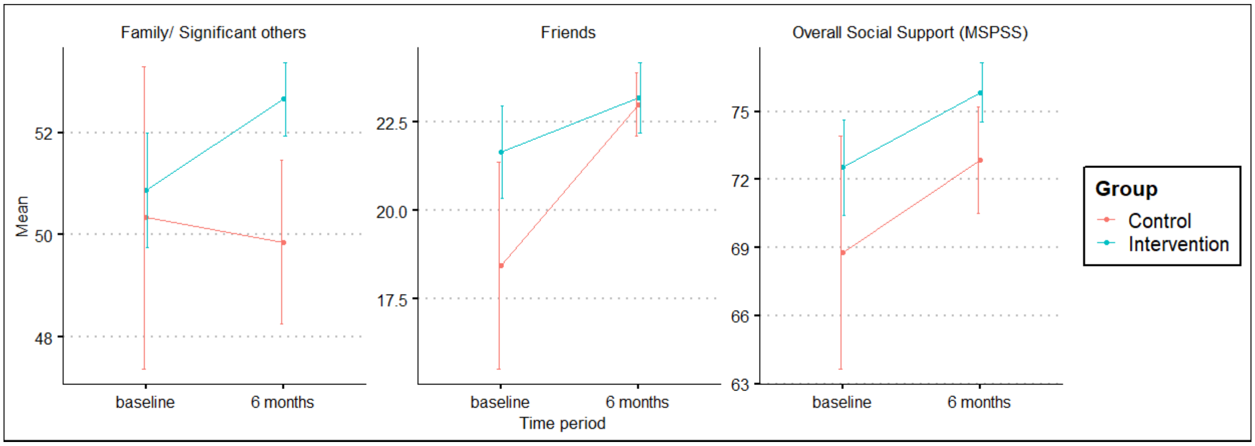


Figure 15: MSPSS means plot

European Heart Failure Self-Care Behavior Scale

There were no baseline differences for this scale which measures behavior and knowledge regarding HF. It was observed gain of knowledge in the IG for the sub-dimension of physical activity and recognition of deteriorating symptoms in the first month which was slightly increased in six-month period [IG baseline=11.7 (3.4)/ 1st month=13.1 (2.0) /6th month=13.6 (1.7)]. Likewise, the same trend was observed for the sub-dimension adhering to recommendations, but with smaller progression [IG baseline= 13.1 (2.6)/ 1st month=13.6 (1.7) /6th month= 13.7(2.2)]. Converse trend was observed in the control group where a decline was shown for the sub-dimension of physical activity and recognition of deteriorating symptoms in the first month. In the six- month follow-up period, results were slightly better compared to baseline. [CG baseline=11.9 (1.7) / 1st month=11.3 (3.0) /6th month= 12.1 (1.2)]. Furthermore, there was an increases trend in the CG for the sub- dimension scale of fluid and sodium management [CG baseline=12.1 (1.6) / 1st month=13.6 (1.4) /6th month= 12.7 (1.7)]. In the overall scale of Gr9-EHFScB there was no difference between the two groups [IG baseline=37.8 (6.7)/ 1st month=39.9 (4.9) /6th month=40.7 (6.1)] [CG baseline=37.1 (4.5) / 1st month=37.2 (6.4) /6th month=39.0 (1.7)] (Figure 16).

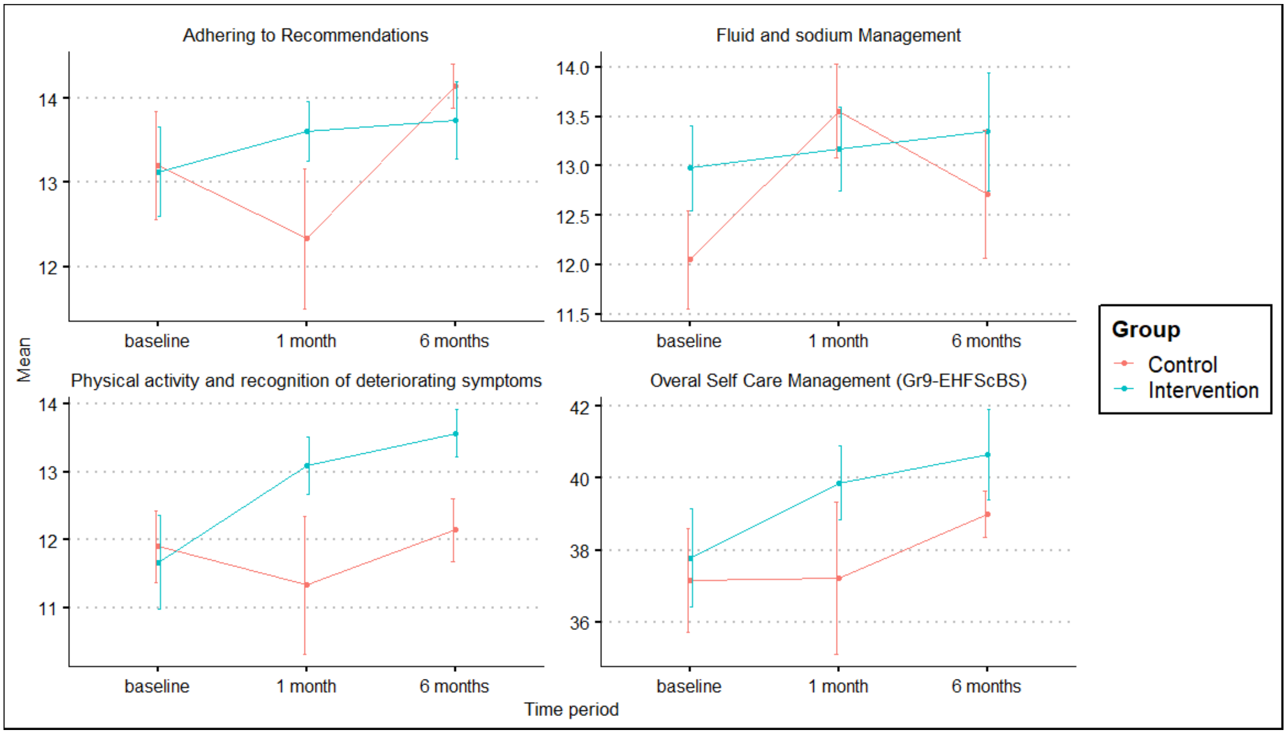


Figure 16: EHFScBS means plot

Hospital and Anxiety depression scale

The patients in the CG had higher baseline levels of depression but they showed a decline trend. A similar trend was observed for the anxiety as well. A decline trend in anxiety and depression was also shown for the IG following a more stably downturn (Figure 17).

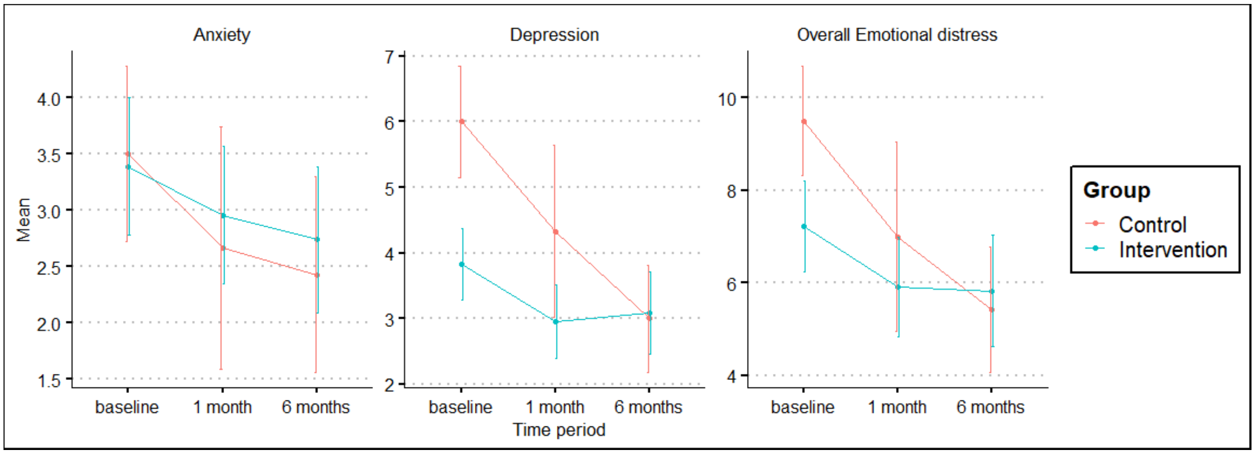


Figure 17: HADS means plot

International Physical Activity Questionnaire

Due to large missing values especially for the baseline levels of PA, there is a limitation to extract results for this variable. In general, there is a declining trend regarding moderate exercise for both groups, greater for the CG as it was indicated a higher baseline level. Participants in the CG showed a slightly increased trend in walking and there was a decline trend for the IG (Figure 18). In an effort to illustrate the trend in the CG just for more reliable comparison with the intervention group, missing values were imputed shaping the results as shown in Figure 19.

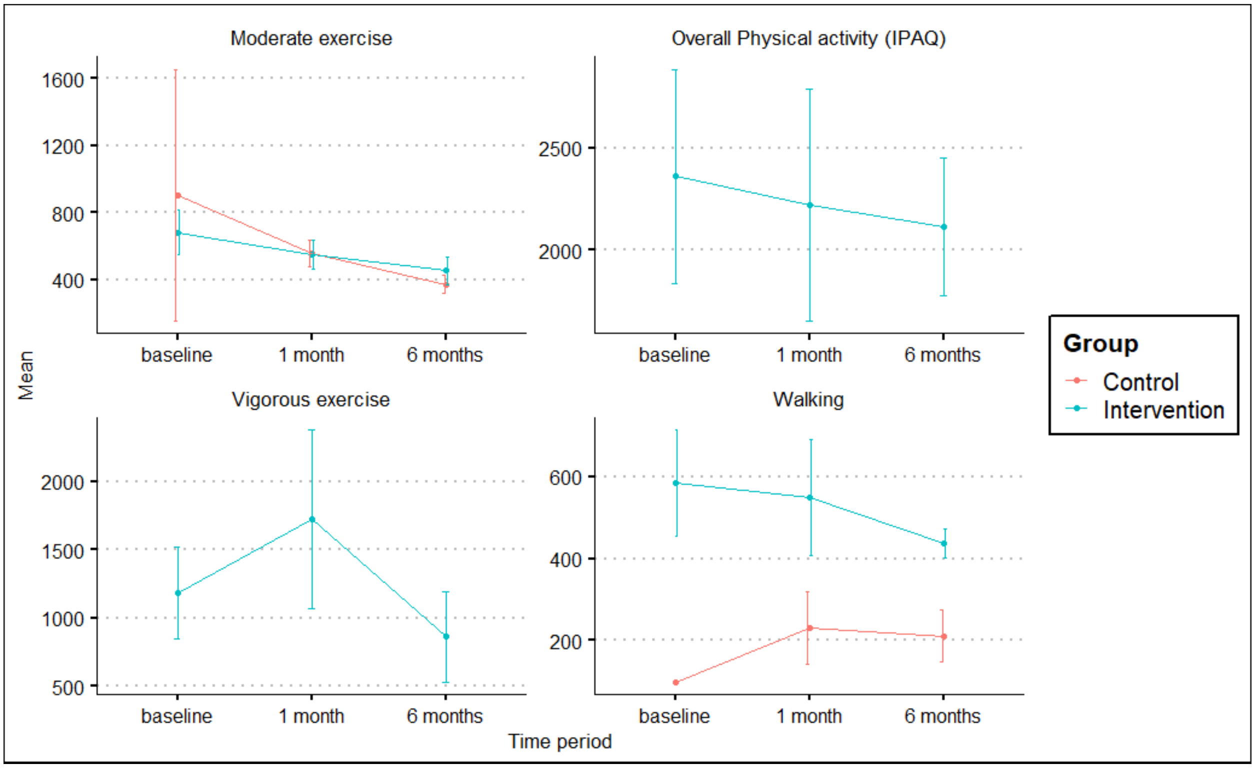


Figure 18: IPAQ means plot

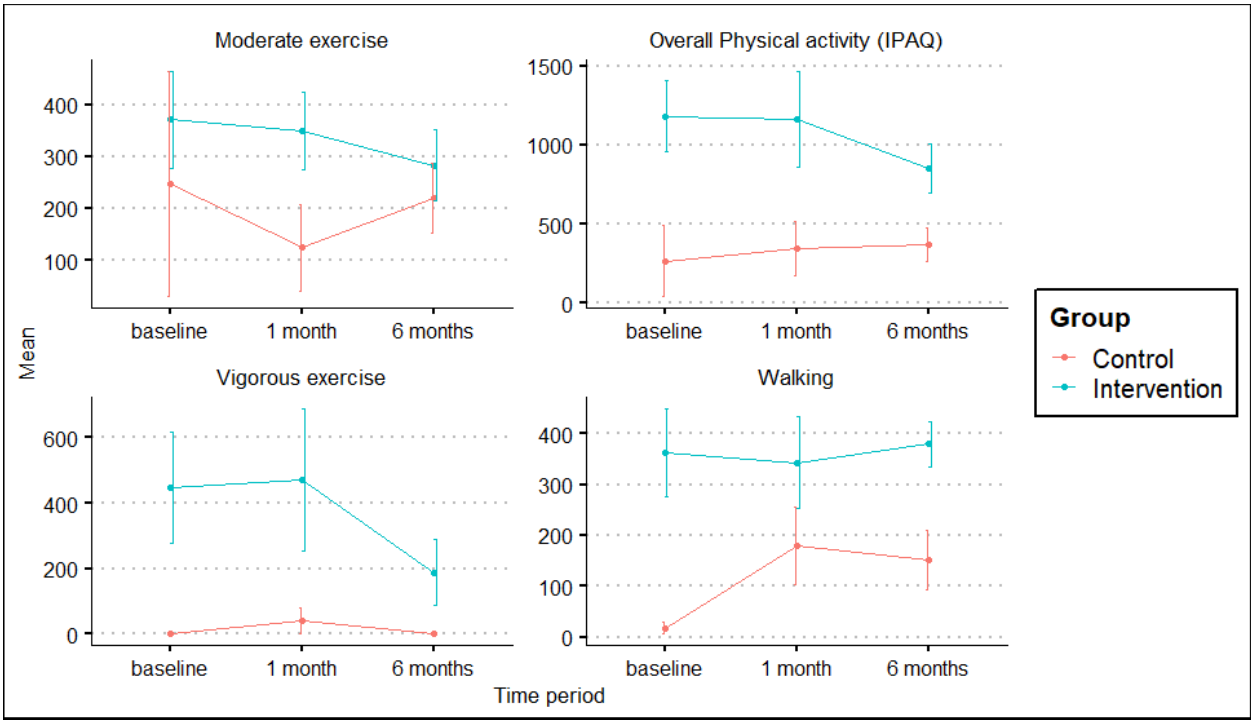


Figure 19: IPAQ means plot after handling missing data

Table 9: Results at Baseline. Comparisons across groups and overall.

	N	Overall, N = 35		Control, N = 11		Intervention, N = 24		p-value*
		Mean (SD)	**[Min-Max]**	**Mean (SD)**	**[Min-Max]**	**Mean (SD)**	**[Min-Max]**	
Adhering to Recommendations	34	13.1 (2.4)	[5.0 - 15.0]	13.2 (2.0)	[8.0 - 15.0]	13.1 (2.6)	[5.0 - 15.0]	0.7
Fluid and sodium Management	34	12.7 (2.0)	[8.5 - 15.0]	12.1 (1.6)	[10.0 - 14.0]	13.0 (2.1)	[8.5 - 15.0]	0.14
Physical activity and recognition of deteriorating symptoms	34	11.7 (3.0)	[3.0 - 15.0]	11.9 (1.7)	[9.0 - 14.0]	11.7 (3.4)	[3.0 - 15.0]	0.6
Overall Self Care (Gr9-EHFScBS)	34	37.6 (6.1)	[18.5 - 45.0]	37.1 (4.5)	[27.0 - 42.0]	37.8 (6.7)	[18.5 - 45.0]	0.5
Anxiety	31	3.4 (2.7)	[0.0 - 11.0]	3.5 (2.2)	[1.0 - 7.0]	3.4 (3.0)	[0.0 - 11.0]	0.7
Depression	31	4.4 (2.7)	[0.0 - 10.0]	6.0 (2.4)	[3.0 - 10.0]	3.8 (2.6)	[0.0 - 10.0]	0.026
Overall Emotional distress (HADS)	31	7.8 (4.5)	[1.0 - 20.0]	9.5 (3.3)	[4.0 - 13.0]	7.2 (4.7)	[1.0 - 20.0]	0.12
Walking	14	549.2 (470.2)	[0.0 - 1485.0]	99.0 (NA)	[99.0 - 99.0]	583.8 (470.4)	[0.0 - 1485.0]	0.2
Moderate exercise	15	726.1 (648.2)	[0.0 - 2400.0]	904.0 (1298.3)	[72.0 - 2400.0]	681.7 (466.4)	[0.0 - 1680.0]	0.7
Vigorous exercise	9	1183.1 (1014.0)	[0.0 - 2880.0]			1183.1 (1014.0)	[0.0 - 2880.0]	-
Overall Physical activity (IPAQ)	6	2359.2 (1289.8)	[0.0 - 3493.0]			2359.2 (1289.8)	[0.0 - 3493.0]	-
Physical	34	17.7 (12.5)	[0.0 - 50.0]	18.6 (15.1)	[3.0 - 50.0]	17.3 (11.6)	[0.0 - 40.0]	>0.9
Emotional	34	6.9 (6.0)	[0.0 - 22.0]	8.0 (5.5)	[1.0 - 15.0]	6.5 (6.3)	[0.0 - 22.0]	0.3
Social	34	4.0 (4.3)	[0.0 - 15.0]	2.3 (1.1)	[0.0 - 4.0]	4.8 (4.9)	[0.0 - 15.0]	0.5
Overall Quality of life (MLHFQ)	34	31.4 (20.9)	[0.0 - 73.0]	32.7 (21.5)	[8.0 - 73.0]	30.9 (21.1)	[0.0 - 70.0]	0.8
Maintenance	34	28.9 (5.8)	[14.0 - 39.0]	23.4 (5.0)	[14.0 - 32.0]	31.2 (4.4)	[20.0 - 39.0]	<0.001
Management	34	14.1 (2.7)	[9.0 - 19.0]	13.2 (1.5)	[11.0 - 16.0]	14.5 (3.0)	[9.0 - 19.0]	0.13
Self-confidence	34	18.3 (3.8)	[10.0 - 24.0]	15.3 (3.0)	[10.0 - 19.0]	19.5 (3.5)	[13.0 - 24.0]	0.006
Overall Self Care (SCHFI)	34	61.3 (9.8)	[36.0 - 79.0]	51.9 (8.5)	[36.0 - 64.0]	65.2 (7.3)	[48.0 - 79.0]	<0.001
Family/ Significant others	32	50.7 (6.4)	[28.0 - 56.0]	50.3 (8.9)	[28.0 - 56.0]	50.9 (5.4)	[36.0 - 56.0]	0.7
Friends	32	20.8 (7.0)	[4.0 - 28.0]	18.4 (8.7)	[4.0 - 28.0]	21.7 (6.2)	[6.0 - 28.0]	0.3
Overall Social Support (MSPSS)	32	71.5 (11.6)	[32.0 - 84.0]	68.8 (15.4)	[32.0 - 84.0]	72.5 (10.0)	[50.0 - 84.0]	0.7

Table 10: Results at 1st month. Comparisons across groups and overall

	N	Overall, N = 33 Mean (SD)	Control, N = 9 Mean (SD)	Intervention, N = 24 Mean (SD)	p-value*
Adhering to Recommendations	32	13.2 (2.0)	12.3 (2.5)	13.6 (1.7)	0.2
Fluid and sodium Management	32	13.3 (1.9)	13.6 (1.4)	13.2 (2.0)	0.8
Physical activity and recognition of deteriorating symptoms	32	12.6 (2.4)	11.3 (3.0)	13.1 (2.0)	0.081
Overall Self Care Management (Gr9-EHFScBS)	32	39.1 (5.4)	37.2 (6.4)	39.9 (4.9)	0.3
Anxiety	33	2.9 (3.0)	2.7 (3.2)	3.0 (3.0)	0.8
Depression	33	3.3 (3.1)	4.3 (3.9)	3.0 (2.7)	0.3
Overall Emotional distress	33	6.2 (5.4)	7.0 (6.1)	5.9 (5.3)	0.6
Walking	20	438.1 (454.1)	231.0 (234.1)	549.6 (510.5)	0.073
Moderate exercise	17	551.3 (305.3)	560.0 (113.1)	550.1 (325.0)	>0.9
Vigorous exercise	6	1726.7 (1600.9)	-	1726.7 (1600.9)	-
Overall Physical activity (IPAQ)	4	2220.1 (1138.6)	-	2220.1 (1138.6)	-
Physical	33	17.1 (15.3)	20.8 (14.4)	15.7 (15.6)	0.2
Emotional	33	5.1 (7.2)	6.3 (7.3)	4.7 (7.3)	0.5
Social	33	3.6 (3.3)	4.4 (2.7)	3.3 (3.5)	0.2
Overall Quality of life (MLHFQ)	33	27.8 (25.6)	34.5 (24.6)	25.3 (26.0)	0.2
Maintenance	32	32.5 (4.5)	31.8 (5.3)	32.7 (4.3)	0.6
Management	32	14.4 (3.9)	13.8 (3.0)	14.7 (4.2)	0.3
Self-confidence	32	19.9 (3.2)	19.2 (3.4)	20.2 (3.2)	0.4
Overall Self Care Management (SCHFI)	32	66.8 (8.2)	64.8 (8.7)	67.6 (8.0)	0.3

Table 11: Results at 6 months. Comparisons across groups and overall

	N	Overall, N = 30 Mean (SD)	Control, N = 7 Mean (SD)	Intervention, N = 23 Mean (SD)	p-value*
Adhering to Recommendations	30	13.8 (1.9)	14.1 (0.7)	13.7 (2.2)	0.5
Fluid and sodium Management	30	13.2 (2.6)	12.7 (1.7)	13.3 (2.9)	0.2
Physical activity and recognition of deteriorating symptoms	30	13.2 (1.7)	12.1 (1.2)	13.6 (1.7)	0.011
Overall Self Care Management (Gr9-EHFScBS)	30	40.3 (5.4)	39.0 (1.7)	40.7 (6.1)	0.016
Anxiety	30	2.7 (2.9)	2.4 (2.3)	2.7 (3.1)	>0.9
Depression	30	3.1 (2.8)	3.0 (2.2)	3.1 (3.0)	0.7
Overall Emotional distress	30	5.7 (5.3)	5.4 (3.6)	5.8 (5.7)	0.5
Walking	25	391.4 (177.4)	211.2 (141.2)	436.4 (157.8)	0.016
Moderate exercise	17	441.6 (282.3)	373.3 (92.4)	456.3 (309.0)	0.8
Vigorous exercise	5	864.0 (740.6)		864.0 (740.6)	-
Overall Physical activity (IPAQ)	4	2114.5 (676.1)		2114.5 (676.1)	-
Physical	29	11.2 (11.8)	9.4 (4.0)	11.8 (13.4)	0.7
Emotional	29	4.0 (4.2)	3.9 (2.7)	4.1 (4.7)	0.6
Social	29	2.8 (3.0)	2.7 (2.8)	2.8 (3.1)	>0.9
Overall Quality of life (MLHFQ)	29	19.1 (18.8)	17.0 (9.0)	19.8 (21.2)	0.6
Maintenance	29	33.3 (4.7)	29.3 (3.8)	34.5 (4.3)	0.011
Management	29	14.9 (3.2)	13.7 (3.4)	15.2 (3.1)	0.2
Self-confidence	29	19.6 (2.4)	18.0 (2.8)	20.0 (2.1)	0.089
Overall Self Care Management (SCHFI)	29	67.7 (8.7)	61.0 (7.3)	69.8 (8.2)	0.030
Family/ Significant others	30	52.0 (3.7)	49.9 (4.2)	52.7 (3.4)	0.041
Friends	30	23.1 (4.3)	23.0 (2.4)	23.2 (4.8)	0.2
Overall Social Support (MSPSS)	30	75.1 (6.3)	72.9 (6.2)	75.8 (6.3)	0.15

The reliability of the scales was explored using the Cronbach's alpha internal consistency index at the baseline measurements. Overall, scales demonstrated a satisfactory (>0.70) reliability index; Gr9-EHFScBs a = 0.80, HADS a = 0.74, MLHFQ a=0.93, SCHFI a = 0.86 and MSPSS a=0.92. The reliability index for the scales' dimensions is seen in Table 12.

Table 12: Scales' internal consistency index (baseline measurements)

Dimension	# items	Cronbach's alpha
Adhering to Recommendations	3	0,64
Fluid and sodium Management	3	0,31
Physical activity and recognition of deteriorating symptoms	3	0,57
Overall Self Care Management (Gr9-EHFScBS)	9	0,8
Anxiety	7	0,78
Depression	7	0,54
Overall Emotional distress	14	0,74
Physical	10	0,93
Emotional	6	0,83
Social	3	0,81
Overall Quality of life (MLHFQ)	21	0,93
Maintenance	10	0,75
Management	5	0,47
Self-confidence	6	0,93
Overall Self Care Management (SCHFI)	21	0,86
Family/ Significant others	8	0,92
Friends	4	0,98
Overall Social Support (MSPSS)	12	0,92

Missing Values

Missing values in the scales have been imputed using the multiple imputation algorithm. Table 13 presents the number of participants with missing values on more than 50% of the scales' items. No missing value imputation was performed on the scores' items hence no dimension scores were calculated for those participants.

Table 13: Number of participants with missing values on more than 50% of the scales' items

	Time point			
Scale	**Baseline**	**1 month**	**3 motnhs**	**6 months**
HADS	5	0	0	0
IPAQ	0	0	0	0
MSPSS	8	-	-	0
MLHFQ	2	1	0	1
Self Care (SCHFI)	3	1	0	1
Gr9-EHFScBS	2	1	0	0

Survival Analysis

The analysis was performed for a 30, 90-days and 180-day period (1, 3 and 6 months). The endpoints for the analysis were the acute events that are expressed as a visit to the ER, or re-admission or death due to heart related complications reasons or other. The term “survival” corresponds to an acute event-free patient throughout the 30, 90 or 180 days. Patients who “survived” until the end of the 30,90 or 180-day period were characterised as “censored” and were assigned a follow-up time of 30, 90 or 180 days accordingly.

Four participants from the CG (44%) and two (9.1%) participants from the IG experienced at least one acute event throughout the 30- day period after their recruitment (p=0.043). The mean number of events per patient in the CG is 0.44 (SD=0.53) and 0.09(SD=0.29) events for the IG (p=0.026). The frequency of acute events in the 30-day period are shown in the Table 14.

Table 14: Frequency of acute events within one month after recruitment.

	Control, N = 9	Intervention, N = 22	P value
Number (%) of patients with acute events			
event_overall	4 (44%)	2 (9.1%)	0.043
event_RA	3 (33%)	2 (9.1%)	0.13
event_ER	1 (11%)	-	0.3
Mean number (SD) of acute events			
n_ALL	0.44 (0.53)	0.09 (0.29)	0.026
n_RA	0.33 (0.50)	0.09 (0.29)	0.10
n_ER	0.11 (0.33)	-	0.12

- Mean number of acute events is calculated over the full sample of patients
- Kruskal Wallis test
RA: re-admissions
ER: Emergency Room

Up to the 90-day period six participants from the CG (67%) and two (9.1%) participants from the IG experienced at least one acute event after their recruitment (p=0.003). The mean number of events per patient in the CG was 0.78 (SD=0.6) and 0.09 (SD=0.29) events for the IG (p<0.001). Results are shown in Table 15.

Lastly, six participants (67%) from the CG and six (27%) participants from the IG experienced at least one acute event throughout the 180-day period after their recruitment (p=0.056). The mean number of events per patient in the CG was 0.78 (SD=0.6) and 0.32 (SD=0.57) events for the IG (p=0.048). The breakdown across Readmissions and ER visits is seen in Table 16.

Table 15: Frequency of acute events within 3 months after recruitment.

	Control, N = 9	Intervention, N = 22	p.value
Number (%) of patients with acute event			
Overall	6 (67%)	2 (9.1%)	0.003
Re-admissions	5 (56%)	2 (9.1%)	0.012
Visits to ER	2 (22%)	-	0.077
Mean number (SD) of acute events			
Overall	0.78 (0.67)	0.09 (0.29)	<0.001
Re-admissions	0.56 (0.53)	0.09 (0.29)	0.006
Visits to ER	0.22 (0.44)	‘-	0.025

Mean number of acute events is calculated over the full sample of patients
Kruskal Wallis test

Table 16: Frequency of acute events within 6 months after recruitment.

	Control, N = 9	Intervention, N = 22	p.value
Number (%) of patients with acute event			
Overall	6 (67%)	6 (27%)	0.056
Re-admissions	5 (56%)	5 (23%)	0.10
Visits to ER	2 (22%)	2 (9.1%)	0.6
Mean number (SD) of acute events			
Overall	0.78 (0.67)	0.32 (0.57)	0.048
Re-admissions	0.56 (0.53)	0.23 (0.43)	0.081
Visits to ER	0.22 (0.44)	0.09 (0.29)	0.3

- Mean number of acute events is calculated over the full sample of patients

- Kruskal Wallis test

Furthermore, survival analysis was made using Kaplan-Meir curves and the log-rank test were to explore the difference between control and intervention with regards to the time until the first acute event. The survival of the CG was lower than that of the IG's in all three time points; 30 days: (log-rank test, $X^2(1) = 5.7$, p=0.02), 90 days: (log-rank test, $X^2(1) = 12.3$, p<0.001) and 180 days: (log-rank test, $X^2(1) = 6.8$, p=0.009). The survival comparison is graphically indicated using Kaplan Meir curves for 30-day, 90-day and 180-day in Figures 20,21,22 accordingly.

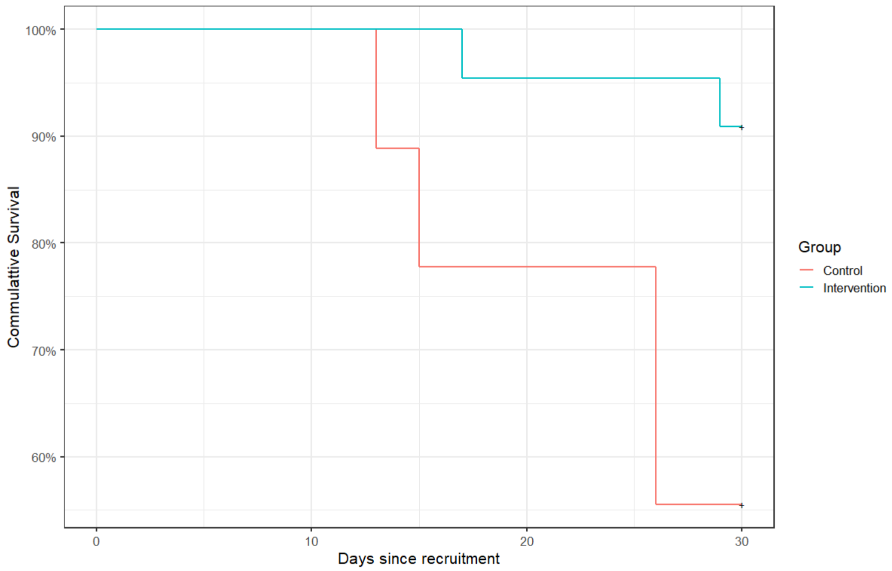


Figure 20: Kaplan Meir curve of the survival for acute events at 1 month after recruitment.

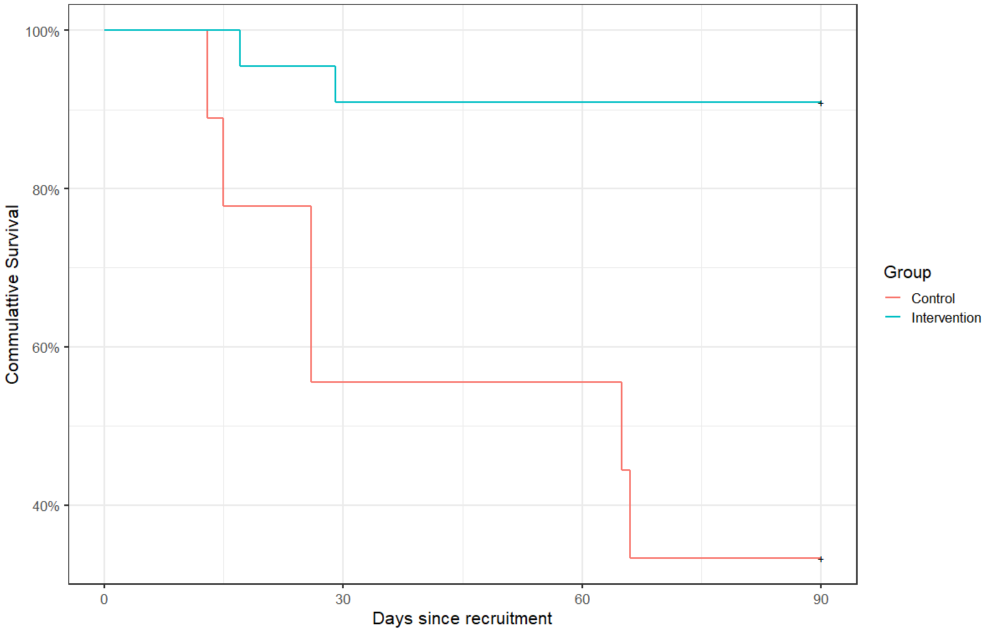


Figure 21: Kaplan Meir curve of the survival for acute events at 3 months after recruitment.

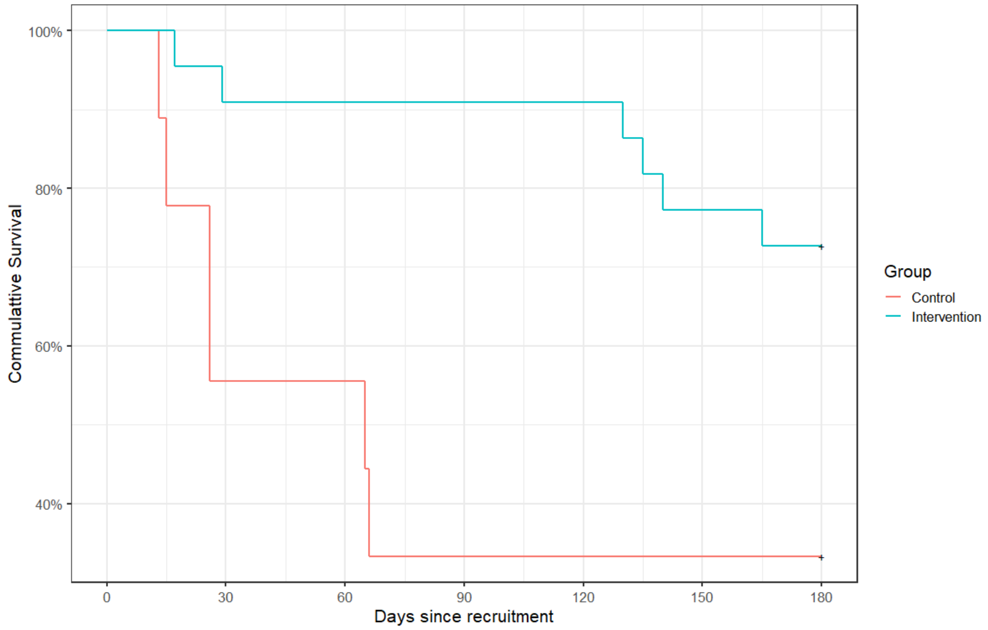


Figure 22: Kaplan Meir curve of the survival for acute events at 6 months after recruitment.

The hazard for an acute event was studied with the cox regression model. The model was also used to control for the demographic and clinical confounders of age and comorbidities.

Cox regression showed that the IG reduces the hazard for an acute event compared to the CG. In the IG a patient is associated with a reduced risk by 93% [HR:0,07 (95CI: 0,01-0.61), p=0.02] in 30-day, a reduced risk by 96% [HR:0,13 (95CI: 0,00-0.39), p=0.001] in 90-days and with a reduced risk by 87% [HR:0,13 (95CI: 0,03-0.54), p<0.001] in 180-days. Results are shown in Tables 17,18 and 19, accordingly.

Table 17: Cox regression for the effect of the intervention on the Hazard for an acute event within 1 month.

Effect	HR	SE	z	95% C.I. for HR		p.value
Intervention	0,07	1,09	-2,41	0,01	0,61	0,02
Age	1,01	0,04	0,32	0,93	1,11	0,75
Diabetes	2,19	1,53	0,51	0,11	43,95	0,61
Hypertension	0,27	1,39	-0,94	0,02	4,14	0,35
Renal failure	0,25	1,35	-1,02	0,02	3,57	0,31
COPD	1,59	1,46	0,32	0,09	28,01	0,75

Table 18: Cox regression for the effect of the intervention on the Hazard for an acute event within 3 months

Effect	HR	SE	z	95% C.I. for HR		p.value
Intervention	0,04	1,13	-2,80	0,00	0,39	0,01
Age	0,98	0,04	-0,53	0,91	1,06	0,60
Diabetes	3,13	1,64	0,70	0,13	77,41	0,48
Hypertension	0,27	1,48	-0,88	0,02	4,92	0,38
Renal Failure	0,48	1,15	-0,64	0,05	4,52	0,52
COPD	1,49	1,50	0,27	0,08	27,93	0,79

Table 19: Cox regression for the effect of the intervention on the Hazard for an acute event within 6 months

Effect	HR	SE	z	95% C.I. for HR		p.value
Intervention	0,13	0,73	-2,82	0,03	0,54	0,00
Age	0,97	0,03	-1,28	0,92	1,02	0,20
Diabetes	0,40	1,02	-0,89	0,05	2,96	0,37
Hypertension	1,20	0,78	0,23	0,26	5,55	0,82
Renal Failure	1,20	0,94	0,19	0,19	7,53	0,85
COPD	13,52	1,25	2,08	1,17	156,65	0,04

Moreover, in table 19 is shown a higher HR for the comorbidity COPD, but this cannot be considered as a noticeable as only two patients out of the thirty-five had COPD.

7.2.2 Qualitative Data

The following open-ended questions were used to assess if participants' needs were met and what else they would like to be included in the program.

1) Are your needs for information and communication met with the HP's through this program?
2) What would you like to be included?

All participants answered whether they were satisfied for the program, not giving more details. Few participants referred the meetings were very helpful by meeting and talking with other patients; it was supportive listening to “similar” stories and how others experience such events was helpful. Even suggestions for the second question were only few. Most of the patients were asking for more practical sessions for PA and some of them asked for even more individualized (private) time for more attention.

8. DISCUSSION

8.1 Designing And Developing a Supportive Care Program For Heart Failure Patients In Cyprus

There are multiple management programs for HF patients and even though evidence exists for successful management programs (Oyanguren et al., 2016) that improve HF-related outcomes, such as readmission rate (Clark et al., 2009; Jokman et al., 2016), patients' testimonies may show different results. Aiming to develop an individualized HF management program, the framework of Medical Research Council for complex interventions was followed. A sequential exploratory approach was used in order to develop the content of the intervention to be tested.

The meta-synthesis conducted in order to identify the needs of patients with HF as they describe these themselves. From the thematic synthesis one core theme ('*Wind beneath my wings'*) and five main themes were revealed: Continuing person-centered care, social support, supportive care, palliative care and self-care management. The meta-synthesis provided information focusing in two aspects of HF management: First, The important active role of the patient being the protagonist in dealing with his/her illness and secondly, the results highlight that the actions of all the mechanisms of disease control reach the patient with HF and his/her needs. Choosing either way, the results remain the same; HP's should take into consideration all these aspects and in collaboration with the person find the way to address their needs. Each person is unique and has different perception of his life even when experiencing similar situations of uncertainty and restriction with others (Alharbi et al., 2012). Thus, the key remains the CPCC (Ekman et al., 2011). The core theme induced was the "*Wind beneath my wings*"; the role of the HPs ('*the wind'*), who encourages patients ('*the wings'*) to take part in their care, to control and take decisions (self-care) for their own health and HR-QoL. Patients' empowerment helps increasing patients' awareness as well as encourages the mutual trust and open communication between patients and HP's (Tengland et al., 2007). Following HF patients in a closer manner, limitations and changes frequently occur and are identified during of such an unpredictable syndrome as HF (Olano-Lizarraga et al., 2016). One of nurses' priorities is to get to know the patient and how this patient copes with the syndrome (Alharbi et al., 2012; Kane et al., 2015).

It is important that HP’s place the patient with HF at the center of every care effort and help him/her to address his/her unmet needs achieving the same time the best possible HR-QoL (Ekman et al., 2017). Kane et al., (2015) refer to CPCC as the answer to the management challenge of HF, by incorporating patients’ preferences, values, beliefs, illness understanding, illness experience and information needs. All of the above are considered into the decision-making process, encouraging patient engagement and collaborative goal setting. But is that enough to address the unmet needs of HF patients?

The answer seems to be CPCC in the context of supportive care. Supportive care could be developed and provided starting from CPCC. The concept of CPCC integrates patients’ and family preferences needs into the goals of care, manages symptoms to the level of comfort desired, and attempts to reduce the burden of illness on both; the patients and their family (Nguyen et al., 2019).

Identifying the framework of supportive care through the meta-synthesis, the next step was to examine the effectiveness of supportive care interventions in HR-QoL of HF patients. The intervention between the studies varied in intensity, complexity and the intervention as such. The overall pooled effect for HR-QoL between patients receiving supportive care was found to be positive and statistically significant. Supportive care in HF patients is a new approach for cardiology nurses (Jaarsma et al., 2009). Even though there is evidence of effective interventions (Lambrinou et al., 2013; Arestedt etal., 2013) there is not a systematic design of supportive interventions that might be comparable with each other. Maybe this is due to the trajectory of HF which is characterized by exacerbations of symptoms requiring acute and intensive care (Murray et al., 2005). But at some point, rescue attempts fail and death may appear to be “sudden’ or unexpected (Goodlin et al., 2009). As revealed from the review and meta-analysis there is no standardized supportive care thus, the large statistical heterogeneity observed in the current meta-analysis might be due to true “methodological” and “clinical heterogeneity”, both in terms of the type of interventions employed as well as the settings and patient characteristics. Interventions of the studies varied in intensity, design and intervention as such (Kyriakou et al in press).

To further understand the results of the meta-analysis, a meta-regression analysis was performed. The meta-regression revealed two variables: behavioral therapy and family support to have an inverse event with the effectiveness of the intervention in relation with the HR-QoL. The current outcome supports the results of the research study of Durante et al (2018) who suggest caregivers' education and formal information. Often caregivers do things 'incorrectly' cause they just do not know the right way or caregivers mental and psychological health does not allow them to do it efficiently (Vellone et al.,2015; Buck et al., 2015; Wolff et al, 2016). As far it concerns the behavioral therapy, even though it is found to be effective, still further research is needed in order to clarify long term effects in HF outcomes (Buck et al., 2015). The result may be further explained with the large heterogeneity between interventions and the variability of the population participating in the intervention.

Recent data shows a close relationship between caregivers' strain, mental health, psychosocial status and support and it is suggested that caregivers need supportive care (Vellone et al., 2015). That is why researchers suggest that supporting caregivers have ethical and clinical rationale as well (Buck et al., 2015; Bidwell et al., 2017). Decreasing family distress is a key to improving patient physical and mental QoL (Goodlin et al., 2004). Studies included in the current review refer that interventions were focusing only on patients even though the care of chronic illness patients depends on caregivers and that could be an explanation of the negative relationship found. Only two studies (Brodie et al., 2008; Aguado et al., 2010) measured support or involved family to obtain data but again, the intervention was focusing only on the patients. The finding is very enlightening for researchers and clinicians developing HF management programs and supportive care interventions.

The heterogeneity of the findings regarding the effectiveness of behavioral therapy may be attributable to varying trial designs, intervention components, follow-up periods, or outcome assessments. The main mechanisms of HF disease management programs are associated with increased patients' understanding of HF and its self-care, higher involvement of caregivers and family members in self-care, enhanced self-efficacy and psychological well-being (Clark et al., 2009), increased support from HPs and convenient use of technology. These main mechanisms do not operate alone but require favorable contextual factors to be present (Jonkman et al., 2016; Wallstrom et al., 2018). That means individualized PCC should be addressed and managed taking into consideration the environment of the patients and their caregivers to whom they count on (Jonkman et al., 2016; Ekman et al., 2017; Durante et al., 2018). Supportive care may be effective when it takes a form that responds to someone's expectations based in a particular culture (Kim et al., 2008).

The optimal characteristics of successful and structured supportive care interventions were not determined through the meta-analysis, but valuable information was gathered and highlighted the need to incorporate supportive care interventions to meet holistically the needs of HF patients. The development of the intervention included focus groups' interviews which were performed to identify Cypriot patients' needs and the form that supportive care needs to be developed and organized in order to be effective. The themes revealed from the focus groups where the same as in the meta-synthesis, with only exception of seeking better health services. Patients were finding ways to cover the lack of organized services, developing personal relations with HP's in an effort to perceive what normally should have, emergency care in symptoms and regular follow-up in certain time framework. It is interesting to refer that focus groups took place before the first phase of the new General Healthcare System implementation in the country. Apart from this key element the rest components that Cypriot patients mentioned where the same as found in the literature.

Last step of finalizing the intervention was to pilot test the study, to determine whether the intervention is effective, whether it is acceptable to patients, and potential effect on patient outcomes.

8.2 Understanding the concept of the intervention

This research followed the design of complex interventions in order to reveal patients' needs following an exploratory research pathway based on CPCC. It is important to understand how patients view their health and what outcomes they deem to be important, thus an exploratory approach to design the intervention was undertaken. The concepts of CPCC and supportive care were the two main elements of the implementation of this research program. A continuing evaluation as patients' needs are changing over time and working as a liaison for them to support, assist or even only discuss their current needs was the mechanism based on which this research was developed and implemented.

CPCC may be the key element of incorporating patients' preferences, values, beliefs, illness understanding, illness experience and information needs into the decision-making process (Blom et al., 2015; Kane et al., 2015). Although a global definition is lacking regarding CPCC approach for HF patients, this concept is close related with other concepts; respect of patients' needs, values, preferences, shared –decision making and patient-healthcare collaboration (Kane et al., 2015). CPCC places the patient in the center as is recognizing them as “whole person”, giving them simultaneously an active role in their disease, involving them in decision making process regarding their treatment. The “idea” is that patients manage their own care, while collaborating with the HPs in making treatment decisions (Casismir et al., 2014). Focusing on the patient and not to the disease, better management of the disease along with patient satisfaction can be achieved through empowering individual patients to become knowledgeable and more informed about their diagnosis, successfully manage their symptoms, and engage in self-care behaviors (Ekman et al., 2012; Casismir et al., 2014). This approach is more complete when adding supportive care in the mechanism as supportive care directly indicate needed resources through needs’ assessment, quantifies unmet needs, and respectively allocates health resources. Furthermore, HPs can identify patients’ levels of need and care and consequently, offer need-targeted prevention and early interventions (Bonevski et al., 2000; Kolhmann et al. 2013). As referred above, the two pillars of CPCC and supportive care frameworks were combined in the development and implementation of the current interventional management program.

8.3 Crude Results

Participants in the pilot study had mean age of 71 years old and most of them were males (83%). This is in linear with the literature as is referred that most of the patients are over 65 years of age and there is greater incidence in men (Roger et al., 2013; Mozaffarian et al., 2016). The last 50 years the incidence of death due to HF has been declined among women but the same does not apply for men (Levy eta l., 2002; Ziaiein &Fonarow., 2018). Women tend to develop HF in older age and they are more symptomatic compared to men, although the prognosis is the same. Due to the more frequent symptoms, women score higher in depression feelings and they tend to describe having worse HR-QoL as they experience restriction in their daily life and social activities (Bozkurt & Khalaf., 2017). This case showed up in our pilot study besides the small sample size, as incidentally five out of the six female patients were allocated in the CG.

HR-QoL in HF patients is seriously impaired due to the symptoms that these patients experience and the complex regimen of self-care that have to manage (Kraai et al., 2012). It is noteworthy to mention that HR-QoL is influenced by several physical, emotional, and social factors and is uniquely perceived by each patient (Gallangher et al., 2019). A poor health status is a significant predictor of adverse prognosis in patients with HF, thus restriction of HF symptoms while finding ways to improve HR-QoL should be a priority treatment goal for HF patients (Mommersteeg et al.,2009; McMurray et al., 2012). Patients with HF have lower HR-QoL compared not only with healthy individuals, but even with patients with chronic conditions (Kraai et al., 2012). In a recent systematic review and meta-analysis, Moradi et al (2019) found that patients with HF have moderate to poor HR-QoL as measured with the health specific questionnaire of MLHFQ. Based on the cut-off point in the MLHFQ tool, a higher score indicates a lower HR-QoL. Scores less than 24, from 24 to 45, and above 45 indicates a good, moderate, and poor HR-QoL, respectively. The same trend was observed in our study of which both groups had moderate HR-QoL based on the baseline scores. In the first month, the IG had a slightly improved trend scoring 25.3 that can be characterized as moderate to good HR-QoL. It continued having this progression ending to good HR-QoL at a six-month period. Conversely, participants of the CG had worse outcomes in the first month, but unexpectedly they had good HR-QoL in six months period. This could be partly explained by the fact that three patients died in this time-period and one patient was lost during the follow-up. Those patients could have worse HR-QoL, especially if they experienced advance disease and after the fatal events, the overall score changed for the whole group.

The most striking feature in our results regarding HR-QoL was the improvement of two marks in the social dimension of MLHFQ. Patients started with 4.8 (4.9) and ended up with 2.8 (3.1). Apparently, some aspects, such as depression and social function disability, which are shown to have a significant impact on HR- QoL in patients with HF, are not taken into consideration enough (Schowalter et al., 2013). The social dimension of HR-QoL is defined as “the dimension of an individual’s well-being that concerns how the individual gets along with others, how other people react to him or her, and how the person interacts with social institutions and norms” (Siegrist J &Junge). Social aspect of health is identified by the patients as social support and social activities. In a qualitative review it was referred that patients are mentioning that having a supportive environment in which their needs are met would improve their QoL (Heo et al., 2009). This may be the explanation for the positive results in the social dimension of HR-QoL. Patients with HF experience limitations in their daily lives due to the nature of the disease, but HR-QoL of patients with HF can be improved by changing patients' psychological perceptions and providing opportunities for meaningful social interaction with friends, family and significant others (Heo et al., 2009; Garin et al., 2013).

The above explanation may also justify the positive effect in the sub-dimension of family/ significant others of the MSPSS scale. Patients were empowered, motivated, and supported in current program's monthly meetings through educational sessions, conversations, practical examples and not limited to those. Patients were also conducted by telephone once a month and they could call a research member team for information or seeking help. Caregivers were also invited in the meetings and could be involved in the tasks. Social support is a multi-faced concept that positively influences disease-related outcomes in multiple chronic illnesses, including HF (Hunt, et al., 2012; Zhang et al., 2015). Social support redirected by nurses through supportive care management may also have an impact on self-care management through practical enhancement of the patients and their family/caregivers on healthy behaviors (Sayers et al., 2008). A realistic dialogue acknowledging the different trajectories and dimensions of needs with the patient, family, and professionals can allow the option of supportive care, focusing on quality of life and symptom control, to be adopted earlier and more frequently (Murray et al., 2007). Nurses can provide individualized supportive care, offering a positive emotional support, enhancing patients' knowledge of self-management and meeting patients' physical and psychosocial needs through continuous assessment, counselling and educating patients with HF (Wang et al., 2015). In this research study, an individualized supportive care program was provided to the patients with HF and despite the monthly meetings, conversations for more personal issues were also established. For instance, conversations related to sexual issues, were privately discussed when the participant needed to, individual counselling for respiratory exercise was given when the participant could not walk due to the severity of the illness and psychological support in the case a spouse passed away. The aim is to continuously assess patients' needs in order to meet them in each time point.

As referent above self-care is a key element for the management of HF. Self-care management is the cornerstone of HF management taking into consideration patients' capability, knowledge, background and concerns (Ekman et al 2011; McMurray et al 2012). Self-care as deliberate action is an action to achieve a foreseen result, preceded by investigation, reflection and judgment to appraise the situation and by deliberate choice about what should be done (Orem, 2001). Self-care of HF involves engagement in routine self-care maintenance behaviors and in self-care management, along with early recognition of deteriorating symptoms, adopting strategies to face a symptom and be able to evaluate if an action helped (Lee et al., 2014).

Participants had a positive course in self-care with no big differences among the three time points of evaluation, but this was observed for both groups. The results for the overall self-care behavior are not surprising as HF is complex regimen and these patients have one or more comorbidities that have to manage as well (Dickson, Buck, & Riegel, 2011). Comorbidities makes HF self-care more complicated. Patients have to be knowledgeable of several strategies for the management of the syndrome the need for example adjustment to diuretics in response to increases in daily weight, and combination of the information taking from multiple providers, related to different comorbidities. Additionally, they are faced with functional limitations related to symptoms, mobility and fatigue that impact the patients' ability to have adequate self-care (Riegel et al., 2006; Dickson, Buck & Riegel., 2011; Graven & Grant., 2014; Zhanget al., 2015). Patients often find it challenging to engage in multiple self-care behaviors that require ongoing commitment, alongside copying with comorbidities and daily living (Paradis et al., 2010).

Although participants of the IG had a stably positive course in self-care behavior the most remarkable feature observed was in the component of physical activity and recognition of deteriorating symptoms. More specifically, participants marked 11.7 (3.4) at baseline, 13.1 (2.6) at first month, and 13.6 (1.7) at sixth month. Conversely, participants of the CG marked 11.9 (1.7) at baseline, 11.3 (3.0) at first month, and 12.1 (1.2) at sixth month. Possible explanation of this finding may be the context and intensity of the intervention; educational sessions were performed every month, giving information for preventing and recognizing symptoms, tips for engagement in self-care behaviors, resolving queries about HF and support to modify lifestyle behavior. The same time patients were empowered communicate with HPs whenever they needed to. From the other hand, this may result from the support that participants felt through this procedure. Social support and networking are important factors affecting self-care management as are to found to positively affect an individual's self-care behavior (Graven et al., 2015).

In the beginning of the program, participants were more hesitant regarding physical activity for multiple reasons including fear of symptoms during exercise, physical limitation due to their functional capacity related to HF or resulting from other conditions such as back pain. In spite of the fact that missing data limits our ability to see the trend regarding physical activity, participants were more willing to perform physical activity after giving information about the intensity of the exercise that each one could perform, giving alternatives, such as respiratory exercises and by reinforcing patients to perform exercise. Specifically, some of our meetings took place in a park for walking. Physical activity has been considered to be an important and essential part of HF management programs (Sato et al., 2012) as it is also indicated in the guidelines (Ponikowski et al., 2016). Patients with HF often avoid physical activity as a result of exercise intolerance stemming from the inability of the heart to deliver sufficient blood to the peripheral muscles (Alosco et al., 2015) or even fear or lack of confidence. Patients with HF experience discomfort during physical activity due to symptoms such as dyspnea and fatigue (Piepoli et al., 2004; Alosco et al., 2015).

In overall, three variables are shown to have greater positive effects in favor of intervention group in the current study; the social dimension of HR-QoL, the support from family/significant others and the self-care behavior of physical activity and recognition of deteriorating symptoms. Unfortunately, the small sample size does not allow further investigation of this triangulation to reveal the cause-effect relation. Gallagher et al (2011) refer that social support has positive effects on medication in some aspects of self-care as adherence and dietary self-care/adherence. Graven et al (2015) mentioned that social support and networking are important factors which affect self-care management and maintenance, as found to positively affect an individual’s self-care behavior (Graven et al., 2015). Last but not least, social support is associated with improved HR-QoL and support offered from HP’s can play a vital role in maintaining health behaviors (Barth et al., 2010).

Apart from HR-QoL, mortality and readmission rate in HF patients are associated with social support (Gallagher 2015; Chung et al., 2017), anxiety and depression (Chung et al., 2017), low physical activity (Alosco et al., 2015) and poor self-care management (Riegel et al., 2009; Dickson, Buck, & Riegel, 2011). There are encouraging data for the effectiveness of management programs in terms of mortality and readmission, as some of the studies achieved a reduction of 50% in HF re-admissions and 20% in mortality (McDonald, 2010), but results are controversial (Savard et al., 2011, Lambrinou et al., 2012). Mortality rate after an acute event is estimated at 10% and 20-25% of patients will be readmitted within the first month after discharge (Cooper, et al. 2015; Discroll et al., 2016). In the current pilot study, both mortality and readmission, had lower rate in the intervention group. In fact, none fatal event occurred in the IG, three participants of the CG died and readmission rate was greater in the CG [0.78 (0.67) for the CG and 0.32 (0.57) for the IG]. It is noticeable that most of the readmission in the CG occurred during the first month. The post-discharge period of 30 days is a particularly vulnerable period for decompensation (Solomon et al., 2007; Chun et al., 2012). Factors that may help to prevent readmissions could be adequate discharge planning, early post-discharge follow-up or improved coordination between inpatient and outpatient health care teams (Feltner et al., 2016). The fact that no patient died in the intervention group might resulted from the close monitoring and early recognition of decompensated symptoms. As stated in a recent systematic review, management programs should contain components that increase patients' understanding of HF, self-care, self-efficacy, family/caregiver involvement, psychosocial well-being, health professional support, and technology use (Kalogirou et al., 2020). Apart from the last, all other components were involved in the current program, although a more organized exercise program and more consisted involvement of caregivers is planned for the RCT program 'SupportHeart'. Lastly, during the last two months the meetings were cancelled due to the pandemic of COVID19 but the communication with the patients continued through phone calls. It shown that patients were seeking ways to "see" each other and not only hear, thus services as viber were used. Although telemedicine is still characterized as vague for the effectiveness in HF management programs, it might be effective in a multicomponent program as now seems to be necessary.

The multiple step process of designing this program along with the pilot testing of the intervention illustrate the effective trend of the RCT. Simultaneously, researchers had the opportunity to identify the weakness or gaps of the program and modify accordingly the intervention.

9. CONCLUSION

Supportive care seems to be a promising concept for HF management programs. Trends from our pilot study illustrated the effectiveness regarding multiple outcomes such as HR-QoL, perceived support and reduced acute events. Testing the feasibility of the study, research team identified the weak components of the program such as physical activity, giving us the opportunity to shape and enrich the intervention of the RCT program “SupportHeart”. As shown from previous research, multicomponent management programs are seemed to be effective but ideally this must be perceived from the patient side as well. Patients’ satisfaction could be achieved when covering their needs. The mechanism by which this is feasible is supportive care; continuing assessment, support and early recognition of decompensation. It is also known that another component of sufficient and successful HF management programs is long term duration which could also be a marker for the value of continuity and long-term support. Thus, a structured program has to be offered to HF patients as part of the health care services.

10. WHAT THE CURRENT STUDY ADDS IN THE LITERATURE AND CLINICAL SETTING

In our knowledge this is the first time that the concept of supportive care is implemented as a framework for the management of HF patients. The aim was to design and develop a management program based in the needs of the HF patients as are prescribed by them. Thus, a sequential exploratory approach followed, developing a complex intervention as known from previous research that multicomponent programs seemed to be more effective.

The adoption of this program as a health care service would be ideal, as the health care system in Cyprus does not offer any kind of services for patients with HF further the six months follow-up visits to the cardiologist. Even though the European guidelines for the management of HF highlight the importance of continuing management care programs by a multi-disciplinary team the new health care system in Cyprus has not been yet organized in a way to be able to offer such programs. ‘SupportHeart’ might be the beginning of nurse-led clinics in Cyprus for patients with HF, but also the start for other chronic diseases as well. Furthermore, this program is pioneer and could be useful for other countries that have more structured services for HF patients. Through continuing assessment and close follow up patients are “supported” in every step based on their needs and may fill the gap in management programs where non-adherence to the therapy still exists causing impaired HR-QoL, acute events, re-admissions and increased costs in health care services.

11. IMPLICATION TO PRACTICE – RECOMMENDATIONS

HF is a complex syndrome requiring patients’ maintenance to certain self-care actions, or even modifying their lifestyle in order to remain healthy and have good HR-QoL. Thus, these patients need continuous empowerment and support to adhere. The supportive care framework in the concept of nurse-led management programs can offer to these patients what they need. This concept would be even more effective when offered to patients as a structure service and/or as part of HF clinics services. The key element of supportive care is the close, individualized and continuing assessment and support of HF patients. This may be the solution for HF management programs’ Achilles’ heel that is non-adherence to the therapy.

Furthermore, this program could be the start for nurse-led HF clinics and other chronic illnesses in Cyprus. This approach (supportive care program) has already been shown to be effective in HF and oncology patients and may work in other chronic diseases as well. Most importantly, nursing holistic approach is shown to be effective in all manners: patients’ satisfaction, clinical outcomes and costs. Strong evidence that should been taken into consideration by HPs, stakeholders and health care systems.

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Appendix I: Systematic review and meta-synthesis

"A Qualitative Meta-synthesis of Patients' with Heart Failure Perceived Needs”

ABSTRACT

Background

Supportive care may have significant input in patients with heart failure treatment. Support, understanding, receiving comfort and being treated as a whole and unique person are vital for patients with heart failure. In order to develop a person -centered program, it is important to know what are patients’ needs from their perspectives.

Objective

The purpose of this systematic review and meta-synthesis was to explore patients with heart failure needs from their perspective.

Methods

A literature review was conducted using a qualitative methodology. Two of the researchers have undertaken the search using the keywords: ("needs" OR "need") AND ("heart failure") AND ("qualitative") in the databases: PubMed, CINAHL, PsycoINFO, and EBSCO. Pre-defined inclusion and exclusion criteria were set before searching. Consolidated criteria for reporting qualitative studies item checklist was used to assess the research methodology of the studies included in the meta-synthesis.

A “thematic synthesis” methodology to undertake the current meta-synthesis was used. This method is a three-step process: 1. Free line by line coding of the findings of the primary studies, 2. The produced free codes have been organized into related areas to build descriptive themes and lastly 3. Analytical themes have been developed.

Results

Eleven articles were found to fulfill the inclusion criteria which were included in the review and meta-synthesis. Meta-synthesis extracted five different categories covering patents’ needs: Self-management, palliative care, supportive care, social support and continuing person-centered care. The need for continuing empowerment and support to meet those needs was also identified revealing the core theme: ‘Wind beneath my wings’.

Conclusions

The meta-synthesis quotations highlight the necessity for a dynamic and interactive continuing person-centered care focusing on the ongoing needs of the patients with heart failure trajectory. Giving more emphasis in the human dimension and holistic approach of patients with heart failure, along with the cardiology medicine development might be the key for the improvement of clinical outcomes and health related - quality of life.

INTRODUCTION

Heart failure (HF) is an important healthcare problem, associated with high morbidity and mortality rates (1). Patients frequently have poor health related quality of life (HR-QoL), even when treated with modern evidence-based therapy (2,3). Particularly in older patients, HF often exists with other chronic diseases, resulting in complex co-morbidity conditions (4). HF affects 6–10% of the population of 65 and over in the US and is estimated to be increased up to 25% by 2030 (5–7) and is associated with high health care costs and reduced patients' HR-QoL (2,7,8).

Progressive physical decline in advanced disease is well documented, with distinct trajectories described for people with different progressive illnesses (9,10). As HF is a progressive syndrome, individuals experience physical and psychosocial issues resulting in complex needs from the time of diagnosis until the end of life (11). Each exacerbation may result in death, and although the patient usually survives many such episodes, this result in a gradual deterioration in health and functional status (12). Individuals' complex needs, comorbidities and severe symptoms of an unpredictable trajectory affect their HR-QoL (2) creating palliative needs from the early stages (12). Thus, patients with HF may live with disability for long time and have to cope with the fear of sudden death (13). These issues should be addressed but it seems palliative and end-of-life needs for patients with HF are under- recognized and under-addressed (14). The notion of 'total pain", has been applied to the experience of HF and includes spiritual pain in which there is a lack of inner peace and personal integrity (15). Patients' with HF psychological and social needs include empathy, counselling, need of independence, financial and practical help and support to fulfill family and social roles. To meet these psychological needs, they need to repair their sense of self which is disrupted by the syndrome (16).

Patients with HF experience changes on the physical, emotional, cognitive, social, economic and spiritual domain of their lives that can directly affect their HR-QoL. Although the experience of patients living with HF varies; every patient has its individual experience which is unpredictable. At the same time, literature shows that there are common aspects in this experience (17). Even though evidence exists for successful management programs (18) that improve HF-related outcomes such as readmission rate (19,20), patients' testimonies may show different results (qualitative studies). Qualitative studies have already carried out the explore of patients with HF needs (4,16,21–28). Although, a qualitative meta-synthesis will give the opportunity to intergrade and synthesize the literature provided and guide clinical practice and future research. In addition, the results of a meta-synthesis can help health professionals (HP) to develop interventions focusing on patient's true needs and expectations and detect vital aspects of the experiences of these patients that are currently not being addressed.

So, in order to develop a person -centred program, it is important to know what are patients' needs based on their perspectives. This will contribute to the development of person-centred management programs. For people with HF, support, understanding, receiving comfort and being treated as a whole and unique person are vital (23,29). That could be offered to a patient through supportive care as is the "care that helps the patient and people important to them to cope with life-limiting illness and its treatment – from before diagnosis, through diagnosis and treatment, to cure or continuing illness, or death and bereavement" (30) aiming to improve their HR-QoL supporting them (31). The aim of the current review and meta-synthesis was to identify the needs of patients with HF as they describe these themselves.

METHODS

A literature review was conducted using a qualitative methodology. Zimmer et al., (2006) (32) stated that meta-synthesis involves the process of comparing, translating and analyzing the original results that leads to the generation of the new interpretations. At first a systematic review of the literature was conducted. Two of the researchers undertook the search using the keywords: ("needs" OR "need") AND ("heart failure") AND ("qualitative") in the following databases: PubMed, CINAHL, PsycoINFO, and EBSCO from December 2018 until February 2019. The inclusion criteria for the selection of the articles are stated below. Articles should use qualitative methodology involving patients with HF and exploring their needs from their perspective. Articles should be published in English language. Articles involving carers/caregivers were included in the review only if the results for patients were presented separately. Exclusion criteria were defined as: articles including other populations than patients with HF or articles not presenting results for patients with HF separately, articles with a focus on patient's experience or perspectives generally related to HF and not related to their needs and studies exploring caregivers or/and family needs. The search yielded 518 articles from which 29 duplicates removed, and 476 papers were excluded based on review aim of titles and abstracts. Thirteen papers were comprehensively reviewed, with eleven found to fulfill the inclusion criteria (Figure 1). The main figures of the included studies are summarized in Table 1.

Methodology assessment

The methodological quality of the included articles was assessed using the Consolidated criteria for reporting qualitative studies (COREQ) item checklist (Table 2a & Table 2b) (33). This has been done in order to have an overview of the methodological quality of the studies included. No study was rejected due to low methodological quality. The checklist consists of 32 specific items for reporting qualitative studies and includes generic criteria that are applicable to all types of research reports. The criteria included support researchers to report important aspects of the research team, study methods, context of the study, findings, analysis and interpretations. The methodological assessment of the included studies is shown in Tables 2a & 2b.

In order to verify validity in the interpretation of the texts, a "thematic synthesis" methodology was used to undertake the current meta-synthesis (34). This method is a three-step process: 1. Free line by line coding of the findings of the primary studies, 2. free codes extracted were then organized into related areas to build descriptive themes and 3. Analytical themes were developed (34,35). The first step; line by line coding of primary results was done independently by five researchers. Researchers gave one code in each initial patient quote. The produced descriptive themes with a representative initial quote are presented in Table 3.

In the next step, "new" codes were created to capture the meaning of the groups of the initial codes. This step of the methodology allowed comparability of the produced codes. A draft summary of the findings organized by the produced descriptive themes was written by one of the researchers and reviewed and revised by all the researchers. Then, the researchers worked together in order to capture all the linkages between the produced themes. A "map" was created as shown in Figure 2, with two themes and five sub-themes for the development of the final model. Researchers located similarities and then proceeded in grouping the codes by descriptive themes.

Finally, researchers went beyond the systematic synthesis of primary studies and interpreted the findings-results in a critical way. They started thinking the produced descriptive themes, first independently and thereafter as a group, resulting to merge those themes; concluding to five "new" themes. "New" themes were created to combine similar needs emerged for the meta-synthesis. For instance, palliative care is the umbrella term for: pain relief, symptom relief and end of life care. This 'new' term/theme is created to cover all three themes. In this last step, the final themes were developed covering all topics related to patients with HF needs as has been identified from their perspective. The final themes provided were: continuing person-center care, social support, supportive care, palliative care and self-care management. Also, all discussions among researchers revealed the need for continuing support of the patients in order to be able to cope with the needs raising through the HF trajectory; and that is how the core theme was raised: 'Wind beneath my wings' (Figure 3).

RESULTS

From the systematic review eleven studies were found to be eligible and were included in this review and meta-synthesis. Through the three -step process of the thematic synthesis one core theme (wind beneath my wings) and five main themes were revealed: continuing person-center care, social support, supportive care, palliative care and self-care management. A description and relevance of the core theme and each of the main themes is listed below.

Core theme: Wind beneath my wings

Researchers identified the mechanism to meet the needs extracted from the literature review and the meta-synthesis that is continuing empowerment and support and the core theme: 'Wind beneath my wings'. Results also showed five different categories to cover patents' needs, interacting with each other: Self-management, palliative care, supportive care, social support and continuing person-centred care (CPCC).

"[…] I would like to know, what the problem is. I would like to know, what treatment I need which one I should emphasize" (16).

All themes are correlated between them as shown in Figure 3, starting from the self-care management and ending up with a continuing process having the patient in the center.

Main themes

Self-care management

Self-care is the cornerstone of HF management. Self-care is comprised of adherence to behaviors, such as maintaining a low sodium diet and medication regimen, as well as symptom monitoring (self-care maintenance) to maintain physiological stability and response to symptoms when they occur (self-care management) (36).

"[…] How to protect myself and avoid risk factors […] As long as I have ways to obtain the information, I hope I can get as much information as I can" (22)

Palliative care

Palliative care for patients with HF has a dual role: treating symptoms and ensuring that patients' treatment plans match their values and goals (37,38). According to WHO (30) palliative care provides care in the relief of pain and other distressing symptoms; affirms life, and regards dying as a normal process; intends neither to hasten nor postpone death and offers a support system to help patients live as actively as possible until they die. This holistic approach also addresses the psychological and spiritual aspects of patient care and supports the family and informal careers during the illness and into bereavement.

"This made me feel sick, uncomfortable. If you see what …Is this your last hour? […]" (24)

Supportive care

Supportive care is necessary throughout HF trajectory in order to manage physical, psychosocial issues, and comorbidities to preserve or improve QoL for patients and their families (37). Supportive care should be responsive in changing patient's needs, especially during times of increased vulnerability, such as after hospital discharge.

"[…] it's good when you have someone who looks after you […] I do not want too much care […] too much responsibility" (4)

Supportive care is "the care that helps the person and people important to them to cope with life-limiting illness and its treatment – from before diagnosis, through diagnosis and treatment, to cure or continuing illness, or death and bereavement" (39).

Social support

Social support is a multi-faced concept that positively influences disease-related outcomes in multiple chronic illnesses, including HF (40,41).

"I don't meet people […] very very lonely. Very very lonely" (23)

"I am worried I do not have someone to live with. I live here alone no one even to make me a cup of tea" (16)

Four types of social support have been found to influence disease-related outcomes in patients with HF, including emotional support, instrumental/tangible support, informational support, and appraisal support (41). Social support distinguishes to informal and formal. The former refers to family members, friends, and neighbors besides while the latter to professionals/ public services (42).

Continuing person-centred care

CPCC is nowadays advocated as a key component of effective illness management (43,44). Giving the patient the opportunity to introduce her/himself as a person in the form of an illness narrative is the starting point for creating a collaborative, egalitarian provider -patient partnership that encourages and empowers patients to actively take part in finding solutions to their problems (43).

"No, no, nothing about that at all. Just this great stream of medicines, between puffs and pills." (18)

"I suppose they do (explain symptoms) but it hasn't penetrated." (18)

"What they explain (to) me, I forget." (18)

"[…] But who is going to explain it to me so that I understand? I haven't met anyone yet who can do that. " (20)

DISCUSSION

This meta-synthesis provides an illustration of some of the needs that occur in patients' with HF lives. The main themes found from the results cover patients' needs depending on fluctuations occurring in the illness trajectory, patients' functional status and severity of the illness (37). Although these revealed themes have been already reported in previews studies as important aspects in the management of HF, the new input is that they come from the patients with HF themselves and the challenge is to find the mechanism to respond to them in an ongoing process.

The current meta-synthesis provides information focusing in two aspects of HF management: Firstly, the important active role of the patient being the protagonist in dealing with his/her illness and secondly the results highlight that the actions of all the mechanisms of disease control reach the patient with HF and his/her needs.

Chosen either way, the results remain the same; health care professionals (HPs) should take into consideration all these aspects and find in collaboration with the person the way to address their needs. Each person is unique and has different perception of his life even when experiencing similar situations of uncertainty and restriction with others (44). Thus, the key remains the person-centred care. Ekman et al., (2011) (43) refers that giving the person the opportunity to present her/himself as a person in the form of an illness narrative is the starting point for building a collaborative, egalitarian provider (care and treatment expert)-patient (person expert) partnership that encourages and empowers persons to actively take part in finding solutions to their problems. "Wind beneath my wings" is the role of the HPs (the wind), who encourages patients (the wings) to take part in their care, to control and take decisions for their own health and HR-QoL. Patient empowerment helps increasing patients' awareness as well as encourages the mutual trust and open communication between patients and HPs (45). Following HF patients in a closer manner, limitations and changes frequently occur and identified during of such an unpredictable syndrome as HF (17). One of nurses' priorities is to get to know the patient and how this patient copes with the syndrome (44,46).

It is important that HPs place the patient with HF at the centre of every care effort and help him/her to address his/her unmet needs achieving the same time the best possible HR-QoL (43). Kane et al., (2015) (17) refer to CPCC as the answer to the management challenge of HF, by incorporating patients' preferences, values, beliefs, illness understanding, illness experience and information needs. All of the above are considered into the decision-making process, encouraging patient engagement and collaborative goal setting. But is that enough to address the unmet needs of HF patients?

The answer is CPCC in the context of supportive care. Supportive care could be developed and provided starting from CPCC. The concept of CPCC integrates patients' and family preferences needs into the goals of care, manages symptoms to the level of comfort desired, and attempts to reduce the burden of illness on both; the patients and their family (47). In order to be able to do this, HPs should know the unmet needs of each patient with HF in an ongoing process, as the needs change rapidly depending on the trajectory of the illness (9). So, before providing supportive care, it is necessary for HPs to assess patient's needs and develop a concrete and consistent process that regularly monitors patients' with HF needs (43). Supportive care is multidisciplinary holistic care provided in the patient and his/her family along with the treatment, from the time of diagnosis aiming to prolong life and improve HR- QoL, and into end of life care (48).

Even though a lot of successful management programs and therapies have been developed for HF patients, evidence show that persons with HF lack HR-QoL (20) and do not always feel HPs respond to their needs (43). A continuing supportive care through the illness trajectory may change the perceived care provided.

CONCLUSIONS

The meta-synthesis quotations constitute the need for a continuing CPCC model in patients with HF, that focuses on the ongoing needs of the individual as the needs change according to the passage of time, the evolution of his/her syndrome, the socio-economic factors (49) (environment, abilities, family and friendly environment (50), the country's health care system, the technology and the possibilities of its application in everyday life and in chronic diseases (51), in one word the general supportive care of a patient with HF in all of its spectrum and expressions (52).

More investigation and research is necessary to document the appropriateness of this care model and the possible implications for all parties in HF care such as patients with HF and their families, medical doctors and other HPs, community and state parties.

Strengths and Limitations of the study

Our meta-synthesis has certain limitations. After the literature review the included studies were qualitative studies with limited number of participants, cumulatively from all 11 studies, 190 patients with HF. It is understandable that the number of patients cannot be considered as representative. However, this is a meta-synthesis that examines prospects, views and thoughts of patients with HF and the first one in the specific population.

The strength of this meta-synthesis is that the meta-synthesis team is composed by qualified cardiology and HF advanced nurses and a practicing physiotherapist, all dedicated on caring patients with HF through the whole disease trajectory.

IMPLICATIONS FOR PRACTICE:

- This review gives valuable information for what patients really need. The results may contribute to further develop management programs for HF patients, more effective in terms of clinical outcomes: adherence to the therapy, acute events, HR-QoL, perceived care and re-hospitalization.
- The use of supportive care in a continuing CPCC management program, may tackle obstacles in patients' non-adherence and bad communication with HPs.

What's new?

● Current systematic review and meta-synthesis of qualitative studies explored the needs from persons' with heart failure perspectives. Those needs have been grouped into groups which are the main themes revealed from the meta-synthesis. All needs seem to be present through the trajectory of HF interacting with each other in a way that they all need to be coped and not avoided. What is important to cope with all needs is the continuing support.

● Recognizing the need for continuing support of the persons with HF gives new implications to practice. It highlights the dynamic relationship persons with heart failure have with health professionals. Often, it is necessary to introduce new behaviors in persons with heart failure (e.g. self-management, exercise, adherence to the therapy). And very often health professionals fail to establish this. A possible reason is that persons with heart failure needs a continuing support to make all necessary changes and cope with their needs described. If this information is taken into consideration the focus is into the point: management of patients' with HF needs; having in the centre of care the persons with HF and continuously supporting them to establish all aims of care.

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Table 1: Articles included in the meta-synthesis.

Author (Year) Country	**Aim**	**Participants**	**Main Findings**
Cortis and William (2007) UK	To explore the experiences of older adults with CHF and gain a deeper understanding of their palliative and supportive needs and the value of possible interventions.	N=10 50% males Years of age(range) 80-90 yrs old NYHA class: II-IV	Four main themes: 1. Experiences of living with heart failure a. Symptoms b. Loss of independence c. Physical, psychological and social isolation d. Loss of self-esteem and self-worth 2. Ways of coping a. Stoicism and acceptance b. Perception of heart failure 3. Constraints to coping a. Not being a burden b. Expectations of care 4. Developing resources for coping a. Self-help and adaptation b. Seeking reassurance
Harding et al (2008) UK	To generate recommendations for information to CHF patients and their family carers, in line with UK and International policy guidelines.	N= 20 80% males $\tilde{x}$ age= 69 70% NYHA III LVEF mean 34% ±8.33	Five main themes: 1. CHF symptoms and management 2. Disease progression and future care 3. Living with inadequate information 4. Barriers to effective information provision 5. Recommendations to improve information provision.

Bekelman et al., (2011)	To learn about patients' and their family caregivers' major concerns and needs and to explore whether and how palliative care would be useful to them.	N=33 (10F/23M) $\tilde{x}$ age = 59 yrs NYHA II-IV EF mean=31%	Six main themes: 1. Major concerns and needs 2. Physical aspects of care 3. Psychological and psychiatric aspects of care 4. Social aspects of care 5. Future of illness 6. Structure and processes of care
Andersson et al (2012) SE	To describe how people with HF experience support in Swedish primary healthcare.	N= 11 participants (6F/5M) $\tilde{x}$ age=77 yrs old	Four main themes: 1. Being abandoned 2. Lack of information 3. An absent dialogue 4. To develop strategies on one's own
Gerlich et al (2012) DE	To explore the needs and experiences of older patients with advanced HF in Germany.	N= 12 participants 50% males $\tilde{x}$ age= 84.5 yrs old	Three main themes: 1. Understanding of illness and prognosis a. Information needs b. Source of information c. Dealing with prognosis 2. Health care services a. Hospitals b. In the community c. Finances 3. Social life a. Social activities b. Communication about illness with family, friends and neighbours.

Baudendistel et al (2015) DE	To explore patient perspectives on guided treatment of HF across multiple health care sectors.	N= 17 participants (5F/ 12M) $\tilde{x}$ age=71,5 yrs old (EF> 35%)	Five main themes: 1. Quality of health care in general 2. initial evaluation – establishment of diagnosis 3. Treatment and professional advice 4. Follow-up 5. Coordination of care
Klindtworth et al (2015) Germany	To understand how old and very old patients perceive advanced heart failure and to assess their medical, psychosocial and information needs at the end of life.	N=25 participants $\tilde{x}$ age= 85 yrs old (14F/ 11M) (NYHA III/IV)	Two main themes: A. Patient understanding of disease and prognosis 1. Dealing with advanced heart failure and ageing a. Perception of heart failure b. Adaption to changing conditions c. Appraisal of quality of life d. Information regarding life 2. Dealing with the end of life a. Value and worthlessness in old age b. Preparation for death B. Delivery of health 1. Perceptions regarding care a. Appropriateness of medical care b. Continuity of care 2. Interpersonal relations a. Interaction in the process of care

			b. Specific aspects in physician-patient interaction 3. Meaning of family
Ross et al (2015) UK	To identify the spiritual needs and spiritual support preferences of end-stage heart failure patients/carers and to develop spiritual support guidelines locally.	N= 16 participants (7F/9M) $\tilde{x}$ age=73 yrs old NYHA IV	Two main themes: 1. Experience of healthcare and effects of the illness a. Love and belonging b. Hope and coping c. Meaning and purpose d. Faith, believe and existential issues 2. Spiritual help/support a. Home visiting service and telephone access b. Care-coordinator c. Voluntary Organisations d. Supporting carers
Yu et al (2016) CN	To explore the underlying perceptions of information needs from the HF patients themselves.	N= 26 (11 F/ 15 M) $\tilde{x}$ age=58,62 yrs old NYHA II-IV	Five main themes: 1. Living with inadequate information a. Poor understanding of HF b. Inadequate knowledge of medication c. Uncertainty about coping strategies 2. Content of information needs a. Risk factors b. Medication c. Disease management strategies 3. Motivators for information learning a. Desire to improve their current health condition

			b. Obligations towards other family members c. Maintaining hope for the future 4. Barriers to information acquisition a. Economic concerns b. Geographical inconvenience c. Material-related and patient-related factors d. Little communication with health professionals 5. Preference for information deliver a. Direct communication with health professionals b. Written materials c. The internet d. TV programs e. Newspaper
Kristiansen et al (2017) DK	To identify the learning needs of patients with HF and ascertain what they emphasize as being important in the design of an educational website for them.	N= 16 (4F/12M) Years of age(range) 47-78 yrs old	Four main themes: 1. Learning needs experienced by patients between follow-up visits 2. Anxiety and uncertainty as driving forces for learning 3. Managing my condition 4. Managing my daily life
Namukwaya et al (2017) UG	To describe patients' experiences of their illness, their perspectives of their	N=21 71.4% females Years of age(range) 18-70 yrs old	Five main themes: 5. Physical needs a. Need to control symptoms and for cure 6. Information needs 7. Psychological needs a. Need for reassurance

	multidimensional needs and what they and their HPs want to be improved.		b. Need for empathy c. Need for attaining life goals and live a normal life d. Need for counseling and emotional support 8. Spiritual needs a. Need to maintain hope b. Need to find the meaning of their illness and for spiritual support c. Need to re-establish a sense of purpose d. Need to feel cared for and to be treated with respect 9. Social needs a. Need for independence and for having control b. Need for practical help and companionship c. Need to fulfill family and social roles

Tables 2a & 2b: Methodological assessment of included studies.

Table 2a

THE ITEMS OF COREQ CHECKLIST	**ARTICLES**					
	1. *(Cortis and Williams, 2007)*	2.(*Harding et al, 2008*)	3.*(Namukwaya et al, 2017)*	4.*(Anderson et al,2012)*	5.*(Baudendistel et al., 2015)*	6.*(Bekelman et al, 2011)*
1. Interviewer /facilitator	N/A	Lucy Selman, Michael Walton and Richard Harding	A medical doctor	The first author (LA)Lena Anderson,(IE) Irene Eriksson and(LN) Lena Nordgren	IB –Ines Baudendistel	1.CTN-Carolyn T. Nowels 2.JHR-Jessica H.Retrum
2. Credentials	N/A	Lucy Selman (BA) Michael Walton (AB,MD) Richard Harding(BSc,MSc,DipSW,PhD)	MD	1.LA-Advanced Nurse Practitioner 2.IE-A lecturer ,Advanced Nurse Practitioner 3.LN-Lecturer and	N/A	1.CTN-MSPH 2. JHR-PhD

				research advisor		
3. Occupation	N/A	-LS and RH Department of Palliative Care,Policy and Rehabilitation) -MW St Thomas Hospital,London, UK, Department of Psychiatry	A medical doctor	1.LA-Advanced Nurse Practitioner at the Center for Clinical Research Uppsala Universtiy Sweden 2. IE-A lecturer ,Advanced Nurse Practitioner in the School of Life Sciences University of Skovde,Sweden 3. LN-Lecturer at School of Health, Care and Welfare, Malardalen University and research advisor at Center for Clinical Research, Uppsala University,Sweden	Department of General Practice and Health Services, Research University Hospital Heidelberg Germany	1.Dinision of General Internal Medicine, Department of Medicine, University of Colorado School of Medicine. 2.School of Public Affairs, University of Colorado

4. Gender	N/A	The one female and the two males	Female	Female	N/A	Females
5. Experience and training	N/A	Two of them work in Department of Palliative Care,Policy and Rehabilitation and the one in St Thomas Hospital, London, UK, in the Department of Psychiatry	N/A	Two of them are Advanced Nurse Practitioners and the other is a lecturer	-IB is a nursing and health scientist -SN is a sociologist with a nursing background -SJ and FPK are GPs with experience in qualitative research.	N/A
6. Relationship established	N/A	Specialist heart failure nurses recruited patients from their outpatient clinic and from hospital wards.	N/A	N/A	N/A	N/A
7. Participant knowledge of the interviewer	The interviewers knew that the researchers were Heart Failure Nurse Specialists	N/A	N/A	N/A	N/A	N/A

	from the HF Support Programme.					
8. Interviewer characteristics	The researchers were Heart Failure Nurse Specialists from the HF Support Programme.	N/A	N/A	N/A	The QUALIPAT heart project in Germany, consists of 3 subprojects. This manuscript describes the results of the first sub project (exploring individual patient views).	N/A
9. Methodological orientation and Theory	A qualitative research approach based on a person-centred and holistic perspective.	Qualitative methodology exploratory ,in-depth research	A grounded theory approach	A content analysis	Qualitative content analysis	Constant comparative method derived from grounded theory.
10. Sampling	purposive	A purposive sampling	Purposive	The participants were selected by a strategic sample procedure	N/A	Purposive
11. Method of approach	face-to-face	Through face-to-face	Face to face during the time of hospitalization and were follow up monthly by mobile phone to maintain	The participants were telephoned and verbally informed	Patients were recruited via GP practices from network of 85 academic research practices of the Medical Faculty of the Department of	N/A

			contact and relationship.		General Practice and Health Services Research. GPs were contacted by telephone and additionally invited in written form to support the patient recruitment.	
12. Sample size	Ten participants	43(20 patients,11 carers,6 clinicians)	48 participants (36 patient alone,4 paired-patient and family carer and 8 with bereaved carers).	11(6 women and 5 men)	17(5 women and 12 men)	33 patients and 20 family caregivers
13. Non-participation	Five people	36	N/A	21 refused. We don't know the reason	0	Of the 38 patients approached for interviews, 3 refused because they were not interested and 2 refused because they felt they were too ill to participate.
14. Setting of data collection	In patient's home	In outpatient clinic and hospital	On the general cardiology	All took place in the participants'	In the participants' domestic	N/A

		wards.Family members were informal carers og CHF patients.Staff were recruited from the cardiology and palliative care teams.	ward in Kampala,Uganda and in patients' home.	homes except for one which at the request of the participant took place at the primary health care centre.	environment(16) and at the Department of General Practice and Health Services Research, University Hospital Heidelberg(1)	
15. Presence of non-participants	In some cases a spouse /family member was present	N/A	No	N/A	N/A	N/A
16. Description of sample	Age, gender, marital status, living situation, NYHA Class, length of time with heart failure, number of co-morbidities and number of times to support group are reported in table 1 of	-Gender,the mean age,NYHA Class,Ejection fraction, comorbidities,invasive cardiac procedures (patients) -The relationship with the patients ,the rate of morbidity(carers) -Clinicians from palliative care(speciali	Age group,sex,education level,marital status and diagnosis are reported in table 4 of the manuscript.	Sex,age,duration of HF	Sex, age, employment, number of additional chronic conditions and number of taken drugs are reported in table 1 of the manuscript.	Age, race, comorbid conditions, NYHA class, ejection fraction, current therapies, relation to patient, hours per week caring for patient and the attend of medical appointments with the patient are reported in the table 2

	the manuscript	st registrar,consultant,specialist in patient nurses,specialist community nurses)				of the manuscript.
17. Interview guide	Qualitative inquiry was chosen to guide the study. The guides were not tested in a pilot study.	A sem-istructured topic guide was drafted for each sample based on a literature review and there was a discussion with clinical experts in the steering group. There was not pilot testing.	No	The interviews started with an opening question. It wasn't pilot tested.	An interview guideline was developed by an interprofessional team of researchers. A pilot-tested	An interview guide was developed to understand HF patients and their family caregivers' major needs.It was pilot tested
18. Repeat interviews	N/A	No.	Yes. Repeat interviews were conducted at 3 and 6 months if the patients' clinical condition remained stable and earlier if there was a deterioration.	N/A	N/A	The interview guide was revised after presentations to primary care and palliative care research groups .

			We don’t know how many.			
19. Audio/visual recording	Data were collected by a single tape-recorded semi-srtuctured interview with each participant.	Interviews were tape recorded,transcribed verbatim	Audio recorded interviews were transcribed verbatim and the interviews were transcribed.	After the interviews the recordings were transcribed verbatim	N/A	Interviews were transcribed verbatim.
20. Field notes	Constant comparison was used for subsequent interview data collection and analysis to refine category dimensions and concepts.	Yes.	Field notes made during the interview.	After the interviews.	Yes. The categories were developed near to the original material	Yes after the interviews.
21. Duration	Each interview lasted 58 min.	Interviews ranged from 20 to 90 minutes	N/A	The interviews lasted between 15 and 45 minutes.	30-83 minutes	60-90 minutes
22. Data saturation	N/A	Yes. 20 patients, 11 carers and 12 clinicians were estimated to achieve data saturation	Recruitment was done until thematic saturation was achieved.	N/A	After performing 17 interviews no new aspects emerged so a saturation of theoretical	N/A

					arguments can be assumed.	
23. Transcripts returned	N/A	N/A	N/A	N/A	N/A	N/A
24. Number of data coders	N/A	3 researchers (LS,MW.RH).	The first author read through all the transcripts and relistened to the audio interviews to confirm completeness of transcription. Three authors discussed and agreed on codes and themes that were generated from the data.	3 researchers(LA,IE,LN).	4 researchers(IB, SN.SJ,FPK)	2 researchers (DBB,CTN).
25. Description of the coding tree	No, but transcripts were read on several occasions and levels of coding applied to establish categories and themes.	Yes.Codes and subcodes were tabulated and data from each sample compared and integrated ,taking into account ralationships between patients and carers.	Yes	Yes.	Yes.	Yes

26. Derivation of themes	The results were presented under four broad themes, each with identified subcategories.	Each code generated subcodes highlighting variation and discrepancy cases to describe data breadth.	Yes	The meaning units were broken down into condensed sentences,i.e. codes, that were shorter but still with the ccore preserved.The cores were put together and compared to each other. Codes with similar content were added together. Meaning units were coded .Finally sub categories and categories were formulated.	Yes.	Initial codes were based on the interview guide topics to identify content of interest .Text within and between codes was compared to develop themes.
27. Software	N/A	NVivo V2	NVivo 10	N/A	ATLAS.ti software	
28. Participant checking	Strengths and limitations	Strengths and limitations	Yes.	Yes through strengths and limitations	Yes through the strengths and limitations	Yes through strengths and limitations
29. Quotations presented	Yes	Yes.	Yes.	N/A	Yes	Yes
30. Data and	Yes there was a	Yes.	Yes there was a relationship	Yes there was a	Yes there was a relationship to	Yes there was a

findings consistent	relationship to existing knowledge		to existing knowledge	relationship to existing knowledge	existing knowledge	relationship to existing knowledge
31. Clarity of major themes	Yes	Yes.	Yes.	Yes.	Yes	Yes
32. Clarity of minor themes	Yes	Yes.	Yes.	Yes.	Yes	Yes

Table 2b

THE ITEMS OF COREQ CHECK LIST	**ARTICLES**				
	7. (Yu et al., 2016)	*8. (Gerlich et a., 2012)*	*9. (Klindtworth et al., 2015)*	*10. (Kristiansen et al., 2017)*	*11. (Ross,2015)*
1. Interviewer/facilitator	It isn’t stated clearly who the interviewers were; however it is assumed that the writers were the interviewers	Klindtworth K,	Klindtworth K	Kristiansen, A.M, Department of Cardiology, Aarhus University Hospital, Denmark Svanholm J.R., Department of Cardiology, Aarhus	Linda Ross, Phd, RGN. Reader in Spirituality & Healthcare, Department of Education and Service Delivery, Faculty of Health, Education, Psychology and Sport, University

				University Hospital, Denmark Schkodt, I., Department of learning , Informatics Management and Ethics, Karolinska Institutent Sweden	of South Wales, Pontypridd Jacky Martin, Phd, RGN. Consultant Nurse, Heart Failure and Cardiac Rehabilitation Services, Aneurin Bevan Health Board, South Wales, UK
2. Credentials	N/A	N/A	N/A	N/A	PhD
3. Occupation	Yu Ming-Ming School of Nursing. Peking Union Medical College Chair SekYing Nethersole School of Nursing. The Chinese University of Hong Kong	Hannover Medical School, Institute for Epidemiology, Social Medicine and Health Systems Research, Research Group Palliative Care and Ageing, Hannover, Germany	Hannover Medical School, Institute for Epidemiology, Social Medicine and Health Systems Research, Research Group Palliative Care and Ageing, Hannover, Germany	KM, Department of Cardiology, Aarhus University Hospital, Denmark SR., Department of Cardiology, Aarhus University Hospital, Denmark SI, Department of learning , Informatics Management and Ethics, Karolinska Institutent Sweden	LR, Phd, RGN. Reader in Spirituality & Healthcare, Department of Education and Service Delivery, Faculty of Health, Education, Psychology and Sport, University of South Wales, Pontypridd JM, Phd, RGN. Consultant Nurse, Heart Failure and Cardiac Rehabilitation Services, Aneurin Bevan Health Board, South Wales, UK
4. Gender	female	female	female	females	females

5. Experience and training	Not stated at the end of the article	Very experienced researcher but not stated at the end of the article	Very experienced researcher but not stated at the end of the article	Qualitative researchers, Platform developer	Qualitative researchers
6. Relationship established	It is not stated that there was a prior relationship. However it is assumed that there was no prior relationship	N/A	N/A	N/A	N/A
7. Participant knowledge of the interviewer	Not exactly stated. However the participants had signed consent forms so it is assumed that they were informed that the aim of the study was to explore the perceptions of information needs from the HF patients themselves	All participants were informed about the purpose of the study	All participants were informed about the purpose of the study	N/A	Patients accepted information about the study during routine follow-up at the heart failure clinic
8. Interviewer characteristics	N/A	N/A	To reduce social bias, the interviewer was not involved in the delivery of health care for the patients and was not employed by	N/A	N/A

			either of the geriatric hospitals		
9. Methodological orientation and Theory	An exploratory qualitative study designed was adopted	Ongoing Qualitative longitudinal research	Ongoing Qualitative longitudinal research	Qualitative research approach with focus groups, diary writing and design sessions. Inductive content analysis	Focus group/consultation with stakeholders, narrative analysis
10. Sampling	Not stated, however one of inclusion criteria was willingness to share experiences (convenience sample?)	Purposive recruitment	Purposive recruitment	Purposive	Purposive. patients were identified from databases in two hospitals
11. Method of approach	Not stated	Face-to-face	Face-to-face	N/A	Patients received information Face-to-face during routine GP follow-up
12. Sample size	26	25 patients	25 patients	20 patients	16 patients
13. Non-participation	Not aware of the number of possible participants that refused to participate in the study. Not stated if there were any drop outs from the study	Not aware of any individuals that refused to participate in the study	4 patients refused prior the commencement of the study 5 refused to attend the follow-up interviews 2 were cognitively unable to attend 8 died	4 patients refused prior the commencement of the study	1 patient died

14. Setting of data collection	The face-to-face interviews were conducted at the cardiovascular department of the hospital	At the place of recruitment, Two geriatric	At the place of recruitment, Two geriatric hospitals in Hannover and Heidelberg, Germany,	The face-to-face interviews were conducted at the Heart Failure clinic of Aarhus University Hospital	Data were collected from patients' homes at 3-monthly intervals over a year
15. Presence of non-participants	N/A	hospitals in Hannover and Heidelberg, Germany,	No	No	Carer of patient
16. Description of sample	Demographic characteristics are reported at the Table 1.	No	All socio-demographic data of the interview participants are shown in Table 1	Sex Demographic characteristics are reported at the Table 1.	Demographic data not shown in the article
17. Interview guide	Interviews were guided by semi-structured questions	An interview guide was developed based on prior studies to cover the experience of having HF	An interview guide was developed based on instruments previously used in other qualitative studies	Interviews were guided by semi-structured questions	demographic questionnaire and semi-structured interview
18. Repeat interviews	No	No	Seven follow-up interviews at three-month interval	Yes	schedule based upon previous work
19. Audio/visual recording	All interviews were taped-recorded with the permission	Data was Digitally recorded and verbally transcribed	Data was Digitally recorded and verbally transcribed	Interviews were transcribed and a content analysis was performed on	47 interviews through one year (3-monthly)

	of the participants.			the text and video data.	
20. Field notes	yes	Yes, analytic process and the emerging categories were continuously discussed in the study group until a consensus was reached by the 12th interview	Yes, analytic process and the emerging categories were continuously discussed in the study group until a consensus was reached by the 12th interview	yes	Audio tapes
21. Duration	N/A	N/A	N/A	N/A	Yes
22. Data saturation	No	Yes, analytic process and the emerging categories were continuously discussed in the study group until a consensus was reached	Yes, analytic process and the emerging categories were continuously discussed in the study group until a consensus was reached	No	For one year
23. Transcripts returned	N/A	N/A	N/A	Yes	Yes
24. Number of data coders	Not stated	Two. (GM,KK)	Two. Not stated who of the authors	Three, (KAM, SJR, SI)	Two
25. Description of the coding tree	Yes. Reported at table 2	Yes. Coding tree is presented at page 3 of article	Yes. Coding tree is presented at page 3 of article and Table 2	Yes. Reported at table 2	Yes. Centred around five areas: Impact of the illness; Meaning, value and purpose; Impact of spiritual needs;

					who could help; and focus on the future.
26. Derivation of themes	All themes were derived by the interviews. Categories and subcategories were emerged from the interview data.	Yes, are presented at page 3 of the article	Yes, are presented at page 3 of the article and Table 2	All themes were derived by the interviews. Categories and subcategories were emerged from the interview data.	Each interview was coded and subjected to narrative analysis. In advance themes
27. Software	No software. Content analysis	Analysis was supported by the software program MAXQDA_ for the analysis and organization of the material.	Analysis was supported by the software program MAXQDA_ for the analysis and organization of the material.	No software. Content analysis was used	Qualitative analysis package ‘Ethnograph
28. Participant checking	N/A	N/A	N/A	Yes	Subjects were asked if they would like to comment on the analysis of the transcript before the next interview
29. Quotations presented	Yes	Quotes of the participants are presented at the “Results” section	Quotes of the participants are presented at the “Results” section	Yes	Quotations are presented at the “Results” section
30. Data and findings consistent	Yes	Yes	Yes	Yes	Yes

31. Clarity of major themes	Yes	Yes	Yes	Yes	Yes
32. Clarity of minor themes	Yes	Yes	Yes	Yes	Yes

Table 3: Developed of themes

Codes	Description	Illustrative quotes
Individualized care	Patients asking for care based on each conditions, abilities, needs, routines, and goals	"[…] Let them take time to know from the patient what they need" (2017 Namukwaya et al) " […] it is giving a certain kind of orientation to you […] things run fairly straight or if you to let things slide" (2016 Baudedistel et al)
General information	Patients asking information for all aspects	"The most important thing is to also let the patient know what is going on […]" (2017 Namukwaya et al) "[…] I know nothing about my disease […] and medications were just given to me" (2012 Andersson et al)
Information for medication	Patients asking information regarding medication	"I think if you don't really know about them (medication) you'll stop taking them" (2007 Cortis and William) "[…] you get too little information […] what effects they have." (2017 Kristiansen et al)

Information for HF disease	Patients asking information regarding HF	“I have no knowledge of HF […] I think it is more serious…I cannot describe it [HF] clearly…I really don’t know” (2016 Yu et al)
		“I did not know I had it […] I was almost shocked” (2012 Andersson et al)
Continuing education	Patients seeking resources of information related to HF	“I need a website where I can search for different symptoms and someone to talk to.” (2017 Kristiansen et al)
		“[…] it could be like a space for patients’ opinions or experiences” (2017 Kristiansen et al)
Individualized education	Patients asking for education depending the need of each one, their preferences and special abilities	“I’d like them to explain more in English to me exactly the reason why this isn’t working, that isn’t working… reasons for and why they are giving me that particular tablet” (2008 Harding et al)
		“[…] I have presbyopia […] I cannot understand [the written materials] if the materials […] the materials should be easy to understand” (2016 Yu et al)
		“[…] I would like to know, what the problem is. I would like to know, what treatment I need which one I should emphasise” (Patient 8, Interview 1) (2017 Namukwaya et al)
Communication	Patients asking to communicate better with health professionals	“A simple conversation with the doctor. So, everything is explained to me, what it is all about and what is going on” (2016 Baudedistel et al)
		“I think direct communication with health professionals is better […] health professionals are always very busy” (2016 Yu et al)

Empowerment	Patients asking to support them providing them with what they need to keep going	"I needed somebody to build me back up" (2015 Ross et al) "[…] now I have to plan much more […] so I find it hard […] you need to go somewhere where you can rest" (2017 Kristiansen et al) "[…] People need some kind of counselling" (2011 Bekelman et al.)
Psychological support	Patients asking for support regarding psychological issues	"[…] And you start panicking and it starts mucking up your sleep […] play on your mind psychologically. (2008 Harding et at)
Empathy	Patients asking someone to understand their emotions and imagine what someone else might be thinking or feeling	"The other thing is that they should also put themselves (the HPs) in the position of the patient especially when they are talking to them […]" (2017 Namukwaya et al) " […] Some health care workers are rude, or tough, but this should be changed they HPs should also put themselves in the shoes of the patient especially when they are talking to them" (2017 Namukwaya et al) " […] Most of the (providers) are just there for the medical part. They are not there to ask how you are really doing. " (2011 Bekelman et al.)
Spiritual needs	Patients seeking support regarding deep	"[…] So when I felt overburdened I said to myself if He says 'I am the way the Truth and life and whoever knows

	feelings and beliefs of a religious nature	this will be set free' so I decided to be saved […]" (2017 Namukwaya et al) "But I was, well, a bit frightened […] "Oh my God! What will still be there and remain when you are dead and gone?" […] everything is on order […] that reassures me now" (2015 Klindtworth et al)
Need for independence	Patients express the need to be independent regarding daily tasks	"Having to depend on others, that's my greatest fear. I never want that to happen, but it will happen" (2012 Gerlich et al) "That is my family, they are young. I cannot even wash for them or cook for them when I want to, that is how it is with this disease […]" (2017 Namukwaya et al)
Management of therapy	Patients seeking ways to manage with all actions related to the therapy	" […] I have to hold back. The heart somehow says: "Stop, don't overdo it […]" (2015 Klindtworth et al) " […] They stop me from walking or running properly, which is actually worse than the shortness of breath" (2015 Klindtworth et al) "[…] I think it's more than being able to deal with one specific symptom. The hardest part is to understand you are going to deal with them all" (2011 Bekelman et al.)
Formal social support	Patients seek to be surrounded with people (family, friends, services) to support them	"Well, for me my GP is a central person. […] if I had another illness, where I do need a specialist, the GP is still, at least for me, he is still the key person" (2016 Baudedistel et al) "There is one health care worker […] So it is not good, they need to be trained" (2017 Namukwaya et al)

Financial support	Patients seeking for financial resources/ support	“[…] this illness started it is a problem so I stopped working […]I would like to eat but the financial situation does not allow me” (2017 Namukwaya et al) “My biggest problem is poverty […]” (2017 Namukwaya et al)
Better health services	Patients asking for more organized and easy access to healthcare services	“[…] I live in a place which is not so developed […] we can only get the information from the newspaper or TV, the resources are too limited anyway.” (2016 Yu et al) “It is very difficult to get in contact with care professionals in primary and hospital care” (2012 Andersson et al)
Lifestyle modification	Patients seeking help for altering long-term habits.	“ […] Well, for me it was a challenge on acting more relaxed and doing less. In the past I did very much walking with my wife for hours … this is missing now completely […]” (2016 Baudedistel et al) “[…] I am living not only for myself, but also for others […] I should give up my bad habit of smoking […] I need to learn more information, the more the better, to effectively control it.” (2016 Yu et al)
Pain relief	Patients asking for analgesia and be free of pain	“I only want to feel better […] nothing good […] I don’t need anything, I can be quite alone. Pain everywhere” (2015 Klindtworth et al)

Symptom relief	Patients describe symptoms of heart failure and seeking for help to be relief	“[…] “You must absolutely do this” […] I have often wished that just close my eyes and the suffering would come to an end […] It’s as someone had put a rope around your neck and is choking you […] I was gasping for air and could not breathe” (2015 Klindtworth et al) “make each day count […] live with as little suffering as possible” (2016 Yu et al)
End of life	Patients seeking for support and care in the end of life taking into consideration their preferences	“This made me feel sick, uncomfortable. If you see what …Is this your last hour? […]” (2016 Baudedistel et al) “ […] let it be. My family knows exactly how I think and that’s the way it is” (2015 Klindtworth et al)

PRISMA 2009 Flow Diagram

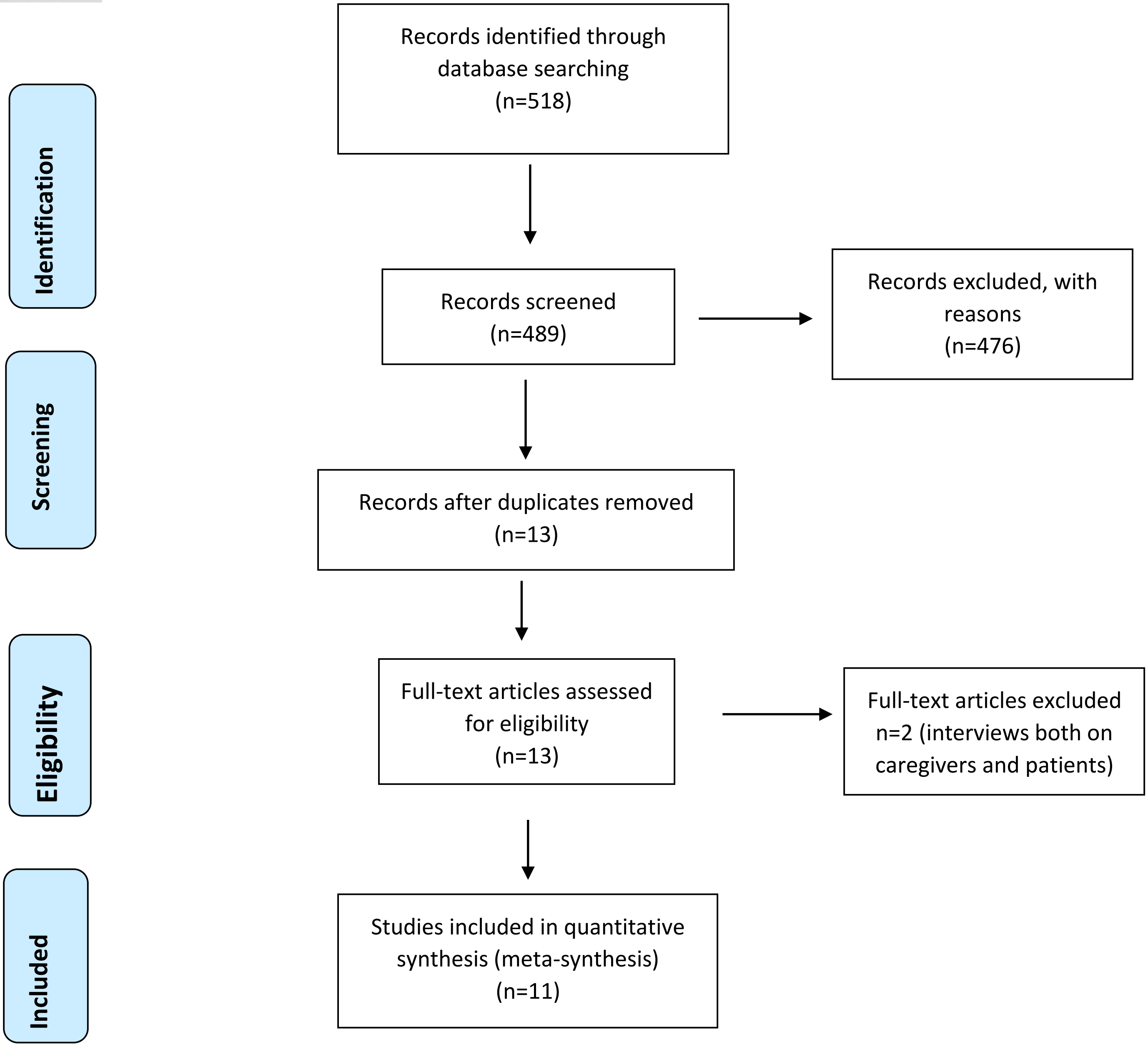

Figure 1. Flow chart for articles selection

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

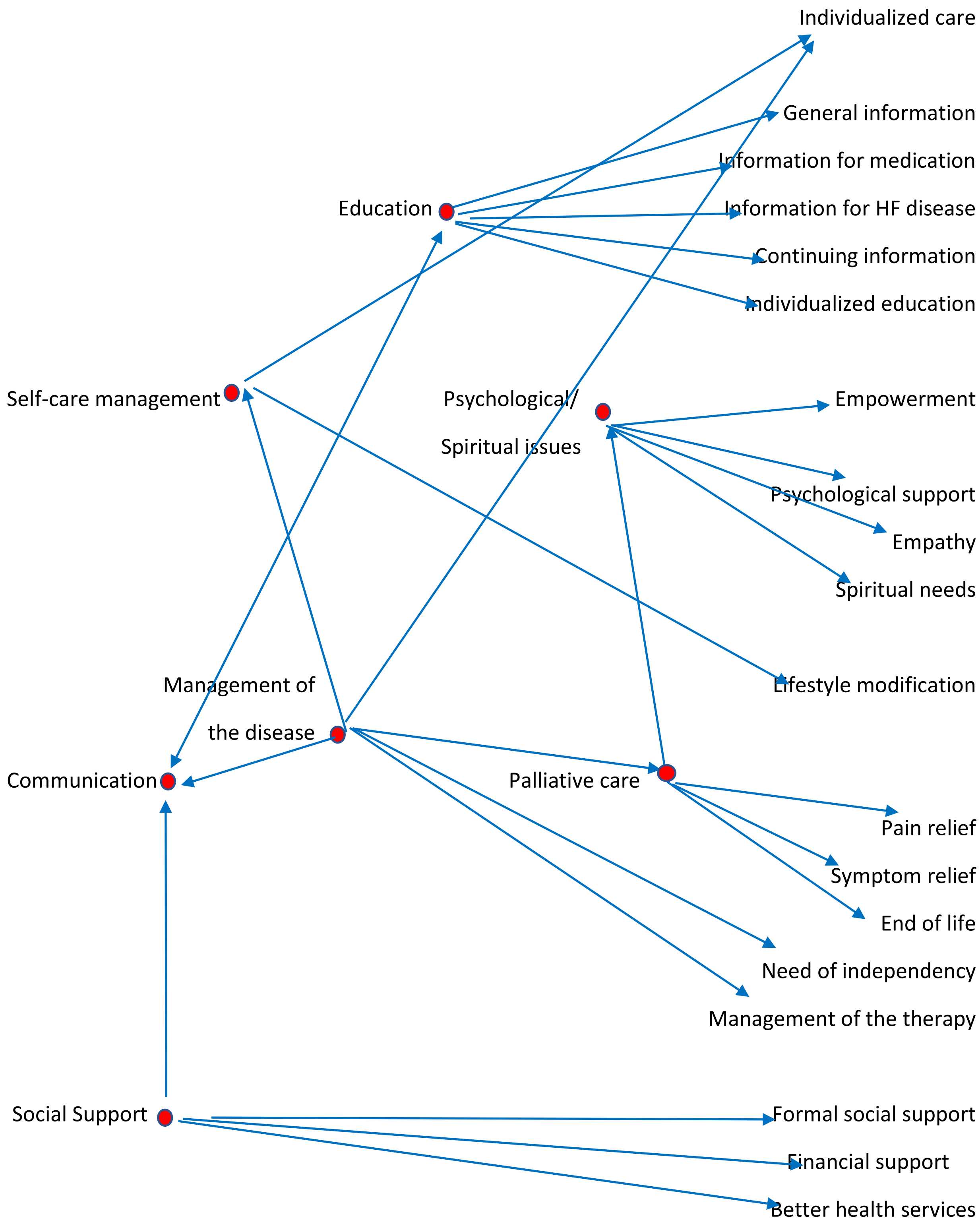

Figure 2. Second step of the meta-synthesis: free codes extracted with all possible linkages between the themes

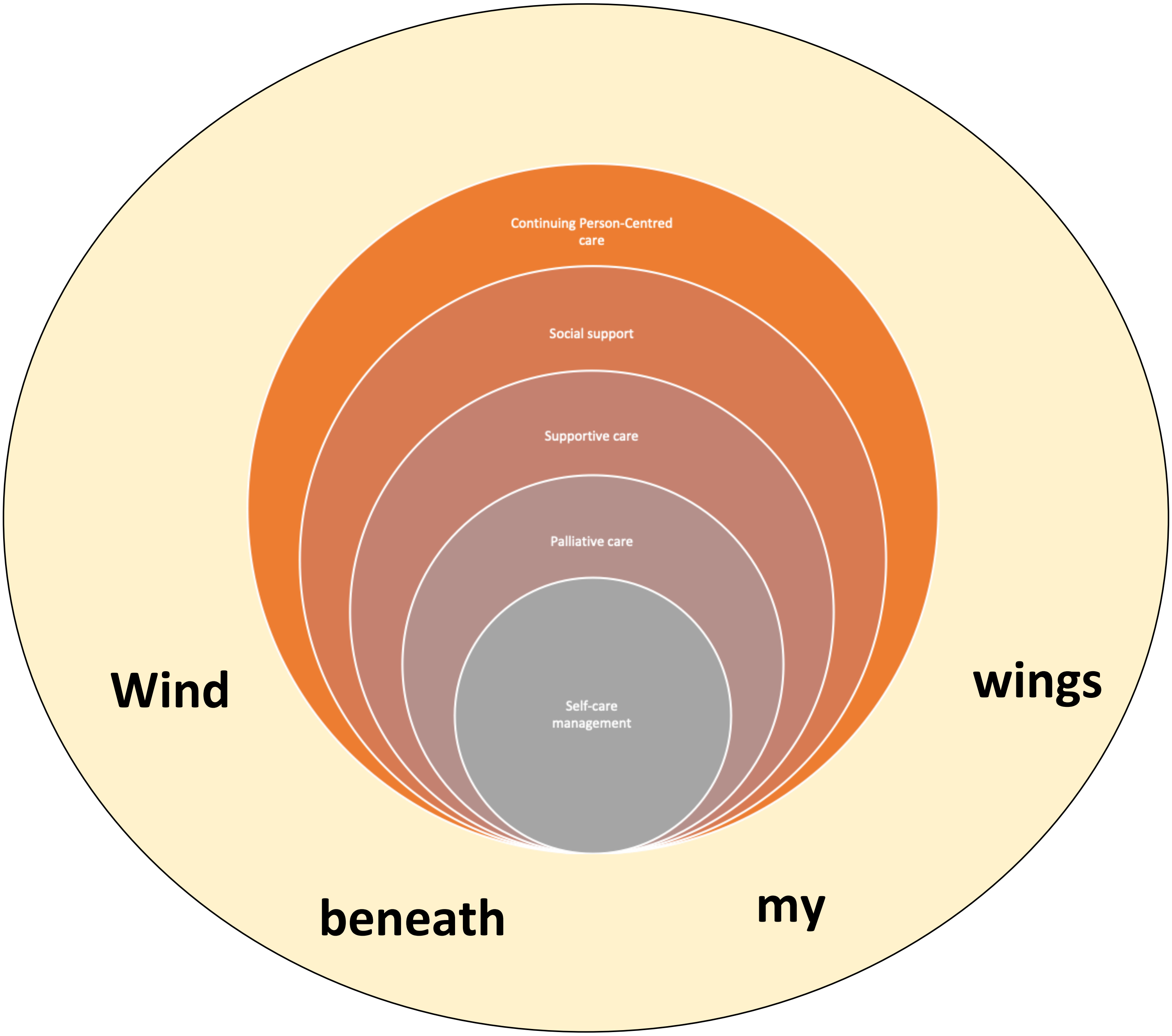

Figure 3. Final themes covering all topics related t0 patients' with heart failure needs.

Appendix II: Systematic review and meta-analysis

Supportive care interventions to promote health-related quality of for patients living with heart failure: A systematic review and meta-analysis.

ABSTRACT

Background: Supportive care may be beneficial as a coping resource in the relation of care needs of heart failure (HF) patients (physical, psychosocial and spiritual). Nurses may provide individualized supportive care to offer a positive emotional support, enhance the patients' knowledge of self-management and meet HF patients' physical and psychosocial needs.

Purpose: To examine the potential effectiveness of supportive care interventions, in improving the health- related quality of life (HR-QoL) of patients with HF. Related outcomes, depression and anxiety, were also examined.

Methods: A systematic search of PubMed, CINAHL and Cochrane Library was performed to locate randomized controlled trials (RCTs), that implemented any supportive care interventions in HF patients published in English language. Identified articles were further screened for additional studies. Ten RCTs were selected for the meta-analysis. Effect sizes were estimated between the comparison groups over the overall follow up period, and presented along with confidence intervals (CI). Statistical heterogeneity for each comparison was estimated using Q (x^2-test) and I^2 statistics with 95% confidence intervals (CI).

Results: Statistical heterogeneity was observed in all study variables (i.e. HRQoL and dimensions). A positive effect of social support on HRQoL, but not statistically significant [MD 5.31, 95% CI (-8.93-19.55), p=0.46]. The results of the two dimensions suggest a positive and statistically significant effect of the supportive care interventions [physical: MD 7.90, 95% CI (11.31-4.50), p=0.00], emotional dimension: MD 4.10 95% CI (6.14-2.06), p=0.00].

Conclusion: The findings of the current study highlight the need to incorporate supportive care to meet the needs of HF patients. HF patients have care needs which changes continuously and rapidly and there is a need of a continuously process in order to address the holistic needs of HF patients' at all the time and not only in a cardiology department or in an acute care setting.

Clinical implication: HF patients have multiple needs, which remain unmet. Supportive care is a holistic ongoing approach that may be effective to identify and meet the care needs of HF patients along with the patient. This review includes all interventions provided in individuals with HF, giving the opportunity to clinicians to choose the most suitable ones in improving clinical outcomes of HF patients.

Keywords: Cardiovascular nursing; heart failure; meta-analysis; quality of life; supportive care.

CONTRIBUTION OF THE PAPER

What is already known

- Supportive care may be beneficial as a coping resource in the relation of palliative care needs of heart failure (HF) patients.
- There are HF management programs that are effective regarding readmission and mortality.

What this paper adds

- Supportive care includes four different components: communication, education, symptom management and psychological and spiritual issues. It is a holistic approach that may contribute in meeting HF patients' needs in a continuing process.
- The current review highlights the effectiveness of supportive care interventions in the HR-QoL of patients with HF and also describes all possible interventions provided to HF patients. This gives the opportunity to clinicians to choose the most suitable intervention programs to their clinical settings and health care organizations and see the possibilities they may give them in improving clinical outcomes of HF patients

INTRODUCTION

Patients with heart failure (HF) suffer from an incurable disease with an often unpredictable trajectory[1,2] . HF trajectory is unique in terms of decline and death. It is characterized by typical slow decline in physical capacities punctuated by serious exacerbations. Unpredictable illness often leads patients to isolation, not allowing them to make plans[3]. Physical symptoms, particularly breathlessness and fatigue limit patients' ability to leave the house, leading them to social isolation[2,3]. Previous qualitative studies have reported social isolation, loneliness and loss of friends as major contributors to the negative impact of the disease[3,5] .These physical, psychosocial (life-threatening illness, isolation) and spiritual factors may influence a person's health related quality of life (HR-QoL) in a number of ways; including declined physical strength, mood, impact on personal relationships (e.g with their career), decreased well-being and emotional distress[5]. Mortality might be improved the latest years, due to new therapeutic approaches. Nevertheless, patients still die from HF and are symptomatic in the last stage of their illness highlighting the need for holistic approach and care[4].

HF patients, though often do not know much for their condition, they realize their poor prognosis as they experience symptoms of HF. In particular, limitations such as shortness of breath, dizziness, and restrictions in activities of daily living[6]. Thus, they need to discuss their condition, concerns and fears with somebody [5,7]. Instead of that, they are not well informed about their prognosis or supported[5,7,8]. Patients often lack sufficient knowledge about their condition and prognosis. This is mostly due to poor communication between patients and health professionals providers[6]. They do not perceive HF as life-limiting illness, even when they have knowledge of HF management[10].

Nurses may provide individualized supportive nursing care to offer a positive emotional support, enhance the patients' knowledge of self-management and meet HF patients' physical and psychosocial needs through continuing assessment, counselling and education[11]. Supportive care is a holistic view of disease management offered to all patients with chronic or life-threatening illness[11]. Provisional planning, support patients to identify the unpredictable deteriorations in health status and mitigate or reduce the isolation and dependency that might co-occur, in part by procure available resources and support in advance [12,13] .

Supportive care has a major role in positive, life-transforming change and allows individuals to have a more positive HR-QoL. The terms 'palliative' and 'supportive' care are often used interchangeably in bibliography; although, there is a different definition for these two terms. Common goal is to improve the HR-QoL of patients who have serious or life- threatening disease and provide them with support[12]. Supportive care is a multidisciplinary holistic care provided in the patient and his family, from the time of diagnosis along with treatment aiming to prolong life expectancy and improve QoL and into end of life care[13]. It is essential to clarify that palliative care is a part of supportive care, a very important part, mainly concerned the internal and psycho-social part of supportive care[14]. Supportive care includes modifying interventions in an effort to manage symptom, psychosocial or existential distress and to identify strategies in order to cope with HF[16]. Supportive care is composed by the four components of: communication and decision making, education, symptom management and psychological and spiritual issues[4,16]. Current systematic review and meta-analysis aims to investigate the effectiveness of supportive care interventions in HR-QoL of HF patients.

AIM OF THE STUDY

The present study examines the potential effectiveness of supportive care interventions, in improving the HR-QoL of patients with HF, compared with the control group. Based on the above framework supportive care interventions were defined as all interventions referring to the four cited component: a) communication (e.g. Understand patient concerns and fears, b) Education (e.g. Patient and family self-management (sodium, weight and volume), c) Psychosocial and spiritual issues (e.g. Coping with illness) and d) Symptom management (e.g. HF medications for dyspnea) [14]. Related outcomes, depression and anxiety, were also examined. Supportive care interventions in all NYHA stages were included, taking into consideration the trajectory of HF. The hypothesis was that supportive care interventions will have a positive effect on the HR-QoL of patients with HF.

METHODS

Design

This study is a systematic review and meta-analysis assessing the effectiveness of supportive care interventions in HF patients in terms of HR-QoL and related outcomes (e.g. depression and anxiety). Checklist of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was used to conduct and report this meta-analysis[18].

Search strategy

Search of electronic databases PubMed, CINAHL and Cochrane was conducted in for articles published until March 2017. Keywords used for the search were: ‘’heart failure”, ‘’supportive care’’, ‘’social support’’, ‘’social network’’ combined with the words ‘‘palliative care’’, ‘’end of life stage’’ and ‘’quality of life’’. The search strategy used was [(heart failure) AND supportive care OR social support OR social network] AND one of the keywords ‘‘palliative care’’, ‘’end of life stage’’ and ‘’quality of life’’. The terms supportive care and palliative care are often used interchangeably in literature. Hence, the study also included term palliative in the search strategy. The tool ‘related articles’ of the PubMed was also used. The most relevant articles and reviews were manually searched for eligible studies.

Inclusion criteria: English language published articles of RCTs results, measuring the outcome of HR-QoL after supportive care interventions to HF, to any component of support or setting. Articles were considered for the review if they included at least one of the four components of supportive care. Supportive care had to be provided simultaneously with the usual care in an effort to manage symptom, psychosocial or existential distress and to identify strategies in order to cope with HF. To enable comparability of the study findings, only studies which used the disease-specific tool Minnesota Living with Heart Failure Questionnaire (MLHFQ) to assess HR-QoL were considered.

MLHFQ is one of the most comprehensive and widely used tools for measuring HR-QoL of patients with HF.[19]

It has been translated and validated in more than 25 languages. The original version included 2 subscales (physical and emotional) and some in versions a third subscale was revealed as well (social)[20] .

Exclusion criteria: Articles matching with any of the following were not pooled: results of studies which calculated and presented patients' and relatives' HR-QoL together as one population. Similarly, findings from pilot studies and unpublished research programs were not included.

Two of the authors screened the titles of the retrieved articles and isolated the potentially relevant ones. The eligibility of the relevant abstracts was examined separately by the two authors, who reviewed each article's abstract. The two authors used standard pretest selection forms independently to assess eligibility. A third author to reach consensus was involved when needed.

Data extraction

One reviewer used data extraction forms to obtain the data of interest (e.g. methodology, setting, type of intervention and statistical data with regards to the observed effect size). A second researcher reviewed the final data, to located any extraction errors.

Quality assessment

The methodological quality of included trials was assessed by two authors of the team using the checklist of CONSORT 2010. The eligible studies yielded from the search assessed for their methodological quality. The methodological quality of the trials according to CONSORT 2010 statement. A 'Yes' or 'No' answer was marked to each item based on whether the author had reported the variable or not. Two independent reviewers evaluated the included studies with the checklist. Any conflicts regarding the evaluation among the reviewers were discussed and resolved, convolving the third reviewer. Frequencies of positive answers are reported as percentages. The number of "positive answers" varied from 0 to 37.

Statistical Analysis

Data from each study were collected and meta-analysed using the software program Review Manger 5.3 of Cochrane Library. Effect sizes were estimated between the comparison groups over the overall follow up period, and presented along with confidence intervals (CI). The overall pooled effect was estimated by the DerSimonian and Laird random effects model in order to account for the observed heterogeneity between studies[19]. Statistical heterogeneity for each comparison was estimated using Q (x^2-test) and I^2 statistics with 95% confidence intervals (CI). The main outcome was overall HR-QoL among control and intervention groups. Furthermore, estimates for a potential effect on the physical and emotional dimensions of the HR-QoL were also calculated. Anxiety and depression were examined as secondary outcomes. For those two outcomes the Standardized Mean Difference (SMD) was used as a summary statistic in the current meta-analysis because different scales have been used by the different research groups. For the three-arm study of Brodie et al. (2006) and the four-arm study of Gary et al (2010), the arm which included all interventions was taken into consideration.

The heterogeneity of the studies was also estimated using funnel plots while small-study effects and/or publication bias was assessed by Egger's test. Due to the small number of studies, subgroup analysis was not performed, but sensitivity analysis was undertaken to assess the extent to which the observed results are affected by excluding studies with uncharacteristic results compared to the rest (e.g. study of Andryukhin et al (2010).

The association and different interventions: intensity and complexity of the intervention, duration, behavioral study, multidisciplinary intervention, family support and study design with the HR-QoL, using meta-regression analysis were also investigated along with the association of different interventions (variables): intensity and complexity of the intervention, duration, including behavioral therapy intervention, family support and study design with the HR-QoL, using meta-regression analysis.

RESULTS

The search strategy extracted 499 studies. The 377 were excluded after examining the title and/or abstract. Three studies were excluded, because they were published in other languages than English. Moreover, 103 studies were excluded because they were reviews or meta-analyses. Six studies were found to be duplicated. Finally, ten studies were found to meet the inclusion criteria (Figure 1).

Overview of the RCTs

The trials were conducted in the following countries: Taiwan[23] , Greece[24,25],Iran [26] , Russia[27] Spain[28] , USA[29], Netherlands[30] and UK[31,32,]. With the exception of two, the rest were single-center[23,24,25,26,27,28,29,32]. The studies of Smeulders et al (2010) and Brodie et al (2004) were set in six and two hospitals, respectively. The duration of the studies ranged from eight weeks to two years (Table 1). The intervention between the studies vary in intensity, complexity and the intervention as such. The intervention of each included study is presented in Table 2.

Methodological quality of the RCTs

The eligible trials were assessed in terms of the 37 items based on the quality criteria and scoring from the most recent CONSORT 2010 statement [218].

Nine trials reported more than half of the checklist items [23,24,25,26,27,28,29,31,32] and one trial reported 92 % of them[30]. None of the articles report all the important harms or unintended effects (for specific guidance see CONSORT for harms[33]). The approach used in each study to estimate primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval) were reported in 9 (90%) articles[23,24,25,26,27,29,30,32] . Finally, 80 % of all articles did not reported description of trial design (such as parallel, factorial) including allocation ratio[24,25,26,27,28,29,31,32] 50 % of all articles report sources of funding and other support (such as supply of drugs), role of funders [23,27,29,30,32]

Quantitative Data Synthesis

Statistical heterogeneity in all study variables was also shown in the funnel plot (Figure 2). Even though there was no statistical evidence of a small study bias based on the Egger test for small-study effect (p=0.400), the small number of studies does not easily allow inference. In terms of the main outcomes there was evidence of high heterogeneity in all three components as indicated by both Q test and I^2 statistics: overall score (x^2=64.64, I^2=86%, p=0.002), physical (x^2=176.99, I^2=97%, p=0.02) and emotional dimension (x^2=61.10, I^2=92%, p=0.02).

Quantitative data synthesis using the funnel plots showed asymmetry and high statistical heterogeneity between the studies. The study of Lakdijabi et al (2013) was found to have the largest positive effect of all study outcomes, and rather uncharacteristic compared to the rest of the studies. The study of Andryukhin et al (2010) did not follow normal distribution hence, it was decided to exclude both studies in a sensitivity analysis, which nevertheless did not affect the overall conclusion (Figure 4).

Health-related Quality of Life of HF patients' receiving supportive care versus usual care

The main study outcome was the effect of supportive care interventions in HF patients in terms of overall HR-QoL, based on the MLHFQ. All of the included studies examined the overall score of the tool and six studies[, 23, 25,26,27,30,32] had also assessed the two subscales: physical and emotional dimensions. The observed overall effect indicates a positive effect of supportive care on HR-QoL, and it is statistically significant [MD -9.44, 95% CI (-15.54, -3.33), p=0.002] (Figure3). A sensitivity analysis excluding the study of Andryukhin et al (2010) and Lakdizaji et al (2013) performed. The former was not following normal distribution and the second study had quite different outcomes compared to the other studies. After the exclusion of those two studies the effect of supportive care interventions compared to standard care, remained positive and statistically significant [(MD -5.84 95% CI (-11.55,-0.13), p=0.05]. The results of the two dimensions of the questionnaire MLWHFQ suggest a positive and statistically significant effect of the supportive care interventions [physical: MD -6.95, 95% CI (12.78, -1.11), p=0.02] (Figure 5), emotional dimension: MD -3.64 95% CI (-6.34, -0.93), p=0.00 (Figure 6)]

Depression and anxiety

Depression and anxiety have been examined in five[23,24,27,29,30] and three[23,27,30] studies, respectively. Even though different tools than MLHFQ were used it was decided to meta-analyse the data, since both are very important needs of the HF. Supportive care was found to have positive effect in depression, [(SMD -0.53 95% CI -1.23, 0.16), p=0.13] and anxiety [SMD -0.83 95% CI (-3.40, 1.73), p=0.53] (Figures 6 and 7), but not statistically significant for either outcome, at least at the 5% level.

Meta-regression

To further understand the results of the meta-analysis, a meta-regression analysis was performed using Stata,which revealed that two of the undertaken variables; family support and behavioral therapy were related with the effect size of the studies. Paradoxically, those two variables were found to have an inverse relation with the effectiveness of the intervention regarding HR-QoL.

Meta-regression also showed that studies with higher baseline tend to find larger effects than those with lower baseline levels. Similarly, studies in which participants were more similar, also tend to find larger effects. Both findings were found to be statistically significant and can justify the existence of this relation/finding (Table 3).

DISCUSSION

The objective of this systematic review and meta-analysis of randomized control trials was to examine the effectiveness of supportive care interventions on the HR-QoL of HF patients. A comprehensive search of the literature yield 10 studies fulfilling the predefined inclusion criteria.

The overall pooled effect between patients receiving supportive care was found to be positive and statistically significant (Figure 3), as the effect on the two dimensions, the physical and emotional were found to be smaller than the total score but statistically significant (Figures 5&6). Quality of life is a subjective measure of the positive and negative aspects of personal life experience and is a multidimensional

concept including physical health, psychological health, social relationship and environmental aspects [34]. Our findings can be supported from other studies that also indicated that supportive care has positive effects on the HR-QoL for patients with HF [35,36,37].

Fitzsimons & Strachan (2012) [38] also discuss that physical and emotional health are the most challenging care needs of HF patients. The focus of care changes from “cure” to “care”. This includes any distressing symptoms, promoting the best possible QoL by providing support to the families. This kind of care might be different from the “usual cardiology care” and cardiology needs. It expands the traditional medical goals to help patients and their families to cope with the unpredictable[1].

Depression and anxiety are important related outcomes for patient with HF. In this study the effect of the supportive care interventions was found to be positive, but not statistically significant (Figure 7&8). Other studies also reported that the supportive care has positive effects on depression and anxiety [29,42]. Also the study of Chang et al., (2016) which had as a primary outcome the effects of a supportive care on anxiety and depression highlights that the effectiveness of the intervention results from the tailored individualized educational sessions, the provision of the manual, video, and telephone follow-up counselling. Thus, the significance of the effectiveness of each intervention on anxiety and depression may rely to the degree of the provision of those variables.

Supportive care in HF patients is a new approach for cardiology nurses[4]. Even though there is evidence of effective interventions[20,40] there is not a systematic design of supportive interventions that might be comparable with each other. Maybe this due to the trajectory of HF characterized by exacerbations of symptoms requiring acute and intensive care[41]. But at some point, rescue attempts fail and death may appear to be “sudden’ or unexpected[11]. And this may also differentiate supportive care for HF patients. After discharge they may go home either at the same health condition, or a little bit worse, and go back to their usual activities. At this point they need supportive care, to keep them stable and at the same time prepare them for the next acute event that may be death. Supportive care plays an important role in positive, life-transforming change and allows individuals to have a more positive HR-QoL. Improved HR-QoL, as defined by patients and their family, is the goal as much as any reduction in mortality [42].

As mentioned above there is no standardized supportive care thus, the large statistical heterogeneity observed in the current meta-analysis might be suggestive of true “methodological” and “clinical heterogeneity”, both in terms of the type of interventions employed as well as the settings and patient characteristics. Interventions of the studies varied in intensity, design and intervention as such. For example, the effect of intervention on fatigue and HR-QoL in one study was assessed over a 12-week follow-up period[23] and in other study over a six months[27]. Another example could be the sample size of a study. Koukouvou et al[25] assessed 26 male patients with HF; a small proportion of eligible patients and Brodie et al[30] who’s study found that the target of 274 patients was not completely reached (n = 265; 97%) which slightly decreases the power of trial to find long-term effects.

The meta-regression revealed two variables: behavioral therapy and family support to have an inverse event with the effectiveness of the intervention in relation with the HR-QoL. The current outcome supports the results of the research study of Durante et al (2018) who suggest caregivers’ education and formal information. Often caregivers do things ‘incorrectly’ cause they just do not know the right way[43] or caregivers mental and psychological health does not allow them to do it efficiently[44,45,48]. As far it concerns the behavioral therapy, even though it is found to be effective, still further research is needed in order to clarify long term effects in HF outcomes[45]. The result may be further explained with the large heterogeneity between interventions and the variability of the population participating in the intervention.

Recent data shows a close relationship between caregivers’ strain, mental health, psychosocial status and support and it is suggested that caregivers need supportive care[44]. That is why researchers suggest that supporting caregivers has ethical and clinical rationale as well[44,45,46,47]. Decreasing family distress is a key to improving patient physical and mental quality of life[36]. Studies included in the current review refer in interventions focusing only on patients even though the care of chronic illness patients depends on caregivers and that might be an explanation of the negative relationship found. Only two studies measured support or involved family to obtain data but the intervention was only for the patients. The finding is very enlightening for researchers and clinicians developing heart failure management programmes and supportive care interventions.

The heterogeneity of the findings regarding the effectiveness of behavioral therapy may be attributable to varying trial designs, intervention components, follow-up periods, or outcome assessments A recent large systematic review and meta-analysis found that there are no effects of self-management (behavioral therapy) interventions on general outcomes, such as QoL in contrast to specific to HF-related outcomes (e.g readmission) [50]. The intervention must be custom based on the needs of each patient, funding along the mechanism that will be effective.

The main mechanisms of HF disease management programmes are associated with increased patient understanding of HF and its self-care, higher involvement of caregivers and family members in this self-care, enhanced self-efficacy and psychological well-being[49], increased support from health professionals and ease of use of technology. These main mechanisms do not operate alone but require favourable contextual factors to be present[50,51]. That means individualized patient-centered should be addressed and managed taking into consideration the environment of the patients and their caregivers to whom they count on [37,43,50].

There are also differences, mostly cultural, on how people perceive support and view their selves and relationships[52]. Supportive care may be effective when it takes a form that responds to someone's expectations based in a particular culture[53].

The results of the current review and meta-analysis may be ambiguous in terms of the overall effect of the supportive care interventions but certainly provides information for the need of new care approach of the HF patients. HF patients have supportive care needs which changes continuously and rapidly. These needs reflect the human entity, which is less medical, but provides comfort to the person. HF patients' holistic needs have to be addressed all the time and not only in a cardiology department or in an acute care setting [45,50].

STRENGHT AND LIMITATIONS

This is a review thoroughly discussing the effectiveness of supportive care in heart failure; giving the opportunity to HF nurses and allied professionals to consider different approaches and interventions when developing HF management programs. It also gives the opportunity to compare interventions and see what is more effective and adaptable. Of course, this also creates the limitation that a small number of studies have been identified with a large statistical heterogeneity.

CONCLUSIONS

The current meta-analysis gives a piece of information on how supportive care interventions may affect HR-QoL. However, the optimal characteristics of successful and structured supportive care interventions remain undetermined and more studies are needed for this task. The findings of the current study highlight the need to incorporate supportive care interventions to meet holistically the needs of HF patients. The care needs of HF patients still remain unaddressed along with other approaches, maybe more effective than those already used.

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PRISMA 2009 Flow Diagram

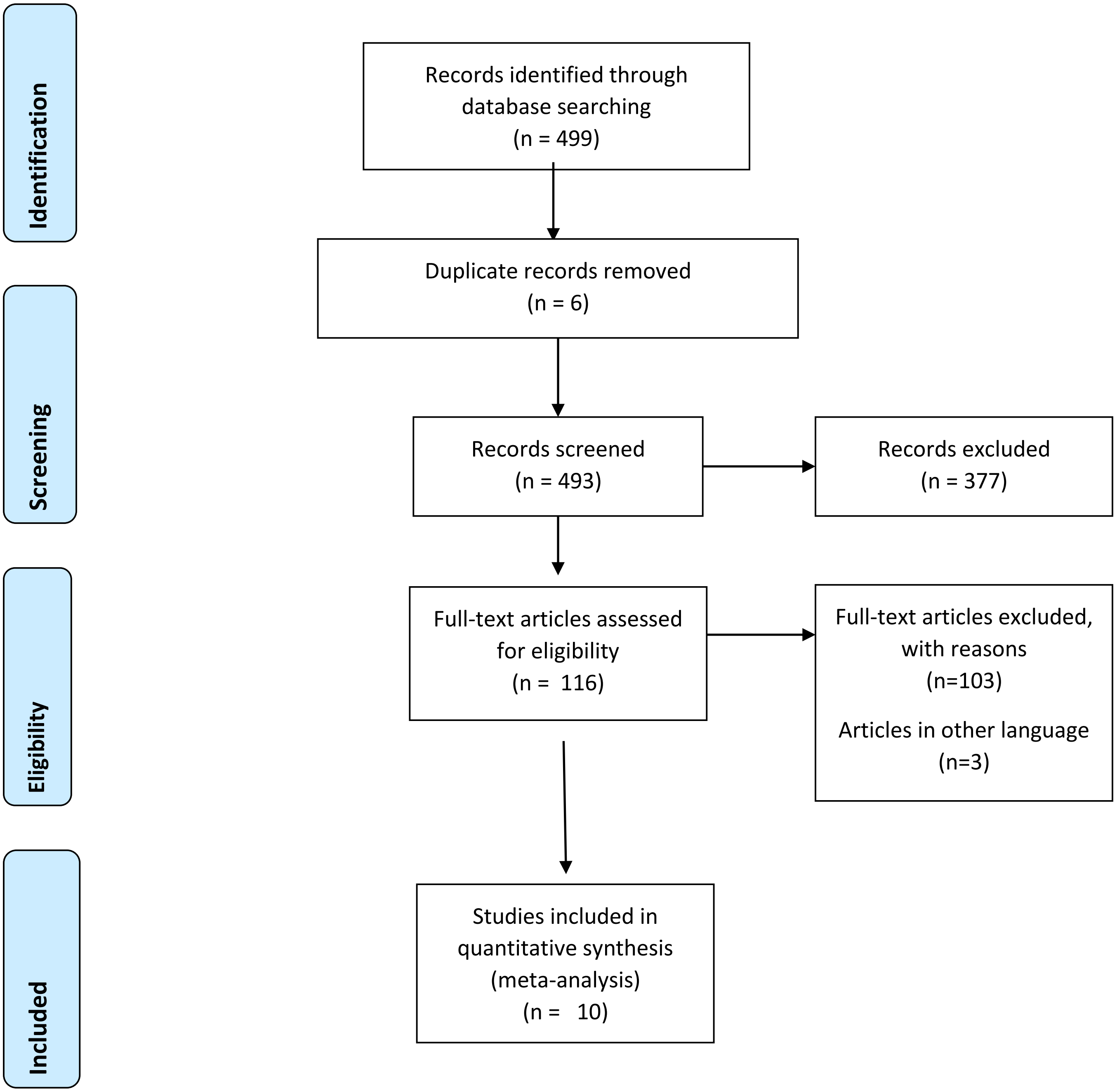

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Figure 1: Flow-chart for articles selection

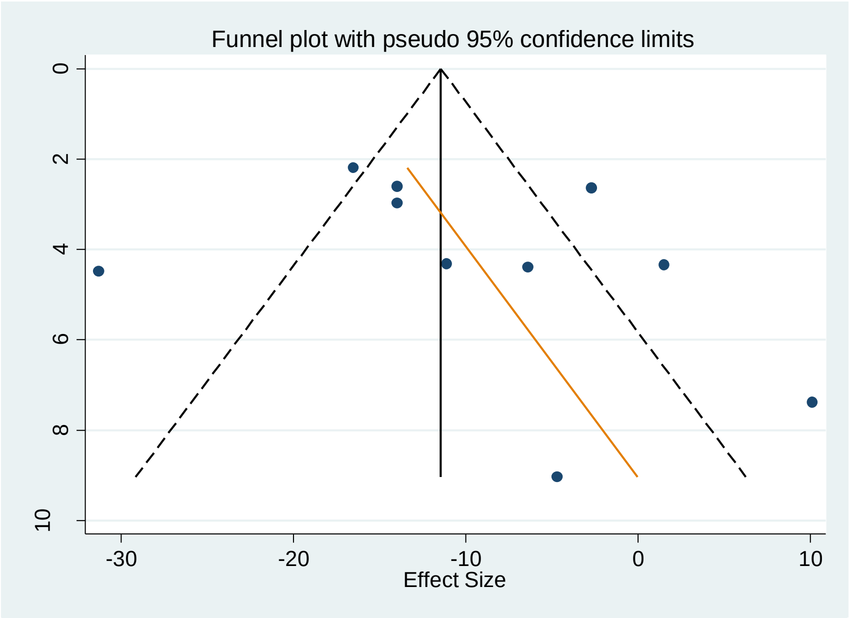
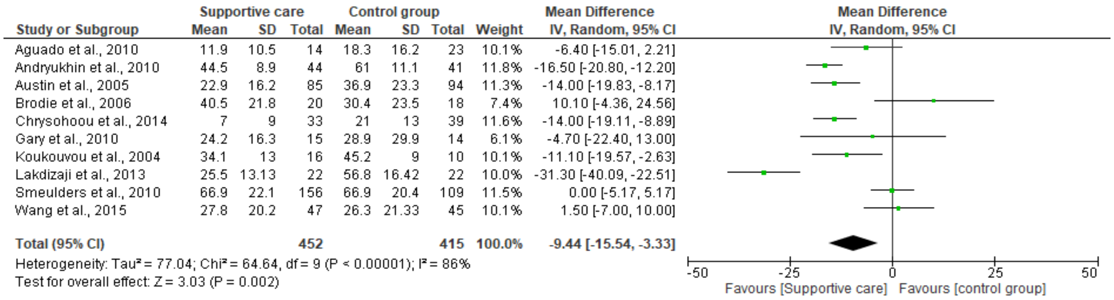


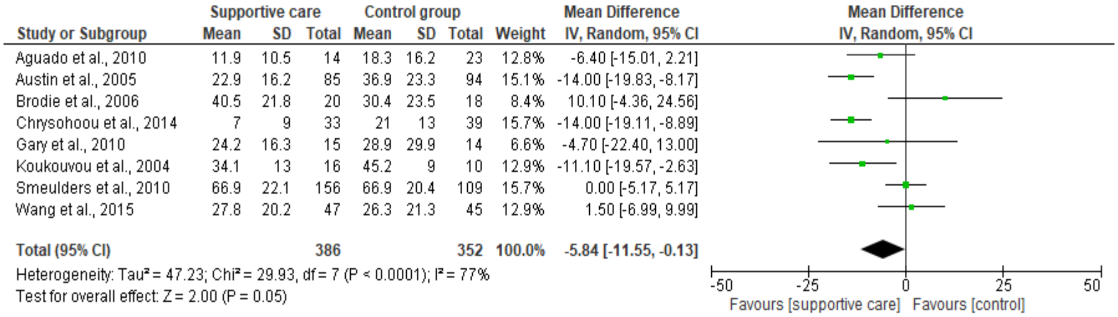
Figure 2: Funnel plot of included studies



	Supportive care			Control group				Mean Difference
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Random, 95% CI**
Aguado et al., 2010	11.9	10.5	14	18.3	16.2	23	10.1%	-6.40 [-15.01, 2.21]
Andryukhin et al., 2010	44.5	8.9	44	61	11.1	41	11.8%	-16.50 [-20.80, -12.20]
Austin et al., 2005	22.9	16.2	85	36.9	23.3	94	11.3%	-14.00 [-19.83, -8.17]
Brodie et al., 2006	40.5	21.8	20	30.4	23.5	18	7.4%	10.10 [-4.36, 24.56]
Chrysohoou et al., 2014	7	9	33	21	13	39	11.6%	-14.00 [-19.11, -8.89]
Gary et al., 2010	24.2	16.3	15	28.9	29.9	14	6.1%	-4.70 [-22.40, 13.00]
Koukouvou et al., 2004	34.1	13	16	45.2	9	10	10.1%	-11.10 [-19.57, -2.63]
Lakdizaji et al., 2013	25.5	13.13	22	56.8	16.42	22	10.0%	-31.30 [-40.09, -22.51]
Smeulders et al., 2010	66.9	22.1	156	66.9	20.4	109	11.5%	0.00 [-5.17, 5.17]
Wang et al., 2015	27.8	20.2	47	26.3	21.33	45	10.1%	1.50 [-7.00, 10.00]
Total (95% CI)			**452**			**415**	**100.0%**	**-9.44 [-15.54, -3.33]**

Heterogeneity: $Tau^2 = 77.04$; $Chi^2 = 64.64$, $df = 9$ ($P < 0.00001$); $I^2 = 86\%$
Test for overall effect: $Z = 3.03$ ($P = 0.002$)

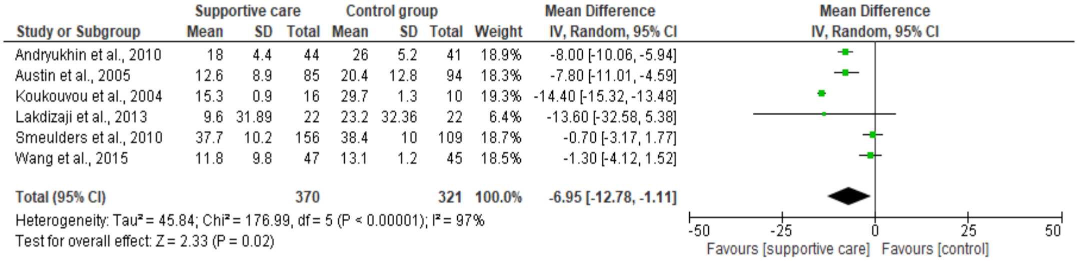
Figure 3: Forest plot of comparison: Quality of life, outcome: MLWHF total score.



	Supportive care			Control group				Mean Difference
Study or Subgroup	**Mean**	**SD**	**Total**	**Mean**	**SD**	**Total**	**Weight**	**IV, Random, 95% CI**
Aguado et al., 2010	11.9	10.5	14	18.3	16.2	23	12.8%	-6.40 [-15.01, 2.21]
Austin et al., 2005	22.9	16.2	85	36.9	23.3	94	15.1%	-14.00 [-19.83, -8.17]
Brodie et al., 2006	40.5	21.8	20	30.4	23.5	18	8.4%	10.10 [-4.36, 24.56]
Chrysohoou et al., 2014	7	9	33	21	13	39	15.7%	-14.00 [-19.11, -8.89]
Gary et al., 2010	24.2	16.3	15	28.9	29.9	14	6.6%	-4.70 [-22.40, 13.00]
Koukouvou et al., 2004	34.1	13	16	45.2	9	10	12.9%	-11.10 [-19.57, -2.63]
Smeulders et al., 2010	66.9	22.1	156	66.9	20.4	109	15.7%	0.00 [-5.17, 5.17]
Wang et al., 2015	27.8	20.2	47	26.3	21.3	45	12.9%	1.50 [-6.99, 9.99]
Total (95% CI)			**386**			**352**	**100.0%**	**-5.84 [-11.55, -0.13]**

Heterogeneity: $Tau^2 = 47.23$; $Chi^2 = 29.93$, $df = 7$ ($P < 0.0001$); $I^2 = 77\%$
Test for overall effect: $Z = 2.00$ ($P = 0.05$)

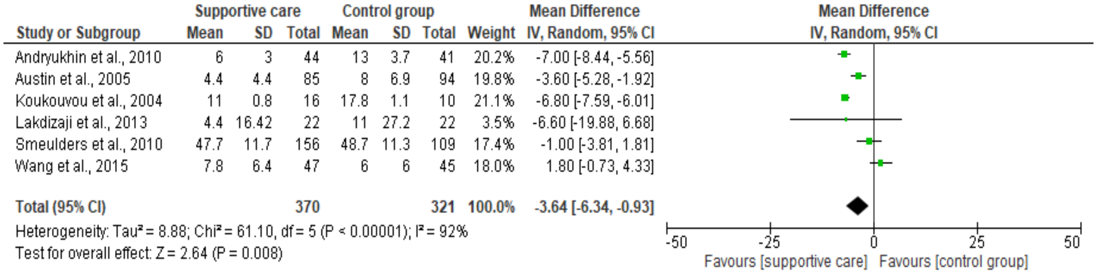
Figure 4: Sensitivity analysis: Outcome QoL total score (Excluding the article of Andrykhiin et al., 2010: not normal distribution and Lakdizaji et al., 2013)



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	18	4.4	44	26	5.2	41	18.9%	-8.00 [-10.06, -5.94]
Austin et al., 2005	12.6	8.9	85	20.4	12.8	94	18.3%	-7.80 [-11.01, -4.59]
Koukouvou et al., 2004	15.3	0.9	16	29.7	1.3	10	19.3%	-14.40 [-15.32, -13.48]
Lakdizaji et al., 2013	9.6	31.89	22	23.2	32.36	22	6.4%	-13.60 [-32.58, 5.38]
Smeulders et al., 2010	37.7	10.2	156	38.4	10	109	18.7%	-0.70 [-3.17, 1.77]
Wang et al., 2015	11.8	9.8	47	13.1	1.2	45	18.5%	-1.30 [-4.12, 1.52]
Total (95% CI)			**370**			**321**	**100.0%**	**-6.95 [-12.78, -1.11]**

Heterogeneity: Tau² = 45.84; Chi² = 176.99, df = 5 (P < 0.00001); I² = 97%
Test for overall effect: Z = 2.33 (P = 0.02)

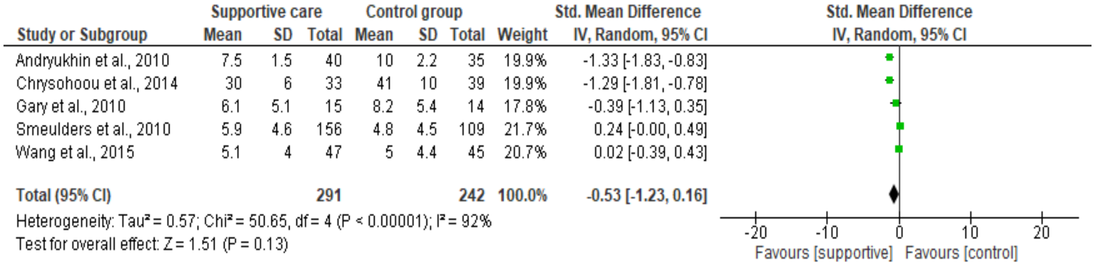
Figure 5:Forest plot of comparison: Quality of life/ physical dimension, outcome: Physical dimension/ QoL.



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	6	3	44	13	3.7	41	20.2%	-7.00 [-8.44, -5.56]
Austin et al., 2005	4.4	4.4	85	8	6.9	94	19.8%	-3.60 [-5.28, -1.92]
Koukouvou et al., 2004	11	0.8	16	17.8	1.1	10	21.1%	-6.80 [-7.59, -6.01]
Lakdizaji et al., 2013	4.4	16.42	22	11	27.2	22	3.5%	-6.60 [-19.88, 6.68]
Smeulders et al., 2010	47.7	11.7	156	48.7	11.3	109	17.4%	-1.00 [-3.81, 1.81]
Wang et al., 2015	7.8	6.4	47	6	6	45	18.0%	1.80 [-0.73, 4.33]
Total (95% CI)			**370**			**321**	**100.0%**	**-3.64 [-6.34, -0.93]**

Heterogeneity: Tau² = 8.88; Chi² = 61.10, df = 5 (P < 0.00001); I² = 92%
Test for overall effect: Z = 2.64 (P = 0.008)

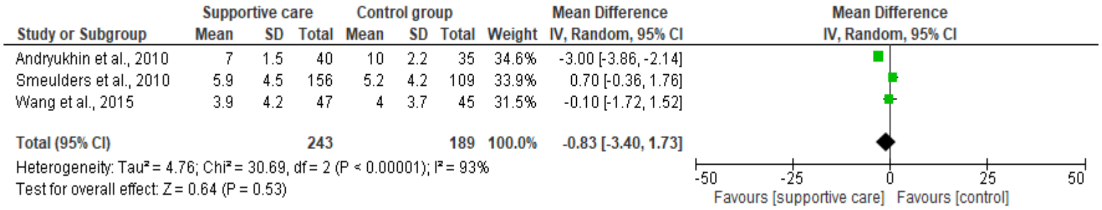
Figure 6 : Forest plot of comparison: Quality of life, outcome: Emotional dimension/QoL.



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	7.5	1.5	40	10	2.2	35	19.9%	-1.33 [-1.83, -0.83]
Chrysohoou et al., 2014	30	6	33	41	10	39	19.9%	-1.29 [-1.81, -0.78]
Gary et al., 2010	6.1	5.1	15	8.2	5.4	14	17.8%	-0.39 [-1.13, 0.35]
Smeulders et al., 2010	5.9	4.6	156	4.8	4.5	109	21.7%	0.24 [-0.00, 0.49]
Wang et al., 2015	5.1	4	47	5	4.4	45	20.7%	0.02 [-0.39, 0.43]
Total (95% CI)			**291**			**242**	**100.0%**	**-0.53 [-1.23, 0.16]**

Heterogeneity: Tau² = 0.57; Chi² = 50.65, df = 4 (P < 0.00001); I² = 92%
Test for overall effect: Z = 1.51 (P = 0.13)

Figure 7: Forest plot of comparison: Quality of life, outcome: Depression.



Study or Subgroup	Supportive care Mean	SD	Total	Control group Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI
Andryukhin et al., 2010	7	1.5	40	10	2.2	35	34.6%	-3.00 [-3.86, -2.14]
Smeulders et al., 2010	5.9	4.5	156	5.2	4.2	109	33.9%	0.70 [-0.36, 1.76]
Wang et al., 2015	3.9	4.2	47	4	3.7	45	31.5%	-0.10 [-1.72, 1.52]
Total (95% CI)			**243**			**189**	**100.0%**	**-0.83 [-3.40, 1.73]**

Heterogeneity: Tau² = 4.76; Chi² = 30.69, df = 2 (P < 0.00001); I² = 93%
Test for overall effect: Z = 0.64 (P = 0.53)

Figure 8: Forest plot of comparison: Quality of life, outcome: anxienty

Table 1: Main characteristics of the included studies.

Author /year	Location	Study purpose	Methods	Conclusion	Study Duration
(Koukouvou et al. 2004)	Greece	Purpose: To assess the physiological and psychosocial effects of exercise training in chronic HF** .	<u>Population</u> (# used in the analysis) 26 HF male patients Intervention group (A): 16 patients Control group (B): 10 patients <u>Median age</u> All= 52.5 (SD 9.8) Group A = 52.3 (9.2) Group B = 52.8 (10.6) <u>Sampling method</u> RCT*** <u>Measures</u> 1. MLWHFQ* 2. BDI* 3. HADS* 4. QLI* 5. LSI* 6. EPQ* 7. VO2 peak*	An exercise rehabilitation program in patients with chronic heart failure is useful for improving their work capacity and psychosocial status. It is also diminishing their depression and anxiety and improves health related QoL.	6 months

(Austin et al. 2005)	United Kingdom	Purpose: To determine whether a cardiac rehabilitation program improves the outcomes of an outpatient heart failure clinic (standard care) for patients, over 60 years of age, with chronic HF**	Population (# used in the analysis) Intervention group (A): 85 patients Control group (B): 94 patients Median age Group A = 71.9 (6.3) Group B = 71.8 (6.8) Sampling method RCT*** Measures 1. MLWHFQ* 2. 6MWT* 3. Borg RPE* 4. EuroQol*	Cardiac rehabilitation is an effective model care for older patients with heart failure	8 weeks
(Brodie, Inoue, and Shaw 2008)	United Kingdom	Purpose: To examine whether a physical activity ‘lifestyle’ intervention, based on motivational interviewing will improve quality of life	Population (# used in the analysis) Intervention group (A): 20 patients Control group (B): 18 patients Median age Group A= 79 (SD 6.9) Group B= 76 (SD 6.4)	Motivational interviewing approach is a viable option compared with traditional exercise programming. This technique is a flexible approach to promote activity and simultaneously it seems to improve QoL	5 months .

		compared to usual care.	Sampling method RCT*** Measures 1. MLWHFQ* 2. SF-36* 3. RTCR*		
(Smeulders et al. 2010)	Netherlands	Purpose: To assess the effects of a chronic disease self-management program on psychosocial attributes, self-care behavior and quality of life among HF patients who experienced slight to marked limitation of physical activity. .	Population (# used in the analysis) Intervention group (A) = 156 Control group (B) = 109 Median age Group A = 66.6 (SD=11) Group B = 66.8 (SD= 67.9) Sampling method RCT*** Measures 1. MLWHFQ* 2. GSES* 3. Gr9-EHFScB * 4. RAND-36* 5. KCCQ* 6. HADS*	Disease self-management program improved cognitive symptom management, self-care behavior and cardiac specific quality of life	12 months

(Aguado et al. 2010)	Spain	Purpose: To evaluate the effectiveness of a single home-based educational intervention for patients with HF .	Population (# used in the analysis) Intervention group (A) = 14 Control group (B) = 23 Median age Group A =77.8 (5D=8) Group B =77.4 (SD=6.8) Sampling method RCT*** Measures 1. MLWHFQ* 2. BT* 3. CI* 4. PsSPMSQ* 5. SF-36*	Patients with heart failure who receive a home-based educational intervention experience fewer emergency department visits and unplanned readmissions with lower healthcare costs and improves QoL	24 months
(Andryukhin et al. 2010)	Russia	Purpose: To estimate the impact of a structured, nurse-led patient education programme and care plan in general practice on outcome	Population (# used in the analysis) Intervention group (A) = 44 Control group (B) = 41 Median age Group A =66.5 (SD= 59-70) Group B =68 (SD=57-72),	This disease management programmes improved the patients' emotional status and quality of life, positively influenced body weight, functional capacity and attenuated heart remodeling	6 months

		parameters and events in patients with HF and preserved ejection fraction .	Sampling method RCT*** Measures 1. MLWHFQ* 2. 6MWT* 3. BMI* 4. WC* 5. HADS* 6. BPLFBG* 7. TC* 8. LDL* 9. CRP * 10. NT-proBNP* 11. CFA*		
(Gary et al. 2011)	USA	Purpose: To assess the effectiveness of a combined 12-week home-based exercise /cognitive behavioral therapy program with cognitive behavioral therapy alone, exercise alone and with usual	Population (# used in the analysis) Intervention group (A): 15 Control group (B): 14 Median age All patient= 65.8(SD=13.5) Sampling method RCT*** Measures	Interventions designed to improve both physical and psychological symptoms may provide the best method for optimizing functioning and enhancing health related quality of life in patients with HF	6 months

		care in HF patients diagnosed with depression. .	1. MLWHFQ* 2. HAM-D* 3. MINI* 4. 6MWT*		
(Lakdizaji et al. 2013)	Iran	Purpose: To examined the impact of a continuous training program on QoL of patients with HF	<u>Population</u> (# used in the analysis) Intervention group (A) = 22 Control group (B) = 22 <u>Median age</u> Group A: 62.8 (SD=9.5) Group B:60.6 (SD=9.5) <u>Sampling method</u> RCT*** <u>Measures</u> 1. MLWHFQ*	Ongoing training programs can be effective in improving QoL of patients with HF. Applying educational program as a non-pharmacological intervention can help to improve the QoL of HF patients.	3 months
(Chrysohoou et al. 2014)	Greece	Purpose: To evaluate the effect of high intensity, interval exercise on QoL and depression status, in HF patients .	<u>Population</u> (# used in the analysis) Intervention group (A) = 33 Control group (B) = 39 <u>Median age</u> Group A= 63(SD=9) Group B= 56 (SD=11)	High intensity exercise program seems to offer beneficial effects hemodynamic, clinical factors and QoL, improving the ability to perform daily activities	12 weeks

			Sampling method RCT*** Measures 1. MLWHFQ* 2. ZDRS* 3. IPAQ,* 4. 6MWT* 5. VO2max* 6. VCO2max*		
(Wang et al. 2015)	Taiwan	Purpose: To investigate the effects of a supportive educational nursing care programme on fatigue and quality of life in patients with HF .	Population (# used in the analysis) Intervention group (A) = 47 Control group (B) = 45 Median age Group A: 63.26±6.18 Group B: 68.33±11.53 Sampling method RCT*** Measures 1. MLWHF* 2. PFS* 3. SDI* 4. HADS*	The supportive educational nursing care programme alleviates fatigue and improves QoL in patients with HF	12 weeks

5. MSPSS*

* Minnesota Living With Heart Failure Questionnaire= MLWHFQ, Medical outcomes short form-36 health survey= SF-36, 6 minute walking test = 6MWT, Hospital Anxiety and Depression Scale= HADS , Kansas City Cardiomyopathy Questionnaire= KCCQ, RAND 36-item Health Survey= RAND-36, European Heart Failure Self-Care Behaviour Scale= Gr9-EHFScB, General Self-efficacy Scale= GSES, Mini International Neuropsychiatric Interview= MINI, Hamilton Rating Scale for Depression =HAM-D, N-terminal pro-brain natriuretic peptide= NT-proBNP , body mass index= BMI, waist circumference =WC, low-density lipoprotein= LDL, C-reactive protein= CRP, blood plasma levels of fasting blood glucose= BPLFBG, Readiness-to-change ruler =RTCR, cardiac function assessment= CFA, Barthel test =BT, Charlson index= CI, Spanish version of Pfeiffer’s Short Portable Mental Status Questionnaire= PsSPMSQ, total cholesterol= TC, Self-Care of HF Index V6= SCHFI V6, Greek language Zung Depression Rating Scale= ZDRS, International Physical Activity Questionnaire= IPAQ, maximal oxygen uptake= VO2max, carbon dioxide production =VCO2max, Beck Depression Inventory= BDI, Quality of Life Index= QLI, Scale of Life Satisfaction= LSI ,Eysenck Personality Questionnaire= EPQ, Borg scale rating of perceived exertion =Borg RPE, Piper fatigue scale= PFS, symptomatic distress index= SDI, multidimensional scale of perceived social support= MSPSS, Master Cheng Man-Ch’ing’s Yang-style short form= MCMCsYsSF, Borg scale =BS, Mood States= MS, Cardiac Exercise Self-efficacy Instrument= CESEI, Community Healthy Activities Model Program for Seniors= CHAMPS ** Heart Failure = HF , *** randomize Control Trial= RCT

Table 2: Intervention and delivery of the intervention of included studies

Author/year	**Intervention**	**Delivery of the intervention**
(Koukouvou et al. 2004)	A 6-month supervised exercise training program gradually modified by the patients’ perceived exertion and adaptation to the training prescription. Three months of aerobic training and then resistance exercises with therabands and small weights.	Exercise program: Not mentioned Psychological testing: By a physician

	Psychological testing performed before starting the exercise program	
(Austin et al. 2005)	An 8-week cardiac rehabilitation program. Patients attended classes twice weekly for a period of 2.5 hours. Patients graduated from the program to a 16-week community-based care regimen consisting of weekly 1-h exercise sessions. During the first 8 weeks of the trial, patients received additional education input, during weekly group sessions, on a variety of essential topics (medication, diet, exercise). If required, patients and their partners also received individual counselling from the dietician, psychotherapist and occupational therapist.	Rehabilitation program: clinical nurse specialist. Education and counselling: Multidisciplinary team (physician, nurse, dietician, psychotherapist and occupational therapist).
(Brodie, Inoue, and Shaw 2008)	Provision of information and recommendations to increase physical activity, including details of options available locally to access such opportunities. Motivational intervention comprised eight, 1-hour home-based sessions, delivered weekly. Sessions concentrated on how to increase energy expenditure by the integration of physical activities into patients' daily routines.	Physical activity recommendations: Experienced heart failure specialist nurse. Motivational intervention: The researcher who had no clinical qualifications.
(Smeulders et al. 2010)	A structured self-management programme consisted of six weekly group sessions of two and a half hours each. The programme incorporates four strategies to enhance self-efficacy expectancies: skills mastery (goal-setting and action-planning), reinterpretation of symptoms (cognitive symptom management techniques and deals with relieving symptom problems), modelling and social persuasion (motivation of patients to change their behaviours and beliefs).	All classes were led by a cardiac nurse specialist ('professional leader') and a patient with HF ('peer leader'), both trained in the protocol

(Aguado et al. 2010)	The intervention consisted of a visit by a trained nurse to patients in their homes 1 week after discharge. The visit lasted 2 hours and patients educated about self-management (e.g medication adherence), habits (e.g fluid intake, salt-free diet) and preventive activities (e.g designed for therapy and physical activity). Periodic meetings were attend by the doctor and nurses to solve problems arising in the home visits, to perfect education skills, and to control the fulfillment of the educational protocol.	Educational intervention: Trained nurse
(Andryukhin et al. 2010)	An educational program consisting of four weekly educational group sessions, targeting individual lifestyle changes and modifications of cardiovascular risk factors (month one). Each session lasted about 90 min and included a lecture and a practical skills session. Exercise training: four weekly introductory sessions of 30 min each (first month). An individualized program was recommended for further practice at home during the next five months (months two-to-six). Proactive and supportive care program: included weekly 15–30 min consultations in the health center or by phone over five months (lifestyle changes, checked medication compliance and elicited information about any changes in the condition of the patient) (months two-to-six).	Educational program and supportive care program: specially trained nurses Exercise training: a physiotherapist who had been trained in the study protocol.
(Gary et al. 2011)	Exercise program: 12 weekly face-to-face home visits to monitor walking progress. • Researchers educated the patient on the rationale for exercise in HF, • Instructed on self-monitoring of symptoms during walking, • Provided the patient with a monitor and instruction on how to use it	Research nurse: Exercise program CBT intervention: Psychiatric clinical nurse specialists or clinical psychology doctoral students

	• Provided patient with exercise logs and instructions • Instructed on use of the 6- to 20-point Borg's rate of perceived exertion scale • Provided patient with blood pressure cuff and weight scale and • Observed participant response to walking outside the home Cognitive behavioral treatment (CBT) The first two to three sessions were used to: • Build and establish rapport with the patient • Review principles of the cognitive model (agenda, thoughts, influence, behavior) • Educate the patient about depression • Teach the patient about CBT methods that may be used (i.e., identifying automatic thoughts, activity scheduling • Establish mutual collaborative goals for therapy and • Clarify concerns and answer any questions about CBT. Depressive symptoms were monitored weekly using mood-rating charts	
(Lakdizaji et al. 2013)	The intervention group first received one-to-one meeting for introducing the objectives of study, content of program and taking educational needs of participants. At the first appointment, each patient in the intervention group was given a booklet, entitled 'How can I learn to live with heart failure' based on modules (heart failure, low salt regimen, medicines, self-care, physical activity, feelings, tips for family), provided by the researcher.	Not mentioned

	Then home meeting happened every three weeks, took approximately one hour for reviewing previous goals and progression toward goals. To ensure between these meetings, a phone call were given to answer patients' questions in the intervention group.	
(Chrysohoou et al. 2014)	A high-intensity intermittent aerobic training. The training consisted of 45min/day, 3 days/week for 12 consecutive weeks. The period of 12 weeks	Not mentioned
(Wang et al. 2015)	A 12-week supportive educational nursing care programme consisted of three parts: fatigue assessment and monitoring, fatigue management education and outcome evaluation. Participants in the intervention group received four face-to-face education and counselling interventions performed by the researchers at the first visit and 4 weeks, 8 weeks and 12 weeks after the first visit at a meeting room. Each face-to-face education and counselling intervention was about 30 minutes. During the intervention, the researchers performed nursing assessment, education and counselling and provided emotional support to patients.	The intervention was delivered by one of the authors who was a senior cardiovascular nurse and was familiar with the interventions

CBT= cognitive behavioral therapy

Table 3: Explanation of the meta-regression findings for the variables behavioral therapy and family.

	Coef.	St. error	P> I z I
Behavioral	10.63818	6.763371	0.116
Family	18.99095	8.950608	0.034
_Cons	-11.1293	9.882136	0.260

	Coef.	St. error	P> I z I
Baseline	9.599226	4.72426	0.042
Variance	-11.99298	4.698562	0.011
_Cons	10.05473	4.216793	0.017

Appendix III

“Guide- assistant” for focus groups

Ερωτηματολόγιο για Focus Groups

1) Continuing Person -Centered care

2) Social Support

3) Supportive care

4) Palliative care

5) Self- Management

CPPC

1) Συμμετέχετε στις αποφάσεις για την θεραπευτική προσέγγιση; (φάρμακα, αλλαγή τρόπου ζωής, άσκηση)
2) Θα θέλατε να συμμετέχετε στη λήψη αποφάσεων;
3) Πως θα θέλατε να είναι η θεραπευτική προσέγγιση με τους Επαγγελματίες υγείας; (γιατρούς, νοσηλευτές κλπ)
4) Έχετε άλλες ανάγκες που χρειάζεστε να καλυφθούν ή βοήθεια; Αν ναι ποιες;

Social Support

1) Ποιες υπηρεσίες θα ήταν βοηθητικές για εσας; (κρατικές, δημοτικές, κοινωνικές);
2) Τι είδους υποστήριξης θα θέλατε να έχετε; (οικονομική/καλύτερο δίκτυο υπηρεσιών);

Supportive care

1) Τι είδους φροντίδα χρειάζεστε; Τι θα θέλατε να περιλαμβάνει η φροντίδα από τους επαγγελματίες υγείας (νοσηλευτές, γιατρούς , φυσιοθεραπευτές)
2) Πιστεύετε θα σας βοηθούσε κάποιου είδους εκπαίδευσης, πληροφόρησης για την ασθένεια σας;
3) Τι είδους επικοινωνία θα επιθυμούσατε να έχετε με τους Επαγγελματίες Υγείας (συχνότητα/περιεχόμενο)
4) Θα θέλατε να έχετε συμμετοχή στις αποφάσεις για τις επιλογές ή τις εναλλακτικές που υπάρχουν στη θεραπεία σας;

5) Ποιες είναι οι ψυχολογικές σας ανάγκες; Τι θα σας βοηθούσε (συναντήσεις σαν αυτές και σε ποια συχνότητα)
6) Είστε ικανοποιημένοι από την ενημέρωση και υποστήριξη που έχετε από τις υπηρεσίες υγείας;
7) Τι νομίζετε ότι θα σας βοηθούσε για να διατηρείται η καρδιά και η υγεία σας σε καλή κατάσταση;
8) Τι νομίζετε ότι θα σας βοηθούσε για να έχετε καλή ποιότητα ζωής;
9) Τι γίνεται μετά την έξοδο από το νοσοκομείο;
10) Υπάρχει κάποιο πρόγραμμα υποστήριξης;
11) Υπάρχει κάποιος επαγγελματίας υγείας στον οποίο μπορείτε να απευθύνεστε εάν χρειάζεστε κάτι;
12) Νιώθετε άνετα να συζητήσετε κάποιο πρόβλημα ή κάτι που σας απασχολεί με τον επαγγελματία υγείας σας; Αν ναι, ποιο; (καρδιολογο, γενικό γιατρό, παθολογο, νοσηλευτή;)

Palliative care

Έχετε άλλες ανάγκες όπως πνευματικές, παρηγορητική φροντίδα που θα θέλατε να καλυφθούν ή να συζητήσετε;

Self -Management

1) Μπορείτε να μας πείτε τι δυσκολίες αντιμετωπίζετε με τις καθημερινές σας δραστηριότητες;
    - Υγιεινή/ μεταφορές –περπάτημα
    - Χρειάζεστε βοήθεια για τις πιο πάνω δραστηριότητες (π.χ. βοήθεια ατόμου ή βοηθήματος όπως μπαστούνι)
2) Τι κάνετε για να παραμείνετε υγιείς; (μέτρηση βάρους, καταγραφή υγρών κλπ)
    - Τι θα σας βοηθούσε για να διατηρήσετε αυτές τις δραστηριότητες καθημερινά;
3) Ασκείστε;
    - Τι είδος άσκησης/δραστηριότητες θα ήταν πιο ευχάριστη για εσάς ώστε να την εντάξετε στην καθημερινότητά σας;
    - Τι θα σας βοηθούσε να διατηρήσετε αυτή τη συνήθεια;
    - Πως Θα θέλατε να ασκείστε;