Original article

Effectiveness and Factors Determining the Success of Management Programs for Patients With Heart Failure: A Systematic Review and Meta-analysis

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ABSTRACT

Introduction and objectives: Heart failure management programs reduce hospitalizations. Some studies also show reduced mortality. The determinants of program success are unknown. The aim of the present study was to update our understanding of the reductions in mortality and readmissions produced by these programs, elucidate their components, and identify the factors determining program success.
Methods: Systematic literature review (1990-2014; PubMed, EMBASE, CINAHL, Cochrane Library) and manual search of relevant journals. The studies were selected by 3 independent reviewers. Methodological quality was evaluated in a blinded manner by an external researcher (Jadad scale). These results were pooled using random effects models. Heterogeneity was evaluated with the I^2 statistic, and its explanatory factors were determined using metaregression analysis.
Results: Of the 3914 studies identified, 66 randomized controlled clinical trials were selected (18 countries, 13 535 patients). We determined the relative risks to be 0.88 for death (95% confidence interval [95%CI], 0.81-0.96; $P < .002$; I^2, 6.1%), 0.92 for all-cause readmissions (95%CI, 0.86-0.98; $P < .011$; I^2, 58.7%), and 0.80 for heart failure readmissions (95%CI, 0.71-0.90; $P < .0001$; I^2, 52.7%). Factors associated with program success were implementation after 2001, program location outside the United States, greater baseline use of angiotensin-converting enzyme inhibitors/angiotensin receptor blockers, a higher number of intervention team members and components, specialized heart failure cardiologists and nurses, protocol-driven education and its assessment, self-monitoring of signs and symptoms, detection of deterioration, flexible diuretic regimen, early care-seeking among patients and prompt health care response, psychosocial intervention, professional coordination, and program duration.
Conclusions: We confirm the reductions in mortality and readmissions with heart failure management programs. Their success is associated with various structural and intervention variables.
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Efectividad y determinantes del éxito de los programas de atención a pacientes con insuficiencia cardiaca: revisión sistemática y metanálisis

RESUMEN

Introducción y objetivos: Los programas de atención a pacientes de insuficiencia cardiaca reducen ingresos hospitalarios. Algunos estudios reducen mortalidad. Se desconocen los determinantes del éxito. El objetivo es actualizar el conocimiento sobre la reducción de mortalidad y reingresos de estos programas, describir sus componentes e identificar factores condicionantes de resultados.
Métodos: Revisión sistemática de la bibliografía (1990-2014) (PubMed, EMBASE, CINAHL, Cochrane Library) y búsqueda manual en revistas relevantes. Tres revisores independientes seleccionaron los estudios. La calidad metodológica fue evaluada a ciegas por una investigadora externa (escala Jadad). Los resultados se combinaron mediante modelos de efectos aleatorios. La heterogeneidad se evaluó con el estadístico I^2, y se determinaron sus factores explicativos mediante análisis de metarregresión.
Resultados: Se identificaron 3.914 estudios. Se seleccionaron 66 ensayos clínicos controlados y aleatorizados (18 países, 13.535 pacientes), y se observaron riesgos relativos de muerte de 0,88 (intervalo de confianza del 95% [IC95%], 0,81-0,96; p < 0,002; I^2, 6,1%), reingresos por todas las causas de

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0,92 (IC95%, 0,86-0,98; p < 0,011; I^2, 58,7%) y reingresos por insuficiencia cardiaca de 0,80 (IC95%, 0,71-0,90; p < 0,0001; I^2, 52,7%). Factores asociados al éxito: programas posteriores a 2001, no realizados en Estados Unidos, mayor uso basal de inhibidores de la enzima de conversión de la angiotensina/ antagonistas del receptor de la angiotensina II, mayor número de profesionales y componentes de la intervención, especialización del cardiólogo y enfermera, educación protocolizada y evaluada, automonitorización de signos y síntomas, reconocimiento de descompensación, pauta flexible de diuréticos, aviso y atención precoz, intervención psicosocial, coordinación de profesionales y duración del programa.

Conclusiones: Se confirma la reducción de mortalidad y reingresos con los programas de insuficiencia cardiaca, cuyo éxito se asoció con diferentes variables de estructura e intervención.

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Abbreviations

HF: heart failure
LVEF: left ventricular ejection fraction
NYHA: New York Heart Association
RCT: randomized controlled trials
RR: relative risk

INTRODUCTION

The prevalence of heart failure (HF) is increasing, reaching > 10% in individuals older than 70 years.[1–3]

It is the main cause of hospitalization in persons older than 65 years.[1] Heart failure has a considerable impact on health care systems and comprises about 2.5% of overall health care expenditure,[1] mainly due to admissions. However, the cost attributable to informal care, typically provided by women in Spain, represents the largest part of the overall health care cost (59.1%-69.8%).[4] The disease has a marked impact on the quality of life of patients and their caregivers.[4,5]

Patients with HF are complex and of advanced age. Their considerable number of comorbidities and readmissions affect their clinical treatment and prognosis.[1,2]

Many of the admissions are considered avoidable.[1,2] Because numerous meta-analyses[6–23] and 1 metareview[24] have shown that HF management programs significantly reduce the number of readmissions, these approaches are recommended in European clinical practice guidelines (I-A).[2]

Nonetheless, these meta-analyses reviewed a limited number of studies, which were, moreover, heterogeneous in terms of populations studied, their characteristics and usual care, geographical area, and health care system. The extraordinarily complex interventions are frequently scarcely described. Thus, it is difficult to evaluate which characteristics and clinical contexts favor program success and could be used to guide the organization of the different health care systems when setting priorities. Some meta-analyses have studied certain characteristics indispensable for success[14,16] in a limited number of studies. Numerous meta-analyses[11,14–16,19–24] and recent articles[25–27] have mentioned the need to explore all of these elements in greater depth.

The objectives of this systematic review were the following: *a)* to update our understanding of the effectiveness of HF management programs not using remote monitoring while accurately describing the type of patient, the organization and contents of the intervention, and their ability to reduce mortality and readmissions, and *b)* to identify the determinants of program success.

METHODS

Design

The study design is detailed in the supplementary material (methodology and bibliographic references[1–10] in Appendix 1).

We performed a systematic review and meta-analysis of randomized controlled trials (RCT) assessing hospital admissions and/or mortality in HF management programs involving multifactorial interventions and not using remote monitoring methods apart from telephones.

Our methodology adopted the CONSORT (Consolidated Standards of Reporting Trials)[1] and AHA (American Heart Association) Taxonomy[2] guidelines to evaluate the sociodemographic and clinical characteristics of the population undergoing the intervention, organizational aspects of the health care team, program intensity, mode of health care delivery, and type of follow-up, and the precise contents of the interventions and usual care.

This meta-analysis adhered to the recommendations of the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analysis) statement.[3]

Electronic databases—PubMed, EMBASE, CINAHL, and Cochrane Library—were searched from January 1990 to December 2014. In addition, we reviewed the main journals publishing articles on the topic of interest and the bibliography of the retrieved systematic reviews and meta-analyses. The databases consulted and the search strategy used are detailed in the supplementary material.

We included RCT published in English, Spanish, French, or German with data on mortality and/or all-cause readmissions or HF readmissions.

Telemedicine/telecare studies were excluded because they have been the subject of specific studies and their inclusion would increase heterogeneity; moreover, because of the high prevalence and high degree of clinical and psychosocial comorbidities in HF patients, this type of health care cannot be offered in a widespread manner. However, we included studies that only involved telephone contact because telephones are typically available to almost all types of patients.

We also excluded medication studies (except for those analyzing drug titration and optimization), those studying multiple diseases, and those that were not multifactorial (eg, only examining exercise or a single technique). Nonetheless, we included 3 multifactorial studies whose intervention included cardiac rehabilitation of patients with HF.

Study Selection and Data Extraction

Three reviewers (M. J. Oyanguren Artola, J. Torcal Laguna, and P. M. Latorre García) independently analyzed the available information sources. At least 2 of the authors separately analyzed the full