

Review

Conceptual Model for Heart Failure Disease Management

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ABSTRACT

The objective of this review is to propose a conceptual model for heart failure (HF) disease management (HFDM) and to define the components of an efficient HFDM plan in reference to this model. Articles that evaluated 1 or more of the following aspects of HFDM were reviewed: (1) outpatient clinic follow-up; (2) self-care interventions to enhance patient skills; and (3) remote evaluation of worsening HF either using structured telephone support (STS) or by monitoring device data (telemonitoring). The success of programs in reducing readmissions and mortality were mixed. Outpatient follow-up programs generally resulted in improved outcomes, including decreased readmissions. Based on 1 meta-analysis, specialty clinics improved outcomes and non-specialty clinics did not. Results from self-care programs were inconsistent and might have been affected by patient cognitive status and educational level, and intervention intensity. Telemonitoring, despite

RÉSUMÉ

L'objectif de cette revue est de proposer un modèle conceptuel de prise en charge de l'insuffisance cardiaque (PCIC) et de définir les composantes d'un plan efficace de PCIC faisant référence à ce modèle. Les articles qui évaluaient 1 des aspects suivants ou plus de la PCIC ont été passés en revue : 1) le suivi en consultation externe; 2) les interventions d'autoadministration de soins pour améliorer les compétences du patient; 3) l'évaluation à distance de la détérioration de l'IC soit en utilisant le soutien téléphonique structuré ou les données du dispositif de surveillance (télésurveillance). Le succès des programmes sur la diminution des réadmissions et de la mortalité était mitigé. Les programmes de suivi en consultation externe entraînaient habituellement l'amélioration des résultats incluant la diminution des réadmissions. Selon 1 méta-analyse, les cliniques spécialisées amélioraient les résultats, mais les cliniques non

Previously described as a constellation of signs and symptoms stemming from the inability of the myocardium to function properly as a pump, heart failure (HF) is now understood to represent a complex composite of functional, structural, and biochemical changes, with a progressively deteriorating natural course intermixed with episodes of acute decompensation.¹ The disease has reached epidemic proportions, with an estimated 6.6 million Americans and 500,000 Canadians affected.² In addition, HF is associated with an increasing number of hospitalizations, from 377,000 in 1979 to 1,094,000 in 2007,³ despite an expanding understanding of the pathophysiology underlying HF and the establishment of evidence-based treatments. These observations translate into increased health care costs for this population, estimated at \$24.7 billion.³

The process of care used to treat HF patients is a central factor implicated in this lack of translation from clinical studies to community practice. In an attempt to re-engineer the process of care, researchers and practitioners have proposed a number of strategies to improve the quality of care and reduce clinical events for HF patients. This review will propose a conceptual model for HF disease management (HFDM) and discuss disease management strategies in reference to this model.

Conceptual Model of HFDM

Disease management refers to an integrative approach that aims to enhance quality of health care and its cost-effectiveness for patients with chronic conditions.⁴ In relation to HF patients, this can be carried out by identifying and closely monitoring high-risk patients and helping patients and clinicians comply with proven prevention and treatment strategies.⁴

The proposed conceptual model for HFDM is based on the assumption that each HF patient has certain baseline risk factors for HF-related hospitalization (or rehospitalization). Past attempts at identifying risk factors for admission because of HF⁵ have produced numerous candidate variables (summarized in

Received for publication September 18, 2013. Accepted December 24, 2013.

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initially promising meta-analyses demonstrating a decrease in the number and duration of HF-related readmissions and all-cause mortality rates at follow-up, has not been shown in randomized trials to consistently reduce readmissions or mortality. However, evidence from device monitoring trials in particular might have been influenced by technology and design issues that might be rectified in future trials. Results from the literature suggest that the ideal HFDM plan would include outpatient follow-up at an HF specialty clinic and continuous education to improve patient self-care. The end result of this plan would lead to better understanding on the part of the patient and improved patient ability to recognize and respond to signs of decompensation.

Table 1), including sociodemographic characteristics, patient understanding of and compliance with treatment, availability and utilization of health care resources, comorbidities, and markers of HF severity. Serum biomarkers, such as elevated levels of blood urea nitrogen, lower hemoglobin concentration, and lower levels of serum sodium might also help to distinguish patients at risk for HF-related adverse events.^{6,7} In addition, increased levels of B-type natriuretic peptide,⁸⁻¹⁰ norepinephrine,⁸ cardiac troponin-T,¹¹ C-reactive protein,¹² tumour necrosis factor- α and its receptor, and interleukin-6¹³ all predict poorer outcomes in patients with HF.

These risk factors interact with different stimuli, such as ischemia, infection, arrhythmias, or patient noncompliance, and can result in patient deterioration. Eventually, symptoms worsen to the point that patients seek additional medical attention. Depending on the delay from initial instability to identification by a patient's provider, the decompensation might require a hospital admission to regain stability. The purpose of HFDM strategies is to prevent this natural history and improve patient outcomes using 3 basic mechanisms: (1) implementing strategies that modify patients' baseline risk; (2) monitoring for worsening signs and symptoms of decompensation; and (3) encouraging patient participation in their own care (Figure 1).

HFDM Strategies

Rich et al., in 1995, were the first to apply what today would be considered an HFDM program using a multidisciplinary nurse-directed approach to managing elderly patients at high risk for HF readmission.¹⁴ In a prospective randomized study, the intervention targeted patient medication and dietary compliance, resulting in a significantly reduced rate of HF readmission, improved quality of life (QoL), and decreased cost of patient overall care. This program included a cardiologist who reviewed and simplified the patient's medication list, a dietitian who individualized dietary recommendations, and social service personnel who facilitated discharge planning and ensured regular follow-up with primary physicians.¹⁴

Since then, a number of studies have evaluated different points of intervention in the HF population: (1) outpatient

spécialisées ne les amélioreraient pas. Les résultats des programmes d'autoadministration de soins étaient contradictoires et pourraient avoir été influencés par l'état cognitif du patient et le niveau d'études, ainsi que l'intensité de l'intervention. La télésurveillance, malgré les méta-analyses initialement prometteuses démontrant une diminution du nombre et de la durée des réadmissions liées à l'IC et les taux de mortalité toutes causes confondues au suivi n'a pas montré réduire de manière constante au cours des essais aléatoires les réadmissions ou la mortalité. Cependant, les données scientifiques provenant des essais sur la télésurveillance au moyen de dispositifs auraient été en particulier influencées par les problèmes de conception et de technologie qui pourraient être rectifiés lors d'essais futurs. Les résultats provenant de la littérature suggèrent que le plan idéal de PCIC inclurait le suivi en consultation externe dans une clinique spécialisée en IC et un enseignement continu pour améliorer l'autoadministration des soins. Le résultat final de ce plan mènerait à une meilleure compréhension de la part du patient et à l'amélioration de l'habileté du patient à reconnaître les signes de décompensation et à y réagir.

interventions involving follow-up in specialized HF clinics, non-HF clinics, or at patients' homes; (2) self-care interventions to enhance patient skills; and (3) remote evaluation of worsening signs and symptoms either using STS or data analysis from monitoring devices (telemonitoring). Most of these interventions enrolled patients at the time of discharge or shortly after an HF admission. Each of these HFDM strategies incorporated 1 or more of the conceptual model mechanisms in an attempt to improve outcomes.

Specialty HF and Non-HF Clinic Follow-up

Outpatient follow-up in specialty HF and nonspecialty clinic serves not only to monitor patients, but also to assess their skills for self-care and educate them based on their level of health literacy and disease awareness. These can lead to improved recognition of signs and symptoms of instability and potentially prevent rehospitalization.

Cintron et al., 1983, showed positive results from having a specialty HF clinic with a nurse practitioner available on a walk-in basis.¹⁵ A complex program comprising frequent patient follow-up (every 3 months for up to 24 months), along with enhanced patient education and patient and family psychological support, correlated with a decrease in the number of rehospitalizations and total length of hospital stay.¹⁵ A meta-analysis by McAlister et al. later confirmed the positive outcomes of outpatient follow-up. Follow-up after discharge by multidisciplinary teams was associated with decreased mortality, HF-related readmissions, and all-cause readmissions in these studies.^{16,17} A meta-analysis by Gonseth et al., in 2004, showed conflicting results. Although the analysis failed to show a significant association between outpatient clinic visits and a decrease in all-cause, HF, or other cardiovascular-related readmissions, this analysis did reveal a significant decrease ($P = 0.04$) in the combined end point of readmission or death.¹⁸

Whellan et al., in 2005, concluded from their meta-analysis that follow-up with a cardiologist correlated with decreased HF and all-cause rehospitalizations and decreased length of hospital stay.¹⁹ However, follow-up under the supervision of a general internist did not correlate with an improvement in these indices.¹⁹ The authors hypothesized

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