Treatment of Patients in the Vulnerable Phase (at Discharge or Early After Discharge)

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Abstract

The clinical course of heart failure includes a period in which the patient is at increased risk of death or rehospitalisation for HF. This period is termed the “vulnerable phase” and occurs during the peri-acute HF phase, due to microenvironmental changes in the cardiovascular system. Typically, the vulnerability phase starts from the onset of an acute HF event leading to admission, continues through a peri-discharge period and lasts up to 6 months after discharge. These poor post-discharge outcomes also represent a significant socioeconomic burden. This article reviews treatments that are beneficial in this important phase.

Keywords: Heart failure; Guidelines; Vulnerable phase

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Introduction

The clinical course of heart failure (HF) includes a period in which the patient is at increased risk of death or rehospitalisation for HF. This period is termed the “vulnerable phase”[1] and occurs during the peri-acute HF phase, due to microenvironmental changes in the cardiovascular system.[2] Typically, the vulnerability phase starts from the onset of an acute HF event leading to admission, continues through a peri-discharge period and lasts up to 6 months after discharge.[2,3] These poor post-discharge outcomes also represent a significant socioeconomic burden.[4]

Patient vulnerability occurs regardless of the type of acute episode, but the individual impact may vary.[2] Although the exact mechanisms leading to readmissions are not fully clarified and there are many possible precipitants of rehospitalisation for HF,[5] the following factors have been identified and may be controlled: persistent congestion, end-organ damage and comorbidities.[6] Despite the increased risk for adverse outcomes, the vulnerability phase may also represent a window of opportunity[7] because in those who survive this period successfully, with the assistance of appropriate management, a phase of long-term stability can be expected.[2]

The vulnerable phase may be seen as a continuum[8] but it is usually divided into three periods that may be overlapping: a very early phase, an early phase, and a late phase. Each period has its own prioritised therapeutic goals[8] based on the patient’s clinical characteristics (Table 8.1).

Very early vulnerability sub-phase

The risk of rehospitalisations is particularly high in the period that immediately follows the acute episode.[2] Thus, early recognition of this vulnerability state and the implementation of management strategies are pivotal to successful navigation of this high-risk phase. The desired management plan should be therefore conceived before discharge[9] to provide clinical stabilisation, relief of symptoms, recovery of and protection from end-organ damage and to reduce the risk of complications.[8] In this phase, the accurate identification of signs of haemodynamic congestion is a priority because congestion leads to high vulnerability and an especially poor prognosis.[10] Patients should be discharged when they have been haemodynamically stable for at least 24–48 hours,[10] euvoelaemic, stabilised on long-term oral medication, and when they have stable organ function, including that of the kidney and liver in particular.[2]

Unfortunately often pre-existing therapy has been discontinued or reduced during the acute hospitalisation and this must be taken into account as a prognostic risk factor for subsequent readmissions and death. In severe, acutely decompensated...
been demonstrated that rehospitalisations are more likely to occur if HF is associated with the aetiology of ischaemia.[9] Cardiac troponins (see paper on Clinical diagnosis this volume). Particular the measurement of natriuretic peptides (NPs) and cardiac troponins should also be taken into account before discharge. The discharge plan should be formulated in order to maintain euvolaemia.

HF patients previously on long-term beta-blocker therapy discontinuing the therapy has been found to lead to a worse prognosis.[11] On the contrary, the continuation of pre-existing beta-blocker therapy at admission has been found to predict the best prognosis.[11]

According to the 2016 European Society of Cardiology (ESC) guidelines[9], acute HF patients should be discharged when clinical parameters are stable and after an individualised educational programme about self-care has been implemented (see below). Once congestion is stabilised and, if possible, euvoelema is re-established, the use of ACEi’s (or if not tolerated an ARB) is indicated. Specifically, the guidelines recommend ACEi’s (or an ARB) in patients with HFrEF to improve symptoms and exercise capacity, reduce the risk of HF hospitalisation and increase survival.[8] Such a therapy should be preferably initiated before discharge. The discharge plan should be formulated also taking into account the level of HF-related biomarkers, in particular the measurement of natriuretic peptides (NPs) and cardiac troponins (see paper on Clinical diagnosis this volume).

The aetiology is an important factor to take into account. It has been demonstrated that rehospitalisations are more likely to occur in patients with ischaemic HF[12] and the risk of subsequent episodes of ischaemia needing active management may be better assessed by measuring levels of NPs and troponins before discharge. The use of biomarker-directed therapy adjustment has been shown significantly to reduce HF events and, also, to be cost-saving.[13]

For all these reasons, a multidisciplinary approach is the recommended strategy for the management of the vulnerable patient (see below). Pre- and post-discharge management should follow the standards of care developed by the Heart Failure Association (HFA) of the ESC.[14] Finally, according to the guidelines, patients should be visited by their general practitioner within 1 week of discharge. The hospital cardiology team should follow up the patients within 2 weeks of discharge, if possible.

**Early vulnerability sub-phase**

In this period, occurring after the patient has been decongested, and is euvoelema, the ESC guidelines[9] recommend to continue the disease management plan individually designed to prevent rehospitalisations, and to improve symptoms, survival and quality of life. Due to neuroendocrine activation, elevated heart rate and diuretic requirements, beta-blockers should be implemented with caution. Ivabradine can be easily implemented in therapy and together with beta-blockers helps in controlling heart rate to target.

**Late vulnerability sub-phase**

Typically extends up to 6 months. Watch for possible beginnings of haemodynamic congestion before overt systemic congestion.

Continue multidisciplinary management programmes designed to improve outcomes through structured follow-up and monitoring. Optimisation of medical treatment.

**Recommendation Class**

Recommendation Class | Class
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It is recommended that regular aerobic exercise is encouraged in patients with HF to improve functional capacity and symptoms. | I
It is recommended that regular aerobic exercise is encouraged in stable patients with HFrEF to reduce the risk of HF hospitalisation. | I
It is recommended that patients with HF are enrolled in a multidisciplinary care management programme to reduce the risk of HF hospitalisation and mortality. | I
Referral to primary care for long-term follow-up may be considered for stable patients with HF who are on optimal therapy to monitor for effectiveness of treatment, disease progression and patient adherence. | IIb
Monitoring of pulmonary artery pressures using a wireless implantable haemodynamic monitoring system (CardioMems) may be considered in symptomatic patients with HF with previous HF hospitalisation in order to reduce the risk of recurrent HF hospitalisation. | IIb
Multiparameter monitoring based on ICD (IN-TIME approach) may be considered in symptomatic patients with HF-EF (LVEF ≤ 35%) in order to improve clinical outcomes. | IIb

Class of recommendation: I = evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective; II = conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure (IIa: weight of evidence/opinion is in favor of usefulness/efficacy; IIb: usefulness/efficacy is less well established by evidence/opinion); III: evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.

HF = heart failure; ICD = implantable cardioverter-defibrillator; IN-TIME = Implant-based multi-parameter telemotoring of patients with heart failure; HFrEF = heart failure with reduced ejection fraction; LVEF = left ventricular ejection fraction.
Box I Components of management programmes for patients with HF according to the ESC guidelines

- Optimised medical and device management
- Adequate patient education, with special emphasis on adherence and self-care
- Patient involvement in symptom monitoring and flexible diuretic use
- Follow-up after discharge (regular clinic and/or home-based visits; possibly telephone support or remote monitoring)
- Increased access to healthcare (through in-person follow-up and by telephone contact; possibly through remote monitoring)
- Facilitated access to care during episodes of decompensation
- Assessment of (and appropriate intervention in response to) an unexplained change in weight, nutritional status, functional status, quality of life, or laboratory findings
- Access to advanced treatment options
- Provision of psychosocial support to patients and family and/or caregivers

ESC = European Society of Cardiology; HF = heart failure.

If heart rate is still high despite therapy with beta-blockers, the addition of ivabradine is the best approach, also to improve HF-related symptoms and well-being.[17] A recent randomised study[18] found that the early co-administration of ivabradine and beta-blockers (24 hours after hospital admission) was more efficacious and safer in acute patients hospitalised with HFrEF in reducing heart rate after hospital discharge, than treatment with beta-blockers alone. Also, a significant improvement in the ejection fraction was observed, consistent with data from the Systolic Heart failure treatment with the If inhibitor ivabradine Trial (SHIFT) study.[15] Finally, a significant decrease in BNP values and a trend toward a reduction in advanced functional classes were observed in the combined therapy group. Thus, the addition of ivabradine to beta-blockers may be introduced earlier than previously indicated by the SHIFT trial (i.e. ≥4 weeks after hospitalisation) to achieve heart rate control and improve prognosis.

Late vulnerability sub-phase

This vulnerability period may last up to 6 months after discharge and is related to late reactivation of the renin-angiotensin-aldosterone system (RAAS). The aim of management in this late phase is to lead the vulnerable patient to a subsequent phase of stability. As haemodynamic congestion may appear before overt systemic congestion, diuretics should be adjusted in order to maintain euvoealma long-term. A gradual rise in ventricular filling pressures may be observed in patients prior to, and predicting, subsequent overt congestion. Thus, other HF episodes might well occur and should be prevented by the above-described multidisciplinary assessment of clinical symptoms/signs and biomarkers.[13]

Poor prognosis in the late phase could be prevented by adequate up-titration of ACEI (or ARB), beta-blockers, MRAs, and ivabradine following the current ESC guidelines.[9] Optimisation of disease modifying therapies, such as device therapy, should be also ensured.[2]

To improve prognosis, the management plan should also consists of an educational programme with appropriate lifestyle adjustments, as recommended by the guidelines. Indeed, education leads to an improvement in patient skills of self-care after discharge.[13,19] Such “self-empowerment” is in line with the prospective of a continuous, “at-a-distance” care[21] that may be obtained through telemedicine, another component of the management plan. This term indicates a comprehensive approach that includes structured telephone support, remote distance monitoring of biomarkers (e.g. weight, heart rate, blood pressure, etc) and the use of implantable devices.[7,21,22] There is also evidence that telemedicine may improve outcomes and reduce HF hospitalisations.[23]

The recommendations from ESC guidelines[9] for multidisciplinary management and monitoring of patients with HF are listed in Table 2. Other components of the management plan for HF patients according to ESC guidelines are listed in Box 1.

In conclusion, HF adverse outcomes should be prevented by using a combination of strategies[24] that may lead the vulnerable patient to a stability phase. It is pivotal that patients are monitored by a multi-professional HF service[9] and evidence-based guideline recommendations such as those from the ESC/ HFA should be followed.

Declarations of Interest

The authors declare no conflicts of interest.

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The authors state that they abide by the “Requirements for Ethical Publishing in Biomedical Journals” [25]

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