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Review

In-hospital journey of patients with heart failure



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ABSTRACT

The number of patients diagnosed with heart failure (HF) is gradually increasing as a result of the increase in the elderly population. As the proportion of patients admitted to the emergency room with the diagnosis of acute heart failure increases, the opinion of cardiologists who are interested in heart failure has gained more importance in both the in-hospital management of these patients during the acute period and also in post-hospital management. The current review aimed to help the clinicians determine the course of patients with HF, beginning with the time of admission, according to the current guidelines and expert opinions.

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Acute heart failure (AHF) is a life-threatening clinical syndrome that can develop as a result of worsening symptoms of existing heart failure (HF) or de novo development of these symptoms. Patients with AHF constitute a majority of the hospitalizations in cardiology clinics and intensive care units (ICU). Thus, the strategy for the management of these patients is critically important for both prognosis and for cost-effectiveness.

The rate of hospitalizations due to AHF has gradually increased within recent years and patients aged above 65 constitute more than 80% of these hospitalizations.¹ In large scaled HF registries, female gender accounts for 37–52% of the HF related hospitalizations, and while the female patient group is predominantly elderly, males remain relatively younger.^{2–4} Several studies have demonstrated that 23–44% of the patients, who are admitted to the hospital with the diagnosis of AHF, are

denovo AHF and approximately half of these have HF that are associated with acute coronary syndrome (ACS).^{5,6} It has been demonstrated that the in-hospital mortality of patients admitting with the diagnosis of AHF varies between 4% and 7% in different studies and this ratio has increased to 30–40% in patients admitted with cardiogenic shock (CS).^{4,7} In addition to in-hospital mortality, the duration of hospital stay and the rate of readmission are also considerably high in patients with AHF. The mean duration of hospital stay was nine days in the Euro Heart Failure Survey.⁴ The rates of rehospitalization were 20% within 30 days and 50% within the following six months.⁸ Hence, in the absence of evidence, experienced based medicine is essential in many aspects of HF management.

How to tackle first contact with the AHF patient?

Previous studies have particularly emphasized that the early management of patients with AHF is important, as is the case in other cardiovascular emergencies.^{9,10} Upon first contact with the patient with AHF

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in the hospital or emergency room (ER) before hospitalization, patients should be immediately evaluated and monitored for vitals including blood pressure, respiratory rate (RR), and noninvasive arterial oxygen saturation (with pulse oximeter) (If saturation drops below 95%, oxygen therapy should be weighed and individualized according to the clinical need. Patients with respiratory distress (RD) should be evaluated for noninvasive ventilation.¹¹ It has been demonstrated that transfer of the patient to a center with a cardiology clinic/coronary intensive care unit (CICU) and/or ICU in the shortest possible period has positive effects on the prognosis.¹²

How to determine in-hospital route of patients with HF?

The main goals in the treatment of AHF are to achieve improvement in hemodynamic status and oxygenation initially, and finally, relief of symptoms. In accordance with this purpose, the findings, obtained from the initial evaluation of the patient are quite important in the determination of the initial treatment strategy.¹¹ Therefore, it is recommended to tailor medical therapy by using nitrates and/or diuretics according to the blood pressure and to the degree of congestion.¹³

Firstly, the degree of cardiac and pulmonary stabilization should be assessed in patients with AHF. During this assessment, systolic and diastolic blood pressure, heart rate (HR) and rhythm, body temperature, and symptoms and signs of hypoperfusion, RR, the ability or inability to lie in the supine position, effort dyspnea, the degree of hypoxia, and the presence or absence of respiratory distress (RD) can provide information related to cardiac and pulmonary stabilization. At the end of these evaluations, unstable patients should be hospitalized in CICU or ICU and further evaluations should be continued after the stabilization of the vital signs of the patient.

After evaluating the degree of cardiopulmonary stabilization, the findings related to congestion such as peripheral edema, audible rales, and jugular venous pressure should also be evaluated and additional diagnostic tests should be performed thereafter.

Supporting elements for the determination of the route; diagnostic tests

Electrocardiography is generally abnormal in patients with AHF and it is recommended to evaluate ECG in all patients with HF, as it could provide information related to the etiology of HF and the factors precipitating AHF.¹⁴ Furthermore, it is known that wide QRS in patients with HF is associated with increased in-hospital mortality and increased mortality during the follow-up period.¹⁵

Chest X-rays are among the routine tests in patients who are suspected to have HF. It gives clues for cardiomegaly, pulmonary congestion and for other reasons that could lead to dyspnea. Of note, a normal chest X-ray does not exclude AHF.¹⁶

Laboratory findings: routine tests including hemogram, blood glucose, urea, creatinine, electrolytes, and liver enzymes should be performed in all patients who are admitted to the hospital with the suspicion of AHF. In addition to providing information related to the factors precipitating AHF, these parameters are also helpful in the selection of the most appropriate treatment regime. In particular, creatinine and electrolytes should be closely followed up in AHF patients. It has been shown that renal function worsens in 25% of the patients who are treated for AHF and this worsening might potentially be associated with poor prognosis unless it is transient and mild.¹⁷ The liver function tests are abnormal in 75% of the patients with AHF and this situation is most frequently consistent with the severity and the clinical findings of AHF.¹⁸ As troponin levels can be above normal values in patients with AHF, the diagnosis of ACS could not be excluded by only measuring troponin levels; however, the high levels of troponin are important, as troponin is a marker of poor prognosis in patients with HF.¹⁹ Blood gas analysis, preferably venous, could be performed to evaluate the metabolic or respiratory acidosis in patients with persistent RD who did not benefit

from initial therapy with oxygen or noninvasive ventilation.²⁰ D-Dimer test could be ordered in patients with suspected pulmonary embolism. Furthermore, it is necessary to evaluate thyroid hormones in AHF patients in order not to overlook hypo/hyperthyroidism.

Natriuretic peptides (NP): although atrial natriuretic peptides (ANP), B-type natriuretic peptides (BNP), and C-type natriuretic peptides are members of the natriuretic peptide family, BNP family is the most frequently studied one. BNP is secreted as a response to ventricular wall tension. Another form of BNP that is inactive and could be measured in blood is NT-pro BNP. According to the current guidelines, during the initial evaluation of AHF, BNP < 100 pg/ml, and NT-pro BNP < 300 pg/ml excludes the diagnosis of AHF.²¹ Although, there is no evidence related to the benefit of in-hospital monitorization of NP, it has been demonstrated that 30–50% decrease in NT-pro BNP or an absolute level below 350 pg/ml at the time of discharge is associated with good prognosis.²²

Emergency detailed echocardiography might not be necessary during the initial evaluation except in patients in CS. However, recent data suggest that emergency bed-side focus echocardiography including basic evaluation of heart and lungs might help triaging of these patients. After stabilization of the patient, it is important to perform echocardiography at any time during the hospitalization period, especially in denovo AHF patients.

Site selection during the in-hospital journey: triaging for HF patient

AHF patients who are admitted to the ER, should first be evaluated according to whether they have shock criteria or not. If the patient is diagnosed with CS, cardiopulmonary stabilization should be immediately achieved and then emergency echocardiography should be performed to help determine the etiology of the shock. If there is clinical, electrocardiographic, and echocardiographic findings that support ACS, the patient should immediately be taken to the catheterization laboratory; otherwise the patient should be hospitalized directly in the CICU or ICU (Fig. 1).

CS is a clinical condition characterized with hypoperfusion (oliguria; urine output < 0.5 ml/kg/h for at least 6 h; impaired mental status; livedo reticularis accompanied by cold extremities; blood lactate level > 2 mmol/l; metabolic acidosis; SvO₂ < 65%) and low SBP (< 90 mmHg for longer than 30 min in spite of sufficient fluid replacement).²³ CS might develop as a result of low cardiac output during end-stage of chronic HF, and also it might develop in ST elevation myocardial infarction or in acute valvular pathologies.

Apart from the patients with AHF and CS, patients with severe symptoms and signs such as RR > 25/min, SaO₂ < 90% or those with intubation, SBP < 90 mmHg or hypoperfusion (confusion, oliguria, metabolic acidosis, cold extremities, mixed venous oxygen saturation < 65%) should be hospitalized in the CICU/ICU. Patients with AHF not having any of these findings could be followed up in the ER or in the ward. Approximately 80% of AHF patients who are admitted to ER are hospitalized.²⁴ It is thought that approximately 50% of the patients who are hospitalized after being admitted to the ER could be safely discharged after a short period of follow-up.²⁵ Presence of low risk criteria in AHF patients such as normal oxygen saturation in room air, normal heart rate and rhythm, absence of troponin elevation, absence of orthostatic hypotension, absence of worsening renal and/or liver function, and normal urine output along with a good response to treatment in the form of improved dyspnea could help discharge patients rapidly from the ER.

Main factor that determines the duration of the in-hospital journey of patients with HF: selection of an appropriate treatment strategy

Patients with low SBP and low cardiac output due to systolic dysfunction constitute only 5–10% of the patients who are hospitalized due to AHF. The majority of them are patients with clinical findings due to systemic and/or pulmonary congestion.

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