Nursing Care in Acute Decompensated Heart Failure (ADHF) Based on Levine's Conservation Model: A Case Study

Arief Shofyan Baidhowy[1(✉)], Elly Nurachmah[2], Tuti Herawati[2], Erwin[3], Endang Sulistiowati[3], and Hana Mutiasari[3]

[1] Department of Nursing, Faculty of Nursing and Health Sciences, University of Muhammadiyah Semarang, Semarang, Indonesia
ariefshofyan@unimus.ac.id
[2] Medical Surgical Nursing, Faculty of Nursing, University of Indonesia, Depok, Indonesia
[3] National Cardiovascular Center Harapan Kita, Jakarta, Indonesia

Abstract. Background: Globally, the prevalence of ADHF is rising. Patients who are diagnosed for ADHF have a high risk of cardiovascular death, re-hospitalization, and in-hospital morbidity and mortality. The Levine Conservation Model, which tries to promote patient conservation energy, is one of the nursing approaches.

Aim: The purpose of this case study is to analyze using Levine's conservation theory on Mrs. S, with a diagnosis of ADHF.

Method: The single case design method is applied in the case study approach using Levine's conservation theory. Five days of patient care were delivered at the National Cardiovascular Center Harapan Kita, Jakarta. Researchers conduct care, always in collaboration with the authorized nurse.

Results: The findings of this case study highlight two issues energy-conservation and integrity conservation. Trophic gnosis results from the integrity of structure conservation include the risk of decreased cardiac output, hypervolemia and the risk of ineffective renal perfusion related to renal dysfunction, while the integrity of energy conservation is pain and decreased activity tolerance. Acute cardiac care and hydration control are the main focus of interventions. The evaluation obtained from this case study was that the patient felt comfortable, reduced pain and edema.

Conclusion: Levine's Conservation Model is an effective nursing model in caring patients with ADHF.

Keywords: ADHF · Levine's · Conservation Model body weight depends on gender

1 Introduction

Heart failure is a chronic and progressive clinical syndrome caused by structural or functional abnormalities of the heart indicating reduced cardiac function. Cardiac dysfunction causes increased cardiac filling pressures at rest and during stress [1]. Symptoms

S. Pranata et al. (Eds.): LSISHS 2022, AHSR 60, pp. 397–406, 2023.
https://doi.org/10.2991/978-94-6463-132-6_45

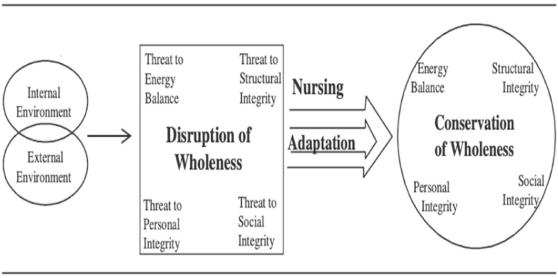

Fig. 1. Conceptual Diagram of Levine's Conservation Model of Nursing

of heart failure include dyspnea (shortness of breath) and fatigue, often accompanied by characteristic physical signs, such as pulmonary rales (abnormal crackling sounds), peripheral edema, or jugular vein distention. There are two types of acute heart failure, acute heart failure for the first time (de novo) and acute decompensated heart failure (ADHF) in chronic heart failure which was previously stable. [1].

Heart failure may result from Coronary Artery Disease (CAD) circumstances such acute myocardial infarction, which enlarges and raises left atrial pressure. [2]. A recent study from the European Society of Cardiology (ESC) states that HF is divided into three categories for recognition of patient status, ranging from patients with normal LVEF (≥50%; HF with preserved ejection fraction (HFpEF)) to those with decreased LVEF (<40%). Preserved (HF with preserved ejection fraction (HFrEF)). Patients with an LVEF in the 40–49% range represent a 'grey area', which we now define as HF with mid-range EF (HFmrEF) [3]. The management of ADHF patients requires a balance between hemodynamic stability, improvement of symptoms and signs, and interventions to reduce morbidity and mortality[4].

Each year, heart failure affects over 3.6 million people in Europe. 20-year-old Americans with heart failure number 5.7 million. According to projections, the prevalence of heart failure in those over the age of 18 would continue to rise, reaching 46% in 2030 [4]. This clinical syndrome is more common in men than in women and is more common in those over 65 years of age. HF is the second most common cause of death in Indonesia after stroke. Based on 2018 Basic Health Research data, the prevalence of HF in Indonesia diagnosed by doctors is 1.5% or around 1,017,290 people [5].

The nurse plays a crucial role in the management of HF patients. Nurses provide specialized care to evaluate hemodynamics, enhance therapy, and promote wellness. [4]. One approach in the application of nursing care is the energy conservation theory developed by Myra Levine. The focus of the conservation model is conservation, adaptation, and integrity (Fig.1).

The principle of energy conservation is implementing nursing care to maintain individual integrity through four main components consist of energy conservation, structural integrity, personal integrity, and social integrity. Levine views nursing care as supporting and encouraging individuals to be able to adapt holistically, each patient's care must be wholeness. Wholeness are able to maintain a balance between energy intake and need and expected to be able to interact continuously with the environment through nursing

interventions so that nursing care is able to recover, restore patients in a healthy, holistic and independent state [7].

This study aims to analyze the application of ADHF patient using Levine's conservation theory at the National Cardiovascular Center Harapan Kita, Jakarta.

2 Methods

A single case design method used a case study which is only done in one case, to patient with ADHF. This design is used to analyze the implementation of Levine's Conservation Model. Five days of patient care were delivered at the National Cardiovascular Center Harapan Kita, Jakarta. These case method uses 5 stages, assessment, data analysis, trophicognosis, implementation and evaluation.

2.1 Assessment based on LEvine's conservation theory:

2.1.1 Internal Environment

Mrs S is 59 years old. The patient entered with complaints of severe shortness of breath, stomach, chest pain until it penetrated to the back of the pain scale 4, Paroxysmal nocturnal dyspnoea (PND) and ascites. The patient was treated with a diagnosis of ADFH EC CAD, CTO, LCX, TR SEVERE, MR Moderate and Renal Insufficiency. The patient has been hospitalized for 5 days.

Complaints of shortness of breath have been felt since the last year. IN. ECG: SR rate 99x, normal axis, old anterolateral infarction, LVH. LAB: In the emergency room, the patient received Lasix 40 mg IV Clopidogrel 1x 75 mg Carvedilol 1x 3.125 mg Ramipril 2x 2.5 mg Simvastatin 1x20 mg Spironolactone 1x50 mg After being admitted to the ER, the patient was then treated in the Intermediate Ward. In the IW room the patient was monitored for hemodynamics and complaints of shortness of breath. The patient was treated with Cedocard 2mg/hour, Furosemide 10 mg/hour. The patient was admitted to the IW for 4 days, the patient complained of shortness of breath and was hypotensive. After from the Intermediate ward the patient was transferred to Medical ward on November 8, 2021. Upon arrival at the room BP: 88/64 mmHg, HR: 80 x/min RR: 18 x/min, Spo2: 98% T: 360C.

2.1.2 External Environment

Patients need nursing assistance in every activity. Families at home do not understand how to care patients with cardiovascular problems.

2.1.3 Energy Conservation

Patients report shortness of breath when lying on their back, and they are more comfortable in the Fowler's position or sitting. Palpitations can come on suddenly. Erring's patient was hospitalized with the same symptoms. The patient complains of weakness, pain to the back of the pain scale 4, sometimes penetrating to the back. Shortness of

breath has reduced a lot, the duration of the complaint has occurred since a year ago. The patient has hospitalized for five days.

The patient complains of decreased appetite, eats in small portions, often eats three times a day. After being sick, the patient said that he had no appetite, he ate 3 times a day and finished 1/2 portion. HB 10.4 mg/dl. Anthropometric examination weight: 51.7 kg, height: 154 cm BMI: 22.47 (ideal). The patient received a heart diet - + 1600 cal and was assisted by the family when giving food. The patient said that since the patient was sick, She drank a little ± 3 glasses a day. Urine 112 cc/hour after lasix extrainjection 200 mg Intravenous.

2.2 Structural Integrity Conservation

The patient looks tired and weak BP: 88/64 mmHg HR: 80 x/min RR: 18 x/min, Spo2: 98% T: 360C, Head to toe examination: Head: within normal limits; Neck: Jugular Vena Pressure 5 + 4 cmH2O, carotid artery pulsation visible; Cardiac: Capillary Refile Time < 2 s, point of maximal pulse seen, palpation at point of maximal at Intercostal Sterna Line VI anterior axilla (there is a lateral shift of apical cardiac impulses in severe mitral regurgitation), and percussion is dull at the heart border, S1 and S2 irregular, pansystolic murmur at the apex; Lungs: dry cough, no phlegm, chest movement is not lagging, decreased lung expansion, normal vocal fremitus, Abdomen: inspection: symmetrical shape, enlarged abdomen, auscultation: peristalsis is heard 10 times/minute; percussion: tympanic sound is heard, palpation: when palpated there is tenderness in the epigastric area, there is shifting dullness, hepatomegaly.

The results of the ECG examination showed sinus rhythm HR 99, Normal axis, left atrial enlargement, old anterolateral infarction.

X-ray examination results showed Cardiomegaly CTR 65% with signs of pulmonary congestion, aortic elongation, prominent pulmonary segment, downward apex, effusion and infiltrates. ECHO DNI results 5 Oct 2021 showed Reduced LV systolic function, LVEF 22%. Akinetic at apicoinferior, apicolateral, mid inferior, mid inferolateral and anterolateral, basal inferior, basal inferolateral and anterolateral, others hypokinetic, LV diastolic dysfunction, grade II, Reduced RV contractility. TAPSE 14 mm Moderate - severe MR (systolic tenting), Mild TR, high probability of PH.

Angiography results “PACR 22/10/2021 showed LM: Stenosis 30% distal, LAD: Diffuse stenosis from mid to distal with maximal stenosis at proximal 80%, myocardial bridging in mild, LCx: Total occlusion in proximal, distal gets flow from, RCA: Dominant, diffuse stenosis from proximal to distal with maximal stenosis 90% proximal, Conclusion: CAD3VD CTO LCX”.

Medical drug Ramipril 2x5 mg po Clopidogrel 1x 75 mg Carvedilol 1x 3.125 mg Simvastatin 1x20 mg Spironolactone 1x50 mg Furosemide 200mg/20cc; 15mg/H Dopamine 2.5 mcg/kgBW/min. Laboratory Results: Hb: 10.7 g/dl; HCT: 30 mg/dl;; Urea: 48; Creatinine: 1.15;; EGFR 48; GDS 167/dl; Na:141 mmol/l;Potassium: 3,3; Chloride 101; total calcium 2.2; magnesium 2.1

2.3 Conservation of Personal Integrity

The patient said why I often hospitalized repeatedly with the same complaint even though I had complied with the daily drinking rules. “Can I recover?”.

2.4 Social Conservation

The patient as a grandmother in a large family. Prior to illness, the patient was active in various activities. Currently, the patient is unable to carry out daily activities because he needs care. The family supports the treatment and care of the patient in the hope of recovering.

3 Result

Trophicognosis
Based on the results of the analysis, several Trophicognosis of structural integrity conservation and energy conservation integrity. Trophicognosis results from the integrity of structure conservation include the risk of decreased cardiac output, hypervolemia and the risk of ineffective renal perfusion related to renal dysfunction, while the integrity of energy conservation is pain and decreased activity tolerance.

Intervention
The interventions in this case were cardiac care, hypovolemia management, peripheral management, pain management and activity management. The selection of these interventions according to the Standar Intervensi Keperawatan Indonesia (SIKI) [8] (Table 1).

Table 1. Hemodynamic and laboratory evaluation

Indicator	Day 1	Day 5	Day 7	Day 9
Heart rate	85	80	72	73
Respiratory rate	18	18	18	16
Systolic	125	88	89	92
Diastolic	70	64	68	69
Pain	5	4	3	2
SpO2	92%	98%	98%	97%
Fluid balance (ml/24 jam)		-1690	-1399	-767
Ureum (mg/dl)	48	48		72
Creatinin (mg/dl)	1.15	1,03		1,15
eGFR	48	58		49

Evaluation
Data found that blood pressure: /70 mmHg, heart rate: 85 x/mnt respiratory rate: 18x/mnt, SpO2: 92% temperature: 36 ^{0}C. Hemodynamic and laboratory evaluation are evaluated gradually to achieve good quality nursing care. The systolic and diastolic show improvement. However, renal function has decreased, this is possible because cardiorenal function has begun to decline.

4 Discussion

4.1 Risk of Decreased Cardiac Output

Decreased cardiac output may cause inadequate blood flow and compromise important processes. Three factors that influence the occurrence of cardiac output, preload, contractility, and afterload. In this case the effect is on preload, afterload and contractility [9].

Preload problem in this case, decreased ejection fraction 22% and urine output: 2690 ml, Fluid balance: -1690 positive fluid balance 1070 ml/12h. The way to increase preload is by loading 500 cc of fluid. Giving the water challenge test is expected to increase the patient's preload [10].

Afterload issue in this case is related to the SVR. The blood pressure in this patient is 99/58 mmHg. This is due to the vasodilation of blood vessels that causes hypotension.

Contractility refers to changes in the strength of contractions that occur at the cellular level and are associated with changes in cardiac fiber length and calcium levels. Usually caused by coronary artery disease. In addition, 65% CTR of this condition results in a decrease in blood supply to all organs of the body which results in hemodynamic instability of the patient. The intervention to increase contractility is the administration of the inotropic Dopamine 2.5 mcg/kg BW/min. Dopamine administration resulted in a HR increase of more than 25% and a decrease in SVR significant [19].

Mrs. S had ADHF with HFrEF, so that the heart's function to perform contractility was reduced which resulted in hypoperfusion throughout the body [10]. The patient had improved since the previous diagnosis, which led to the choosing of this one. The patient complained of pain, weakness, and shortness of breath, but his condition had improved by the end of the care.

Impaired conservation of this structure results in impaired oxygen supply to the myocardium which eventually leads to cellular hypoxia. The existence of this condition will change the integrity of the cell membrane. When the elasticity changes automatically the function in contraction will decrease. The condition of decreased contractility in the heart muscle, especially in the ventricles, will have an impact on the inhibition of ventricular emptying. This condition will increase end diastolic volume and decrease cardiac output. The heart's workload will be heavy, potentially leading to heart pump failure [11].

Interventions based on Levine's theory in the conservation of structural integrity refer to maintaining cardiovascular, respiratory and urinary functions to restore body structure to prevent physical damage and promote healing. This intervention aim to increase the contractility of Mrs. S, monitoring the administration of renal dose of Dopamine 2.5 mcg/kg BW/min and Furosemide 200mg/20cc. In addition, to increase afterload,

Ramipril 2x5 mg was given as an ACE inhibitor and Carvedilol 1x 3.125 mg was given to a non-selective beta blocker / beta blocker which works by relaxing blood vessel muscles. Lasix has diuretic properties to reduce the burden of heart function. While administration of Dopamine will affect Beta-1 adrenergic receptors which are associated with positive inotropic and chronotropic effects [12].

4.2 Hypervolemia

Hypervolemia is usually defined as an abnormal increase in plasma volume, we can also consider hypervolemia as an expansion of extracellular volume, including intravascular and extravascular space volume [13]. The problem of excess fluid volume in this case is caused by sodium and water retention (Na + H2O) from the activation process of Renin Angiotensin Aldosterone due to decreased kidney function [14]. The renin–angiotensin–aldosterone system (RAAS) plays a key role in the regulation of blood volume, blood pressure, and cardiovascular function. [15]. The intervention carried out was optimizing the administration of the diuretic furosemide at an initial dose of 5 mg/hour to a dose of 40 mg/hour and a renal dose of dopamine 2.5 mcg/kg BW/min with a target balance of -500 cc/24 h to -4000cc/24 h.

Heart failure can lead to edema caused by cardiac decompensation, the occlusion is comprehensive. This is caused by the failure of the heart ventricles to pump blood properly so that blood collects in the venous or capillary area, and the tissue will release fluid into the intestines. This is evidenced by an increase in the value of the Tricuspid annular plane systolic excursion (TAPSE). TAPSE is specifically performed to assess right heart function, and if normal, it will be more than 2 cm, or 20 mm. The tapse value in this patient is 14 mm, which means that there is a right heart failure so that increases backward throughout the body in addition to the increase of Jugular Vena Pressure value of 5 + 4 cmH2O [16].

The clinical condition of the patient was found to have a strong pulse, systolic blood pressure 100–105, diastolic blood pressure 49-59mmHg with inotropic support, mean atrial pressure $\geq$ 65 mmHg, no dizziness, no restlessness, fluid balance -500 to -1000cc/24 h on palpation, there is tenderness in the epigastric area, reduced shifting dullness, reduced soft or coarse wet rale.

4.3 Risk of Ineffective Renal Perfusion

The systolic and diastolic cardiac dysfunction that results in decreased renal blood flow (RBF) and increased renal venous congestion is the pathophysiology view of renal impairment during acute decompensation of HF. Acute renal impairment results from these hemodynamic mechanisms, which cause a decrease in renal perfusion and an increase in neurohormonal activity [17]. In this case, the patient had hyperuremia with a urea value of 72 with a creatinine value of 1.03 and eGFR = 58 (Mildly to moderately decreased).

The implementation is management of kidney care by maintaining intake and output accurately, monitoring fluid balance and monitoring vital signs. The laboratory shows Urea: 72; Creatinine: 1.115; EGFR 49, which indicate better treatment decease renal

function. Numerous factors can affect kidney health and impact the emergence of concurrent renal impairment. In essence, decreased cardiac output causes decreased organ perfusion, primarily as a result of heart failure with a reduced ejection fraction (HFrEF). The main hemodynamic characteristic is high filling pressures, and decreased systolic filling will result in insufficient stroke volume reserved, ultimately leading to a reduction in cardiac output. It has been demonstrated that a decrease in cardiac output in those with chronic HF causes a decrease in renal blood flow [17].

5 Energy Conservation Disorder

5.1 Pain

Personal integrity conservation data shows that patients routinely take heart and cholesterol drugs (statins), but patients still have heart attacks. The pain that occurred in Mrs. S was caused by an old anterolateral infarct. The angiography results showed CAD3VD CTO LCX which showed the presence of Chronic Total Occlusion in the Left Circum Flex.

Interventions that are carried out to encourage structural interventions and patient energy are pain management by conducting a comprehensive pain assessment, monitoring vital signs, encouraging patients to feel calm [18]. The evaluation obtained by the patient said that the pain was reduced on the 2 VAS scale.

5.2 Activity Intolerance

Activity intolerance is a diagnosis that focuses more on the body's response to being unable to move too much because the body is unable to produce enough energy. It can simply be explained that, to move, we need a certain amount of energy. The existence of red blood cell deficit, which reduces the flow of oxygen and nutrients to the cells and results in anemia with a Hb value of 10.4 g% [19]. Red blood cells are in charge of transporting oxygen and nutrients. Additionally, health complications have an impact because the heart is responsible for pumping blood throughout the body, If the heart isn't functioning properly, less oxygen and nutrients are carried by the blood, which has an impact on how much energy is produced.

The body's need to meet energy activities depends on the supply of blood and nutrients from the heart, when CO is reduced, the body will also experience activity intolerance [20]. The interventions carried out were monitoring the patient's cardiorespiratory status during activities, doing passive ROM, helping patients in daily activities, fluid and nutritional therapy and collaborating with physiotherapists.

6 Conclusion

Nursing care for ADHF patients with Myra Levine's energy conservation theory approach obtained energy conservation Tropichognosis: pain, activity intolerance; and structural integrity: risk of decreased cardiac output, hypervolemia, and risk of ineffective renal perfusion. Based on the hypothesis of nursing care in ADHF patients with the

energy conservation theory approach of Levine, it was found that patients were able to tolerate reduced activity and pain, effective heart pumps, and balanced fluid volume. Peripheral management, pain management and activity management. The results of the evaluation of nursing care in ADHF patients with myra Levine energy conservation theory approach, it was found that patients were able to conserve the problems of decreased cardiac output, fluid balance, pain and activity tolerance. Renal perfusion monitoring needs to be increased for the patient.

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