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Case Report

Investigation of Betty Newman's Systemic Model in a Patient With Heart Failure

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ABSTRACT

Background and Aim: Nurses should provide their care and interventions in a practical framework. Performance-based theories make nursing interventions based on principles and rules. Therefore, the present study was conducted to implement Betty Newman's systemic model in a patient with heart failure.

Materials and Methods: A case study was conducted in November 2020 in one of the hospitals of the Tehran University of Medical Sciences, Tehran, Iran. A patient with heart failure was examined and Newman's model was applied to him. Nursing care was performed based on Newman's nursing process.

Results: A patient with heart failure was evaluated according to Newman's model. Intrapersonal stressors (in the physiological dimension, including weakness and lethargy and the inability of the person, fatigue, bowel movements disorder, and shortness of breath), interpersonal stressors (away from family and children), and extrapersonal stressors (wife's aggression and psychological pressure) were found. Based on the investigations, 10 nursing diagnoses and nursing care are presented based on three levels of prevention that are vital according to Newman. The results were used in the classification of nursing interventions and the classification and results of nursing, respectively.

Conclusion: According to the results of the present study, the implementation of nursing care based on the Newman model can be effective in reducing the physiological and psychological needs of patients with heart failure. Nurses can play a more effective role in improving the problems of these patients by applying nursing care based on Newman's systemic model.

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1. Introduction

Heart failure is one of the most common cardiovascular disorders, which is considered a chronic, progressive and debilitating disorder [1]. This disease is associated with physical limitations, low quality of life and its dimensions, frequent hospitalization, and unfavorable social conditions of patients. Although with the emergence of new treatments, this situation may have changed [2].

The prevalence and incidence of this disease increase with age. In America, approximately 1% of people over the age of 50 years and about 10% of the elderly over the age of 80 years have heart failure [3]. According to the statistics of developed countries, nearly 25% of patients with heart failure are hospitalized within 30 days after discharge [2]. It is estimated that 12 years after the diagnosis, only 15% of affected patients are still alive [4].

In recent years, various drugs have been produced to control the complications of this disease and reduce mortality and improve the quality of life of these patients. Despite the successful reduction of mortality following drug treatments, the range of therapeutic changes is still small. Because even patients under drug therapy based on standard guidelines are often limited due to disease symptoms and dependent on drug treatment conditions, and as a result, their functional capacity and quality of life can be significantly reduced [4]. It seems necessary to deal with this big and growing problem in human societies, and more reliable and suitable solutions should be found in addition to drug therapy. One of these methods is care based on nursing theories and models.

The clinical use of nursing models and theories contributes to the development of nursing knowledge. Using the nursing model is a crucial step to achieve the practical goals of clinical and educational research. The use of nursing models and theories in the process of client care can provide a framework for thinking [5]. The selection of nursing models and theories depends on the situation. Betty Newman's systems model is a theory that can guide nurses' practice in three levels of prevention [6].

Newman's system model is based on general system theory and reflects the nature of living organisms as open systems interacting with each other and with the environment. In Newman's model, the client may be an individual, a family, a group, a community, or a social institution. The critical assumption of Newman's theory is that the client is unique [5].

A human being is a person who is characterized by five physiological, psychological, cultural, social, spiritual, and developmental variables. Psychological variable refers to mental processes in interaction with the environment. Sociocultural variable refers to the effects of social and cultural conditions. The spiritual variable refers to spiritual beliefs and influences. The growth variable refers to age-related processes and activities.

The outermost human layer in Newman's model is the flexible defense line. The range of this layer is variable and responds to certain stresses. The client's next line of defense is the "natural" line of defense, and reflects the individual's state of health and adaptation and is stable. Resistance lines represent the internal factors determining the organism's response to a stressor. Stressors (intrapersonal, interpersonal, and extrapersonal) affect the client's system and potentially change it [7].

Intrapersonal factors include interactions within the client, such as conditioned responses. Interpersonal factors arise from the interaction between two or more people, such as role expectations. Extrapersonal factors include all interactions occurring outside of the client, such as financial conditions.

Newman defines the environment as all the internal and external forces surrounding the client that affect the client at any point in time. He identifies three related environments, internal, external, and created [5]. The effects of the internal environment exist at the boundaries of the client's system. External environmental influences exist outside the client. The created environment is unconsciously developed and used by the client to support coping with protection.

Optimal health exists when the total needs of the system are met and disease exists at the opposite end of the health continuum [5]. Newman believes that humanity is defined by 5 physiological, psychological, cultural, social, spiritual, and growth variables. According to Newman, these 5 variables are considered in nursing. He looks at nursing as a unique profession and believes that nursing should pay attention to all the variables affecting the individual's response to stress. The main goal of nursing is the stability of the client's system. This issue is achieved through the nurse's intervention to reduce stressors. Newman's nursing process includes three basic parts, nursing diagnosis, nursing goals, and nursing outcomes. Newman emphasizes the importance of identifying the client and caregiver's perceptions and cooperation between the client and the caregiver in all stages of

the nursing process. He specifies three levels of primary, secondary, and tertiary intervention [8].

Conceptual models of nursing in the process of caring for clients can be a framework for connecting the nurse's critical thinking and examining the client's condition, better analyzing the condition, organizing thinking to make the best decision for the client, problem-solving, increasing attendance at the bedside and increasing patient participation in treatment. Nursing conceptual models provide unique knowledge that can be used to guide case studies and increase the application of educational content in nursing practice [9]. One of the approaches that provide an opportunity for nurses to implement nursing models is case studies because in case studies, nurses provide a care plan based on the needs of the patient and his family using creative thinking and problem-solving. Nursing care based on Betty Newman's systemic model has been investigated in chronic diseases, such as multiple sclerosis [6], anesthesia [10], laryngeal cancer [11], and intensive care unit [12]. However, it has rarely been used in patients with heart failure. While these patients need a comprehensive nursing care plan due to their chronic and debilitating nature. Therefore, the researchers decided to conduct a study to investigate Betty Newman's systemic model in patients with heart failure. Perhaps a step can be taken to improve the conditions of these patients and the health of society.

2. Materials and Methods

A descriptive case study was conducted in November 2020 in one of the hospitals of the Tehran University of Medical Sciences. A patient with heart failure who was diagnosed with this disease based on diagnostic tests and with the approval of a cardiologist, but had no psychiatric diseases or cancer, was examined and Newman's model was implemented on him. To conduct the study, the researcher 1st came to the patient's bedside. The purpose of the study and how to do it were fully explained to the patient. A written consent form was obtained from the patient. Nursing care based on Newman's nursing process, an interview was conducted to guide research and determine stressful factors. Due to the restrictions caused by COVID-19, only 2 face-to-face meetings were held with the patient. In the 1st session, the patient was interviewed for 15 minutes and his history was obtained. Clinical examination and review of case documents were done in 20 minutes. Then the nursing diagnoses were determined. In the 2nd session, by observing the health protocols, necessary training was provided to the patient in oral and written form for 15 minutes. After that, for two months, the patient was contacted once a week and the results of the interventions were checked and the training was repeated if needed. Also, the patient was allowed to contact the relevant nurse in case of need.

3. Results

The patient was a 65-year-old man, married with three children, retired with an associate degree, and living in Tehran. His economic status was average and covered by medical insurance. The time of data collection was November 14, 2020, and the source of information was the patient's person, family, and medical documents. On November 12, 2020, at 6 PM, he had symptoms of shortness of breath and cold sweat, and it worsened with time. He had hemoptysis 40 minutes later. The patient had no symptoms of a cold during the past few days. During the last 3 years, he has been suffering from heart failure with an ejection fraction of 20%. When the symptoms appeared, the patient immediately called emergency 115. In emergency 115, the patient was placed in a sitting position with hanging legs, and oxygen therapy, peripheral vein placement, and cardiac monitoring were performed. In the hospital, when the patient entered the emergency department, he was admitted to triage in one of the hospitals of Tehran University of Medical Sciences with a definite diagnosis of pulmonary edema. His oxygen saturation (O2SAT) was 88%. He was restless and used the secondary respiratory muscles. His blood pressure was 95/70, heart rate/min was 115 to 120, tachypnea (respiratory rate (RR)=25-30/min) and temperature was 36.1°C. In troponin tests, WBC 7000 was 0.1 (>0.4 positive), neutrophils were 70% and lymphocytes were 12%. Serum glutamic-oxaloacetic transaminase (SGOT)=50, serum glutamic pyruvic transaminase (SGPT)=45, urea=45, creatinin (Cr)=1.3 and c-reactive protein (CRP)=13. The 1st electrocardiogram (ECG) taken was sinus tachycardia. The 2nd ECG taken on the 4th day was normal. Medical treatment was started in the acute phase (oxygen therapy with a reserve bag mask, nitroglycerin infusion, Lasix, and morphine sulfate). He had a history of smoking for more than 30 years. He had no family history of other underlying and respiratory diseases, allergies, surgery, and drug use. His family history of heart disease was positive. The patient evaluation was performed to classify stressor types according to Newman's model. Intrapersonal stressors were investigated in physiological, developmental, psychological, cultural, social, and spiritual fields.

Physiologic

Neurological: The function of this system is normal. The patient has no symptoms of nervous system dys-

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function. His inability to walk and get help from others is due to weakness and lethargy.

Gastrointestinal system: The mouth has no lesions. The mucous membranes of the mouth are dry and have no periodontitis. The dysfunctions of this system include loss of appetite, early satiety, weight loss in recent months and disturbance in bowel movements in the form of constipation and occasional nausea and vomiting, and abdominal enlargement due to hepatomegaly.

Respiratory: The airway is open and the trachea is in the midline. The patient has tachypnea, uses secondary respiratory muscles, and has rhonchus on auscultation of the lungs. Bilateral multilobular infiltration is evident in the chest X-ray.

Cardiovascular: it is tachycardia and hypotension.

Genitourinary system: The volume of urine is high after taking diuretic drugs. It is no gynecological problem.

Skin: The skin is dry and fragile.

Musculoskeletal: He has weakness in his arms and legs.

Hearing: He has no hearing problems.

Vision: The conjunctiva is slightly pale. The sclera is not icteric. The external structure of the eye is normal.

A person's weakness and lethargy, fatigue, intestinal movement disorder, and shortness of breath are interpersonal factors that cause stress and affect the natural defense line, the flexible defense line, and the resistance line. Following the occurrence of physiological symptoms, the person needs nursing interventions.

Mental status: He does not express any special feelings about the disease, but he is depressed and anxious and seems tired and bored. Aggression and mental pressure by the patient's wife are extrapersonal factors that cause stress and affect the line of resistance. Due to the stress and separation from his family, he is constantly agitated and anxious. He needed intense psychological support from his family.

Sociocultural: The patient participates in local group activities and walks with his friends and believes that he will be mentally calm.

Growth: He has not had any problems in meeting the growth needs proportionate to a middle-aged adult.

Spiritual: He considers himself a religious person. He believes in God and prays. He attends religious ceremonies.

Interpersonal stressors include being away from family due to long distance and impersonal stressors which cause stress and anxiety and affect the natural line of defense and the line of resistance. Therefore, the person needs to communicate with his family and control stressors. Nursing findings were used to classify nursing interventions and classify nursing results, respectively. After evaluating and collecting data, 10 nursing diagnoses and nursing care were presented based on the three levels of prevention that are vital according to Newman. The diagnoses were as follow:

1. Intolerance of activity related to weakness, fatigue, and irritability

2. Stress and anxiety associated with being away from children and family, illness, and aggressiveness of the spouse

3. Receiving food less than the body needs for anorexia and nausea

4. Risk of trauma and falling to weakness and lethargy

5. Disturbance in bowel habits along with illness, weakness, and disability

6. Change in a sexual pattern related to fatigue and depression

7. Irregularity in the sleep pattern due to shortness of breath

8. Impairment of skin integrity concerning drugs and their side effects

9. Avoiding loneliness along with being away from children and family

10. Disturbance in gas exchange related to shortness of breath

Table 1 presents the nursing process according to Newman's theory for the patient with heart failure.

4. Discussion

In addition to the physical consequences, heart failure affects the spiritual, social, and psychological health of the patient, and as a result, it overshadows

Table 1. Nursing process according to Newman's theory for patients with heart failure

Type of Patient's Need	Nursing Diagnosis	Target	Level of Prevention	Flexible Defense Line	Intervention	Consequence
Psychological	Disruption in the concept of "self" associated with the disease, decreased strength, and muscle weakness	1. Encouraging the patient to talk about beliefs and parameters such as the concept of "self", power and self-efficacy 2. Helping the patient to find motivations to continue his life and activities despite the limitations of strength and energy.	Secondary and tertiary	The natural line of defense and resistance line	Allowing the patient to express feelings, mood, and behavior Encouraging him to talk to other patients with similar problems Spending more time with family Encouraging him to do physical activity at the level of tolerance The above measures were carried out in 4 weeks.	The patient communicates with nurses, spouse, and family, and expresses feelings about his condition and concerns. He stated that the hope for a bright future for his children is a motivation for the rest of his life.
Physiologic	Intolerance of activity associated with weakness, fatigue, and irritability	Helping the patient to tolerate activities without the presence of others	Secondary	The natural line of defense	Avoiding exposure to high-temperature environments Using a hot water shower, eating heavy food, lots of activities, hunger, and stress which aggravate fatigue Exercise, such as swimming and simple movements, as tolerated Reducing ambient noise Avoiding too much work, resting between periods of work, and enough sleep Observing energy-saving techniques, such as sitting while showering, and brushing teeth, taking cold showers, sucking ice, using ice packs or wet towels, when feeling hot The above measures were carried out from the 1st week.	The patient does the exercises carefully and rests between the activities.
Psychological	Stress and anxiety along with being away from children and family, illness, and aggressiveness of spouse.	Helping the patient to reduce and control anxiety and stress.	Secondary	Resistance line	Learning techniques to calm down and get away from negative thoughts (from the 3rd week, they participated in virtual classes for 8 weeks) Personal contact and phone calls with children and family (done from the 1st week) Encouraging the patient to participate in sports classes as much as the patient can tolerate (starting walking at home during the 2nd and 3rd week with rest between activities and continuing outside the home)	When the patient became aware of the effect of stress on the progression of his disease, he decided to reduce the amount of stress. His family was also advised to put aside family tensions.
Physiologic	Eating less than the body needs concerning anorexia and nausea	Improving the patient's appetite and quality of nutrition	Secondary	The natural line of defense	Avoiding irritants and fragrances Resting before each meal to minimize fatigue. Eating in a quiet and clean environment and dedicating enough time to it Eating small frequent meals Avoiding fatty foods such as butter, sauces, and nuts Avoiding liquids during meals to prevent premature satiety Avoiding eating foods containing caffeine such as tea, coffee, and spicy foods Food recommendations were implemented from the 1st week by the patient and his family.	The patient mentioned some types of food that he should avoid, such as fatty, salty, and spicy foods, and decided to avoid conditions that reduce his appetite. As a result, the nutritional status improved.

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Type of Patient's Need	Nursing Diagnosis	Target	Level of Prevention	Flexible Defense Line	Intervention	Consequence
Physiologic	Risk of trauma and falling related to weakness and lethargy	Avoiding trauma, and injury and controlling the patient's balance during weakness and lethargy	Primary	Flexible defense line	Availability of needed supplies and prevention of disorder and chaos Use appropriate shoes and slippers The ambient light is sufficient Keeping calm and avoiding rush during work Avoiding sudden changes in a position to prevent falls while sitting during severe weakness Use of a walker and cane The recommendations were implemented from the 1st week.	By following the nurse's recommendations, the patient was not harmed during the two months of follow-up.
Physiologic	Disturbance in bowel habits with illness, weakness, and disability	Improving the patient's excretion pattern	Secondary	The natural line of defense	Allocating regular hours for defecation, preferably one hour after meals Encourage eating high-fiber foods such as bran, bread, fruits, and fresh herbs Increasing fluid intake throughout the day Activity at the level of patient tolerance The recommendations were implemented from the 1st week.	The patient mentions several foods containing fiber that help improve bowel movements. He uses black aloe and dried figs to prevent constipation.
Psychological	Change in sexual patterns associated with fatigue and depression	Helping the patient to have correct and satisfactory sex at the individual's level of tolerance	Secondary and tertiary	The natural line of defense and line of resistance	family counseling Encouraging the patient to consider the sexual needs of his partner Rest between activities to reduce stress and boredom Talking to the spouse about emotional support for the patient The recommendations were applied from the 1st week, but sexual activity started a month later.	In the 2nd month, the patient had sexual activity once without any problems and flirted once without any problems.
Physiologic	Irregularity in sleep patterns due to shortness of breath	Improving the quality of sleep and rest	Secondary	The natural line of defense	Reduce fluids in the evening to prevent waking up during sleep Avoiding caffeinated beverages and diuretics 3 hours before bedtime Creating a calm environment, reducing ambient light, maintaining appropriate room temperatures, and using appropriate covering The above measures were carried out from the 1st week.	The patient's sleep has improved and he wakes up only once at night at 3-4 in the morning to urinate.

Type of Patient's Need	Nursing Diagnosis	Target	Level of Prevention	Flexible Defense Line	Intervention	Consequence
Physiologic	Impairment of skin integrity concerning drugs and its complications	Maintain skin integrity	Secondary and tertiary	The natural line of defense and line of resistance	Avoid exposure to strong sunlight Encouraging the use of protective clothing such as hats, gloves, and appropriate sunscreen It is recommended to use gloves when working with detergents It is recommended to brush gently and not to use rough combs Avoid using chemical hair dyes Cold showers to prevent itching The above measures were carried out from the 1st week.	Two weeks after receiving the training, the patient's skin is soft and the body is fragile.
Psychological	Avoiding loneliness along with being away from children and family	Increasing patient support and getting away from the feeling of loneliness	Secondary	The natural line of defense	Encouraging phone calls with children during absences and hospitalizations Encouraging patients to continue participating in religious, sports, and art classes Encouraging the patient to interact and communicate with neighbors to get away from loneliness The above measures were carried out from the 1st week.	The patient makes a video call with his children. From the 1st week, he participates in virtual religious classes, and from the fourth week, he walks with his peers. Due to the restrictions caused by COVID-19, he makes video and phone calls with his friends and relatives
Physiologic	Gas exchange disorder related to shortness of breath	Improve oxygen exchange and shortness of breath	Secondary	Resistance line	Teaching how to take prescribed medications on time Establishing a balance between activity and rest Do not go uphill Using more pillows while sleeping Training in bud lip breathing and incentive spirometry if necessary The above actions were carried out from the 1st day.	After a week, the patient's shortness of breath improved and he uses a pillow while sleeping.

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the patient's perception of health. With the emergence of new treatments, the life expectancy of patients has also increased. Increasing the life expectancy of patients with heart failure has profound effects on the individual and social life of the individual and his family. The chronic, progressive and irreversible nature of heart failure is one of the crucial reasons for the decline in the quality of life of these patients [13].

The patient examined in this case study is 65 years old and has a family history of heart disease. Currently, the patient suffers from shortness of breath, weakness and lethargy, insomnia, and stress caused by the consequences of the disease, in addition to suffering from a chronic disease with a progressive nature. In implementing the nursing process, the nurse should consider the chronic nature of the disease and its consequences. The patient needs continuous preparation to deal with the disease and its consequences in different physiological and psychological dimensions.

Newman's systemic model is based on a person's relationship with stress and his reaction to it. What separates Betty Newman's system model from other nursing models is the type of perspective on the client's system, examination, recognition, and diagnosis of nursing, planning and setting goals, focusing on actions at different levels of prevention during the implementation of the care plan. In this model, after identifying and prioritizing the needs, the treatment team starts to intervene in nursing to control and balance the anxiety-causing factors. In this model, the interventionist should reduce the person's exposure to stress as much as possible or, in some cases, reduce the relevant reactions by strengthening flexible defense lines [5]. In the present study, an attempt was made to carry out nursing interventions for the patient's problems considering the levels of prevention. In this way, it helps the nurse to design a detailed plan to solve the patient's problems. Although some interventions, such as the interventions performed in the psychological dimension (such as stress and anxiety) were effective in the long term, the upward trend and recovery in this stage helped in the effectiveness of the interventions in other dimensions in a shorter time. It is also carefully observed in the interventions performed. Care is provided in the family environment, which is essential in accelerating the recovery process of patients.

Newman's theory is widely used in America, but in Iran, it has been used only in special cases, such as multiple sclerosis [6], anesthesia [10], laryngeal cancer [11], and intensive care unit [12], and mostly in secondary and tertiary levels. However, at the primary level, which plays a vital role in promoting health and reducing treatment costs, the Betty Newman model has rarely been used [14]. In the current study, the nursing model based on Newman's theory was useful in the treatment process of patients with chronic heart failure because using this model, not only the physiological and psychological needs of the patient were identified and met in three levels of prevention, but also he achieved the necessary skills to deal with the consequences of the disease. It seems that the use and application of this model in some cases require the passage of time and in some cases, it is responsive in the short term, but what is clear is the continuity of care and nursing services. Therefore, Betty Newman's systemic model can be used both in research to develop nursing and in the daily work of nursing.

Since this is a case study, its results may not be completely generalizable, and the way it is implemented in each patient should be revised according to his conditions. Therefore, to investigate the consequences of implementing the nursing process based on Newman's systemic model; it is suggested to conduct further studies on a larger number of samples and follow up for a longer period.

5. Conclusion

The results of the study showed that using the nursing process based on Newman's systemic model is one of the practical models for stressful conditions in treatment units, leading to improving the quality of care for patients and increasing the ability of families to reduce stress. Carrying out nursing care based on Newman's theory of three levels of prevention improves the quality of nursing performance in patients with heart failure. Using nursing models in client care, it can be hoped that care standards will be improved, and the quality of care and client satisfaction will increase. Therefore, it is suggested that Newman's nursing process be used in clinical environments and other diseases.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

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