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Case Report

Nursing process based on Betty Neuman's systemic model: A case study

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Abstract

This study aims to apply Betty Neuman's systemic model in the execution of the nursing process for a patient undergoing Whipple surgery. In this case study, a patient was assessed utilizing Neuman's model, wherein intrapersonal stressors encompassing physiological, psychological, socio-cultural, and spiritual dimensions, alongside interpersonal and extra personal stress factors, were systematically observed. Subsequent to the examination, three nursing diagnoses are delineated, adhering to the categorization stipulated by the International Association of Nursing Diagnosis of North America. Nursing care strategies are formulated based on three levels of prevention (primary, secondary, tertiary), as deemed significant within the framework of Neuman's perspective. The outcomes derived from this assessment informed the classification of nursing interventions and contributed to the categorization and evaluation of nursing outcomes. Consequently, it is advisable to consider the application of Neuman's model, along with other pertinent models, in the context of nursing care for the optimal well-being of patients/clients.

Keywords: Betty Neuman's Systemic Model, Nursing Theory, Nursing, Patient, Case Study.

1 | Introduction

Hospitalization and illness often lead to heightened levels of anxiety and stress among individuals, as evidenced by various stressors such as the fear of illness, unfamiliar environments, separation from the community and family, occupational concerns, and the financial burden associated with the illness [1-3]. These stressors significantly impact an individual's mental state, potentially leading to chronic anxiety and increased vulnerability [4]. Anxiety, characterized by an unpleasant sense of worry or pressure, has been identified as a hindrance to the treatment process, impeding the patient's resilience [5, 6].

The inhibitory and detrimental nature of anxiety contributes to various consequences and complications associated with illness and hospitalization, including heightened heart excitability, increased blood pressure, delayed healing processes, and an elevated risk of infection [7, 8]. During such challenging circumstances, individuals often seek assistance from healthcare professionals, who play a crucial role in providing necessary support [9].

The experience of illness and hospitalization induces role loss and changes, disrupting an individual's sense of control and coordination over their own well-being [10, 11]. Successful adaptation to the condition of the disease is pivotal for effective treatment and a timely recovery [12]. Contemporary healthcare services aspire to deliver quality care, with nursing care models grounded in different theories utilized by nurses to enhance health, expedite treatment processes, and foster patient recovery [13, 14].

Betty Neuman's systemic model emerges as one such theoretical framework employed by nurses to assess, integrate information about individuals, and holistically enhance health status [15, 16]. The model's fundamental structures provide nurses with a framework to consider each client's uniqueness, assess the cli-

ent's environment, and subsequently plan meaningful care interventions [16]. Central to Neuman's model is the examination of stressful factors affecting individuals and the corresponding nursing interventions aimed at facilitating patient recovery [17]. The open system perspective inherent in Betty Neuman's model positions it as a suitable framework for implementing patient care programs [18].

Against this backdrop, this study aims to apply Betty Neuman's systemic model in the execution of the nursing process for a patient undergoing Whipple surgery, recognizing the model's potential to guide and enhance patient care interventions in a holistic manner.

1.1 | Betty Neuman's systemic model

Betty Neuman's systemic model intricately incorporates the fundamental concepts of holism, client health, stress, the client's response to stressors, and the notion of client adaptation through defense lines [19]. Within Neuman's model, the client is conceptualized as an open system, wherein iterative cycles of input, process, output, and feedback establish a dynamic organizational pattern [20]. A client, in this context, may refer to an individual, group, family, or community engaged in reciprocal exchanges with the environment [21]. The optimal environment is achieved when the client attains the desired stability [22]. Each concentric circle in Neuman's model comprises five personal variables: physiological, psychological, socio-cultural, spiritual, and evolutionary [23].

Neuman's systemic model features a core structure and associated energy sources essential for the client's survival [18, 19]. The individual is viewed as an open, dynamic system continually undergoing change. Stability, or homeostasis, is achieved when the available energy surpasses the energy expended by the system [21]. Protective circles encompass the core structure, comprising resistance lines, the natural defense line, and the flexible resistance line [22]. The outermost circle is identified as the natural line of defense, signifying system stability under normal circumstances. Beyond this lies the flexible defense line [12]. If the flexible defense line proves insufficient in protecting against the natural defense line, resistance lines are activated [13]. These resistance lines, encircling the core structure, are triggered when a stressful factor breaches the natural defense line [14]. In cases where the resistance lines are ineffective, the system faces energy depletion, potentially leading to adverse outcomes, including death [23].

Neuman's model addresses the impact of stressful factors on health and delineates strategies for stress relief and reduction [15]. Stress factors encompass any environmental force whether internal (emotions and feelings), interpersonal (role expectations), or external (job or financial pressures)—that has the potential to disrupt system stability [16]. The model posits that individuals are in constant, dynamic interaction with the environment, which comprises internal and external forces, including stressful factors, intrapersonal, interpersonal, and extra personal forces, all capable of influencing system stability [24].

Intervention in Neuman's model is categorized into three levels: primary, secondary, and tertiary prevention [25]. Primary prevention precedes the system's response to a stressor and involves health promotion and maintenance [26]. Secondary prevention focuses on preventing damage to the central core after the system reacts to a stressor, strengthening internal lines of resistance [27]. Tertiary prevention comes into play after treating the system through secondary prevention, aiming to add energy to the system or reduce the required energy for facilitative regeneration [28].

Additionally, Neuman's model incorporates the concepts of reaction and reconstruction [15]. The degree of reaction signifies the level of system instability resulting from the onslaught of stressors countered by the body's natural defense line [23]. Restoration refers to the return and maintenance of system stability post a stressful reaction [28]. Neuman posits that client health equates to the optimal stability of the system, representing the pinnacle of health [29]. She introduces a health continuum, wherein an excess of required energy over available energy propels the client's system towards disease and death, while an abundance of available energy over necessity propels it towards health [30, 31]. Nursing, according to Neuman, is a distinctive profession that comprehensively addresses all variables influencing an individual's response to a stressor [32]. A person is viewed holistically, and it is the nurse's responsibility to approach the individual in their entirety [33]. Neuman defines nursing as actions geared towards assisting clients in maintaining the highest possible level of health [4, 19]. She underscores the significance of evaluating not only the client's perceptions but also those of the caregiver (nurse) as the nurse's perception significantly impacts the care provided [34].

2 | Case presentation

This research constituted a clinical case study that explored the implementation of the nursing process utilizing the Betty Neuman nursing model in the provision of care for a patient admitted to the surgery department of a hospital located in Northern Iran. The focus of the study was on a patient who underwent Whipple

surgery. Following the project's approval by the research council and the acquisition of ethical clearance under the reference number IR.GOUMS.REC.1402.422 from the Biomedical Ethics Committee of Golestan University of Medical Sciences, the researcher proceeded to the research setting and purposefully selected an available patient. Adhering to the ethical principles outlined in the Declaration of Helsinki, and subsequent coordination with the patient, the nursing process for patient care was systematically designed based on the Betty Neuman model, encompassing nursing diagnoses, nursing goals, and nursing outcomes (Table 1). The initial phase involved conducting an interview with the patient and their family to acquaint them with the process, assess their condition, and identify potential stressors. The preliminary assessment entailed scrutinizing the interaction among the five patient variables, stressors, and resources within the intrapersonal, interpersonal, and extra personal domains. Following comprehensive data collection and evaluation, three nursing diagnoses were ascertained according to the classification outlined by the North American Nursing Diagnosis Association International (NANDAI). Subsequently, nursing care interventions were implemented based on the three levels of prevention deemed significant within the framework of Neuman's model.

The research findings encompass the assessment and compilation of information, as detailed in Table 2. The application of the nursing process within the Betty Neuman model, prioritized according to identified needs, is delineated in Table 3. This includes the presentation of three nursing diagnoses formulated as a result of the evaluation and collection of pertinent patient data.

Table 1. Stages of the nursing process based on Neuman's systemic model.

Nursing diagnosis	1. Database and evaluation ✓ Identifying, classifying and evaluating the interactions between the five client variables ✓ Identifying stressors and resources in intrapersonal, interpersonal and extra personal domains ✓ Identifying and distinguishing the perceptions of the client and caregiver ✓ Trying to resolve cognitive differences 2. Actual or potential changes in health ✓ These are what most other theorists call "nursing diagnoses".
Nursing goals	1. Expected outcomes, specific desired behavioral responses to deal with actual or potential health variances (jointly decided by client and caregiver) 2. Planned interventions, specific actions by the client, caregiver, or others to influence expected outcomes
Nursing outcomes	1. Real interventions 2. Evaluation and reformulation of the goal ✓ Analyzing specific client responses

3 | Discussion

The nurse's role in the control model is characterized by the management of five primary variables within the foundational structure of the client's system, encompassing flexible, natural, and resistant defense lines. Stress is categorized into three types based on its environmental origin: internal, external, and created. The intrapersonal dimension involves interactions within an individual, while interpersonal factors pertain to interactions between two or more individuals. Extra personal factors encompass all interactions occurring in the extra personal environment. Nursing care, within the framework of the Betty Neuman model, is delineated as preventive interventions across primary, secondary, and tertiary levels, addressing the impact of stress on each line of defense. The first dimension of interventions seeks to prevent the adverse effects of stress on the client's system. The second dimension involves secondary interventions following the system's response to stressors and the inadequacy of the natural defense line. Interventions in the third dimension aim to forestall the progression of signs and symptoms, mitigate the severity of the disorder, and prevent damage to the lines of resistance. According to the Betty Neuman model, prevention occurs at the third level post-nursing and treatment. Level two interventions focus on reinforcing lines of resistance, preventing the manifestation of signs and symptoms, and improving the prognosis of the disease to restore and enhance health conditions within the client's system. In this model, the nurse plays a crucial role in supporting the client by fortifying defense lines and implementing appropriate nursing actions to facilitate the restoration of health conditions.

4 | Conclusions

The utilization of Neuman's system model in nursing practice facilitated the identification of diverse facets of interpersonal, intrapersonal, and extra personal stressors experienced by Mr. A-M. This proved beneficial in delivering comprehensive care. The application of this theoretical framework elucidated the manner in which primary, secondary, and tertiary prevention interventions can be employed to address issues within the client population.

Table 2. Evaluation and collection of information.

Data source **Identification of patient and caregiver perceptions** **Perceptual difference resolution approach**	**Identify stressors and sources**	**Identification, classification and evaluation of interactions between five variables, interpersonal and extra personal factors**
		Physiological variables
Data source: Interview with the patient and his wife, Examination of medical records **Identification of patient and caregiver perceptions:** Interview with the patient and regular communication with the patient and caregiver **Perceptual difference resolution approach:** Re-interviewing the patient, improving the patient's level of awareness	**Stress:** The patient has difficulty in starting the flow of urine. No complaints of painful urination or difficulty urinating.	Urinary-genital system
	Eustress: Respiratory rate is normal, there is no abnormal sound on auscultation. The breathing rate is 16 breaths per minute.	Breathing system
	Eustress: Heart rate is 76 per minute. In auscultation, no abnormality was detected. There is edema on the left ankle, which is non-pitting in nature.	Cardiovascular system
	Eustress: Normal functioning of the nervous system	Nervous system
	Stress: The patient complains of loss of appetite, nausea, vomiting, etc. Food consumption is much less. Oral examination is normal. Bowel sounds are reduced. The abdomen could not be palpated due to the surgical incision. Bowel habits are not regular after hospitalization	Digestive system
	Eustress: Has done vaccinations in certain periods and also done hepatitis vaccination about 8 years ago.	Safety system
	Stress: He needs the support of others to get out of bed. He also needs support to walk. He performs his personal care activities with the support of others	Self-care activities
	Stress: Decreased due to pain and other problems.	Sleep
	Eustress: It is normal, the appearance of the eye is normal in examination. Pupil reaction to light	Vision
Similar to physiological variables	**Stress:** He is worried about his situation.	***Psychological variable***
Data source: Interviews with the client, the patient's wife and family. **Identification of patient and caregiver perceptions:** The client's statements and obtaining information from the caregiver and retransmitting the client's perceptions to check the agreement. **Perceptual difference resolution approach:** Re-interviewing the patient in cases of disagreement in the diagnosis and creating a client-centered agreement	**Eustress:** He is active in social activities in his hometown and is also active in religious activities. He has a good and sincere relationship with his neighbors. He has good and close friends in his place and actively interacts with them. There is a good social support system from the family as well as from the neighborhood	Socio-cultural variable
Similar to the socio-cultural variable	**Eustress:** The patient confidently says that he was a very good teacher for students and a good colleague for friends. He said that he can manage official and domestic activities well, he was very active after retirement and will resume his activities after his return.	Evolutionary variable
Similar to the socio-cultural variable	**Eustress:** The patient is Muslim. He believes in going to the mosque and is also an active member in religious activities. Whenever he was worried or anxious, he prayed or read the Quran. He has a good social support system that helps him keep his mind active.	Spiritual variable
Data source: Similar to socio-cultural variables, in addition to evaluating the client's living environment and the medical facilities and equipment of the hospital department. **Identification of patient and caregiver perceptions:** Similar to socio-cultural variables. **Perceptual difference resolution approach:** Creating an agreement with the client, spouse and family to increase awareness about environmental factors and available resources.	**Eustress:** Has supportive family and friends. Has good social interaction with others. There is a good social support system. After retirement, he is active in agricultural work and at home. Active in religious activities. He has good interpersonal relationships with his wife and children. Good social compatibility is available	Interpersonal factors
	Eustress: All health and treatment facilities are present in his place. All communication facilities, means of travel and transportation, etc. are present in their place. His house is in a village that is not far from the city and facilities are available in the place. They are financially stable and can cover the costs of treatment.	Extrinsic factors

Table 3. The nursing process of Betty Neuman's model based on the priority of nursing diagnoses.

Nursing diagnosis	Acute pain related to the presence of a surgical wound on the abdomen secondary to periampullary carcinoma
Nursing plans	The patient is relieved of pain, which is evident by the decrease in pain scale score and verbal expression.
Nursing outcomes	***Primary prevention:*** 1) Assess the intensity of pain using a pain scale; 2) Inspect the surgical site for any signs of infection or complications; 3) Support the surgical incision to prevent pressure; 4) Avoid unnecessary handling as this will affect the healing process; 5) Apply a surgical dressing to the incision site to prevent any infection; 6) Non-pharmacological measures to relieve pain such as distraction activities of patient; 7) Administer painkillers as prescribed by pain clinics to relieve pain.
	Secondary prevention: 1) Encourage the patient to divert his mind from the pain and participate in enjoyable activities such as being with others; 2) Do not allow the patient to do heavy activities and explain to the patient why those activities are contraindicated; 3) Involve the patient in making decisions about their care and provide positive psychological support; 4) Provide primary preventive care as needed.
	Tertiary prevention: 1) Educate the client about the importance of cleanliness and encourage him to observe personal hygiene; 2) Involve family members in the patient's care; 3) Encourage relatives to be with the client to promote mental health for the patient. be provided; 4) Teach family members about pain control measures; 5) Provide primary and secondary preventive measures to the client if necessary.
	Assessment: The patient verbally said that the pain has decreased and the pain scale score is zero. His facial expression also shows that he is relieved from the pain.
Nursing diagnosis	Activity intolerance related to fatigue secondary to pain at the surgical site and dietary restrictions.
Nursing plans	The client will perform appropriate levels of activity without excessive fatigue, as evidenced by normal vital signs and verbal understanding of the benefits of gradually increasing activity and exercise.
Nursing outcomes	***Primary prevention:*** 1) Give the client enough oxygen; 2) Teach the client to avoid activities that cause severe fatigue; 3) Prepare the necessary equipment near the patient's bed; 4) Assist the patient in initial walking; 4) Monitor the patient's reaction to activities in order to reduce discomfort; 5) Provide a nutritious diet to the client; 6) Avoid causing mental discomfort to the client. Tell family members to be with him; 7) Schedule rest periods as it helps reduce fatigue.
	Secondary prevention: 1) Instruct the client to avoid activities that cause severe fatigue; 2) Advising the client to do exercises to strengthen the limbs and improve activities; 3) Tell the client to avoid activities such as straining at stool etc.; 4) Teach the client the importance of early walking and help the patient in the first step; 5) Teach the client appropriate movement exercises to improve blood circulation.
	Tertiary prevention: 1) Encourage the client to do movement exercises; 2) Tell family members to provide nutritious diet at regular intervals; 3) Educate the patient and family about the importance of mental health in recovery; 4) Provide primary and secondary care if necessary.
	Assessment: The client verbally stated that his activity level has improved. He can do some of his activities with help. Fatigue is gone and the client seems much more active and interactive.
Nursing diagnosis	Impaired physical mobility related to the presence of dressings, pain at the site of surgical incision.
Nursing plans	The client will have better physical mobility as evidenced by walking with minimal support and performing limited activities.
Nursing outcomes	***Primary prevention:*** 1) Performing active and passive exercises for all organs to improve muscle tone and strength; 2) Have the client do breathing exercises that strengthen the respiratory muscles; 3) Massage the upper and lower limbs, which helps improve blood circulation; 4) Keep magazines close to the client and encourage activities in the range that make them feel good.
	Secondary prevention: 1) Provide positive reinforcement to increase the frequency of the desired activity, even for a small improvement; 2) Teach appropriate movement exercises for the patient to improve blood circulation and prevent contractions; 3) Encourage the client to do so if possible; 4) Encourage the client to participate in their care activities; 5) Provide basic preventive measures if necessary.
	Tertiary prevention: 1) Teaching clients and families about patient care and recovery; 2) Support the client and family in achieving goals; 3) Coordinate care activities with family members and other disciplines such as physical therapy; 4) Teach the importance of mental well-being that indirectly affects physical well-being; 4) Provide basic preventive measures if necessary.
	Assessment: The client verbally stated that his physical mobility had improved. He can function with minimal support.

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Authors' contributions

Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work: MK, KY; Drafting the work or revising it critically for important intellectual content: MK, KY; Final approval of the version to be published: MK, KY; Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: MK, KY.

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Competing interests

We do not have potential conflicts of interest with respect to the research, authorship, and publication of this article.

Availability of data and materials

The datasets used during the current study are available from the corresponding author on request.

Using artificial intelligent chatbots

None.

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