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Roy's Adaptation Model in Patient with Pneumonia

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Background and Objective: Pneumonia is an inflammatory respiratory disease that can affect the patient's adaptive patterns. Nurses play a key role in facilitating the adaptation process of the patient. Therefore, this study aimed to explore the use of Roy's Adaptation Model in the care of a patient with pneumonia.

Materials and Methods: This case report study was conducted in May 2025 at a hospital in Lahore, focusing on a patient with pneumonia. Nursing care based on the Roy's Adaptation Model was implemented in six stages according to the nursing process.

Results: The results showed a significant reduction in the patient's maladaptive behaviors across four modes: physiological, self-concept, role function, and interdependence and independence.

Conclusion: Nursing care based on the Roy's Adaptation Model effectively reduced maladaptive behaviors in patients with pneumonia. Therefore, the implementation of organized nursing care based on appropriate nursing models is essential to improve patient health.

Introduction

Pneumonia is an inflammation of the lung parenchyma caused by infection and is considered the most important lower respiratory tract infection (1). Studies show that over 100 different microorganisms are involved in the development of infectious pneumonias, which are mostly viral and bacterial (2). Community-acquired pneumonia is one of the most common infections and the second leading cause of death worldwide (3). Symptoms of pneumonia often include fever, cough, shortness of breath, sputum, and chest pain (4). According to population-based research, the annual incidence rate of pneumonia in adult's ranges from 2.6 to 13.4 per 1,000 individuals. Community-acquired pneumonia varies between 0.1 to 0.7 per 1,000 individuals annually, depending on nationality, population, and hospitalization (3). Nurses play a significant role in supporting patients with both acute and chronic diseases. A combination of behavioral, attitudinal, and healthcare factors contributes to disease management, which may cause disturbances in the psychological and social adaptation of patients. These disruptions in adaptation lead to issues such as sleep disturbances, restlessness, irritability, anger, fatigue, stress, lack of focus, emotional dysregulation, and social withdrawal (5). The use of nursing models for achieving health through facilitating adaptation in various dimensions of the patient's existence is possible (6).

Roy's Adaptation Model, as a nursing model, focuses on evaluating stimuli, identifying maladaptive behaviors, and transforming them into adaptive behaviors, which can play a crucial role in promoting health. Applying this model helps the nurse focus, organize, and direct thoughts and actions effectively and appropriately toward the desired goals (7). According to this model, the nurse systematically and precisely assesses the patient through interviews, observations, and measurements. Then, maladaptive behaviors, which are the problems of patients, are identified in four dimensions, along with the stimuli for the behaviors. Detailed educational and care programs are then designed to address the patient's issues and maladaptive behaviors (8).

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According to Roy, adaptation occurs in four dimensions: physiological, self-concept, role function, and interdependence. The physiological dimension is primarily responsible for maintaining physiological balance regarding basic needs such as activity and rest, nutrition, elimination, oxygenation, and protection. The self-concept dimension refers to physical self, personal self, and interpersonal self. The role function dimension relates to the behaviors expected of an individual by society, divided into primary, secondary, and tertiary roles. The interdependence dimension refers to the ability to give and receive love, respect, and value (9).

In this model, three primary, contextual, and residual stimuli influence adaptation. Primary stimuli are those that have the greatest impact on adaptation. Contextual stimuli are those identified during the patient's health assessment through environmental screening. Residual stimuli are the beliefs and convictions of individuals that interact with primary and contextual stimuli (10) (Figure 1). The results of various studies have pointed to the effectiveness of Roy's Adaptation Model (11, 12). Case studies are beneficial for implementing nursing models as they encourage critical thinking and problem-solving by the nurse, leading to care plans that are based on the patient's needs. A literature search did not yield any reports on the application of Roy's model in pneumonia patients. Therefore, this study was conducted to apply Roy's Adaptation Model in the care of a patient with pneumonia.

Overall Objective: Explanation of the zinc adaptation model in patients with pneumonia.

Specific Objectives

- Investigation of serum zinc levels in patients with pneumonia;
- Investigation of the relationship between zinc levels and the severity of respiratory symptoms;
- Analysis of physiological and biochemical patterns of the body's adaptation to changes in zinc levels Identification of individual, nutritional, and inflammatory factors affecting the adaptation model.

Research Questions

Is there a significant relationship between zinc levels in the body and the severity of pneumonia symptoms?

What mechanisms are activated in the body's adaptation to zinc deficiency or excess?

How can this adaptation model be strengthened to accelerate the recovery process of patients?

Research variables Independent variable

Serum zinc level Dependent variable: Severity of pneumonia symptoms, length of hospitalization, rate of recovery Control variables: Age, sex, nutritional status, underlying diseases Definition of key concepts Pneumonia: Acute inflammation of the lungs, mainly caused by bacterial, viral, or fungal infection.

Zinc: A rare mineral that acts as a cofactor in more than 300 enzymes in the body and is effective in strengthening the immune system. Adaptation **Model:** A bio behavioral model that explains the processes of regulation and response of the body to environmental or internal changes, such as mineral deficiencies.

Rezaei (2019): Studying zinc levels in children with pneumonia in Tehran showed a significant relationship between decreased zinc levels and length of hospitalization.

Naderi et al. (2014): Zinc supplementation in hospitalized patients reduced fever duration and the need for antibiotics.

Shankar & Prasad (1998): The vital role of zinc in innate and acquired immunity and its relationship with respiratory infections Walker et al. (2009): In a double-blind study, zinc supplementation in children resulted in a 25% reduction in the incidence of pneumonia

Wessells et al. (2012): Modeling zinc distribution in the body under infection conditions showed that zinc stores are directed towards damaged tissues

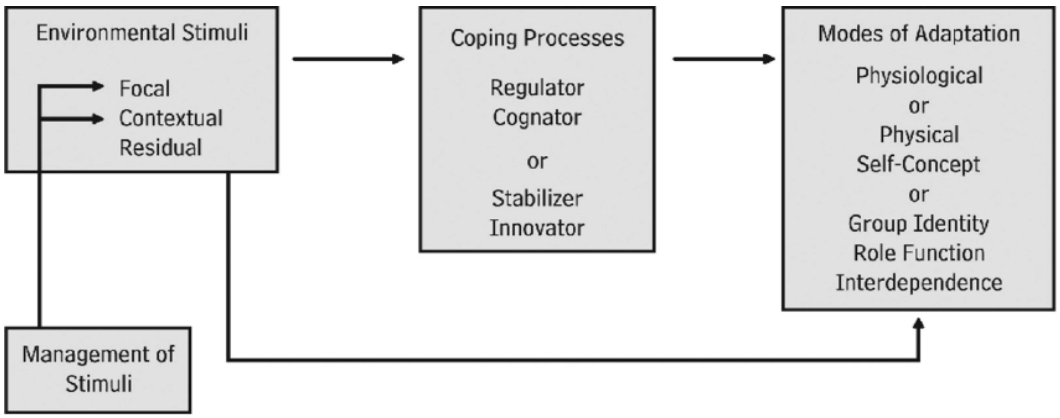

Figure 1. Roy's Adaptation Model

Methods

This case study was conducted in May 2025 at a hospital in Lahore, Pakistan, involving a patient diagnosed with pneumonia. The patient was informed about the purpose and method of the research, and written informed consent was obtained. A patient with pneumonia, whose diagnosis was confirmed through diagnostic tests and by an infectious disease specialist, was included in the study. The patient did not have any other acute or chronic physical or psychological diseases. The source of information was the patient and their medical record. Roy's Adaptation Model was applied to the patient. The researcher examined the patient daily and provided care and nursing processes based on Roy's model in six stages (assessment of behavior, evaluation of stimuli, goal setting, implementation, and evaluation). Interviews and observations were used to collect data. The patient was assured that all information would remain confidential, and the name of the individual studied was not disclosed, adhering to principles of honesty and trustworthiness. Ethical principles were followed in accordance with the guidelines of the Helsinki Declaration.

Biochemical Adaptation Models

Adaptation Models examine the body's response to internal or environmental changes.

These models include three main stages:

Warning stage: The body becomes aware of the change (e.g., zinc deficiency)

Resistance stage: Compensatory mechanisms are activated (increased intestinal absorption, decreased excretion)

Erosion or complete adaptation stage: If the stress continues, the body either reaches a new equilibrium or becomes dysfunctional 2-6.

Zinc adaptation model in inflammatory conditions: In conditions of inflammation or infection such as pneumonia, the body experiences changes in zinc levels:

Decreased plasma zinc levels due to redistribution to the liver.

Increased zinc requirement in immune cells Induction of expression of metalloproteinase and ZIP/ZnT transporters for intracellular regulation.

Biological adaptations of the body include: Activation of oxidative stress-resistant genes Increased synthesis of zinc-storing proteins such as metallothionein.

Changes in expression of zinc uptake and excretion transporters 2-7. Consequences of zinc deficiency or excess.

Consequences situation Zinc deficiency

Impaired immune response, increased severity of inflammation, reduced tissue repair

Excessive inhibition of absorption of other minerals (e.g. copper), cytotoxicity, impaired immune function 2-8.

Statistical population: All patients over 18 years of age with pneumonia who have been hospitalized in teaching hospitals

Inclusion criteria: Definitive diagnosis of pneumonia by a specialist physician (based on clinical symptoms and imaging)

Informed consent of the patient or family to participate in the study No zinc supplementation in the last 3 months.

Exclusion criteria:

- Presence of advanced chronic diseases (such as kidney failure, cancer, HIV)
- Pregnancy
- Drug or alcohol abuse

Sample size: According to the expected correlation coefficient ($r \approx 0.3$) and with a confidence level of 95% and a test power of 80%, the desired sample size is estimated to be about 90 patients. To reduce possible error, 100 patients are considered.

Sampling method: Available Sampling is performed among hospitalized patients during a specific time period.

Data collection tools:

a) **Demographic and clinical questionnaire:** Information such as: Age, sex, weight, height History of underlying diseases , Initial symptoms and their duration, Medication use Nutritional status

b) **Pneumonia severity checklist:** The CURB-65 scoring system is used to determine the severity of the disease.

c) **Measurement of serum zinc levels:** 5 ml of blood is taken from fasting patients on the first day of hospitalization.

Samples are analyzed by atomic absorption spectrometry.

Normal serum zinc level: 70–120 μg/dL

Results

The patient is a 44-year-old married man with two children. He holds a bachelor's degree, works as an employee, lives in Lahore, and is covered by health insurance. His socioeconomic status is average. The study was conducted in May 2025.

The patient's symptoms included fever, shortness of breath, cough, sputum production, and chest pain. He reported a history of recent travel a few days prior to the onset of illness. He was hospitalized and started on antibiotic therapy. Lab tests showed WBC = 19,000, ESR = 23, and CRP = 2+Chest X-ray and CT scan confirmed pneumonia. He had no history of underlying or familial diseases.

Nursing care for the patient was provided based on Roy's Adaptation Model in its four modes. Initially, the physiological mode was assessed, covering

activity, sleep and rest, nutrition, elimination, hemodynamic status, senses, fluid and electrolytes, neurological and endocrine conditions, as well as three types of stimuli: focal, contextual, and residual. Below are the detailed findings:

Physiological Mode

Activity

Observation: The patient showed mild weakness and fatigue. No deformities were observed in muscles or nails. Joints had a normal range of motion. There were no wounds, swelling, tenderness, or stiffness in joints or bones.

Interview: "I'm very tired. It feels like I've walked several kilometers. I have no energy. I used to exercise, but now my chest feels like it's being pierced."

Sleep and Rest

Observation: The patient sleeps 4–5 hours at night and takes a short nap (30 minutes to 1 hour) during the day. Continuous sleep is disrupted by shortness of breath and coughing.

Interview: "At home, I have no trouble falling asleep and I don't use sedatives. But in the hospital, due to medical care at night, I keep waking up and it takes a long time to fall back asleep. There are a lot of disturbing sounds."

Nutrition

Observation: No weight loss or loss of appetite. He eats his meals. In the morning, he eats bread and cheese and drinks soup as a snack. He consumes a small amount of fruit. His weight is 78 kg. He has no difficulty swallowing or chewing. No mouth sores. No nausea, vomiting, or history of gastrointestinal ulcers. Abdomen is soft.

Interview: "I don't really feel like eating, but I force myself to eat so I don't get weak. I think it's because I sometimes feel nauseated."

Elimination

Observation: Has regular daily bowel movements (soft stools after breakfast). Doesn't use medication for bowel relief. No discharge, lesions, or wounds in the genital area. No burning, frequency, hematuria, flank pain, or urgency in urination. No abdominal bloating or hemorrhoids. Urine and stool analysis and cultures were normal.

Interview: "I don't have any elimination problems. I don't let myself get constipated."

Hemodynamic Status

Observation: Breathing independently, with chest pain and a respiratory rate of 24 per minute. Shortness of breath, cough, and sputum are present. The patient is in a semi-sitting position with the head of the bed elevated. Receives 5 L/min of oxygen via nasal cannula. Lung auscultation reveals rales, and percussion reveals dullness. Experiences dyspnea while lying down. No palpitations. Blood pressure: 125/90 mmHg. No coldness, numbness, color changes, edema, or intermittent claudication in **extremities. Pulse:** 120 bpm. Temperature: 38.5°C. Arterial oxygen saturation: 85%. Heart rhythm is regular and sinus.

Interview: "When I struggle to breathe, I feel a strange pain in my chest. The coughing is really bothering me."

Senses

Observation: The patient feels weak and says his muscles lack strength. No deformities in muscles. No ear pain, discharge, or tinnitus. Doesn't use hearing aids and has no hearing loss. No eye pain, double vision, or night blindness. He is farsighted and uses glasses for reading. Taste, smell, and touch are normal.

Interview: "My muscles ache and my chest feels heavy."

Fluids and Electrolytes

Observation: Patient's skin turgor is reduced due to dehydration. Electrolyte levels are within normal range. Arterial and venous blood gas measurements were normal.

Interview: "I force myself to drink water to avoid problems."

Neurological Mechanism

Observation: No numbness, tingling, or abnormal movements. Sensitivity to hot and cold is intact. No headaches or dizziness. No loss of consciousness. Maintains balance.

Interview: The patient is fully alert and oriented in interview responses. (GCS = 15)

Endocrine System

Observation: No signs of gland enlargement.

Interview: "I've never had any gland issues since childhood. Everything has always been normal."

Stimuli

Focal Stimulus (main): Shortness of breath. Patient says: "Since I developed shortness of breath, I can't do things like before. It bothers me to have to rely on others."

Contextual Stimulus: Sleep disturbance due to environmental factors. Patient says: "There's too much noise and movement. The lights stay on at night. I can't sleep well."

Residual Stimulus: Fear of not recovering or regaining full health. Patient says: "I keep thinking this illness will stay with me and I won't fully recover, but I try to stay hopeful that it's nothing serious (Table 1)."

Table 1. Fear of not recovering or regaining full health. Patient says: "I keep thinking this illness will stay with me and I won't fully recover, but I try to stay hopeful that it's nothing serious."

Nursing Diagnosis	Nursing Goals	Nursing Interventions	Nursing Evaluation
Dyspnea related to illness	The patient will achieve an effective breathing pattern.	Use of oxygen mask at 6–8 liters per minute, elevating the head of the bed, teaching deep breathing exercises.	O2SAT = 93%, relief of dyspnea.
Insomnia related to environmental factors	The patient will be able to sleep 6 to 8 effective hours within a 24-hour period.	Minimizing environmental noise, scheduling nursing care to avoid interfering with the patient's rest, teaching relaxation techniques.	Improved sleep quality.
Activity intolerance related to weakness and fatigue	The patient will be able to perform daily activities without experiencing sweating, dizziness, or significant changes in vital signs.	Continuous monitoring of vital signs, encouraging activity with increased rest periods, immediately stopping activities causing dizziness or severe fatigue, assisting the patient with self-care, making personal items easily accessible, limiting the number and duration of visits.	Ability to independently perform daily tasks and self-care.

Self-Perception Mode:

This mode includes physical self (body image), personal self (ideal, moral, and spiritual self), and interpersonal self (how the person perceives themselves in relation to others).

The patient's body image is generally positive, but due to illness, he appears disheveled and unkempt (physical self). He is a Muslim and prays in the hospital. He is hopeful that, with God's help, he will recover (personal self). The patient feels sad, worried, and misses his children. Due to shortness of breath, he fears imminent death and can no longer perform his usual tasks (interpersonal self).

Nursing Diagnosis: Stress related to family matters

Nursing Goals: Reduce patient's stress, loneliness, and anxiety

Nursing Interventions: Encourage patient to express emotions, promote positive thinking and hope, distract from distressing thoughts

Nursing Evaluation: Decreased anxiety and patient achieving a state of relative calm

Role Function Mode:

The patient's primary role is that of a 44-year-old man, his secondary role is as a husband and father, and his tertiary role is as a patient. He mentioned having small children and that his wife now must take care of both the children and himself at home. He is unable to fulfill his responsibilities, leaving the burden on his family members.

Nursing Diagnosis: Ineffective secondary role related to inability to care for self and fulfill responsibilities

Nursing Goals: Help the patient effectively resume his secondary role in self-care and daily tasks

Nursing Interventions: Provide information about the disease, prognosis, treatment, and care plan; educate on the illness course and recovery; facilitate meetings with similar patients upon discharge

Nursing Evaluation: Patient resumes self-care responsibilities. During a home visit, he said: "Now I can do things like before, go to work, shop, and play with my kids."

Interdependence Mode

The patient lives independently with his family. His wife manages the household. He maintains good relationships with his family, wife, and children, and mutual respect is a core family value. He stated: "I have good relationships with my family and others, but right now, due to weakness and fatigue, I don't feel like talking to people. I also worry I might pass the illness to them."

Nursing Diagnosis: Ineffective interaction with others related to fear of disease transmission

Nursing Goals: Improve communication and interaction with family and acquaintances

Nursing Interventions: Encourage patient to make phone or video calls with family and friends; reassure him that risk of transmission decreases a few days after starting medication; increase weekly visits

Nursing Evaluation: Increased patient satisfaction, reduced withdrawal and irritability

Discussion

This study was a case study conducted using the Roy Adaptation Model-based nursing process on a patient with pneumonia. The patient had no prior history of illness. According to Callista Roy's perspective, human health is achieved when one continuously adapts to stimuli through effective coping mechanisms. When these mechanisms are ineffective, illness occurs. In this study, applying the Roy Adaptation Model had a positive impact on all aspects and modes of the patient.

No studies were found that specifically investigated the use of the Roy Adaptation Model in patients with pneumonia. However, a similar case study showed that applying this model improved the patient's physiological problems (13). Another study reported that the implementation of Roy's model improved body image in women with breast cancer (14). The case study by Borzou et al. on a burn patient demonstrated the model's positive effect on role function (15). These findings align with the present study. However, in the study by Sadeghnejad on diabetic patients, the model was not effective in the role function dimension (16), possibly due to the chronic nature of diabetes or the presence of comorbidities.

The study by Mansouri and colleagues confirmed that applying the Roy Model improved the interdependence dimension in heart failure patients (12), supporting the current findings as well.

In this study, the patient received education in physical, psychological, and social dimensions. Since the Roy Adaptation Model focuses on the human as the center and aims for harmony with the environment, nurses can use it in their daily care routines. One limitation of the study is the reduced generalizability of its results, as it was conducted on a single patient and needs to be applied more broadly.

Conclusion

The results showed that care based on the Roy Adaptation Model can reduce maladaptive behaviors and enhance adaptation in patients with pneumonia. Using nursing care grounded in scientific frameworks highlights the necessity of model-based care. Given the effectiveness of Roy's model, it is recommended that nursing models be considered in clinical care, and further research should be conducted to evaluate its impact on health promotion in other diseases.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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