SciMedCentral

Annals of Nursing and Practice

Case Report

Application of Betty Neuman Systems Model in Nursing Care of Patients with COVID -19

Poonam Joshi*, Vanita Kumari, and Ajesh Kumar TK

Department of Nursing Services, AIIMS, India

***Corresponding author**
Poonam Joshi, Associate Professor, College of Nursing, AIIMS, New Delhi, India. Tel: 91-9818039744; Fax: 91-11-2658-8663, 2658-8641; Email: pjoshi495@gmail.com

Submitted: 02 August 2020

Accepted: 12 September 2020

Published: 14 September 2020

ISSN: 2379-9501

Keywords
• Betty Neuman Systems Model; COVID -19

Abstract

Introduction: Nursing education is a recognized distinct discipline comprising of conceptual frameworks, models and theories. The integration of nursing theories into clinical practice is helpful in providing quality patient care.

Objective: to assess the applicability of the Betty Neuman Systems Model in the nursing care of a patient with moderate to severe COVID- 19.

Methodology: A clinical case was studied to assess the applicability of the Betty Neuman Systems Model in nursing care of a patient with moderate to severe COVID- 19 admitted in a COVID unit of a selected tertiary level care facility.

Results: We evaluated a patient with COVID-19 having moderate to severe illness according to Betty Neuman Systems model. We assessed the patient for all kinds of intrapersonal, interpersonal, and extra-personal stressors. After taking a detailed history and performing physical examination, 14 nursing diagnoses were framed based on North American Nursing Diagnosis Associations' Taxonomy (NANDA, 2020). On the basis of obtained data, nursing care was planned on three levels of prevention. The data from the patient was further used in classifying nursing interventions and describing the outcomes.

Conclusion: The case study suggests that Betty Neuman Systems model can be used as a framework by nurses in providing quality nursing care to COVID-19 patients.

ABBREVIATIONS

SARS- CoV-2: Severe Acute Respiratory Syndrome Corona Virus 2; ARDS: Acute Respiratory Distress Syndrome; ICU: Intensive Care Unit; HCW: Health Care Workers

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a highly infectious pandemic disease, that has affected a large number of people world over. The disease is caused by novel corona virus, also known as severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) [1]. It was first time identified in Wuhan, Hubei, China in December 2019. Common symptoms of the disease include fever, cough, fatigue, and shortness of breath. A few patients may complain of loss of smell and taste as well during the illness [2,3]. The average time of onset of symptoms from exposure is typically found to be around 5 days, but may range from 2 to 14 days [3,6]. Majority of COVID -19 present with mild to moderate type of illness. Around 5-6% of patients become critically ill, who may progress to acute respiratory distress syndrome (ARDS) (ARDS), septic shock, multi-organ failure, and hyper-coagulable disorders, etc [4,5]. A critically ill patient with COIVD-19 require nursing care in an intensive care unit (ICU).

The virus primarily spreads from one person to another as a result of close contact or small droplets produced during talking, coughing or sneezing. The droplets may remain suspended for a period of half an hour to one hour in the environment. People may also get this infection less commonly, by touching contaminated surfaces [7]. The gold standard test for diagnosing COVID-19 is reverse transcription polymerase chain reaction (RT-PCR) test from a naso-pharyngeal swab [8]. However, rapid antigen detection test for isolating an antigen is also done, which is not a confirmatory test. Chest X ray and CT scan may be helpful in diagnosing a patient, whenever there is a high suspicion of infection based on clinical presentation.

A large number of patients require symptomatic treatment and only few patients, less than 5% require ICU care. Other recommended general measures to prevent transmission of infection include maintaining physical distance from other patients, frequent hand hygiene, maintaining respiratory hygiene and home quarantine for at least 14 days after the recovery [9]. Unfortunately, till now there is no vaccine or specific antiviral treatment available for COVID-19 [7]. All the drugs used for the management of COVID-19 are experimental drugs.

Nursing care in the management of COVID-19 is very crucial as these patients have no direct interaction with their families during hospitalization. Aim of the nursing care of the COVID-19 patient during his hospitalization is to promote recovery and improve the quality of life during quarantine period. Nurses are acting as front line warriors in management of COVID -19 patients. As per the protocol, nurses are expected to be donned in appropriate PPE including N-95 mask, gown/ coverall, goggles/ face shield, double gloves and shoe covers. This is required for the safety of the health care workers (HCW). All standard safety

precautions were observed by the nurses in our unit, while taking care of COVID -19 patients as per the institute protocol.

Many nursing theories have made a significant contribution in expanding the body of nursing knowledge in nursing practice; which makes the modern nursing more significant and consequential to promote nursing as an ordered profession. Nursing theories describe and relate different aspects of practice and give as a framework for systemizing the nursing practice [12]. According to Neuman Systems model, nursing is a unique profession that brings stability in the client system. According to Betty Neuman, nursing is an *"action which assist individuals, families and groups to maintain a maximum level of wellness, and the primary aim of nursing is to provide stability to the patient/client system, through nursing interventions in order to reduce stressors"* [12]. This model emphasises on three level of prevention (Primary, Secondary, and Tertiary). The prevention focuses on keeping stressors and the stress responses of the patient from having a detrimental effect on his body. This theory has been tried out in some clinical conditions like stroke, and multiple sclerosis [13-14]. We decided to study application of Betty Neuman Systems model in a COVID-19 patient, in the present pandemic situation.

CLINICAL CASE REPORT

Mr ABC, a 47 year old male was admitted in COIVD -19 ward resident of Gwalior, Madhya Pradesh, India was admitted though emergency department after being referred from a private hospital. The presenting chief complaints of the patient were fever for 9 days associated with chills and rigors and shortness of breath for 6 days. There was no history of orthopnea or paroxysmal nocturnal dyspnea [PND] or cough or hemoptysis, but complained of some epigastric discomfort. He also complained of loss of appetite and wheezing. However there was documented weight loss.

On examination Conscious, $E_4V_5M_6$, HR 79/min, BP 131/87 mm Hg, RR 18/min, SPO_2 95% on 6-7 liters/ min

There was no past history of Hypertension, Coronary Artery Disease, Diabetes Mellitus, Jaundice or Tuberculosis or any previous surgery. He was a nonsmoker and consuming smokeless tobacco for 30 years and alcohol for 3 years.

INVESTIGATIONS

Rapid antigen test done on the patient was negative, but Reverse Transcription Polymerase Chain Reaction (RT-PCR) test was positive. Chest x ray revealed bilateral (B/L) Lower Lobes infection. High contrast Computerized Tomography (HCCT) revealed B/L consolidation with ground glass density and enlarged lymph nodes and mild hepatomegaly. Focused Assessment with Sonography for Trauma (FAST) scan showed B/L minimal pleural effusion, Inferior Vena Cava (IVC)> 50% collapsibility and left ventricle showing good contractility. ABG report of the patient showed pH 7.53, PO_2 59 mmHg, PCO_2 34.6 mmHg HCO_3^- 28.6mEq/L, and moderately raised Serum Lactate (2.1mmol/L) level suggestive of ongoing organ dysfunction and sepsis. Clinical blood chemistry showed neutrophilia (75.4%) and lymphopenia (17.3%) and low Serum Potassium level (2.9 mEq/L).

TREATMENT

He was started on oxygen therapy with high frequency nasal (HFNC) cannula @7 L/ min. The medical treatment plan included Inj Piptaz (Piperacillin and Tazobactam) 4.5 gm IV TDS, Inj Azithromycin 500 mg BD, Inj Levofloxacillin 750 mg IV OD, Inj Pantoprazol 40 mg OD, Inj Paracetamol (PCM) 1 gm SOS and IV Lactated Ringer fluid @ 100ml/hr with 2 mEq/100 ml KCL. Patient was allowed to take oral fluids only for the administration of oral drugs. Oral medications such as Tab Vitamin C 500mg TDS, Tab Hydroxychloroquine 400 mg BD followed by 400 mg OD, Tab Zinc 50 mg BD were also started. IV fluid normal saline @ 100mL/ hr over 24 hours was started. He was voiding self.

Comprehensive nursing care was provided by a team of nursing personnel posted in COVID unit. They were donned in appropriate personal protective equipment (PPE). A primary nurse was made responsible for identifying and developing the nursing care plan. Patient was also provided with a triple layer surgical face mask to contain the droplets and respiratory secretions. Stressors and reactions of the patient were identified (Table 1). Nursing care plan was developed which included nursing diagnoses, nursing goals, nursing interventions and nursing outcomes. Nursing care was provided to the patient according to the developed nursing care plan.

DISCUSSION

Nursing care was given to the patient as per the identified stressors and his reaction to the stressors. He showed signs of improvement and was successfully discharged from the hospital with the advice of 14 days home quarantine. Results of our clinical case study are similar to the previous case studies done on multiple sclerosis and stroke patients. [13,14].

In the present clinical case study 14 nursing diagnoses were framed considering intra-personal, interpersonal and extra-personal stressors and patient's reactions to those stressors.

Table 1: Stressors and reactions of Mr. ABC to COVID-19.

Stressor	Reaction
Physiological	Difficulty in breathing and wheezing Fever Epigastric discomfort Loss of appetite Inability to sleep
Psychological	Powerlessness and having weakness. Anxiety about 3 children, who were still studying and about their future. Concerned about his wife at home, what will happen if something happens to him? Did not share information about his sickness with his close friends and relatives
Developmental	47 year middle aged, studied up to middle level and an active member of the family
Socio-cultural	Had few relatives and close friends Had not disclosed his status to all the relatives and family friends
Spiritual	Followed Hindu religion, He had faith on Hindu idol (*Hanumanji*), who will come for his support. Praying to the GOD while being in the hospital

Table 2: Nursing Management of the patient with COVID-19.

S.N.	Nursing Diagnosis	Nursing Goal	Level of Prevention	Nursing Intervention	Nursing Outcome
Physiological					
1	Altered breathing patterns	To ease the work of breathing and maintain SPO_2 within normal range	Secondary and tertiary	-Assessed respiratory rate and pattern -Provided Prop up position -Initiated oxygen therapy using HFNC cannula @ 7 L/ min -Promoted humidification -Monitored SpO_2 -Encouraged coughing and deep breathing exercises while observing all respiratory precautions - Provided frequent mouth care	Hypoxemia got corrected, patient was maintaining saturation > 95% with FiO_2 of 60% and gradually be weaned off oxygen
2.	Altered body temperature	To maintain body temperature with in normal range	Secondary	-Monitored temperature of the patient every 4 hourly -Administered antipyretic Inj Paracetamol 1gm IV SOS -Given tepid sponging to reduce the body temperature	Patient's temperature was maintained within normal range
3	At risk for hemodynamic instability	To maintain vital parameters within age appropriate normal range	Primary and Secondary	-Monitored vital signs like heart rate (HR) and blood pressure (BP) -Recorded intake output and laboratory reports	Vital parameters were maintained within age appropriate normal range
4	Impaired nutritional status	To improve patient's nutrition	Secondary	-Provided food in a quiet environment -Given him easily digestible soft food, and small frequent meals -Offered warm freshly cooked food according to his likes and dislikes -Administered Vitamin C and Zinc Sulphate to improve the immunity of the patient	Patient was trying to increase his food intake
5	Activity intolerance	Assisting the patient in carrying out activities of daily living	Secondary	-Assisted patient in performing his activities of daily living on the bed itself -Helped him to walk in his unit as per his tolerance	Patient was able to perform activities with minimal assistance
6	Disturbed sleep	Providing rest and improving his quality of sleep	Secondary	-Provided quiet environment for sleep with minimum disturbance -Scheduled drug administration timing in order to minimize disturbances	Quality and duration of sleep improved
7	Potential to develop fluid overload and electrolyte imbalance	Restricting fluids to 2/3rd of maintenance fluid Maintaining normal lactate and electrolytes levels	Primary & Secondary	-Started IV fluids @ 100mL/ Hr in 24 hours -Monitored serum electrolytes and lactate levels Administered KCL 20 mEq/ L	No signs of fluid overload. Electrolyte and lactates were maintained within normal range
8	Potential to develop added infections	To protect the patient from developing super-added infections	Primary & Secondary	-Administered antibiotics as prescribed Encouraged patient to observe hand hygiene and respiratory hygiene	Patient did not develop any added infections
Psychological					
9	Psychological distress In terms of anxiety and stress related to family and disease course	Helping patient to reduce his anxiety and stress related to family members	Secondary	-Calmed him down during acute respiratory distress -Made oneself available to meet the needs of the patient -Kept a call bell system for calling nurse for help -Assisted him in learning relaxation techniques and keeping his negative thoughts away Encourage patient to express his feelings -Encouraged him to talk to his family after stabilization of his condition members through video call on stabilization of his condition	His anxiety got relieved and communicated with his family telephonically

10	Fear of unknown and being away from his native place	Assisting patient to feel comfortable in a hospital away from his family and in a city not much known to him	Secondary	-Reassured him. -Made oneself available to meet all his physiological needs -Helped him in connecting with his family members telephonically	His fear of unknown was reduced to some extent
Socio-cultural					
11	-Social isolation due to disease condition -Stigma attached to COVID-19	Providing patient support and helping him to get rid of loneliness	Secondary	-Counseled him to understand the etiology of disease -Encouraged family members to talk to the patient through video call -Prepared him to disclose his status to his close friends	Patient felt relaxed after having talked to his family members and friends
Developmental					
12	At risk for developing cardio-vascular respiratory and oral problems	Counselling him to give up alcohol and smokeless tobacco upon his complete recovery	Tertiary	-Counseled patient to change his life style -Performed yoga and breathing exercises -Abstain from alcohol and smokeless tobacco after his recovery	Will be able to abstain from alcohol and smokeless tobacco
13.	Knowledge deficit related to unfamiliarity with disease transmission information	Educating patient about the disease COVID-19	Secondary and tertiary	-Provided health education to the patient about the disease transmission and ways to prevent the transmission of infection	Patient observed all precautions
Spiritual					
14.	Spiritual distress	Involve patient in religious activities	Secondary	-Assisted patient in reciting *Hanuman Chalisa (a Hindu devotional hymn (stotra) addressed to Lord Hanuman).* -Assisted him in offering prayers and arrange a spiritual person for the counseling	Patient appeared comfortable and relaxed after offering prayers

Nursing interventions were carried out as per the nursing care plan.

Application of Neuman's systems model in COVID-19 patient helped us in identifying various intrapersonal, interpersonal, and extra-personal stressors present in the patient with COVID-19. Nursing interventions were planned and delivered, considering all three levels of prevention of care (Table 1,2). The application of this theory in the present clinical study revealed the effectiveness of the primary, secondary and tertiary prevention interventions. The model could be used for solving the problems of patient with COVID-19 by controlling the effect of all stressors on the client's system.

CONCLUSION

Betty Neuman Systems model can be used as a framework by nurses in providing quality nursing care to COVID-19 patients. The model is effective in solving the nursing problems of patient with COVID-19, by controlling the effect of all stressors on the patient/client's system.

ACKNOWLEDGEMENTS

Authors would like to thank Mahesh Kushwaha, who was admitted with COVID-19 disease in our COVID unit, and allowed us to use his case history for preparing the clinical case study.

REFERENCES

1. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. The Lancet. 2020; 395: 507-513.
2. Hui D, I Azhar E, Madani T, Ntoumi F, Kock R, Dar O, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health — The latest 2019 novel coronavirus outbreak in Wuhan, China. Int J infect Dis. 2020; 91: 264-266.
3. Grant M, Geoghegan L, Arbyn M, Mohammed Z, McGuinness L, Clarke E, et al. The Prevalence of Symptoms in 24,410 Adults Infected by the Novel Coronavirus (SARS-CoV-2; COVID-19): A Systematic Review and Meta-Analysis of 148 Studies from 9 Countries. SSRN Electronic Journal. PLoS ONE. 2020; 15: e0234765.
4. Murthy S, Gomersall C, Fowler R. Care for Critically Ill Patients With COVID-19. The Journal of the American Medical Association. 2020; 323: 1499.
5. Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. "Features, Evaluation and Treatment Coronavirus (COVID-19)". Stat Pearls. Treasure Island (FL): StatPearls. 2020: 32150360.
6. Velavan T, Meyer C. The COVID-19 epidemic. Tropical Medicine & International Health. 2020; 25: 278-280.
7. Bourouiba L. Turbulent Gas Clouds and Respiratory Pathogen Emissions. JAMA Insights. 2020.
8. Centre for disease control and prevention. Interim Guidelines for Collecting, Handling, and Testing Clinical Specimens from Persons for Coronavirus Disease 2019 (COVID-19). 2020; 1-5.
9. Feng S, Shen C, Xia N, Song W, Fan M, Cowling B. Rational use of face masks in the COVID-19 pandemic. The Lancet Respiratory Medicine. 2020; 8: 434-436.

10. Knight J. The Betty Neuman Systems Model applied to practice: a client with multiple sclerosis. Journal of Advanced Nursing. 1990; 15: 447-455.

11. George JB. Nursing Theories. The base for professional nursing practice. 6th ed. Pearson. 2010; 14.

12. Smith MC, Parker ME. Nursing theories and nursing practice. 4th edn. Philadelphia.

13. Sultan B. Application of Betty Neuman Theory in Care of Stroke Patient. Annals of Nursing and Practice. 2018; 5: 1092.

14. Ahmadi Z, Sadeghi T. Application of the Betty Neuman systems model in the nursing care of patients/clients with multiple sclerosis. Multiple Sclerosis Journal – Experimental, Translational and Clinical. 2017; 3: 205521731772679.

15. Vera M. Nursing Diagnosis: Everything You Need to Know. Nurseslabs. 2019.

Cite this article

Joshi P, Kumari V, Ajesh Kumar TK (2020) Application of Betty Neuman Systems Model in Nursing Care of Patients with COVID -19. Ann Nurs Pract 7(2): 1116.