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

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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.


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 COVID-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 built upon 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 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, 

\[ V_M = \text{HR 79/min, BP 131/87 mm Hg, RR 18/min, SPO}_2 95\% \text{ on 6-7 liters/min} \]

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 Levofloxacin 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 Hanuman (Hanumani), 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.

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<th>S.N.</th>
<th>Nursing Diagnosis</th>
<th>Nursing Goal</th>
<th>Level of Prevention</th>
<th>Nursing Intervention</th>
<th>Nursing Outcome</th>
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| 1    | Altered breathing patterns        | To ease the work of breathing and maintain SPO2 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 SpO2  
- Encouraged coughing and deep breathing exercises while observing all respiratory precautions  
- Provided frequent mouth care | Hypoxemia got corrected, patient was maintaining saturation > 95% with FiO2 of 60% and gradually weaned off oxygen |
| 2    | Altered body temperature          | To maintain body temperature within normal range                            | Secondary            | - Monitored temperature of the patient every 4 hourly  
- Administered antipyretic Inj Paracetamol 1 gm 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 |
| 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 |
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.

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**REFERENCES**


