Review Article

Applying the Betty Neuman Model to Explain the Relationship between Workload as Stressors and Shift Work Disorder among Nurses; a Conceptual Model

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Abstract: *Background*: Theories and models are the bedrock of sound reasoning and judgments in any clinical practice. They serve as frameworks for scientific understandings and intellectual discussions. This paper provides a review of the Betty Neumann Systems Model (NSM) and how it could be applied to understanding the relationship between workload as a stressor and shift work disorder among nurses. *Method*: The Betty Neumann System Model was reviewed, and the main concepts were explained. A conceptual explanation of the model was then presented using the concepts relating to nurses' workload and shift work disorders among nurses. *Results*: The conceptual model shows that high workload as stressors if persistent could break the defence lines and results in symptoms predictive of shift work disorder among nurses who rotate shifts. However, primary prevention is needed before the individual is in contact with such a stressor. An example of primary prevention includes pre-shift napping and reducing working hours. Also, secondary prevention of stressors includes several treatment strategies such as promoting rest periods, reducing shift duration, and increasing inter-shift recovery. By augmenting inter-shift recovery, sleep debt and fatigue may subsequently diminish. When treatment occurs and is maintained, the restoration of balance may be achieved through tertiary prevention. *Conclusion*: The negative outcomes of workload stressors as manifested as shift work disorder (SWD) among nurses could be averted if the conceptual model of the Betty Neumann System Model is applied.

Keywords: Betty Neumann; Workload; Shift work disorder; Stressors; Prevention; Nurses.

BACKGROUND

Betty Neuman Systems Model (Neuman, 1997) was used to explain the relationship between workload stressors and shift work disorder (SWD) among nurses. Betty Neuman's model is related to the meta-paradigm of the discipline of nursing (Neuman, 1997). This model is useful in that it emphasizes nursing interventions to reduce shift work stress and improve the homeostasis of the individual or group to optimize health and prevent the emergence of shift work disorders (Partlak-Gunusen, Ustun, & Gigliotti, 2009). Shift work disorder (SWD) has been described as a sleep disorder characterized by sleepiness and insomnia, which could be attributed to the nurses' work schedule. Sleepiness and insomnia increase the risk of committing medication errors and may result in personal injuries on shift and while driving home (Fallis, Mcmillan, & Edwards, 2011). SWD is an extrinsic circadian rhythm sleep disorder with far-reaching implications in terms of associated morbidity, occupational and traffic accidents, and reduced work productivity (Culpepper & Md, 2010). The heavy workload for nurses in the hospital is a major problem for the health care system. A large number of studies on nursing workload and patient safety used nurse-patient ratios as the measure of nursing workload. In recent times, Nurses are experiencing higher workloads than ever before due to four main reasons:

increased demand for nurses, inadequate supply of nurses, reduced staffing and increased overtime, and reduction in inpatient length of stay (Carayon & Gurses, 2008), having the right number of nursing staff with the right skills to meet the needs of patients on a ward was fundamental to delivering high-quality; compassionate healthcare to patients (Kaplan, 2014).

The individual or group is identified as an open system that is surrounded by concentric rings whose purpose is to maintain system stability from stressor invasion. The normal line of defence (NLD) may be a standard of health by which changes in stability or wellness are often measured. It is represented as the middle of the three concentric rings. The normal line of defence is seen as the accumulation of various coping mechanisms over time, which maintains system stability, or wellness. This line of defence is flexible, with expansion reflecting improved wellness, and contraction reflecting diminished wellness or illness.

On the other hand, the flexible line of defence (FLD) is the Outermost ring that protects the normal line of defence and maintains wellness. This ring is described as being "accordion-like" therein during expansion it provides increased protection, whereas less protection is out there when it draws closer (Fawcett, 2005). The third concentric ring resides closest to the essential system structure and is understood because of the lines of resistance (LOR). The line of resistance functions to stabilize and return the system to wellness, following exposure to an environmental stressor (Fawcett, 2005).

The Neuman Systems Model views systems as holistic entities that are in constant interaction with the environment. Stressors existing in that environment are capable of invading the normal line of defence if they are not adequately buffered by the flexible line of defence. If the normal line of defence is invaded, then the line of resistance is activated as a result. Stress is the initial response to stressors that invade the line of resistance, however, if the stress is not alleviated it can result in strain identified by Neuman as a core response (Partlak-Gunusen *et al*., 2009). When the line of resistance is activated during the normal line of defence invasion, various coping mechanisms obtained over time which are physiological, psychological, sociocultural, developmental, and spiritual in nature are utilized in a stress response. If the coping strategies are effective, a core response is prevented. However, if the stressors are too strong or the coping mechanisms too weak, then burnout will eventually result and one of the consequences of burnout is "poor health outcomes, among which is shift work disorders" (Partlak-Gunusen *et al*., 2009). Individuals with burnout have been found to have higher cortisol levels, more sleep problems, increased anxiety, and are more prone to smoking and alcohol use (Danhof-Pont, van Veen, & Zitman, 2011).

The environment in Neuman's theory is subdivided into internal, external, and created environments. The internal environment is comprised of forces within the boundaries of the system structure itself. The external environment is defined as factors lying outside the system boundaries. Lastly, the created environment is unconsciously constructed via manipulation of the system variables in an attempt to take care of or return system stability. It has been referred to as a "protective coping shield" which can be increased or decreased based on unconscious knowledge of the need to adjust for available energy utilized by the system for the preservation of wellness (Fawcett, 2005).

According to Neuman (1997), three types of stressors exist within the environment: intrapersonal, interpersonal, and extra personal. Intrapersonal stressors are those that reside within the boundaries of the system (Ahmadi & Sadeghi, 2017). Examples of intrapersonal stressors are tolerance to shift work (Partlak-Gunusen *et al*., 2009). Interpersonal stressors are people who arise outside the system boundaries but at a "proximal range" (Fawcett, 2005). An example of interpersonal stressors would be "workplace conflicts, inefficient leadership, relationships with colleagues, and communication problems with patients and relatives" (Konstantinos & Christina, 2008). Extra personal stressors also arise outside the system boundaries but at a "distal range" (Skalski, DiGerolamo, & Gigliotti, 2006). Examples of extra personal stressors include "reduced staff, long work hours, high workload, unclear job descriptions, and shift work like night shift (Partlak-Gunusen *et al*., 2009). Stressors, such as shift work, high workload, long working hours, and disrupted circadian rhythm, may impact a nurse's normal line of defence. When these three variables lead to system instability and core disruption, a nurse may present with symptoms predictive of shift work disorder.
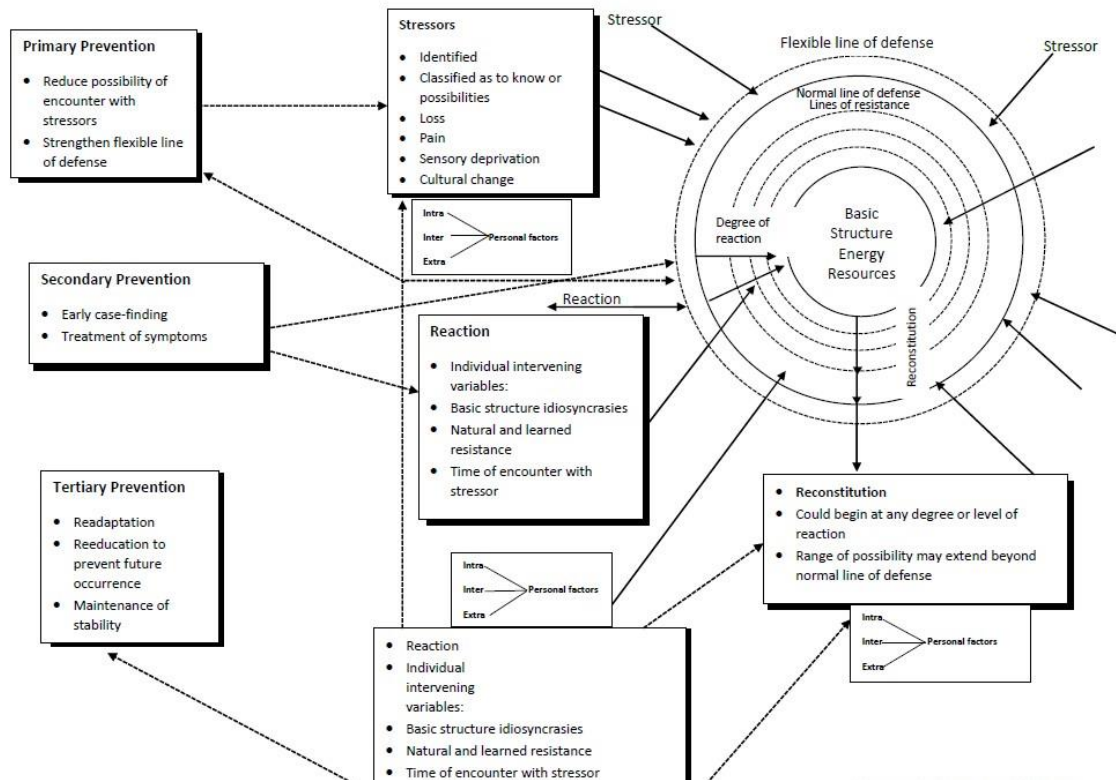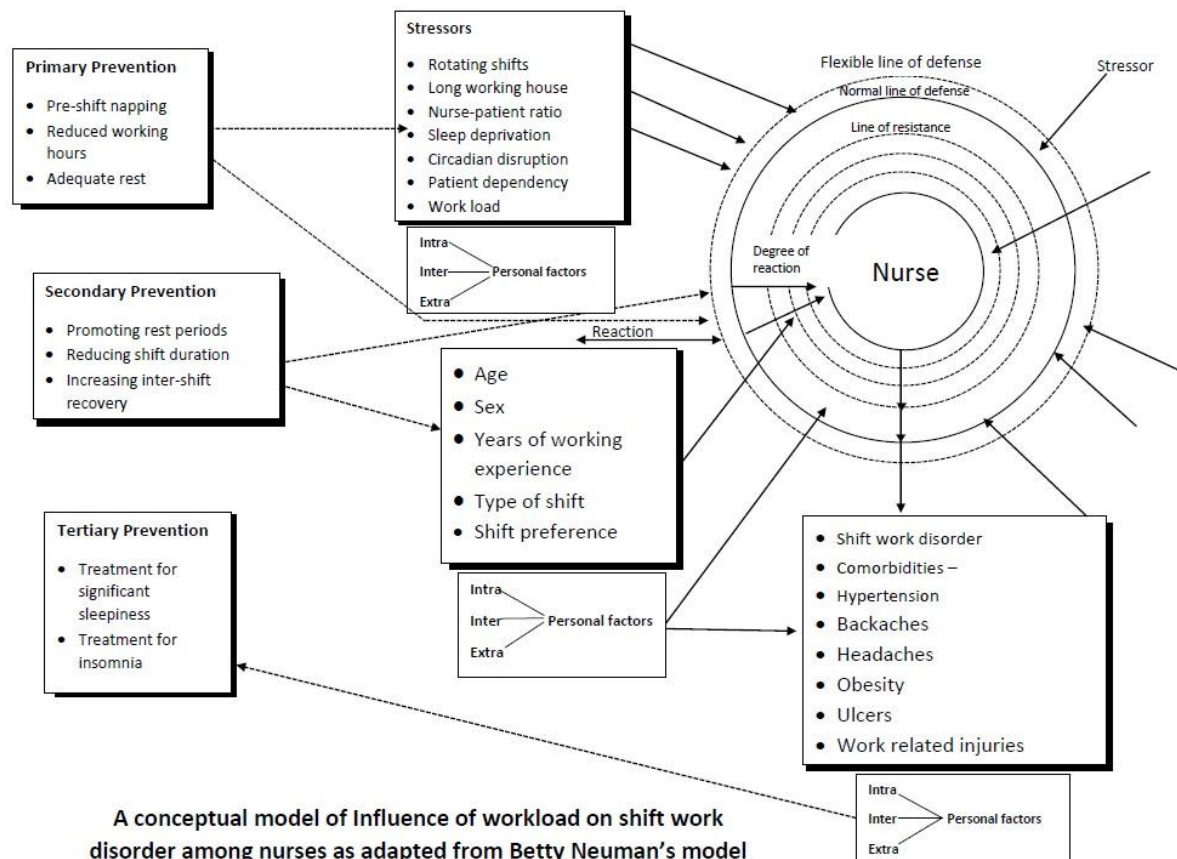
Fig 1: Source Neuman, B. (1996), The Neuman systems model in research and practice pg 67-70

A conceptual model of Influence of workload on shift work
disorder among nurses as adapted from Betty Neuman's model

Fig 2: Conceptual framework of influence of workload on shift work disorder among nurses
Source: Neuman, B. (1996), The Neuman systems model in research and practice pg 67-70

APPLICATION OF THE MODEL

According to Neuman (1996), if a stressor breaks through the flexible line of defence, it disturbs the individual's equilibrium and triggers a reaction. The reaction may lead toward restoration or a decline, depending on internal lines of resistance that attempt to restore balance. The reaction to the stressor and the prognosis are influenced by the number and strength of the stressors affecting the person (shift work tolerance and workload), the length of time the person is affected (rotating shifts) the meaningfulness (shift preference) of the stressor to the person.

The NSM included the concepts of primary, secondary, and tertiary prevention. Primary prevention encompasses directing energy to diminish stressors or reinforce the flexible lines of defence. This level of prevention focuses on providing additional protection for the individual's baseline level of performance. Primary prevention is appropriate before the individual is in contact with a stressor. Objectives of secondary prevention strategies include intervention after the normal lines of defence have been breached. This treatment approach would target the need for additional protection and begin to repair the normal lines of defence to regain optimal system stability. After restoration and repair have occurred, tertiary prevention strategies focus on methods to prevent further stressor penetration and support restoration of one's level of functioning. Tertiary prevention accompanies the restoration of balance as the individual recovers from stress-related causal agents. The concepts and relationships within the NSM are congruent with the variables of interest under investigation. The central core of this study is the nurse who rotates shifts. The flexible line of defence, normal line of defence, and lines of resistance prevent stressor penetration (long working hours, shift work, workload, reduced sleep, and disrupted circadian rhythm) and disruption of the central core. In this study, stressors will be identified as the duration of nursing shift work and length of shift, caring for highly dependent patients, workload (high or low) sleep deprivation, and circadian rhythm disruption. The less recovery obtained by a nurse, coupled with the stress of shift work and workload, may contribute to strained lines of resistance, with potential jeopardy to the central core (nurse retention). If stressors penetrate through lines of resistance and damage the central core, nurses may present with shift work disorder. Primary prevention is needed before the individual is in contact with such a stressor. An example of primary prevention includes pre-shift napping and reducing working hours. Secondary prevention of stressors includes several strategies. Treatment of the stressors may include promoting rest periods reducing shift duration, and increasing inter-shift recovery. By augmenting inter-shift recovery, sleep debt and fatigue may subsequently diminish. When treatment occurs and is maintained, the restoration of balance may be achieved through tertiary prevention.

CONCLUSION

Betty Neuman Model could be used to explain the development of symptoms predictive of shift work disorder among nurses with heavy workloads. The negative outcomes of workload stressors as manifested as shift work disorder (SWD) among nurses could be averted if the conceptual model of the Betty Neumann System Model is applied.

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