

Nursing Interventions for Critically Ill Traumatic Brain Injury Patients



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ABSTRACT

Neuroscience intensive care unit (ICU) nurses deliver a number of interventions when caring for critically ill traumatic brain injury (TBI) patients. Yet, there is little research evidence documenting specific nursing interventions performed. As part of a larger study investigating ICU nurse judgments about secondary brain injury, ICU nurses were asked to identify interventions routinely performed when caring for TBI patients. Quantitative and qualitative analyses indicate that all nurses routinely monitored hemodynamic parameters such as oxygen saturation, blood pressure, and temperature. Nurses were responsible for monitoring intracranial pressure and cerebral perfusion pressure approximately 50% of the time. Qualitative analyses revealed that additional nursing interventions could be categorized as neurophysiological interventions, psychosocial interventions, injury prevention interventions, and interventions to maintain a therapeutic milieu. Findings from this study provide evidence of the multifaceted role of the neuroscience ICU nurse caring for TBI patients and can be used in future research investigating the impact of nursing interventions on patient outcomes.

Traumatic brain injuries (TBIs) account for over 200,000 hospital admissions every year in the United States, costing over 3.2 billion health-care dollars annually (Langlois, Rutland-Brown, & Thomas, 2006; Russo & Steiner, 2007). It is estimated that 71% of TBI hospitalizations are for patients with severe injuries necessitating critical care monitoring (Russo & Steiner, 2007). Neuroscience intensive care unit (ICU) nurses deliver a myriad of interventions when caring for these critically ill TBI patients. Yet, there is little research evidence documenting specific interventions performed. This information is needed to highlight the autonomy and role of the neuroscience ICU nurse when caring for critically ill TBI patients and as a basis for future research investigating how nursing interventions impact patient outcomes. Therefore, the purpose of this article was to present findings from a research study in which neuroscience ICU nurses described interventions routinely performed when caring for TBI patients.

Background

Descriptions of Nursing Interventions

Several reports identify nursing interventions for critically ill TBI patients. Although these reports are

not based on research evidence, they do provide general descriptions of ICU nurse responsibilities when caring for TBI and other neurologically impaired patients (Ladanyi & Elliot, 2008; Littlejohns & Bader, 2009; Olson & Graffagnino, 2005; Presciutti, 2006; Wong, 2000). Responsibilities include monitoring patient physiological parameters and ensuring hemodynamic stability, performing serial neurological examinations, preventing secondary injury, and providing emotional support for patients and families (Chamberlain, 1998; Olson & Graffagnino, 2005; Presciutti, 2006). More recently, ICU nurses are involved with advanced technologies, such as monitoring and maintenance of brain tissue oxygenation and monitoring electroencephalograph and bispectral index readings (Albano, Comandante & Nolan, 2005; Bader, Littlejohns, & March, 2003; Littlejohns & Bader, 2009). Collectively, these described interventions comprise the multifaceted role of nurses caring for TBI patients in the ICU, where technical and interpersonal competencies are crucial.

Nursing Priorities of Care

The interventions described earlier are often guided by nursing priorities that have been identified in the research literature (Fonteyn & Fisher, 1994; Villanueva, 1999). Two qualitative studies specifically describe nursing priorities and associated interventions when caring for critically ill neurologically impaired patients. A key priority when caring for unconscious patients is “giving the patient a chance,” in which interventions center on learning about the patient, maintaining and monitoring patient status, talking to the patient, and working with the family (Villanueva, 1999).

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In a separate study, nurse priorities when caring for postoperative craniotomy patients are the following: (a) The patient will become responsive and (b) the patient will remain hemodynamically stable (Fonteyn & Fisher, 1994). Nursing interventions related to these priorities include assessments of patients' level of consciousness or neurological status, blood pressure (BP), breath sounds, temperature, amount of respiratory secretions, central venous pressure, heart rate and rhythm, pulse pressure, and arterial blood gases. These studies contribute information about nursing priorities guiding interventions for neurologically impaired patients in the ICU. However, findings from these studies are limited by small sample sizes ($n = 16$ and $n = 3$, respectively), and interventions described are not specific to the complex care often required for critically ill TBI patients.

Factors Influencing Nurse Interventions

The presence of external factors can influence nursing interventions performed with neurologically impaired patients (Cook, Deeny, & Thompson, 2004; McNett, 2009; McNett, Doheny, Sedlak & Ludwick, 2009). Nursing judgments about appropriate interventions when managing secondary brain injury in critically ill TBI patients are influenced by worsening values for oxygen saturation, intracranial pressure (ICP), cerebral perfusion pressure (CPP), and nursing shift. Nurses are less likely to rely solely on nursing interventions and more likely to consult another member of the healthcare team as values for oxygen saturation, ICP, and CPP fall farther from recommended parameters. In addition, nurses working day shift are more likely to rely solely on nursing interventions and less likely to consult other healthcare team members than are their night shift colleagues (McNett, 2009).

When managing subarachnoid hemorrhage, neuroscience ICU nurses are influenced by knowledge of current standards and therapies for fluid and hydration management. Judgments about interventions center on the nursing process of assessment, planning, implementation, and evaluation. Using this process, nurses rely on patient cues, such as physical appearance, recorded intake–output, and neurological status when determining need for interventions (Neal & Deeny, 2004). When managing fever in neurologically impaired patients, nurses describe decisions about interventions being influenced by the individual nurse, the patient, and the barriers present within the organization or nursing unit (Thompson, Kirkness & Mitchell, 2007).

The studies mentioned contribute information about nursing priorities and factors influencing

Extrinsic factors as disparate as worsening oxygen saturation and shift worked can influence the interventions nurses employ with neurologically impaired patients.

nurse interventions for neurologically impaired patients. However, there is no research evidence documenting specific interventions performed by ICU nurses when caring for critically ill TBI patients. The purpose of this article therefore was to present findings from a research study in which neuroscience ICU nurses reported routine interventions administered when caring for TBI patients.

Methods Procedures

The findings presented here are part of a larger study investigating ICU nurse judgments about secondary brain injury using a prospective factorial survey research design (McNett, 2009; McNett et al., 2009). Approval for the study was obtained from the institutional review boards and nursing administration at both study sites. An anonymous survey was administered to 67 nurses working in three ICUs from two level I trauma centers who routinely care for critically ill TBI patients. Both study sites were designated as level I trauma centers by the American College of Surgeons and were classified as large teaching hospitals. Both were similar in terms of delivery and structure of nursing care, staffing ratios, and nurse characteristics. Study site A had a larger trauma volume, admitting approximately 3,000 trauma patients per year, whereas study site B averaged 1,000 trauma admissions annually. Study site A had recently identified the Guidelines for the Management of Severe Traumatic Brain Injury (Brain Trauma Foundation, American Association of Neurological Surgeons, The Joint Section on Neurotrauma of Critical Care, 2007) as a reference to guide care of the critically ill TBI patient in their ICUs. However, there were no standing order sets or standardized care plans in place for critically ill TBI patients at either study site.

Nurses from both sites were invited to participate in the study if they held an active state license as a registered nurse; were employed full-time, part-time,

or per diem as a clinical bedside nurse in an ICU that admits critically ill TBI patients; and were employed in the current ICU for a minimum of 3 months. Nurses were excluded if they did not have experience caring for critically ill TBI patients, were currently in nursing orientation, or were not directly responsible for the continuous bedside monitoring and delivery of care to critically ill TBI patients in that ICU. A power analysis indicated that a sample size of 60 would be sufficient to detect a medium small effect size of .20 with a power of .80.

Nurses in the ICU were approached during unit staff meetings and change-of-shift report times and invited to participate in the study. The study survey had three parts: Part A contained a series of questions about the last TBI patient nurses cared for in their unit and interventions typically performed when caring for these patients, part B contained case scenarios in which nurses were asked to indicate judgments they were most likely to make, and part C gathered demographic information about nurse respondents. Findings from the latter two survey sections have been previously reported (McNett, 2009). In this article, findings from survey part A (nurse interventions) are presented.

Part A of the study survey contained six fixed-response questions about the last TBI patient nurses cared for in their ICU. Nurses were asked how long ago they took care of a TBI patient, which physiological parameters they were responsible for managing, and the patient's mechanism of injury, age, gender, and comorbidities. Content for these questions was derived from an extensive review of the literature describing various nursing interventions and was validated by a team of clinical nurses and two clinical nurse specialists who routinely care for critically ill TBI patients. A final open-ended question on the study survey asked nurses to identify using free-text responses what interventions they performed when caring for this patient.

Data Analysis

Descriptive analyses, including means, standard deviations, and frequencies, were performed, with the quantitative data gathered from the fixed-response questions on the study survey. Methods for qualitative data analyses outlined by Pope and Mays (1999) were then performed with the free-text responses nurses provided. All free-text responses were recorded and systematically reviewed using first-level coding to identify recurring phrases and commonalities among responses. The constant comparison method was used to ensure that the identified codes were inclusive of all data. These first-level codes were then reviewed and grouped into larger categories

using second-level coding, which described the types of interventions performed by nurses. The recorded data, initial codes, and overall themes were reviewed by a second investigator with extensive neurocritical care experience to validate the findings.

Results

Study Sample

Table 1 presents a summary of the characteristics of nurse respondents. A total of 67 nurses returned completed surveys, yielding a 44% response rate. Most nurses in the study were between the ages of 26 and 40 years (64%), Caucasian (92.4%), and women (76.1%). Many nurses had less than 10 years of experience working in the ICU (70.1%) and caring

TABLE 1. Summary of Nurse Characteristics

Demographic Characteristics	%	n
Age (years)		
25 or younger	9	6
26–40	64	43
41–50	18	12
51 or older	9	6
Gender		
Male	23.9	16
Female	76.1	51
Ethnicity		
Caucasian	92.4	61
Other	7.5	5
Years in intensive care unit		
0–10	70.1	47
11–20	19.4	13
21 or more	10.4	7
Years with traumatic brain injury		
0–10	74.6	50
11–20	16.5	11
21 or more	9.0	6
Highest nursing degree		
Associate degree	22.4	15
Nursing diploma	19.4	13
Bachelor of science in nursing	58.2	39
Primary shift		
Days	25.4	17
Day–Night	29.9	20
Day–Evening	10.4	7
Evening	1.5	1
Nights	32.8	22

for TBI patients (74.6%). Over half of the nurses (58%) held bachelor degrees, and primary shifts included days (25.4%), day–night rotating (29.9%), day–evening rotating (10.4%), evenings (1.5%), and nights (32.8%).

Quantitative Data

Descriptive analyses were used to analyze the first six questions on the study survey. ICU nurses were asked to indicate how long ago they last cared for a TBI patient in their unit and which physiological parameters they were responsible for managing and to identify the patient's mechanism of injury, gender, age, and comorbidities. Table 2 provides a summary of ICU nurse responses.

All ICU nurses had cared for a critically ill TBI patient either within the last week (65.7%) or month (34.3%). ICU nurses indicated that they were responsible for monitoring BP, oxygen saturation, and temperature among all of these recent patients. Approximately 50% of nurses indicated that they were also responsible for monitoring ICP and CPP. Most nurses described their most recent TBI patients as male patients (85%), between the ages of 36 and 65 years (55.2%), and being injured from a motor vehicle crash (46.3%). Over 60% of patients recently cared for by nurses had also experienced extracranial injuries requiring additional nursing care, and smaller percentages of patients had other comorbidities, such as hypertension (34.3%) or diabetes (14.9%).

Qualitative Data

Nurses in the ICU were then asked to identify additional nursing interventions performed when caring for their most recent TBI patient. Qualitative analyses of these responses indicated that interventions could be grouped into four categories: neurophysiological interventions, psychosocial interventions, injury prevention interventions, and interventions to maintain therapeutic milieu. Figure 1 displays each category and the corresponding interventions reported by nurses.

Neurophysiological Interventions

Nurses in the ICU reported being responsible for monitoring and maintaining various physiological parameters to ensure neurological stability in patients. Consistent with their responses to the quantitative questions, nurses described monitoring patient oxygen saturation, BP, ICP, CPP, and temperature. In addition to these parameters, nurses also monitored pulmonary artery and central venous pressure readings, cerebral spinal fluid drainage, serial laboratory values, and carbon dioxide parameters. By keeping

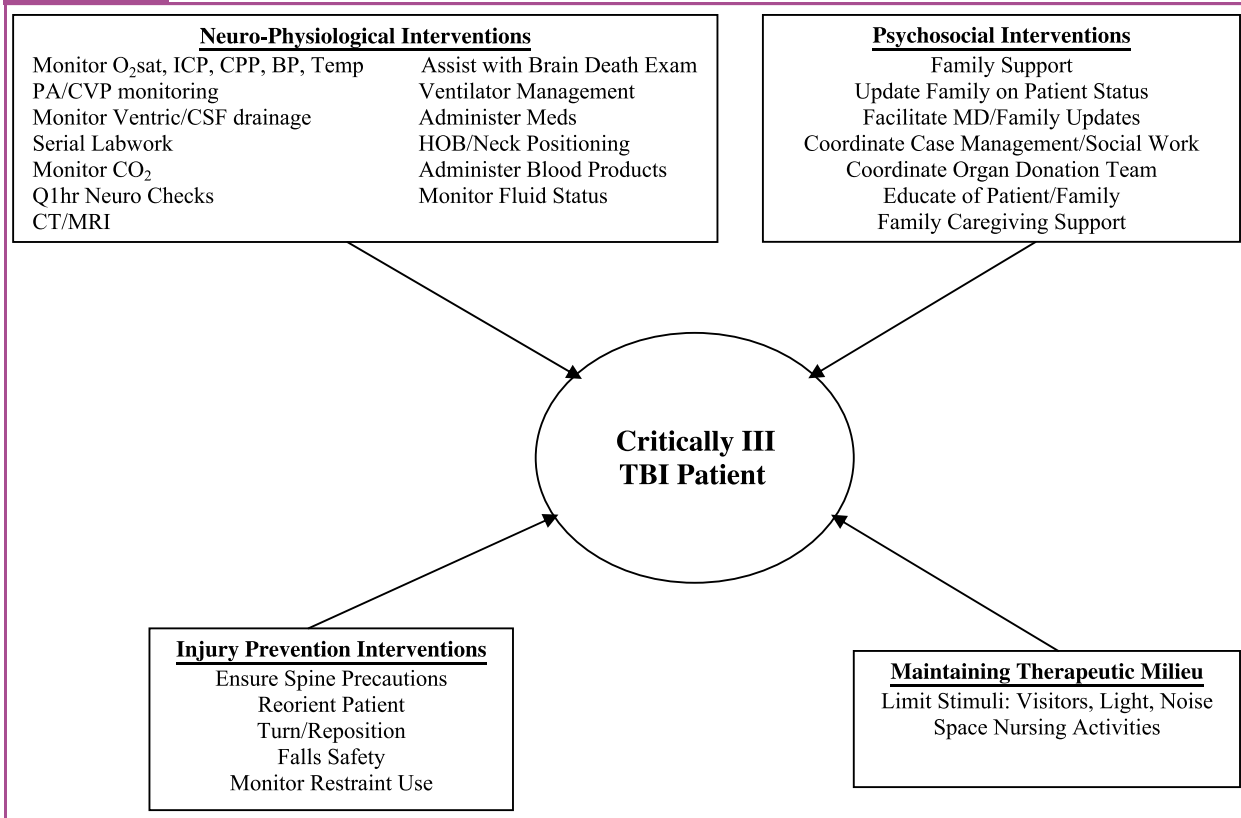
TABLE 2. Characteristics of Most Recent TBI Patient

Last Case Information	%	n
Last time cared for TBI patient		
Within last week	65.7	44
Within last month	34.3	23
Parameters responsible for managing		
BP	100	67
O2Sat	100	67
Temperature	100	67
ICP	52.2	35
CPP	50.7	34
Other	16.4	11
Patient mechanism of injury		
Motor vehicle accident	46.3	31
Fall	34.3	23
Assault	10.4	7
Other	9.0	6
Patient gender		
Male	85.1	57
Female	14.9	10
Patient age (years)		
18–35	29.9	20
36–65	55.2	37
66–85	10.4	7
Over 85	4.5	3
Patient comorbidities		
Extracranial injuries	61.2	41
Hypertension	34.3	23
Diabetes mellitus	14.9	10
Other	10.4	7

Note. TBI = traumatic brain injury; BP = blood pressure; O2Sat = oxygen saturation; ICP = intracranial pressure; CPP = cerebral perfusion pressure.

these values within acceptable limits, nurses were preventing secondary brain injury and promoting neurological stability. Additional interventions to monitor neurological stability included performing neurological assessments at a minimum of every hour and transporting and monitoring patients for computed axial tomography scan and magnetic resonance imaging testing. Several nurses also cited assisting with brain death examinations and preparing patients for organ donation as other interventions.

Within this category of neurophysiological interventions, nurses provided evidence of specific interventions performed to ensure that the mentioned physiological parameters remained within normal

FIGURE 1 Nurse Interventions for Critically Ill Traumatic Brain Injury Patient

limits. To obtain acceptable values for oxygen saturation, nurses cited being responsible for ventilator management and suctioning. To keep BP, ICP, and CPP within normal limits, nurses administered medications such as mannitol, propofol, and narcotics and kept the patient's head of bed elevated and neck in a midline position. Nurses also administered blood products and closely monitored intake–output to ensure adequate circulating blood volume, thus promoting cerebral perfusion.

Psychosocial Interventions

Nurses in the ICU described delivering a variety of interventions that were psychosocial in nature. Interventions in this category involved coordinating meetings and communication between family members and various members of the healthcare team, both in the acute (i.e., coordinating with physicians or organ donation teams) and long-term plans of care (i.e., coordinating with case management, social work). ICU nurses also provided education to family members about the plan of care, possible patient outcomes, and rationale for current therapies. Finally, nurses described simply serving as a source of support for family members by listening and providing necessary reassurance.

Injury Prevention Interventions

The third type of interventions reported by nurses included those aimed at preventing additional patient complications and ensuring patient safety. Within this category, some interventions were specific to TBI patients, such as maintaining spine precautions and frequently reorienting patients. Other interventions were considered routine care for any critically ill patient. These included frequent turning and repositioning of patients to prevent complications of immobility, such as skin breakdown and ventilator-associated pneumonia. ICU nurses also reported ensuring patient safety by preventing falls and determining the need for and monitoring restraint use to prevent disruption of medical devices. All interventions in this category were delivered to ensure a safe environment for patients and to prevent further injury.

Maintaining Therapeutic Milieu

The final category of interventions reported by nurses included those performed to maintain a therapeutic environment for the critically ill TBI patient. These interventions included intangible care given by nurses considering the special needs of TBI patients. Specifically, nurses reported working to limit environmental stimuli for patients. Interventions included

regulating visitors, decreasing lighting, and minimizing noise. Many nurses also cited spacing nursing activities to allow for adequate rest periods and to limit increases in ICP.

Discussion

Neuroscience ICU nurses have an integral role in the care of the critically ill TBI patient. Interventions routinely performed prevent secondary brain injury and patient complications and provide the necessary support and guidance for family members. Yet, there is no research documenting specific interventions associated with this multifaceted role, neither is there data indicating positive outcomes associated with these nursing interventions. These data are needed to acknowledge the unique contribution of ICU nurses as part of the interdisciplinary team caring for TBI patients and as a basis for future research investigating how ICU nurses impact patient and family recovery from TBI during the acute stage of injury.

Findings from this study support the anecdotal descriptions of ICU nurse responsibilities when caring for neurologically impaired patients (Chamberlain, 1998; Ladanyi & Elliot, 2008; Littlejohns & Bader, 2009; Presciutti, 2006). The four categories of interventions described indicate that neuroscience ICU nurses must possess extensive knowledge of the pathophysiological processes associated with primary and secondary brain injury. Nurses must also have the technical skills to effectively manage these processes and ensure neurological stability. Finally, excellent interpersonal skills are crucial to communicate with families and other members of the healthcare team.

When examining the interventions reported by nurses, it is interesting to note that most interventions were classified as neurophysiological, which centered on ensuring the neurological and physiological stability of the patient. This finding is supported by findings from the larger study in which the physiological parameters, specifically a patient's oxygen saturation, ICP, and CPP, were the most significant variables influencing ICU nurse judgments when caring for TBI patients (McNett et al., 2009). This is consistent with smaller qualitative studies concluding that maintenance of physiological and neurological parameters is a priority when caring for neurologically impaired patients (Fonteyn & Fisher, 2004; Villanueva, 1999). Thus, although the ICU nurse caring for critically ill TBI patients is responsible for a number of interventions, it does appear that stabilizing the patient's physiological parameters and neurological status is the key priority. This certainly is of utmost importance because

these factors ultimately are what influence patient mortality and outcome.

The study is limited by the fact that data were only gathered from two study sites in one geographical location. As a result, findings may not be generalizable to all neuroscience ICU nurses. In addition, nurses in this study were asked to recall interventions they performed with previous TBI patients and therefore may not remember all interventions delivered when caring for that patient. It is likely that additional interventions were done but not necessarily reported by the nurses in the study. Despite these limitations, findings do provide baseline evidence of specific interventions of ICU nurses. This information is necessary for future research investigating the impact of these interventions on outcomes.

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