Neurotrauma Nursing: Clinical and Educational Challenges

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Abstract

Neurosurgery trauma patients are unique, and their care is often complex, requiring multidisciplinary, multimodal, and creative approaches. The uniqueness of brain injuries mean that patient care must be individualised, and therefore a standardised, generic approach is not sufficient. This paper explores a case study of a patient with a severe traumatic brain injury, detailing management of some of the key complications that they experienced. This case raised several challenges in both the provision of clinical care, and the required nursing education. The case highlighted the importance of specialised, knowledgeable and experienced neurosurgery nurses, and raises several questions for future practice and research.

Keywords: neurosurgery, nursing, trauma, education, challenges

Introduction

Neurosurgery trauma patients are unique, and caring for them involves a myriad of challenges for neurosurgery nurses. Therefore, high quality neurosurgery nursing care should be individualised to meet the complex needs of the patient. The local neurosurgery service referred to in this paper is within a major trauma hospital and tertiary referral centre for several acute specialties providing statewide services. As a result, the service cares for patients from a wide geographical area, managing complex trauma patients with severe injuries. This paper will provide a case overview of a patient transferred to the local neurosurgery service, whose care was complex and demonstrated several clinical challenges. The clinical care challenges for this patient will be discussed, as well as the educational challenges this patient posed for the nursing workforce, and questions that this case raised for future practice in neurosurgery nursing.

Case study

A young male was the driver in a high-speed motor vehicle accident. On assessment at the scene, the patient was unresponsive with an initial Glasgow Coma Scale (GCS) of 3/15. The patient was only observed to spontaneously move his right upper limb on scene. Due to the suspected severity of the patient's injuries, including concern for spinal cord injury (SCI) with no movement observed in the lower limbs, the patient was retrieved by Air Ambulance to the local practice setting, as a major trauma. On admission to hospital, the patient was found to have a multicompartmental intracranial haemorrhage, multiple skull fractures, spinal fractures without SCI, and orthopaedic injuries.

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The patient underwent insertion of an external ventricular drain, and 24 hours later underwent a bifrontal decompressive craniectomy as a life-saving measure for refractory intracranial pressure (ICP). Following this decompression, ICP remained within normal limits, and sedation was weaned, however the patient remained in a vegetative state, as defined by the Royal College of Physicians (2020). The patient was tracheostomised and transferred from the intensive care unit to the neurosurgery ward. The patient had a magnetic resonance imaging (MRI) brain and was diagnosed with a grade 3 diffuse axonal injury. As a result of the severity of his injury, the patient had several complications which were challenging to manage. Therefore, care of this patient raised several unique clinical and educational challenges on the neurosurgical ward.

Complications

The patient remained on the acute neurosurgical ward for several months, with a prolonged disorder of consciousness demonstrating some wakefulness with no awareness (Royal College of Physicians, 2020). As a result, the patients care was complex and included management of a tracheostomy and enteral feeding, complex medication management, positioning and hygiene, and high risk of pressure injuries. The most significant complication the patient experienced in the initial months post-injury was paroxysmal sympathetic hyperactivity (PSH), which may also be referred to as sympathetic storming. PSH is the dysregulation of sympathetic activity, resulting in episodic presentations of excessive sympathetic activity (Jafari, 2022). The reported incident of PSH in patients with TBI ranges from 10-30% and is thought to be caused by a disconnection of sympathetic centres in the hypothalamus and brain stem, and inhibitory areas of the cortex, resulting in dysregulation of the sympathetic nervous system (Juneja, 2024). For this patient, the symptoms of PSH included tachycardia, hypertension, tachypnoea, diaphoresis, hyperthermia, and increased muscle tone. These episodes were often triggered by cares such as repositioning and tracheal suctioning, however at times occurred seemingly without a trigger, which is typical of PSH (Juneja, 2024). Clustering of care was instigated for this patient, with nursing staff performing all necessary care in one episode, then minimising other stimulation between cares. The patient was also located in a single room to reduce excessive stimulation, and visitors were initially limited to immediate family only.

Clinical care such as tracheostomy weaning was significantly impacted by PSH. This is reflected in the literature, with patients with PSH having a significantly longer tracheostomy duration compared to patient without PSH (Totikov, 2019). When attempting tracheostomy weaning interventions, such as cuff deflation or placement of a one-way valve, the patient would often appear uncomfortable, and display clinical changes including tachycardia, tachypnoea, and increased muscle tone. It was challenging for nursing and allied health staff to determine whether these symptoms were episodes of PSH triggered by tracheostomy interventions, or clinical signs of not tolerating such airway changes. This raised challenges for the multidisciplinary team, utilising clinical judgment in when to persevere with interventions in the interest of achieving decannulation, and when to stop.

Another complication which greatly impacted the patient's care was their significantly increased muscle tone. The increased muscle tone was severe and may be referred to as spasticity or dystonia. Spasticity may be defined as 'a disorder of sensorimotor control, resulting from an upper motor neuron lesion, presenting as intermittent or sustained involuntary activation of muscles', and is considered generalised if affecting more than one segment of a limb (Khan et al., 2019). Dystonia may be referred to as movement disorder characterised by abnormal movements or postures, that may be intermittent or sustained, with fixed dystonia referring to prolonged postures, as was the case for this patient (Albanese et al., 2025). The definitions across the literature are varied and therefore will be henceforth referred to as spasticity. Spasticity can cause patients significant pain and may cause secondary complications including pressure injuries and contractures. In this case study, the spasticity progressed to contractures of fingers, hands, wrists, elbows, and ankles, and significantly impacted the patient's clinical care.

Positioning, splinting with orthoses, and passive physiotherapy range of motion exercises were implemented initially in attempt to maintain range of movement. Oral medication baclofen was trialled initially in an attempt to alleviate spasticity; however, it is noted in the literature that intrathecal baclofen often has higher efficacy for severe spasticity (Romito et al., 2021). Botulinum neurotoxin (BT) is often considered first line therapy for focal spasticity (Tamburin et al., 2022). However, BT has a maximum total dose limit, which affects how many muscles can be addressed with this treatment (Dressler et al., 2021). Therefore, although potentially beneficial, consideration of BT for this patient was debated due to the number of muscles affected. A multidisciplinary decision was made to prioritise BT treatment for fingers, wrists and elbows due to the impact these contractures were having on hygiene and skin integrity. Multimodal therapy is considered optimal for treatment of spasticity (Dressler et al., 2021), and therefore other interventions such as serial casting, other oral medications and intrathecal baclofen were also trialled.

For the initial three months of the patient's admission, they were unable to be safely seated in a chair and were also unable to use even specialised shower chairs. This resulted in the purchase of a shower trolley for the neurosurgery ward, providing another option for safe showering for such patients. Clinical interventions such as routine tracheostomy tube changes were challenging due to increased muscle tone. The patient's clinical status encouraged nursing staff to be creative with care, for example nursing staff conducting tracheostomy tube changes in the interventional radiology setting whilst the patient was anaesthetised, to minimise risk or discomfort to the patient. At various times throughout the patient's journey, he developed grade 1 and 2 pressure injuries to the palms of his hands, chest and feet due to the spasticity and contractures. Whilst individual interventions did not appear to produce significant improvements, over time, multimodal therapies demonstrated some benefits, with the patient eventually being able to sit in a wheelchair for extended periods.

Challenges in nursing care

In a reflective article, a neurosurgeon Kondziolka (2023) stated that "neurosurgery nursing is its own calling… and to become

involved in the care of patients with challenging and debilitating neurological disorders… is a commitment toward excellence". Neurosurgery nursing care is complex, and with advances in critical care resulting in more patients surviving initial neurological insults, patient acuity is increasing. A 2022 study found that nursing care in neurosurgery settings increases patient self-rated quality of life and decreases incidence of adverse effects (Jing et al., 2022). Furthermore, the study found that more detailed nursing care which encompasses the holistic care of the patient increases these outcomes further, resulting in increased staff satisfaction (Jing et al., 2022). Therefore, it is reasonable to deduce that in environments where nurses are unable to provide this higher quality care, caused by issues such as staffing or resource constraints, staff satisfaction may be reduced. This is seen frequently in the local practice setting, where inability to provide high quality nursing care for all patients results in self-reported reduced job satisfaction and increased burnout. It is not uncommon for nurses to stay beyond the end of their shift, working unpaid overtime to finished perceived essential patient tasks, or documentation that has been delayed by completion of patient tasks.

Whilst neurosurgery nursing is complex and requires satisfactory knowledge of neurosurgery physiology and conditions, it also requires significant emotional labour. Emotional labour is the requirement of nursing staff to regulate emotions to manage patient and family distress and to build and maintain therapeutic relationships (Zhang, 2024). Nurses are susceptible to work-related stress, burnout and compassion fatigue, due to this emotional labour. Effective management of emotional labour results in increased nursing wellbeing and job performance (Zhang, 2024). This case, requiring nurses to care for a young patient with severe injuries and complications over several months, whilst also supporting family members, required significant emotional labour from nursing staff. The nature of this case, with the patient and family from a more rural geographical location, meant that nursing staff became the support system for family. This posed a challenge for the nursing leadership team to ensure that nursing staff were provided with support to address the increased emotional labour that these types of cases may carry. This also highlighted that there is a lack of resources and tools for those in leadership positions to provide such support.

Educational challenges and impact on care

Anecdotally in the local practice setting, it is recognised that neurosurgery nursing is highly specialised and thus increased knowledge and detailed nursing care results in better patient outcomes. However, this requires extensive education. Delivering nursing education is increasingly challenging in the post-COVID pandemic era. Whilst there is evidence across the literature which supports this challenge for undergraduate students (Head et al., 2022), there is little evidence detailing this within the current nursing workforce. Ongoing staffing challenges have resulted in staffing shortfalls, and a more junior workforce in the local neurosurgical unit. There has also been a shift identified in nursing attitudes towards education, where the value placed on education has decreased, in favour of completing the practical, clinical tasks. Change-fatigue also increased through the pandemic, where nurses were constantly being educated on new processes and pro-

cedures and adapting to change (Arcadi et al., 2021). This is exacerbated by the increased patient acuity, resulting in nurses making decisions to commit their time to bedside nursing care rather than attending structured education sessions. The perception that structured education is a lower priority is increasingly noted in the practice setting, however there is little evidence in the literature which reflects this shift.

Due to the complexities of this patient's care, educational challenges were identified in ensuring that junior staff were provided with both the neurosurgical knowledge and support, to provide a high standard of care. In this case, it was anecdotally noted that this patient had an increased number of medical reviews when cared for by less experienced nurses, particularly due to their PSH symptoms. In comparison, experienced neurosurgery nurses were able to confidently utilise their knowledge and critical thinking skills to implement strategies and increase observation prior to determining if medical review was necessary. Experience and reflective practice have been identified as essential to the development of nurses' critical thinking, which requires time as well as support and guidance from senior staff (Khalil & Hashish, 2022). Senior nursing staff faced the conundrum of educating junior staff that accepting vital signs outside of normal parameters, may be appropriate in certain scenarios, which is contrary to usual protocols. On other occasions, medications such as beta blockers would be withheld as thought to be not necessary based on vital signs, as the pathophysiology of PSH and treatment with beta blockers was not well understood by less experienced nurses, resulting in a subsequent exacerbation of PSH symptoms. Furthermore, it appeared less experienced medical staff were more likely to initiate further investigations such as septic screens. This patient underwent a large number of septic screens due to the symptoms of his PSH. Of note this included multiple chest x-rays and additional blood tests or blood cultures. High level clinical judgement and experience is essential for medical staff to determine whether these assessments were necessary or potentially of low value. Disruption in training for medical officers following the COVID-19 pandemic may be a limiting factor in developing such clinical judgement (Seifman et al., 2021). Low value care can be defined as treatment or tests that are regularly used in practice but may be inappropriate due to lack of evidence, and therefore may expose patients to unnecessary adverse events, radiation from additional tests, or incidental findings that are insignificant (Moore et al., 2022). Low value care also contributes significantly to healthcare costs (Moore et al., 2022), with up to 30% of healthcare costs hypothesised to be related to unnecessary interventions (Kulkarni, Leykum & Moriates, 2021). Local influence is considered the most influential factor in reducing low value care, with staff collaborating with and learning from their colleagues to change behaviour (Kulkarni, Leykum & Moriates, 2021). This reiterates the need for experienced senior staff to provide education and guidance, overseeing care of such complex patients.

Conclusion and questions for the future

Reflections on this case study raised several questions for future practice in the neurosurgery nursing setting that currently remain unanswered. It is widely accepted within the local facility that neurosurgery patients are best cared for in the acute neurosurgery ward. Furthermore, patients or their families

consistently request to be cared for on the neurosurgery ward on readmissions, relevant medical teams request their patients be cared for on the neurosurgery ward, and bed management acknowledge the importance of locating these patients on the neurosurgery ward. Whilst there is evidence to demonstrate the improved outcomes of stroke patients in specialised stroke units, there is minimal evidence in the literature on the effect of specialised neurosurgical units on improved outcomes or the associated intricate nursing skills that we recognise improve the quality of care provided to complex neurosurgical patients (Geraedts et al., 2022). So, how can we capture and demonstrate this perception that neurosurgery patients cared for on acute neurosurgery units have better outcomes? Additionally, how do we equip nursing staff with the necessary critical thinking and clinical reasoning to care for such complex patients in this current environment of increased acuity and decreased resources? And how might that influence the incidence of low value care? These unanswered questions may guide future research and quality improvement activities.

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