Clustered stroke patients on a general medical unit: What nursing skills and knowledge contribute to optimal patient outcomes?

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Abstract
The purpose of this paper is to explore the nurse’s role in caring for adult stroke patients, both ischemic and hemorrhagic, who are clustered on general medical units. There is evidence in the literature that having patients cared for in a dedicated stroke unit improves patient outcomes by decreasing disability and mortality rates for stroke survivors. However, having a dedicated stroke unit may not be practical or feasible because of the population distribution, particularly for smaller urban and rural communities. Therefore, training nurses on the general medical units to provide care to clustered stroke patients requires specific skill training. This will decrease hospital stays and improve patient outcomes, as a result of specialized trained health care workers. A review of the literature indicates that there are specific skills and knowledge the nurse requires to perform evidence-based best practice therapy and have optimal patient outcomes when caring for patients on general medical units.

Key words: organized stroke units, nursing care, acute stroke care, clustered stroke care

Résumé
Le présent document a pour but d’examiner le rôle de l’infirmière ou de l’infirmier dans les soins aux patients adultes atteints d’un AVC ischémique ou hémorragique qu’on a regroupés dans des unités de médecine générale. La documentation prouve que soigner les patients dans des unités spécialisées dans les soins de l’AVC améliore les résultats des patients, car cela réduit les taux d’invalidité et de mortalité chez les victimes d’AVC. Cependant, il n’est pas toujours pratique ou possible de posséder une telle unité du fait de la répartition de la population, en particulier pour les collectivités urbaines ou rurales plus petites. Il est donc nécessaire de donner une formation professionnelle spécifique aux infirmiers et infirmières de ces unités de médecine générale afin de soigner les groupes de victimes d’AVC. La présence de fournisseurs de soins de santé ayant reçu une formation spécifique réduira la durée du séjour à l’hôpital des patients et améliorera leur état de santé. Une étude de la documentation révèle que les infirmières et infirmiers doivent avoir acquis des aptitudes et des connaissances particulières afin de fournir des traitements optimaux qui soient fondés sur des données probantes, et ainsi obtenir les meilleurs résultats possible chez les patients hospitalisés dans des unités de médecine générale.

Mots-clés : unités d’AVC organisées, soins infirmiers, soins de l’AVC aigu, soins de l’AVC regroupés

Stroke is the number one cause of adult disability in North America (Canadian Stroke Network, 2011; Green & King, 2011; Justice, Howe, Dyches, & Heiferson, 2008) and the third leading cause of disability in the developed world (Stroke Unit Trialists’ Collaboration, 2013; Struwe et al., 2013). Stroke is a multifaceted disease and involves the skills, efforts and knowledge from a coordinated interdisciplinary team in treating the stroke patient (Kalra & Langhorne, 2007; Summers et al., 2009). There is evidence in the literature that having patients cared for in a dedicated stroke unit improves patient outcomes by decreasing disability and mortality rates for stroke survivors (Saposnik et al., 2011). Unfortunately, the percentage of patients who spend any time on a stroke unit after being admitted with a stroke is low, only 53%, which is undesirable in terms of optimal outcomes (Heart & Stroke Foundation, 2014).

While it is not feasible to have a dedicated stroke unit in every community, how can these patients be best cared for at smaller urban and rural centers with lower stroke admission rates? According to the Heart and Stroke Foundation: Canadian Stroke Best Practice Recommendations (2014), having four patients in the facility at any one time defines clustered patients on a general medical unit. What is not clear is the expertise necessary for acute care nurses located in these smaller centres to provide best practice for optimal patient outcomes. Therefore, the purpose of this paper is to determine and explain what acute nursing knowledge and skills are required to achieve optimal patient outcomes for adult stroke patients, both ischemic and hemorrhagic, clustered on a general medical unit.

Methodology
Published literature on the topic of stroke and nursing care for adult stroke patients while on an acute care unit was compiled. Two search strategies were used. The first approach involved using the following search terms, “organized stroke units”, “nursing care”, and “acute stroke care”, by accessing academic databases such as CINAHL, MEDLINE, Cochrane Library and ProQuest Nursing & Allied Health for articles. The second strategy involved reviewing the reference lists of key Canadian

The first step was to review the title of the article and then the abstract. If deemed relevant for the purpose of this paper the full text was reviewed. Criteria for inclusion in this paper was that the articles were peer reviewed, published after 2004, and contained information on nursing care beneficial to acute stroke patients. This process generated more than 75 articles of which 47 documents were deemed relevant. These articles were utilized for the paper.

**Review of the literature**

Organized stroke units are recommended for caring for stroke patients (Stroke Unit Trialists’ Collaboration, 2013). Admission to a stroke unit signiﬁcantly contributes to reducing the social and economic aspects of the burden of stroke (Di Carlo et al., 2011). A dedicated stroke unit is a unit where only acute stroke patients are admitted and treated (Lindsay et al., 2005). The necessary acute care nursing skills and practices that are required to produce optimal patient outcomes in caring for acute stroke patients was identiﬁed in the literature review. Clustering stroke patients alone does not translate into improved patient outcomes; instead it is the ability to apply the nursing skills and knowledge in a timely manner that leads to favourable patient outcomes (HSF, 2014). The Stroke Unit Trialists’ Collaboration (2013) identiﬁed important components of organized inpatient stroke units (p. 8). These include a coordinated interdisciplinary rehabilitation team, comprising nursing staff, physiotherapist, occupational therapist, speech language pathologist [SLP], registered dietitian [RD], pharmacist, recreation therapist, social worker and chaplain), neurologist or specialist on staff, involvement of the caregivers, and a regular education program for the nursing staff are also key (Stroke Unit Trialists’ Collaboration, 2013).

Hyperacute care for the stroke patient predominantly involves the emergency medical services (EMS) and the care delivered in the emergency departments (ED) where blood work and a CT scan are performed. Here the etiology of the stroke is determined, and treatment initiated in the ﬁrst few hours of a stroke (HSF, 2014). Acute care focuses on continuing to stabilize the patient; preventing deterioration and medical complications during the following days. Topics and information presented below have been identiﬁed as best practice in the acute nursing care of clustered stroke patients (Summers et al., 2009). In particular, education for nurses is crucial, as their nursing practice reﬂects their knowledge and skill sets in all of the following areas (Stroke Unit Trialists’ Collaboration, 2013).

**Telestroke**

Patients who have suffered a suspected stroke require an examination from a specialist, preferably a neurologist (HSF, 2014). Telestroke (Telehealth) improves access to best care. It is a comprehensive method for connecting with a Stroke Neurologist from a comprehensive stroke centre who can expedite treatment for patients (Jeerakathil et al., 2012; Rudd, 2011). Telestroke allows the physician to visualize and examine the patient remotely from a larger stroke centre (Rudd, 2011).

**Stroke order sets**

Physician stroke order sets are speciﬁc standing orders that direct care for the patient and address lab work, diagnostic imaging tests, cardiac tests and other items related to stroke and assessment of the patient’s condition. Examples include monitoring of blood pressure (BP), level of consciousness (LOC) changes, nutrition and swallowing, and standing orders for certain medications (Summers et al., 2009). Stroke order set guidelines were published by Heart & Stroke Foundation: Canadian Stroke Best Practice Recommendations (2014) and reﬂect evidence-based best practice research for neurologists to consider when developing their own institutions stroke order sets.

**Clinical pathways**

Clinical pathways contain evidence-based recommendations for plan of daily care (Struwe et al., 2013). They are used to guide the nursing team in managing stroke patients and coordinating the care, discharge planning, lab work and DI tests (Summers et al., 2009). Use of these pathways results in a decrease in hospital costs, decrease in readmission rates, reduction in the length of stay (LOS), and enhanced usefulness of outcome measurement and quality improvement (Summers et al., 2009, p. 2922). Green et al. (2011) found that “nurses play a key role in the implementation of evidence-based recommendations” (p. 15) and clinical pathways ensure the recommendations are followed daily.

**Nursing care**

Nurses monitor the patients on an ongoing basis: 24 hours, seven days a week, and observe and report any variations in the physiological and psychological status of the patient (Seneviratne, Mather, & Then, 2009). Nurses need to undergo specialized training in order to develop communication skills that enable them to effectively converse with the patient who has aphasia. Nursing feedback helps support decisions made regarding management and treatment (Cowey, 2012). Assessments listed below were identiﬁed in the literature as knowledge and skills that nurses require to care for the acute adult stroke patient (Summers et al., 2009). By developing expertise in acute stroke practice, the nurse can help to minimize or even prevent many complications that may arise (Lindsay et al., 2008).

**Neurological assessment**

**Knowledge**. Detecting changes (even subtle differences) in neurological status is vital to understanding, managing and recognizing alterations in neurological function, as well as predicting outcomes in patients who have experienced a stroke. Ongoing neurological vital signs, head-to-toe assessment, and effective use of the tools to determine the neurological status are important. The neurological assessment includes assessing the level of consciousness (LOC) and cognitive status (arousal, alertness and orientation) using the Glasgow Coma Scale (GCS) and by applying the National Institute of Health Stroke Scale (NIHSS) to determine stroke severity (NIHSS, 2014; Niemi, McErlane, & Tillett, 2013).
The GCS, which has “three components: eye opening, verbal response and motor response”, is widely used to assess and record the LOC in patients (McNutt, 2007, p. 69). The GCS is a reliable predictor of outcomes in head injured patients, including those who experience an acute stroke, when combined with the patient age and pupillary response (McNutt, 2007). Cerebral edema, mass effect and seizures are some of the complications screened for by observing the patient and taking the vital signs and GCS on a frequent basis (Hickey, 2009). Level of consciousness is the first change noted if a patient is deteriorating. By recognizing this variation in LOC early, the nurse can notify the physician and the change can be addressed (Hickey, 2009). Performing a head-to-toe neurological assessment at the beginning of each shift and at frequent intervals during the shift allows the nurse to gauge any alterations in neurological status (Hickey, 2009). The NIHSS provides the nurse with a “snapshot” of how the patient is faring at that particular moment in time and allows for ongoing evaluation of progress (Jauch et al., 2013; Gocan & Fisher, 2008). The NIHSS tests a number of the cranial nerves and permits the nurse to identify where some of the difficulties originate (Hickey, 2009).

**Skill.** GCS is performed in conjunction with vital signs and neurological assessment at least every four hours in the initial acute care phase (HSF, 2014). It is imperative that all nurses working with acute stroke patients have their certification in the NIHSS (NIHSS, 2014). The NIHSS is performed on the days deemed important by the stroke orders, or as needed by the nurse (HSF, 2014). Monitoring for any kind of seizure activity is necessary, as seizures are only treated if observed (APSS, 2010).

**Blood pressure (BP) assessment and management**

**Knowledge.** Hypertension is the most important modifiable risk factor for primary and secondary stroke prevention (Lindsay, 2008, p. 58). The use of anti-hypertensive agents and education on lifestyle modifications are recommended to decrease the risk of another stroke (Lindsay, 2008). Hypertension is often observed during and following an acute stroke, normalizing within a few days (Weiss et al., 2013). Continued hypertension may be attributed to an increasing intracranial pressure (ICP), pain, full urinary bladder, hypoxia, pre-existing hypertension and cerebral hemorrhage (Hickey, 2009; Summers et al., 2009).

In the initial 24-hour period, BP reduction management in ischemic strokes is required for BP greater than 220/120 mmHg (Jauch et al., 2013) while guidelines for intracerebral hemorrhagic strokes are to maintain the systolic BP less than 180 mmHg (Qureshi, 2013). It is important to note that there is a risk of increasing cerebral ischemia when the BP is lowered excessively or too rapidly in the acute phase, as decreased blood flow to at-risk cerebral tissue occurs (Jauch et al., 2013). The brain has already been compromised by the stroke, therefore the BP has to be lowered cautiously (<15%-25%) (Summers et al., 2009). After the acute phase, target blood pressure parameters aim to keep the blood pressure lower than 140/90 mmHg for non-diabetic individuals and 130/80 mmHg for patients with diabetes (HSF, 2014).

**Skill.** Measuring BP at least every four hours in the initial phase (48 hours) identifies any hypertensive episodes that may need to be treated (HSF, 2014). Knowledge about BP guides the nurse in identifying potential problems.

**Temperature assessment and management**

**Knowledge.** “Hyperthermia (temperature greater than 37.5°C) is associated with poorer outcomes and is associated with more severe neuronal injury” (Hickey, 2009, p. 603). Aggressive treatment of an elevated temperature is essential, as neurological deterioration can occur (Hickey, 2009). A combination of increased ICP and cerebral ischemia can result from a decreased oxygen (O2) supply, as a direct effect of hyperthermia (Hickey, 2009). Shivering, which can accompany fever, may also cause increased ICP and should be prevented whenever possible (Hickey, 2009). Searching for a cause of the fever is recommended (Lindsay et al., 2008).

**Skill.** Frequent monitoring of temperature (every four hours for the first 48 hours) and as needed (prn) in the post stroke phase is vital (Lindsay et al., 2008). Treating the elevated temperature with antipyretics (eg. acetaminophen [Tylenol]) and mechanical measures such as tepid sponge, light bed linen and/or clothing and antimicrobial therapy (as required) may be necessary to lower the temperature (Lindsay et al., 2008; Jauch et al., 2013).

**Respiratory management**

**Knowledge.** Ensuring patency of the airway and adequate oxygenation of the patient, following acute stroke, is critical to prevent hypoxia and further neurological injury to the cerebral tissue (Hickey, 2009). Hypoxia is defined as oxygen saturation levels “less than 96% for greater than five minutes within the first 48 hours of a stroke” (Jauch et al., 2013, p. 888). Changing position of the patient at least every two hours helps prevent pooling of the secretions in the lungs on the dependent side, which potentially leads to a hypostatic pneumonia (Hickey, 2009). An increase in oxygen needs (as evidenced by low oxygen saturation levels) indicates an adverse change in respiratory function (Hickey, 2009).

**Skill.** The respiratory assessment includes: observing the respiratory rate, taking the oxygen saturation levels with pulse oximetry, administering oxygen to maintain optimal oxygen saturation levels, (88-92% for patients with COPD [Austin et al., 2010] and greater than 94% for hypoxemic individuals [Jauch et al., 2013; HSF, 2014]), performing auscultation of the lung fields and reporting any abnormalities heard (Hickey, 2009).

**Swallow screen**

**Knowledge.** Dysphagia is a major concern for the stroke patient and is present in more than half of stroke patients (Martino et al., 2008). Martino et al. (2008) devised the swallow screen, Toronto Bedside Swallowing Screening Test (TOR BSST), which is sensitive, simple, highly predictable and reliable in detecting dysphagia in stroke patients (p. 559). The stroke patient should be referred to an RD within 48 hours of admission to ensure nutrition and fluid needs are ordered. Different textures may be ordered depending on the assessment from the SLP (Lindsay et al., 2008).

If the patient fails the TOR BSST or swallow screen and can have nothing by mouth (NPO), then meticulous oral care using a suction toothbrush should occur every two to four hours. This frequent oral care decreases the risk of aspiration pneumonia in patients with dysphagia. When the secretions are not...
allowed to accumulate in the oral pharyngeal area, the bacteria cannot collect and inadvertently enter the trachea and subsequent lungs.

**Skill.** All nurses working on a clustered stroke unit should be certified in performing the TOR BSST. The TOR BSST should be performed within 24 hours of admission (HSF, 2014) so any swallowing difficulties that might lead to complications can be detected early (Jeerakathil et al., 2012). Frequent oral care using suction toothbrushes is required on all patients, but most meticulously on those patients that are NPO (HSF, 2014).

**Hydration and nutrition**

**Knowledge.** Hydration and nutrition are both important for recovery (Summers et al., 2009). If the patient is kept NPO because it is unsafe for the patient to eat or drink, then an intravenous (IV) infusion of normal saline is recommended to help maintain hydration (Summers et al., 2009; Jauch et al., 2013). If a patient becomes dehydrated or hypovolemic, there is the potential for hypotension to occur and the brain to receive decreased blood flow and potentially exacerbate cerebral ischemia (Summers et al., 2009). At some point during the first few days, enteral feeds must be initiated as a strategy to meet nutritional and recovery needs in patients who are NPO (Lindsay et al., 2008). If the patient has a continued inability to swallow safely, then a tube may be inserted into the stomach for longer term feeding (Jauch et al., 2013).

**Skill.** Maintaining an IV is vital for the infusion of normal saline to maintain adequate hydration. If the patient is unable to swallow during the first few days, a nasogastric feeding tube is inserted. The patient requires nutrients if they are going to heal. The RD is responsible for calculating the nutritional needs of the patient. The appropriate enteral feeding formula is chosen and monitored by the nurses and RD (Lindsay et al., 2008).

**Blood glucose assessment**

**Knowledge.** Diabetes mellitus is a major risk factor for stroke and up to one third of all stroke patients admitted to hospital have diabetes mellitus (Laird, 2014). The acceptable blood glucose parameters for a patient with hyperglycemia are levels between 7 mmol/L and 10 mmol/L (Jauch et al., 2013). Hyperglycemia is also associated with increased risk of hemorrhagic transformation (hemorrhage after t-PA or ischemic stroke), as well as a risk of a future stroke (Laird, 2014). Hyperglycemia is associated with the stress response, inflammatory response and any pre-existing glucose abnormality (Jauch et al., 2013). Administering glucose solutions is contraindicated in this patient population, as high blood glucose levels have a detrimental effect on neural tissue following an acute brain injury (Summers et al., 2009; Jauch et al., 2013). Similarly, hypoglycemia is undesirable, as it mimics stroke-like symptomology (Summers et al., 2009). Measuring the patient’s hemoglobin A1C (HbA1C) may help gauge blood glucose abnormalities occurring in the three months prior to the stroke.

**Skill.** All patients admitted with a suspected stroke should have their blood glucose checked immediately (Lindsay et al., 2008). Hypoglycemic and hyperglycemic episodes should be avoided. As a result, frequent blood glucose monitoring is necessary (Allport et al., 2006; Summers et al., 2009). Any hypoglycemic or hyperglycemic episodes should be treated (Lindsay et al., 2008).

**Lipid management**

**Knowledge.** Fasting serum lipid levels should be measured on all patients who experience stroke (HSF, 2014). High cholesterol levels lead to plaque build-up in the arteries (atherosclerosis), which causes narrowing of the artery lumen and leads to elevated BP (Anderson et al., 2013). To maintain the LDL cholesterol level below 2.0 mmol/L (the recommended level) many patients require a lipid lowering medication, usually a statin (HSF, 2014). The RD also educates the patient on dietary changes that could be helpful in decreasing sources of ingested cholesterol.

**Skill.** The nurse needs to ensure a proper fasting lipid test occurs and that the patient receives the appropriate teaching about the lipid lowering medication and its potential side effects.

**Language and speech**

**Knowledge.** Nurses need to develop effective expertise and communication skills to assess the patient’s ability to communicate. This is especially significant when the patient has suffered a left hemispheric stroke, as the major language centres are located in the left frontal (Broca’s area) and left temporal (Wernicke’s area) lobes (Hickey, 2009). The type of aphasia can vary from being specific to more global, depending how much brain tissue is involved. Broca’s aphasia is when the person has problems converting thoughts into meaningful language (expressive aphasia), while an individual with Wernicke’s aphasia has impaired comprehension of the language (receptive aphasia) and can pronounce the words, but they usually make no sense (Hickey, 2009, p. 118). If the stroke is extensive, with a large portion of the brain being damaged, the person may suffer a global aphasia where both major language areas are affected (Hickey, 2009, p. 118). Apraxia and dysarthria are motor speech disorders characterized by disruptions or abnormalities of movement parameters (Duffy, 2008; Hickey, 2009).

**Skill.** Recognizing what area of the brain is involved and interacting with the patient allows the nurse to identify issues that the patient is having with the understanding, translation and expression of thoughts into speech. The clarity of the patient’s speech aids the nurse in the accuracy of her assessment. Collaborating with an SLP assists the nursing staff to reduce communication challenges: the use of gestures, augmentative communication devices and eye movements can aid the health care team in identifying the patient’s needs.

**Urinary continence care**

**Knowledge.** Establishing a baseline for urinary continence begins on admission by determining the patient’s urinary function prior to the stroke, including issues with dribbling, incontinence or difficulty starting their stream (Woodward, 2013a). Between 40% and 60% of all people admitted to hospital following a stroke experience urinary incontinence and 15% continue to experience incontinence at one year (Thomas et al., 2009; Woodward, 2013a, p. 31). The problem is either with the storage of urine (incontinence) or emptying of the bladder (retention) (Woodward, 2013a, Woodward, 2013b). If the patient is unable to void on their own, intermittent catheterization every six hours may be required to help stimulate normal physiological filling and emptying of the bladder (Summers et
Ultrasound device is useful in determining the amount of urine in the bladder, both before voiding or post-void residuals (Lindsay, 2008). Nurses need to be taught how to properly use a bladder scanner. The use of indwelling urinary catheters is discouraged, as they contribute to urinary tract infections (Lindsay, 2008; Summers et al., 2009).

**Skill**. To deal with these issues, patients can be taught pelvic floor exercises, and encouraged to participate in bladder training, either through prompted voiding or timed voiding (Woodward, 2013b). Pharmacological interventions are available if the bladder training and pelvic floor muscle exercises are not effective alone (Woodward, 2013b). Bladder scans and intermittent catheterizations are performed as indicated on the stroke order set if the patient is unable to void or has a high post-void residual (greater than 150 mL) (APSS, 2010; Lindsay et al., 2008; Woodward, 2013a).

**Bowel care**

**Knowledge**. Harari et al. (2004) studied constipation and fecal incontinence over the 12-month period following stroke; they found that encouraging daily pelvic floor exercises, the use of suppositories (instead of laxatives), bulking agents (rather than stool softeners to avoid anal leakage), increased fluid intake, and diet all contributed to improved bowel function. Constipation, which causes straining while having a bowel movement, results in increased intra-abdominal pressure and ICP and should be avoided (Hickey, 2009).

**Skill**. Identifying when the patient had their last bowel movement helps establish any problems. Use of a bowel routine for constipation or fecal incontinence is suggested for stroke patients (Lindsay, 2008). Incorporating this knowledge, when educating the patients and families, is necessary so that improved bowel function can return over time.

**Visual and spatial neglect**

**Knowledge**. Unilateral spatial neglect (USN) is a term used to describe the inability of the patient to respond, report or orient with any sensory modality to stimuli that is presented to the hemibody opposite to the side of the brain lesion (more often the right brain) (Menon-Nair et al., 2006). Menon-Nair et al. (2006) report that the incidence of USN is found in approximately 30% of all stroke patients. USN makes it difficult for the patient to focus on their needs in their personal space (e.g., combing hair), near extrapersonal space (within arms’ reach) and far extrapersonal neglect (beyond arms’ reach) (Menon-Nair et al., 2006).

**Skill**. Nurses could use a simple test to check for USN by using the comb and razor test to evaluate for personal space neglect (Stroke Engine, 2013). Other recommended tests are the single letter cancellation for near extrapersonal neglect, and the NIHSS for testing personal and near extrapersonal neglect (Menon-Nair, Korner-Bitensky & Ogourtsova, 2007; Stroke Engine, 2013). A member of the interdisciplinary team should test for USN on their initial assessment.

**Cognitive assessment**

**Knowledge**. All stroke patients with hypertension, hyperlipidemia, diabetes, and older than 65 years of age are at a high risk for cognitive and perceptual impairment (Lindsay et al., 2008). For every patient who exhibits stroke symptoms, there are up to nine people who have covert strokes that exhibit cognitive impairment (Bayley et al., 2008). Screening for cognitive impairment using validated assessment tools should be completed to investigate the cognitive status of the patient (Lindsay et al., 2008). Areas addressed include: “arousal, alertness, attention, orientation, memory, language, agnosia, problem-solving, planning, insight and judgement” (Lindsay et al., 2008, p. S17). Two tests utilized include: Montreal Cognitive Assessment (MoCA) and Mini-Mental Status Examination (MMSE) (Lindsay et al., 2008; Hickey, 2009).

**Skill**. An abbreviated bedside assessment can be done to evaluate the patient's cognitive function (Hickey, 2009). Higher level deficits may be more difficult to detect, as the patient may have devised methods to compensate for any deficiencies (Hickey, 2009). Nursing staff can collaborate with other members of the interdisciplinary team to identify and implement strategies that assist the patient and their family members to manage any cognitive limitations.

**Mobility**

**Knowledge**. Regaining mobility is a vital part of the rehabilitation process following a stroke (Lindsay et al., 2008). Activities involving moving the patient in bed, transferring the patient from bed to chair, sitting in a chair and walking constitute mobilizing the patient (Lindsay et al., 2008). To decrease the complication of pneumonia, venous thromboembolism (VTE), pressure sores and dislocation of the shoulder, nursing care needs to focus on skin integrity, careful positioning and handling of the patient when turning and mobilizing, and pressure area risk evaluation (Ringelstein et al., 2013). Falls pose a considerable safety risk post stroke and it is every health care professional's responsibility to assess the patient's abilities and need for assistance to minimize this risk (Summers et al., 2009).

**Skill**. Safely mobilizing the patient as soon as possible for chair sitting and walking is crucial. Changing the patient's position at least every two hours while they are in bed or in the chair decreases the chances of the patient developing pneumonia, pressure area or a VTE. Identifying the patients who are at risk for falling and using appropriate precautions, mobility aids and levels of assistance are part of the mobility assessment.

**Venous thromboembolism (VTE) prophylaxis**

**Knowledge**. Stroke patients are considered to be at high risk for developing a VTE because they are paralyzed on one side and may be immobile (Lindsay et al., 2008; Summers et al., 2009). To avoid deep vein thrombosis (DVT) and pulmonary embolism (PE), all patients should be mobilized as soon as possible, be adequately hydrated, and started on prophylactic subcutaneous (sc) anticoagulation medication, either low molecular weight heparin (acute ischemic strokes) or unfractionated heparin (renal failure) (HSF, 2014, section 4, p. 17; Lindsay et al., 2008). If the patient has experienced a hemorrhagic stroke, the physician needs to monitor the size of the bleed with additional CT scans; this ensures no stroke expansion after the patient has been started on heparin (HSF, 2014, section 4.2.2).
Understanding the modifiable risk factors associated with neuroimaging and diagnostic investigations include: CT scan, cerebral angiography, MRI, carotid Doppler and echocardiogram. These tests are critical to the diagnosis and determining the etiology of the stroke (Jeerakathil et al, 2012; Summers et al., 2009). Explaining each of the tests to the patient and family is important and contributes to developing a trusting relationship with the patient and family.

Nurse's role in education of patient and family
The sudden signs and symptoms of a stroke are considered a medical emergency (HSF, 2014). It is essential that patients and families are educated about stroke and are able to recognize and respond to the signs and symptoms of acute stroke. Understanding the modifiable risk factors associated with stroke is important for secondary prevention (Cameron, 2013; Dombrowski et al., 2013; Justice et al., 2008). This is especially important in improving public awareness and ensuring a quick response if symptoms recur (Cameron, 2013; Dombrowski et al., 2013; Justice et al., 2008). The risk factors to be discussed include: hypertension, diabetes, dyslipidemia, cardiac disease, smoking, excessive alcohol consumption, drug abuse, obesity and physical inactivity (Graham, 2008; Jeerakathil et al, 2012).

Interactive discussion with the patient and families is desirable to review the risk factors related to stroke and to ensure transfer of knowledge about the patient's progress; the goal is to lessen the occurrence of another stroke (Cameron, 2013; Lindsay et al., 2008). It is necessary to educate the patient and family regarding the current medications (benefits and side effects) the patient is taking (Graham, 2008).

Rehabilitation
Discharge planning and rehabilitation begin on admission on the clustered stroke unit with the use of an interdisciplinary team (Lindsay et al., 2008). The smooth transition from the hospital to home involves effective discharge planning (Summers et al., 2009). Improved patient outcomes are dependent on having support systems, both family and community, in place for the patient when discharged (Summers et al., 2009). For patients not needing in-hospital rehab, the Early Supported Discharge (ESD) program is valuable; an interdisciplinary team treats the patient in their home environment for five days a week (HSF, 2014, section 5.4.2). This program has shown to be a cost-effective method of discharging the patient to their home with therapy supports (Langhorne et al., 2013).

Palliative care
In the initial phase, all stroke patients should have access to acute stroke care, whether on a dedicated or clustered unit (Burton & Payne, 2012). When it is identified that the patient experiencing stroke is not going to survive the devastating event, palliative care then becomes necessary (Burton & Payne, 2012; Cowey, 2012; Payne et al., 2010). Palliative care needs to be integrated within the acute stroke care model (Burton & Payne, 2012). Palliative care encompasses the time period months before death, while end-of-life is the component of palliative care when death is imminent (Cowey, 2012). Planning for palliative care with patients who experience a sudden acute stroke and die within the first 30 days is difficult to prepare for, as it is such an unexpected event for the patient and family (Payne et al., 2010). In 2011–2012, the 30-day mortality rate post-stroke was 17.9% in Canada (HSF, 2014). According to the qualitative study by Payne et al. (2010), families want their loved ones to die in peace and with dignity. In order for nurses to be effective in palliative care treatment, education and training has to be provided that incorporates the integration of palliative care on an acute stroke unit (Burton & Payne, 2012).

Discussion
Patients who experience stroke take a high-priority status in treatment requiring a skilled nursing and interdisciplinary team, as the sudden signs and symptoms of a stroke are considered a medical emergency (HSF, 2014). The majority of patients do not present early enough to receive the clot buster (t-PA) drug. Therefore, care provided on an acute designated stroke unit or
clustered within a general medical unit can significantly impact the survival and reduction of disability and length of stay (LOS) for patients (Stavem et al., 2011). Acute care focuses on stabilizing the patient, as well as preventing deterioration and medical complications during the first few days following for either an ischemic or hemorrhagic stroke (HSF, 2014).

Improved patient outcomes occur when proper acute stroke care is provided (McCann, Groot, Harnley & Gardner, 2009; Saposnik et al., 2011). It is the responsibility of the nursing staff to apply the nursing skills and knowledge in a timely manner to ensure patient outcomes are optimised (HSF, 2014). All nurses require certification in the NIHSS and TOR BSST (swallow screen) as part of their qualifications to work on a clustered stroke unit. To be effective, medical units providing care for clustered stroke patients need skilled nursing staff who collaborate closely with an interdisciplinary team (Brooke & Walia, 2013; Langhorne et al., 2013). The focus of this interdisciplinary team is early rehabilitation and incorporation of a number of complex interventions, management of physiological variables such as vital signs (BP, pulse, respiratory function and oxygenation), hydration and nutrition, early swallow screen, and early mobilization (Brooke & Walia, 2013; Langhorne et al., 2013). An awareness of the complications that can occur following a stroke is necessary; care is directed towards preventing or reducing those complications. Jeerakathil et al. (2012) states that the most common complications include: “pneumonia, urinary tract infections (UTI), falls, seizures, decubitus ulcer and VTE” (p. 54). The factors that contribute to variations in outcome, reduced hospital stay, rehabilitation in hospital, early supported discharge program and death require specialized training and expert knowledge to prepare the nurse to deal with these type of outcomes. Knowledge and skills requisite for optimal care of the clustered stroke patient are extensive and described under the review of the literature.

In addition, admission to a stroke unit significantly contributes to reducing the social and economic aspects of the burden of stroke (Di Carlo et al., 2011). The financial burden is high with both direct costs (costs around hospital and rehabilitation care) and indirect costs (loss of productivity and future earnings) (Summers et al., 2009). Having dedicated stroke care has been found to be cost effective, primarily due to the decrease in length of hospital stay, improvement in patient outcomes and decrease in long-term care costs (Jeerakathil et al., 2012; Langhorne et al., 2013). Alternatively, a clustered stroke care model (providing care to four or more patients “clustered” on a medical unit), may also impact that financial burden by decreasing costs with skilled nursing staff and a dedicated interdisciplinary team.

**Conclusion**

Based on the literature review, clustered stroke patients on general medical units with nursing staff trained in stroke care would likely improve patient outcomes over what is achievable on general medical units with nurses with no specialized training. When patients are treated on either a dedicated stroke unit or clustered stroke unit, they are more likely to survive the stroke, regain independence and return home compared with those patients who are not treated with specialized care (Stroke Unit Trialists’ Collaboration, 2013). Some of the areas of particular importance include: NIHSS certification, TOR BSST (or similar swallow screen certification), neurological assessment, preventing complications by providing hydration and nutrition, monitoring hypertension, temperature, blood glucose, ensuring mobility and proper positioning, educating the patients and families on the disease process, treatment, rehabilitation processes and patient progress. Having a dedicated stroke unit may not be practical or feasible because of population distribution, particularly for smaller urban and rural communities. Therefore, educating nurses on the general medical units to provide care to clustered stroke patients requires specific skill training.

Keeping the communication open with the patient and family by being honest and transparent in all areas of the care is crucial. Stroke is such an unexpected and devastating event for both the patient and family; effective communication with the patient and family impacts the overall experience. Palliative and end-of-life care are areas where nurses specialized in stroke care can greatly assist the family in dealing with the death of their loved one.

Dedicated and organized stroke unit care is ideal, but it is not always possible. Having well trained and skilled nursing staff specialized in stroke care improves patient outcomes following stroke. Whenever possible, having stroke patients clustered on a general medical unit with nurses who have the specialized nursing knowledge and skill sets, improves patient outcomes, decreases LOS in hospital and has the greatest opportunity of returning the patient home as a functioning member of their community. The hope is a positive outlook for such a devastating disease.

**About the Author**

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