Triage, Treatment and Transfer: Evidence-based clinical practice recommendations and models of nursing care for the first 72 hours of admission to hospital for acute stroke

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Stroke is a medical emergency and care provided in the first hours is critical in shaping patients' long-term recovery and prognosis.[1] There is robust evidence demonstrating significant reductions in death and disability with early interventions in acute stroke care, including antiplatelet therapy[2] stroke unit (SU) care[3] and thrombolysis.[4] International clinical guidelines for stroke provide key recommendations to guide clinical practice,[5-8] however, uptake of evidence-based care is variable and often less than optimal.[9-14] For example, among ischemic stroke patients, rates for treatment with intravenous recombinant tissue plasminogen activator (rtPA) are relatively low in the USA (5%)[9], and Australia (7%)[10], compared to Canada (12%)[11] and some European centers (14%).[15]

Nurses play a pivotal role in rapid identification and triage of acute stroke patients, initial assessment, and coordinating the timely flow of acute stroke patients through the health system, for delivery of relevant time-critical treatments, and rapid transfer to acute SUs for on-going assessment and provision of further treatment (Table 1).

Table 1 about here

The purpose of this paper is to highlight nursing's essential contribution to the expedient delivery of acute stroke care by providing evidence-based recommendations for clinical practice processes of care and models of care where nurses have a pivotal role during the first 72 hours from arrival at the Emergency Department (ED) through to SU care. A more detailed comprehensive overview of nursing and interdisciplinary care for acute ischemic stroke patients extending beyond the first 72 hours previously has been published.[16]

Where available in existing guidelines, the Class and Level of Evidence for recommendations shown in the Tables 2 to 4 have been provided using the American Heart Association taxonomy.[6] As there is a dearth of evidence from high quality stroke nursing research, not all the recommendations described in this paper have been evaluated using randomised

controlled trials. Therefore, we have included examples of clinical models and systems for which lower levels of evidence suggest improvement in patient outcomes or a reduction in barriers to rapid assessment and management of stroke.[17-19] Furthermore, we also have included models of care that emphasize the multidisciplinary team, as examination of nursing care in isolation from care provided by other health professionals does not reflect current evidence based practice. Where no rigorous evidence exists for a recommendation, we have labelled it a 'good practice point' (GPP).[7] Lastly, opportunities for future research are identified in an effort to direct the growth of acute stroke nursing research.

Triage and rapid management

Key processes relevant to emergency nurses that are tied to timely assessment, triage and rapid management of acute stroke in the ED are outlined in Table 2. As urgent administration of thrombolysis provided up to 4.5 hours from symptom onset is one of the few proven interventions for stroke,[4] the aim of rapid triage is to commence immediate assessment of suitability for this treatment. It has been estimated that each 15 minutes of decrease in treatment delay results in one month of additional disability-free life following a stroke.[20] However, triage times[21] and process[22] upon arrival in the ED remain variable.

Use of a 'Code Stroke' alert system has been shown to improve time to diagnosis and treatment, and reduce intravenous rtPA door-to-needle times (Table 2).[17-19] Recently, use of stroke team models led by appropriately trained advanced practice nurses have been shown to be efficient, accurate, and safe at identifying and treating patients with rtPA.[23-26] These teams capitalize on the 24-hours-a-day nature of nursing providing around the clock on-site expert input for both Code Stroke calls, and ongoing acute stroke patient management. Code Stroke advanced practice nurses oversee the diagnostic work up, interpretation of neuroimaging, review of laboratory work, and communicate remotely to physician supervisors about their

estimation of suitability for rtPA treatment. This model of care enables rapid decision making that may significantly reduce door-to-needle times. Advanced practice nurse-led teams offer a method to safely extend vascular neurologist services when an in-house neurologist is unavailable 24 hours a day[23-25] and to augment telemedicine services.[26]

Table 2 about here

Transfer

Organised SU care significantly reduces death and disability[3] and improves processes of care[30] as grouping patients together by clinical specialty is associated with improved outcomes.[31] However, overall access to SUs is variable and suboptimal eg 23% (Canada),[11] 58% (Australia);[10] and SU staffing, structure and organization may vary considerably. Timeliness of SU access also may be a critical factor.[32,33] Extended waiting time in EDs for non-stroke specific conditions is associated with poorer outcomes and higher inpatient mortality.[34] While data are limited, better outcomes have been reported in stroke patients with shorter admission times (greater than six hours compared to within three hours),[32] and earlier admission to SU (within 2 days) has been associated with fewer complications.[33] Hence, any unnecessary delays in transfer to a SU likely may compromise patient outcomes, especially for patients requiring complex stroke care and those needing close nursing surveillance. Key nursing elements and models of care that facilitate rapid admission to the SU are shown in Table 3 and include pre-notification of incoming stroke to the stroke team[35] and use of protocols to ensure patients are admitted directly to the SU.[32] The effect of admission to a short-stay ward prior to transfer to a dedicated SU is unknown and requires further research.

Significant variability exists in the nursing qualifications, education/training, and services offered in hospitals throughout the world[36] and this variability is likely also to be reflected in

SUs. Local policies and procedures, often underpinned by nursing care safety concerns (lack of nursing staff, lack of nursing staff with necessary skill mix) may impede direct admission to SUs for the entire hospital admission. For example, in some hospitals an admission to an intensive care unit (ICU) or high dependency unit is required[6] following thrombolysis administration or for those patients requiring more complex care including cardiac monitoring or acute blood pressure management. Specifically, in the United States, SUs commonly are set up as general care wards with a few dedicated beds, and rarely are rtPA treated patients admitted to SUs directly, without first spending 24 hours in an ICU. In contrast, in Australia and Europe, rtPA patients often are admitted directly to SUs that offer an ability to provide close monitoring of these patients. Recent evidence from the USA suggests that an ICU admission solely for monitoring patients post-rtPA may be unwarranted and unnecessarily expensive and that these patients safely can be managed in a SU when nurses have undertaken specialized education and training.[37] Furthermore, admission directly to a SU for rtPA patients improves continuity of care and the opportunity to provide early and consistent education about the stroke event, stroke recovery, and strategies for stroke prevention.

Emerging evidence from the UK has demonstrated improved quality of care and lower mortality in SUs with staffing ratios of ≥3.0 registered nurses/ten beds. The study also found that patients admitted to a SU with 1.5 registered nurses/ten beds on a weekend had a significantly higher adjusted 30-day mortality rate (15.2%) when compared with patients admitted to a SU with a weekend ratio of 3.0 registered nurses/ten beds (11.2%).[38]

Table 3 about here

Monitoring and Treatment

Nurses play a pivotal role in the on-going monitoring and treatment of patients in the first 72 hours of acute stroke (Table 4). Adherence to evidence based processes of stroke care improves patient outcomes[13,30] and many of these are either initiated, administered, or co-ordinated by nurses.[40] Use of clinical pathways and stroke care protocols also improve adherence to evidence-based care[41,42] and patient outcomes.[43] Use of specialised stroke clinical co-ordinators to implement change also can improve SU access, aspirin administration within 24 hours, use of care plans, increased allied health assessments and result in more patients discharged to home.[39]

For all stroke patients, but particularly following administration of rtPA, and those with acute intracerebral haemorrhage (ICH), close and accurate blood pressure (BP) monitoring is required. Non-invasive automatic oscillometric blood pressure monitors commonly are used, but are not recommended for use in patients with atrial fibrillation due to significant beat-to-beat variability. In this situation, manual sphygmomanometers should be considered recording the average of three consecutive systolic and diastolic measurements.[44,45] Importantly, non-invasive oscillometric BP monitors only accurately measure the mean arterial pressure and then algorithmically derive a systolic and diastolic pressure.[46,47] As current stroke BP management guidelines are not based on mean arterial pressure ranges, more research is warranted to refine the use of derived values from these devices in acute stroke patients. Goals for blood pressure levels are outlined in Table 4. In the case of ICH, aggressive blood pressure lowering appears to be safe with potential small improvements in outcome.[48]

Accurate and frequent neurological observation assists in early identification and subsequent management of deterioration.[6] The Glasgow Coma Score is not recommended for ongoing monitoring of ischaemic stroke patients and has been shown to produce a normal score of 15 when the NIHSS in the same patient reflects significant disability.[49] The NIHSS is

recommended as a method to quantify stroke disability and can be validly and reliably performed by nurse.[50] Using the full NIHSS more accurately reflects the vascular territory involved rather than use of a 'cut down' version of the NIHSS which involves an arbitrary selection of assessments that may not be related to the presenting stroke deficit.[49]

Evidence of the impact of a nurse-led multidisciplinary intervention on outcomes in acute stroke was provided by the Quality in Acute Stroke Care (QASC) Trial.[43] Results demonstrated that supported implementation of three clinical protocols for the management of fever, hyperglycaemia and swallowing dysfunction [**Fe**ver, **S**ugar, **S**wallowing (FeSS) clinical protocols] in the first 72 hours of stroke significantly decreased death and dependency by 16% and also significantly reduced temperature, blood glucose level and improved swallowing management. Specifically, the FeSS protocols consisted of: four to six hourly monitoring of temperature with treatment of temperature > 37.5° C with antipyretics; monitoring of glucose levels sixth-hourly and treatment of elevated glucose > 198mg/dl (11 Mol/L) with insulin; and either a swallowing screen by nurses within 24 hours of admission with referral to speech-language pathologist for those who fail the screen, or a swallowing assessment by a speech-language pathologist. This is one of the few trials in stroke nursing care demonstrating that evidence-based nursing care can reduce death and dependency[13,43] and results from this trial reinforce the potential that nursing quality improvement initiatives can have dramatic impact on patient outcomes.

Maintenance of glucose levels of 140-180 mg/dl (7.8 – 10 mmol/L) is recommended.[6] Hyperglycaemic management is important not just for diabetic patients, as hyperglycaemic stroke patients not known to have diabetes (glucose 108 to 144 mg/dL [6 to 8 mmol/L]) have a 3-fold higher risk of death when compared with euglycaemic stroke patients not known to have diabetes.[51] Hence, glucose monitoring for all stroke patients is crucial and often overlooked.[13]

Nurses play a critical role in implementing important clinical processes of care at the bedside, many of which have demonstrated association with improved outcomes.[13,30] These are outlined more fully in Table 4 and include: assessment procedures, early mobilization; avoidance of urinary catheterization; treatment of hypoxia, hyperglycaemia and suspected infection; ongoing rehabilitation policies (eg co-ordinated multidisciplinary team care; and early assessment for discharge).[52] Use of intermittent pneumatic compression,[53] but not compression stockings[54,55] has been shown to reduce the risk of deep venous thrombosis and possibly improve survival in immobile patients following stroke.

Dysphagia is a significant problem following stroke experienced by 42% to 67% of patients within three days of stroke.[56] Patients with dysphagia have a three-fold increased risk of pneumonia[57] and should be nil by mouth until their swallowing ability has been determined.[6] Dysphagia screening should be performed using a validated,[7] evidence-based tool[6] and can safely be undertaken by nurses.[58] A dysphagia screen is defined as '*a pass/ fail procedure to identify an individual who may need a complete dysphagia assessment*'.[59] Patients who fail a swallow screen should be referred to a speech-language pathologist for a full dysphagia assessment.[60]

Determination of stroke pathogenic mechanism is a key area of focus during SU care and guides subsequent secondary prevention therapies. Identification of atrial fibrillation requires either serial ECGs or telemetric cardiac monitoring.[61] Nurses play a vital role in overseeing this aspect of care through inquiry about stroke risk factors and mechanism, reviewing diagnostic test results, and providing advice on secondary prevention measures to prevent future stroke.

Additionally, nurses are responsible for educating patients and family members/carers about their stroke care, including the pathogenesis of stroke, treatment provided, personal risk

factors, medications, stroke signs and symptoms, use of emergency medical services and strategies to reduce further stroke risk. Despite this, recent data show that patients and family members/carers poorly retain information taught to them in the hospital about stroke.[62]

Table 4 about here

A summary of key nursing supported factors guiding stroke care in the first 72 hours are shown in Table 5.[77]

Table 5 about here

Discussion

The clear priority for improving stroke care outcomes is closing known evidence-practice gaps by improving timely access to early interventions with demonstrated efficacy. Nurses play a crucial role in stroke care and they are well placed to take a leadership role in implementing evidence based care within the multidisciplinary stroke team.[40,78] The internationally emerging roles of the stroke advanced practice nurse and stroke nurse practitioner hold great promise for development of new nurse-led models of stroke nursing care, including stroke telemedicine services which could be augmented by inclusion of these nursing roles.[26]

The future for SUs to involve critical care is worthy of consideration where nurses have the appropriate qualifications and experience to undertake complex nursing care such as care of ventilated patients, administration of intravenous insulin, co-ordination of rtPA administration, post tPA recovery, and care of the unstable stroke patient.[6]

Quality monitoring and improvement activities are recommended to ascertain adherence to nationally accepted clinical practice guidelines.[6] Routine collection of quality data in the form of local or national audit[10,11,14,79] or stroke clinical registries[80,81] to measure adherence to

important stroke processes of care is imperative. Use of these data to drive continuous quality improvement in stroke care can benefit patients.[82] Recently published clinical performance measures for acute ischemic stroke have been published by the American Heart Association and American Stroke Association.[83]

Acute stroke nursing research is in its infancy. Encouragingly, there are an increasing number of trials underway exploring vital questions for acute stroke care nursing.[84-88] Nurse researchers also have a pivotal role in conducting implementation research, that is, examination of methods to increase evidence uptake by clinicians.[43,84] Future rigorous clinical and implementation research will help to address gaps in evidence and strengthen existing models of care and clinical guidelines.

Take-home points:

- Rapid evidence-based assessment and management of stroke is fundamental to reducing mortality and disability.
- Nurses have a key role to facilitate multidisciplinary models of care and improve uptake of evidence-based stroke care
- Nurse-led stroke research is paramount to further inform the evidence-base for nursing care

Table 1: Stroke Chain of Survival^ involving nursing care from emergency department (ED) arrival to stroke unit (SU) admission

Triage	Door	Immediate ED triage to high-acuity area
Treatment	Data	Prompt ED interdisciplinary evaluation, stroke team activation, brain imaging, stroke scale scoring, and laboratory studies
	Drug	Timely administration of appropriate drugs or other interventions
Transfer	Disposition	Timely admission to SU, intensive care unit or transfer to a comprehensive stroke center

^ adapted from Stroke Chain of Survival from AHA Stroke Guidelines[6]

Table 2 Triage: Key nursing elements for timely assessment, triage and rapid management of acute stroke in emergency department (ED)

- ***Use of evidence-based rapid stroke screening tools at triage*** such as the Los Angeles Pre-hospital Stroke Screen, the Cincinnati Pre-hospital Stroke Scale (FAST)[27] , or Recognition of Stroke in the Emergency Room Scale (ROSIER)[28] (Class I; Level of Evidence B).[6]
- Assignment of a ***high severity triage category - to be seen within < 10 minutes of ED arrival***[6] - using a standardized triage system such as the Emergency Severity Index (ESI) (GPP).
- ***Systems to urgently notify the hospital Stroke Team*** such as hospital pre-notification and initiation of 'Code Stroke' (see below) (Class I: Level of Evidence B) aiming for rapid brain imaging (Class I: Level of Evidence A), assessment for suitability for rtPA and thrombolytic administration where indicated (Class I: Level of Evidence A) with a 'door-to-needle' time of less than 60 minutes (Class I: Level of Evidence A).[6]
- ***Code Stroke alerts*** including: a) pre-notification: ambulance to the ED or directly to stroke team; and/or ED notification to stroke team; b) rapid assessment of airway, breathing, circulation, and disability (ABCD), with assignment of triage category to be seen in < 10 mins; c) rapid patient registration or use of a pre-registration alias; d) priority use of computed tomography (CT) scanner; e) immediate intravenous access, with blood drawn for standard laboratory tests; f) immediate transfer to CT directly from ambulance after obtaining a brief but thorough history including time last seen normal, anticoagulant use, and medical-surgical history pertinent to thrombolysis risks; g) rapid imaging interpretation by stroke team and completion of the National Institutes of Health Stroke Scale (NIHSS); h) rapid control of arterial blood pressure as indicated by rtPA treatment criteria, with infusion kit brought to CT to expedite treatment; i) rtPA bolus and infusion initiated on CT scanning bed when possible (Class 1: Level of Evidence C).[17,18]
- ***Assessment of initial stroke severity*** using the National Institutes of Health Stroke Scale (NIHSS) on arrival in ED, and prior to and post-treatment with rtPA (Class I: Level of Evidence B).[6,29]
- ***Rapid imaging*** of the brain (Class I: Level of Evidence A)[6] with either non-contrast CT or magnetic resonance imaging within 25 minutes of arrival to the ED with rtPA administration commenced before use of additional imaging sequences (i.e. CT angiography) (GPP).

Key: GPP = Good practice point

Table 3 Transfer: Key nursing elements for rapid transfer of acute stroke patients from the emergency department (ED) to the stroke unit (SU)

- All patients should be cared for in a ***dedicated SU*** (Class I: Level of Evidence A).[3,6]
- ***Rapid transfer*** to the SU from the ED is optimal[32,33, 30] (GPP).
- ***Pre-notification*** of the stroke team may facilitate rapid transfer to the SU on admission (GPP).[35]
- ***Use of stroke protocols*** may facilitate rapid transfer to the SU on admission (GPP).[32]
- ***Formal appointment of a stroke coordinator*** may streamline stroke system processes and strengthen quality improvement of stroke services. (Class I: Level of Evidence C).[39]

Key: GPP = Good practice point

Table 4 Key nursing elements for monitoring and treatment in first 72 hours of acute stroke

Monitoring

- ***Neurological assessment*** with the National Institutes of Health Stroke Scale (NIHSS) to determine deterioration or improvement in neurological condition (GPP).[6]
- ***Continuous oxygen saturation monitoring*** to identify hypoxia and early development of complications (eg aspiration) (GPP).[6]
- ***Cardiac monitoring*** for at least the first 24 hours to determine possible stroke pathogenic mechanism (eg atrial fibrillation) and monitor for possible arrhythmias (Class I: Level of Evidence B).[6]
- ***Blood pressure (BP) monitoring*** every 15 minutes for two hours, then every 30 minutes for six hours, and then every hour for 16 hours in patients undergoing reperfusion therapy (GPP); Ongoing blood pressure assessment to manage titration of antihypertensive medications, and identify patients for improved stroke risk factor management.[6]
- ***Temperature monitoring*** at least every four hours (Class I: Level of Evidence B) to determine the need for treatment of hyperthermia.[8,43]
- ***Glucose monitoring*** on arrival to ED and every six hours thereafter for the initial 72 hours of care to determine the need for regularly scheduled glucose monitoring and implementation of glucose control measures (GPP) (Class I; Level of Evidence B).[43]
- ***Dysphagia screening using a valid and reliable tool*** by a trained non-speech-language pathologist (SLP) or swallowing assessment by a SLP should occur prior to administration of food, drink or oral medications,[60] (Class I: Level of Evidence B)[6] within 4 to 24 hours of hospitalization.[63,64] Referral to SLP for those failing the screen for formal swallowing assessment. (Class I; Level of Evidence B).[43,60] The presence of a gag reflex does not constitute an adequate dysphagia screen as this does not indicate safety with swallowing.[6]
- ***Fluid Balance monitoring*** is recommended to identify dehydration and concurrent conditions seen in vascular patients (i.e. renal insufficiency associated with long-standing hypertension; congestive heart failure or left ventricular dysfunction) (Class I: Level of Evidence C).
- ***Comprehensive nursing care assessment within 4 hours of SU admission for****:* nutritional and hydration needs, positioning and mobilization needs, bladder control and incontinence management, pressure ulcer risk, cognitive and language capacity, hearing and visual needs, and family/ carer needs (GPP).[5]

Treatment

- ***Use of appropriately educated and credentialed advanced practice nurses*** where available to initiate standardized diagnostic protocols (ie ordering and interpreting standardized laboratory tests and neuroimaging) (GPP), and administer intravenous rtPA (Class IIb: Level of Evidence B).[25]
- ***Airway*** and breathing support as required (Class I: Level of Evidence C) with provision of oxygen for hypoxic patients (< 94% oxygen saturation) (Class I: Level of Evidence C);[6] routine oxygen for non-hypoxic patients is not recommended (Class III: Level of Evidence B).[6]

- ***Thrombolysis:*** Delivery of prompt intravenous rtPA treatment for eligible ischaemic stroke patients up to 4.5 hours from symptom onset (Class I: Level of Evidence A)[65] with a door-to-needle time (time of bolus administration) target of less than 60 minutes[6] (Class I; Level of Evidence B).
- ***Hypertension management:*** Goals for target blood pressure (BP) are uncertain.[6] However, the following are recommended:
  - Pre-thrombolysis (potentially eligible patients): systolic blood pressure (SBP) < 185 mmHg and diastolic (DBP) < 110 mmHg (Class I; Level of Evidence B).[6]
  - Post rtPA bolus: target <180mmHg SBP, <105mmHg DBP.[6]
  - Non thrombolysed ischemic stroke: a reasonable approach is BP lowering by 15% during the first 24 hours post-stroke. Withhold medications unless systolic BP > 220 mmHg or diastolic BP > 120 mmHg (Class I: Level of Evidence C),[6] or there are signs of cardiac decompensation due to left ventricular afterload (GPP).
  - Intracerebral hemorrhage (ICH): Intensive BP lowering is safe and feasible.[48,66] BP lowering within six hours of ICH onset to a target systolic BP of <140 mmHg may improve functional outcome at 3 months post stroke as compared to a traditional BP lowering target of < 180 mmHg (Class I: Level of Evidence B).[48]
  - Subarachnoid hemorrhage (SAH): Reduction of systolic blood pressure to a target of 90/160 mmHg[67] until the aneurysm has been occluded by endovascular or surgical means (GPP).
  - Ongoing monitoring and reporting of blood pressure control throughout hospitalization to identify patients in need of medication additions or dose adjustments (GPP).
- ***Temperature****:* Treatment of temperature > 37.5° C with antipyretics (Class I; Level of Evidence B),[8,43] ; evidence supporting induced hypothermia is currently lacking (Class IIb; Level of Evidence B).[6]
- ***Hyperglycemia:*** Maintenance of glucose levels of 140-180 mg/dl (7.8 – 10 mmol/L) (Class IIa; Level of Evidence C).[6,43] Avoidance of hypoglycemia (blood glucose < 60 mg/dL) (Class I; Level of Evidence C).[6]
- ***Use of standardised evidence-based stroke care protocols/ pathways*** to inform care (Class I: Level of Evidence B).[6]
- ***Preparation for endovascular interventions*** for patients undergoing mechanical thrombectomy, noting that three month functional outcome efficacy data currently are lacking (Class IIa; Level of Evidence B).[6]
- ***Head positioning:*** There is no large trial data to date examining the best head position following stroke, although these are underway. There is some evidence to support improved blood flow when lying flat (0 degrees) for large artery ischemic strokes, including those with fluctuating clinical presentation[68,69] (Class IIb; Level of Evidence C), however these findings cannot be generalized to patients with small vessel occlusions presenting with relatively minor symptoms who may best be served by early mobilization; ICH patients at risk for increased intracranial pressure may benefit from head of bed elevation to 30 degrees (GPP)
- ***Palliative care:*** Identification of patient goals and commencement of relevant discussions for patients with poor prognosis (GPP).[6]
- ***Education*** for stroke survivors and their caregivers/family (GPP).[6]
- ***Caregiver support*** for those overseeing the needs of stroke survivors, including provision of accurate information about stroke, emotional and practical support, and identification of important community resources/agencies (GPP).[7]

- ***Rehabilitation:*** Early assessment and commencement of rehabilitation where relevant (GPP).[52,70,71]

Prevention of complications

- ***Antiplatelets:*** Administration of antiplatelet medications within 48 hours of stroke (Class I; Level of Evidence A)[2,6] after swallowing screen or swallowing assessment undertaken;[6] Antiplatelet agents should be withheld for 24 hours in rtPA treated patients (Class III: Level of Evidence C).[6] If the patient is unable to swallow, aspirin or other medication may be administered rectally.[72]
- ***Anticoagulants:*** Use of anticoagulation to prevent recurrent stroke or improve outcomes is not recommended in non-cardioembolic ischemic stroke (Class III; Level of Evidence A).[6] Anticoagulation is recommended for the primary and secondary prevention of cardioembolic ischemic stroke patients (Class I; Level of Evidence A), however, the best timing for initiation of anticoagulation after an acute stroke event remains unknown.
- ***Venous thrombo-embolism (VTE)****:* use of anticoagulation provides superior VTE prophylaxis in patients with acute ischemic stroke (Class I; Level of Evidence A). Use of intermittent pneumatic compression (IPC) for immobile patients reduces the risk of VTE and possibly death. Class I: Level of Evidence B).[53] Routine use of anti-embolic stockings is not recommended.[54,55]
- ***Incontinence:*** Routine use of indwelling urinary catheters is not recommended due to infection risk (Class III: Level of Evidence C).[6,7]
- ***Early mobilization:*** within the first 24 hours for neurologically and hemodynamically stable patients is safe and feasible (Class 1Ia: Level of Evidence B).[70] Early mobilization (within 52 hours) is associated with fewer complications.[71] Patients with stable neurologic and hemodynamic presentation can be mobilized to out of bed chair sitting even if level of consciousness is depressed (ie stupor, obtundation, lethargy) (Class IIa: Level of Evidence C).[73]
- ***Hydration:*** Euvolemia should be maintained. Use of volume expanders to achieve hemodilution is not recommended in ischemic stroke (Class III; Level of Evidence A). Treatment of hypovolemia should include use of isotonic intravenous normal saline (Class I: Level of Evidence C)[6]
- ***Nutrition:*** Ensure adequate nutrition. Use of nasoenteric tube feeding in patients unable to swallow for the first two to three weeks post stroke is preferred over use of PEG tube feeding (Class IIa: Level of Evidence B); for patients unable to safely swallow and those incapable of meeting their nutrition and hydration needs, consider initiating nasoenteric feeding within 24 hours (GPP).[5] Verification of feeding tube placement should be done by radiographic methods.[74]
- ***Oral hygiene*****:** Oral hygiene should be provided to reduce the risk of aspiration pneumonia (GPP).[6,7,75] At least three times per day, and immediately after meals is recommended (GPP).
- ***Pressure Area Care:*** Those at high risk of developing pressure injuries should be placed on a high-specification foam mattress (Class I: Level of Evidence A).[76]
- ***Antibiotics****:* patients with suspected pneumonia, sepsis or urinary tract infections should receive antibiotics that target the relevant pathogen (Class I: Level of Evidence A).[6]

Key: GPP = Good practice point

Table 5 Key nursing-supported factors guiding stroke care in the first 72 hours[77]

Rapid assessment	Stroke is an emergency and rapid assessment and treatment improves outcomes.
Early identification	Early identification of acute stroke will improve access to time dependent interventions.
Pre-hospital services facilitate access	Organised pre-hospital services improve outcomes by increasing access and decreasing delays to time dependent acute stroke treatments.
ED systems	Systems that prioritise assessment and management of acute stroke in the ED will minimise treatment delays and maximise proportion of eligible patients receiving thrombolysis.
SU access	Rapid flow of acute stroke patients from ED to SU improves outcomes for stroke patients.
Multi-disciplinary assessment and treatment	Co-ordinated and rapid onset of specific treatments by a multi-disciplinary team within SUs will improve outcomes.
Whole of system quality improvement	Quality improvement activities will improve performance within all aspects of care / system performance.

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