With a high mortality and devastating long-term disabilities, stroke is a heavy burden for individuals, their families and carers, and the wider health system. In the UK, one stroke occurs every five minutes (Puthenpurakal and Crussell, 2017) and stroke is the fourth largest single cause of death. Two thirds of stroke survivors leave hospital with some form of disability (Stroke Association, 2017).

Acute stroke is a medical emergency and needs to be recognised, diagnosed and treated urgently – that is, almost immediately – to lighten the burden. This article covers its immediate treatment, based on the National Institute for Health and Care Excellence (NICE) (2008 updated in 2017) for the management of acute stroke and of transient ischaemic attack (TIA), which is considered a precursor of stroke.

Early recognition and diagnosis
In 2008, NICE published guidelines, Stroke and Transient Ischaemic Attack in Over 16s: Diagnosis and Initial Management (NICE, 2008), which have played a part in improving outcomes of acute stroke. These guidelines were revised in 2017 – with some changes made and further recommendations included. One of the key messages of the NICE guidelines (NICE, 2017) is the importance of early recognition and treatment of stroke and TIA.

There is plenty of evidence that, after acute stroke, limiting the extent of damage to the brain through timely assessment and interventions increases the chances of survival and reduces the risk of long-term disability (Emberson et al, 2014). Research also consistently highlights that access to appropriately trained doctors, nurses and other members of the multidisciplinary team reduces the risk of death following stroke, reduces the risk of patients being affected by long-term disabilities, and increases their chance of regaining independent living (Royal College of Physicians, 2016a).

As 95% people who have an acute stroke present from the community to an accident and emergency department in hospital (Royal College of Physicians, 2016a), it is important that the general public and health professionals in primary care know the signs and symptoms of stroke. NICE
continues to accept the FAST checklist (Box 1) as an effective tool to help lay people recognise stroke. However, in the acute hospital setting, NICE recommends the use of the validated assessment Recognition of Stroke in the Emergency Room (ROSIER) tool to help health professionals diagnosing acute stroke (NICE, 2017).

Table 1 shows the ROSIER assessment tool. Stroke is likely if the total score is >0. A score ≤0 indicates that the possibility of stroke is small, but cannot be completely excluded. Patients who present with neurological deficits other than those featuring in the ROSIER tool should be admitted and assessed for stroke in an acute stroke unit.

The NICE guidelines (2017) recommend that, once patients have been admitted to hospital, brain imaging should be performed as soon as possible to determine the type of stroke they have experienced. In 2016 the Intercollegiate Working Party reduced the recommended time between admission and brain imaging for a suspected stroke from 12 to one hour of arrival in hospital (Royal College of Physicians 2016a). This requires 24/7 access to specialist imaging technology and expertise.

Treat acute ischaemic stroke

Acute ischaemic stroke (AIS) occurs when a thrombus or embolism blocks a cerebral blood vessel, usually as the result of a blood clot travelling to the brain. The lack of blood flow deprives brain tissue of essential oxygen and nutrients, resulting in brain tissue ischaemia (Hickey, 2014; Mooley et al, 2014). According to the Stroke Association (2017), 85% of strokes are ischaemic. Rapid treatment is required to restore cerebral blood flow through the occluded artery, which will preserve brain tissue and limit the damage caused by the stroke.

Thrombolysis with alteplase

The fibrinolytic agent alteplase is the only drug licensed in the UK to treat AIS (NICE, 2012). Known as a ‘clot-busting drug’, alteplase acts by activating plasminogen to form plasmin, which dissolves and clots travelling to the brain. The lack of

<table>
<thead>
<tr>
<th>Table 1. ROSIER assessment tool</th>
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<tr>
<td>Assessment of BP, Glasgow Coma Scale and capillary blood glucose level</td>
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<table>
<thead>
<tr>
<th>Has there been loss of consciousness or syncope?</th>
<th>Yes/No</th>
<th>Score</th>
<th>Yes/No</th>
<th>Score</th>
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<tr>
<td>Has there been seizure activity?</td>
<td>Yes/No</td>
<td>Score</td>
<td>Yes/No</td>
<td>Score</td>
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<tr>
<td>Is there new acute-onset (or on awakening from sleep):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymmetric facial weakness?</td>
<td>Yes/No</td>
<td>Score</td>
<td>Yes/No</td>
<td>Score</td>
</tr>
<tr>
<td>Asymmetric arm weakness?</td>
<td>Yes/No</td>
<td>Score</td>
<td>Yes/No</td>
<td>Score</td>
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<tr>
<td>Asymmetric leg weakness?</td>
<td>Yes/No</td>
<td>Score</td>
<td>Yes/No</td>
<td>Score</td>
</tr>
<tr>
<td>Speech disturbance?</td>
<td>Yes/No</td>
<td>Score</td>
<td>Yes/No</td>
<td>Score</td>
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</table>

In the UK, one in nine patients with AIS receive alteplase for thrombolysis (Royal College of Physicians, 2016a), but 15% of patients who should receive it do not because suitably trained staff are not available (Royal College of Physicians, 2016b). To safely administer thrombolysis with alteplase nurses must be aware of the potential complications and adverse effects of the therapy. This includes recognising signs of severe haemorrhage both at the site of administration and systemically and action required if this occurs. Nurses also need to understand the correct dose ranges and methods of administration.

In 2015, following concerns about potential risks of alteplase therapy such as increased risk of intracranial haemorrhage, the MHRA reviewed the available evidence and concluded that the benefits of treatment outweigh the risks as long as alteplase is used in accordance with the terms of its licence (MHRA, 2015). It also indicated that there should be no upper age limit for

Box 1. FAST checklist

FAST provides a quick checklist of signs and symptoms of stroke and prompts people to urgent action. The acronym stands for:

- **Face** – has the face fallen to one side?
- **Arms** – can both arms be raised and held raised?
- **Speech** – is speech slurred or difficult to understand?
- **Time** – call 999 if any of these signs of stroke are present.

Box 2. Thrombolysis with alteplase in AIS: recommendations

- **Treatment as early as possible within 4.5 hours of onset of symptoms**
- **Intracranial haemorrhage must be excluded before treatment by appropriate imaging**
- **All staff must have expert knowledge and training in thrombolysis delivery, contraindications and monitoring patients for known side-effects**
- **Level 1 and 2 nursing care staff must be trained in AIS care and thrombolysis administration**
- **Imaging and re-imaging facilities, as well staff trained to interpret results, must be available**
- **Protocols and policies for the administration of treatment and management of side-effects must be available**
- **Early treatment is crucial so accident and emergency staff must be suitably trained to administer treatment**
- **Hypertension must be managed and BP kept <185/110mmHg**
- **Older age is not a barrier to administration of alteplase**

AIS = acute ischaemic stroke; BP = blood pressure

Source: adapted from Royal College of Physicians (2016a), NICE (2012), NICE (2017)
administering alteplase in AIS and that people aged 80 years and over will benefit from it, especially if receiving it within the first three hours of the onset of symptoms.

Box 2 outlines the current recommendations for thrombolysis with alteplase in AIS and Box 3 outlines the main exclusion criteria for its use.

**Thrombolysis with tenecteplase**
A new fibrinolytic drug, tenecteplase, licensed in the UK for the treatment of myocardial infarction, is currently undergoing clinical trials as an alternative to alteplase (Stroke Association, 2015). Conducted in 2015, the pilot phase of the Alteplase-Tenecteplase Trial Evaluation for Stroke Thrombolysis (ATTEST) has shown some advantages of tenecteplase, including a reduced risk of bleeding (Huang et al, 2015; Stroke Association, 2015). However, larger clinical trials are required to establish the superior efficacy of this new medication in the treatment of AIS.

**Antiplaquette therapy**
Antiplaquette medication keeps blood clots from forming by preventing platelets from sticking together. Antiplaquette therapy is recommended 24 hours after thrombolysis therapy to reduce the risk of further clot formation, once appropriate imaging has excluded cerebral bleeding (NICE, 2017). According to Ward et al (2012), antiplatelet therapy reduces the occurrence of clot formation and can decrease the risk of stroke by 22%.

Aspirin 300mg daily is the first-line antiplatelet therapy. If the patient does not tolerate aspirin or aspirin is contraindicated, clopidogrel should be given instead. If the patient is dysphasic, administration should be via suppository or enteral tube. Antiplatelet treatment should be given for two weeks after AIS, after which long-term antithrombotic therapy should be instigated.

**Anticoagulation therapy**
Anticoagulants – for example warfarin – delay the clotting of blood. Although not contraindicated, anticoagulation therapy should not be prescribed in the acute phase of AIS (Joint Formulary Committee, 2016; NICE, 2017). If atrial fibrillation (AF) is considered to be the underlying cause of AIS, and is still present, then anticoagulation with warfarin or a non-vitamin K antagonist oral anticoagulant (NOAC) such as dabigitran, apixaban or rivaroxaban is recommended.

The risks and benefits of anticoagulation treatment must be gauged by an appropriately trained health professional, and a person-centred approach should be adopted – taking into consideration the patient’s wishes.

**Antihypertensive therapy**
Although antihypertensive therapy may be indicated long term after AIS to maintain a blood pressure (BP) <130/80mmHg, antihypertensives, which can reduce cerebral perfusion, should not be routinely administered in the acute phase of AIS. The Intercollegiate Stroke Working Party recommend that antihypertensive treatment should commence prior to discharge from hospital or two weeks following stroke (Royal College of Physicians, 2016a) unless there is a hypertensive emergency.

**Mechanical clot retrieval**
Mechanical clot retrieval is the direct removal of the embolism via angiography. Once the location of the clot has been identified, a catheter with a clot retrieval device is inserted via the femoral artery into the site of the occlusion, and the clot is grasped and pulled out (NICE, 2016). Fig 1 explains the procedure.

New clinical trials of mechanical clot retrieval – also known as mechanical thrombectomy – after AIS are showing encouraging results in terms of both survival and disability (Evans et al 2017). This is reflected in recent guidance from NICE that supports mechanical clot retrieval as a safe and effective treatment for AIS (NICE, 2016). However, mechanical clot retrieval requires careful patient selection, adequate staff training and appropriate access.
to radiography services. Robust services available 24/7 that can undertake mechanical clot retrieval are not yet available across the whole of the NHS.

Treating intracranial haemorrhage

Intracranial haemorrhage (ICH), which occurs in approximately 11% of the population in the UK (Royal College of Physicians, 2016a), is a less common cause of acute stroke. Stroke caused by ICH is more likely to result in death and major disability than AIS (Stroke Association, 2017).

Patients diagnosed with ICH are at high risk of rapid deterioration due to the nature of the condition. The NICE (2017) guidelines specify that anyone diagnosed with ICH should be admitted directly, and if possible, to a hyper-acute stroke unit (HASU) for urgent specialist assessment and monitoring. Assessment should include close monitoring of neurological observations. If a patient’s level of consciousness deteriorates, they should be sent for urgent repeat brain imaging.

If possible, it is recommended to determine the underlying cause of ICH so appropriate treatment can be started promptly. For example, if a patient presents with ICH and is being treated with warfarin, the possibility of clotting abnormalities should be investigated and, if needed, treatment with prothrombin complex concentrate (PCC) or intravenous vitamin K should be urgently administered to reverse the effects of the anticoagulant.

If systolic BP is >150mmHg, hypertension control should be started within six hours of the onset of a confirmed ICH. The NICE guidelines (NICE, 2017) recommend lowering systolic BP to 140mmHg for at least seven days. However, the following circumstances may preclude BP control:

- Glasgow Coma Scale score ≤5;
- The haematoma is very large and death is expected;
- A structural cause for the haematoma has been identified;
- Immediate surgery to evacuate the haematoma is planned.

Complications of acute stroke

After IAS and ICH, patients are at high risk of complications such as dehydration, malnutrition, infection, hypoxia and hypoglycaemia. Alongside the immediate treatment, NICE recommends that all specialist stroke units implement a series of standardised protocols to enable staff to assess and manage all potential complications appropriately.

Treating transient ischaemic attack

A TIA is a neurological event that occurs due to a temporary interruption of blood supply to the brain, causing a neurological deficit but followed by recovery within 24 hours (Moorley et al, 2014). The patient may demonstrate all the signs of having a stroke, but spontaneously recovers without medical intervention. Research has demonstrated that someone who has a TIA is at increased risk of having a stroke in the next few days (Rothwell et al, 2007), so TIA is considered a precursor of stroke.

The current guidance puts emphasis on TIA assessment and treatment. It says that all individuals who present in hospital or primary care with a recent history of TIA should be fully assessed in a neurovascular clinic or acute stroke unit as soon as possible (NICE, 2017). The assessment should include an exploration of the possible causes of the TIA (one of which is AF) and appropriate treatment should then be initiated.

The assessment should also exclude the possibility of haemorrhage being the cause of the neurological symptoms. If haemorrhage is a possibility, brain imaging should be performed to check whether or not there is bleeding. However, if there is a suspicion that the patient may have had ischaemic stroke, NICE recommends that imaging should be not be performed, as this is not cost-effective.

Once haemorrhage has been excluded, to reduce the risk of further TIAs and of stroke, the patient should be given aspirin 300mg immediately – or at least within 24 hours – and receive maintenance anti-platelet therapy. The guidelines recommend clopidogrel 75mg once daily (NICE, 2017). Statin therapy is also recommended.

Because there is a high risk that TIA will be followed by stroke, the guidelines further recommend that patients and families are taught how to recognise the signs of stroke to speed up admission to an acute stroke unit should the need arise.

Conclusion

The current NICE guidelines make it very clear that, when acute stroke or TIA is suspected, rapid assessment and intervention are critical to limit the risk of death and long-term disability. Nurses have a pivotal role in this and are well placed to provide immediate and ongoing care to reduce the stroke burden of patients and their families and/or carers. Research in stroke management continues at a fast pace, and nurses must remain up-to-date and knowledgeable so they can provide effective evidence-based care to patients. NT

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