Thrombolysis for acute ischaemic stroke: the development of a nurse protocol in the United Kingdom

IST-3 Stroke Nurse Collaborative Group (see appendix for list of collaborators and participating hospitals)

Abstract

This paper describes a nursing protocol for patients treated with thrombolysis for acute ischaemic stroke developed during the Stroke Association phase of the Third International Stroke Trial (IST-3), a randomised controlled trial of recombinant tissue plasminogen activator for acute ischaemic stroke.

The IST-3 Nurse collaborative group met three times over three years. The meetings consisted of educational updates on stroke thrombolysis, training on trial procedures, presentations by participating nurses and discussions of good practice, local initiatives and sharing common problems.

Lack of knowledge, fear of bleeding complications and lack of appropriate NHS beds were common barriers. Core nursing requirements suggested by this research included: fast-tracking of patients; access to trained stroke physicians; acute physiological monitoring and nursing intervention; effective communication and support of patients and carers; knowledge of complications and actions to be taken; transfer to an appropriately skilled stroke unit environment and successful discharge planning to home or rehabilitation.

INTRODUCTION

This article summarises the reasons why thrombolytic therapy is a promising treatment for acute ischaemic stroke and describes the development of the core nursing implications of introducing thrombolytic therapy in selected United Kingdom hospitals. In 2002, the Committee for Proprietary Medicinal Products for the European Union, agreed a framework to allow national drug licensing bodies of individual European Union countries to grant a licence for alteplase (a recombinant tissue plasminogen activator thrombolytic agent known as rt-PA). This may lead to a license being granted in the UK for patients treated up to three hours following an ischaemic stroke (at the time of writing this was still awaited). Consequently, there is an urgent need to establish and refine appropriate nursing guidelines for NHS hospitals.

Stroke is a major problem in the United Kingdom

In the UK, about 150,000 people have a stroke each year (110,000 being first-ever strokes) (Bamford et al, 1988). The underlying pathology in 85% of patients with stroke is cerebral ischaemia (infarction), and therefore treatments directed at this subgroup will have greatest impact (Bamford et al, 1990). Stroke is an important illness, as 30% of patients are dead within 6 months and a further 30% are dependent in activities of living. (Bamford et al, 1990). In addition, stroke consumes about 5% of all NHS resources and places a considerable burden on family and carers. (Isard and Forbes, 1992; Department of Health (DOH), 2001). It remains a
major health problem for Europe, with a stroke rate of about 1 million a year, and globally, with over 5 million stroke deaths around the world. (Sandercock et al, 1992).

As the population ages, stroke is likely to become more frequent even if stroke incidence rates remain constant or decline. It is, therefore, likely that stroke will represent a significant health problem for many decades to come. Important research investment in stroke is needed to tackle this problem. There needs to be effective stroke prevention and improvement in stroke management through greater availability of stroke units to provide acute treatment and rehabilitation and facilitate research. (DOH, 2001; Rothwell 2001)

Better treatments needed for acute stroke

Few treatments are effective for acute stroke. Aspirin treatment (150-300mg daily, orally or rectally, started immediately after acute ischaemic stroke confirmed) has only modest benefit (approximately 12 more independent survivors per 1,000 treated). (Chen et al, 2000) In contrast, thrombolytic therapy, which works by dissolving the thrombus causing the ischaemic stroke, can potentially re-open the occluded artery and reverse the stroke. Research has demonstrated that some patients with severely disabling stroke (e.g. aphasia, dense hemiparesis and hemianopia) recover quickly after emergency with thrombolysis, and are discharged home within days, with little or no residual disability. (The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group 1995) Without effective treatment, such patients usually require months of in-patient rehabilitation, have a high risk of dying and often need long-term institutional care. (Stroke Unit Trialists' 2001)

Why is thrombolytic therapy the promising treatment to evaluate for acute ischaemic stroke?

There have now been 18 completed randomised controlled trials involving 5721 patients, of thrombolytic therapy for acute ischaemic stroke and the results from these trials have been systematically reviewed in the Cochrane Library. (Wardlaw et al. 2003) This Library provides high quality systematic reviews of medical treatment (and management strategies) and is widely available in medical libraries and the Internet (http://www.update-software.com/cochrane).

Table 5 lists references for the trials.

Four different thrombolytic agents have been evaluated but about half of the data come from trials of alteplase (recombinant tissue plasminogen activator or rt-PA for short). Sixteen trials used the intravenous route of administration, with only two using the more complex intra-arterial route. The time window from onset of stroke symptoms to treatment varied between trials but almost all patients were treated within six hours of the onset of stroke symptoms.

In the following sections the overall results of thrombolytic therapy from the systematic review are summarised.

RESULTS OF THROMBOLYTIC THERAPY

Reduction in "death or dependency".

Thrombolytic treatment significantly reduced the number of patients dead or dependent from
58% in control patients to 53.3% in treated patients. (Wardlaw et al, 2003) This is equivalent to an additional 43 independent survivors for every 100 patients treated (95% Confidence Interval 13 to 71). This is a substantial and worthwhile benefit.

**Risk of major intracranial haemorrhage.**

The main risk of thrombolytic therapy for stroke is fatal intracranial haemorrhage (ICH). The data in the Cochrane review showed that treatment increased the absolute risk of fatal ICH from 0.9% in control patients to 5.1% in treated patients (2p<0.00001, a highly significant result). The risk of symptomatic ICH (including fatal bleeds) increased from about 2.3% to 8.7% (2p<0.00001). (Wardlaw, de Zoppo, Yamaguchi, & Berge 2003)

The risks of alteplase were somewhat less and the benefits somewhat more and thus alteplase appears to be one of the more promising thrombolytic agents to evaluate in further trials. (Wardlaw, de Zoppo, Yamaguchi, & Berge 2003)

Overall, this evidence suggests that thrombolytic therapy may increase independent survival in many patients despite causing intracranial haemorrhage in others. Whilst it is already clear that some highly selected patients with stroke will benefit from thrombolytic therapy there is far less data on thrombolytic therapy for stroke than, for example, for myocardial infarction (MI). (Fibrinolytic Therapy Trialists' (FTT) Collaborative Group 1994) By the time thrombolysis for MI was routine, some 60,000 patients had been included in the major trials. (Fibrinolytic Therapy Trialists' (FTT) Collaborative Group 1994) The relative lack of stroke data has resulted in very little use of thrombolytic therapy in the UK. Treatment remains controversial and doctors are uncertain of the benefits of treatment. It is with this background that a further trial evaluating thrombolysis has been developed and this trial, the Third International Stroke Trial (IST-3), started recruitment in May 2000 in the UK.

**The Third International Stroke Trial (IST-3)**

The third International Stroke Trial is an international collaborative trial funded independently from the pharmaceutical industry with a trial co-ordinating office based at the University of Edinburgh. A detailed protocol for the IST-3 is available on the Internet (http://www.dcn.ed.ac.uk/ist3), but in brief, this trial is a randomised controlled trial evaluating alteplase (rt-PA) for patients with acute ischaemic stroke.

The main eligibility criteria for the IST-3 are shown in Table 2

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<thead>
<tr>
<th>Table 2. Main eligibility criteria for the Third International Stroke Trial (IST-3)</th>
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<tr>
<td>Clinically definite stroke with a known time of onset</td>
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<tr>
<td>Computerised tomography (CT) brain scanning has excluded intracranial haemorrhage and mimics of acute stroke (e.g. brain tumour)</td>
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<tr>
<td>Appropriate consent has been obtained</td>
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<tr>
<td>Treatment started as early as possible, and no later than 6 hours after stroke onset</td>
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Trial treatment consists of alteplase in a dose of 0.9mg/kg up to a maximum of 90mg given as a 10% intravenous bolus and the rest of the dose as a 1-hour intravenous
infusion. Control patients were given matching placebo in the early phase of the trial described in this paper (2000 – 2002).

Non-trial thrombolytic treatment

In the absence of a license for alteplase for acute stroke in the United Kingdom, few patients receive routine thrombolysis treatment. However, there is a licence for stroke, for patients who can treated within 3 hours of stroke onset, in the United States of America, Germany and Canada. Treatment has to be administered within 3 hours of stroke onset and published guidelines from North America are available. (Special Writing Group of the Stroke Council of the American Heart Association 1996) These guidelines provide some useful information but are difficult to implement in the United Kingdom (UK), as the health services, and stroke services differ so much between North America and the UK. This prompted research to develop core nursing standards appropriate to the NHS, based on the North American guidelines and the experience of implementing thrombolysis (mainly in the context of the IST-3) in UK centres.

Nursing requirements are exactly the same whether patients receive trial (e.g. IST-3 treatment), with a 50% chance of receiving alteplase, or routine treatment, with 100% receiving alteplase.

METHODS

The Stroke Association funded pilot and service development phase of the IST-3 covers the period from February 2000 to January 2003. Multicentre Research Ethics Approval was obtained in 1999. During this period centres in the United Kingdom (and abroad) with local ethics committee approval developed fast-track thrombolysis protocols and sought appropriate patients for the trial. Centres in the UK were asked to nominate a member of nursing staff with an interest in stroke. There was some financial aid (from the Stroke Association grant) to assist NHS staff support this research, which was about 0.1 whole time equivalent funding per centre.

The IST-3 Nurse Collaborative Group consisted of the Principal Investigator, Trial Manager and Medical Research Fellow for the trial and one or more nurses from each UK centre. The collaborative group met three times. The meetings were structured with presentations by each participant, and there was ample time for discussion. The prespecified aims of the meetings were to share knowledge, disseminate good practice and to learn from the experiences of others. Core nursing standards, appropriate for thrombolysis in the UK, were discussed, agreed and redrafted by the collaborative group.

RESULTS

The Stroke Association start-up phase of the IST-3 commenced in Edinburgh in May 2000 and 11 UK centres obtained full ethics approval. The first two meetings of the collaborative groups discussed the local barriers to recruiting patients in the IST-3.

Barriers to the introduction of thrombolysis for ischaemic stroke in the NHS
The practical barriers to the introduction of thrombolysis for ischaemic stroke in the UK included:

- Lack of nursing knowledge about thrombolysis for stroke
- Lack of necessary skill mix in stroke centre
- Lack of fast-track organisation
- Nursing fears of the intracranial haemorrhagic side effects
- Lack of appropriate stroke unit beds
- Consent issues

Lack of knowledge about thrombolysis for stroke:

A lack of knowledge about thrombolysis was a considerable barrier to the introduction of a thrombolysis service in most UK hospitals. Indeed, many of the group admitted uncertainties themselves. Stroke unit staff needed to keep up to date with the current information about thrombolysis. Nursing staff were often unaware of the promising data to support the use of thrombolysis for some highly selected patients (Wardlaw et al 2003) e.g. younger (< 80 years) patients who can be treated within 3 hours of stroke onset, and that thrombolysis may be beneficial for many more patients (such as those suitable for the IST-3 trial). (Wardlaw at al, 2003). The group rapidly realised that stroke thrombolysis teams had an ongoing responsibility to educate all staff including nursing staff.

Necessary skill mix on stroke unit:

Thrombolysis for stroke can have serious complications and at present it can only be recommended for organised stroke services, e.g. hospitals with a stroke unit. The introduction of thrombolysis is an important service development for acute stroke services. Thrombolysis services will need to be funded (i.e. with health improvement plans or research and development funding). Local co-ordinators, in discussion with nurse managers need to ensure that a suitable skill mix is available to safely deliver a thrombolysis service. In some centres, this may mean limiting thrombolysis to "office hours" when more support is immediately available. Acute stroke unit areas will need to be developed. Each shift should include at least one staff nurse who has been trained in stroke thrombolysis.

In addition many centres have only one stroke consultant prepared to supervise a thrombolysis service. This is a major barrier. The National Service Framework for Older People emphasised the importance of a stroke consultant in every hospital but there are a lack of suitably trained physicians in the UK (DoH, 2001). This situation should improve; in the meantime, stroke physicians should consider involving other physicians or neurologists to share the caseload. This is especially important for out-of-hours consultant support for nursing and medical staff.

Lack of fast-track organisation:

http://www.dcn.ed.ac.uk/newist3/nurse_protocol_article.htm (5 of 16) [13/05/2003 11:59:06]
The three centres with the best recruitment (Western General Hospital, Edinburgh, Addenbrookes Hospital, Cambridge and Arrowe Park Hospital, The Wirral) had organised fast-track stroke systems. The Western General Hospital had an integrated care pathway that was developed by a multidisciplinary task force and was very effective in identifying suitable patients for the acute stroke team. Arrowe Park hospital had an acute stroke pathway, and its stroke service was awarded an NHS Beacon. Addenbrookes hospital had an acute stroke pathway. Organisation of stroke admissions by pathways of care, agreed by multi-disciplinary members is key to successful acute stroke assessment.

**Fear of side effects and medico-legal protection for nursing staff:**

Both doctors and nurses fear the haemorrhagic complications of thrombolytic treatment, especially major extra cranial bleeding (e.g. massive gastrointestinal bleeding) or intracranial bleeding (e.g. severe or fatal recurrent stroke or deterioration). However, the frequency of these risks is similar to the frequency of complications in the natural history of a major ischaemic stroke. (Bamford et al, 1990) In legal terms this is called "minimal risk". Although the risks of thrombolysis are greater than many typical medical treatments, the risks of the natural history of stroke are greater than many typical medical conditions. (Bamford, et al,1990) The risks of thrombolysis can, therefore, be compared to the risks of cerebral oedema in some patients with untreated ischaemic stroke. Consumer work has emphasised that older people are comfortable with a risk of death IF there is a chance of future independence.(Koops & Lindley 2002). A simple analogy is to compare thrombolysis for stroke to major surgery. There are definite risks, but potential major advantages. In Koops’s study, older people supported research for thrombolysis despite these increased risks. If patients are given alteplase treatment, it is very important that informed consent is obtained from the patient (and relatives if medically appropriate). The IST-3 has strictly controlled consent procedures with full UK Multi-Centre Research Ethics approval. NHS Trusts should provide management approval for non-licensed use of alteplase and management approval is mandatory for clinical trials such as IST-3. These formal approval mechanisms help provide medico-legal protection for nursing staff.

**Lack of appropriate beds:**

Many acute NHS hospitals (and stroke units) have average bed occupancy of greater than 95%, which predicts regular bed crises. (Bagust, et al, 1999) Stroke thrombolysis needs to be given the priority afforded to thrombolysis for acute MI. Ideally, acute stroke units need to keep a bed for the next potential thrombolysis patient, or have a strategy for clearing a bed within an hour. This has been a recurring problem in the IST-3 hospital centres. However, liaison with bed management, a written protocol and a dedicated stroke unit bed are some solutions to this problem. It is vital that a bed is protected for stroke thrombolysis to ensure that treatment is always given in a safe environment with trained and experienced staff.

**Consent issues:**
Consent for thrombolysis creates unique ethical dilemmas and there are considerable problems to overcome. (Lindley 1998) However, the unique consumer involvement in the design of the IST-3 has created a streamlined and ethical consent process that has worked well so far. (Koops & Lindley, 2002)

**Core Nursing Requirements**

There are **10 requirements** for the safe delivery of thrombolysis for patients with acute stroke. These are shown in Table 3 and are discussed below:

<table>
<thead>
<tr>
<th>Table 3. Core nursing requirements for safe thrombolysis</th>
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<tr>
<td>Triage nursing in the emergency room</td>
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<tr>
<td>Urgent skilled medical assessment in a safe environment</td>
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<tr>
<td>Communication and support</td>
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<tr>
<td>Quick and safe transfer to Computerised tomographic (CT) brain scanning</td>
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<tr>
<td>Monitoring and nursing prior to treatment</td>
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<td>Treatment</td>
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<tr>
<td>Monitoring and nursing during and after treatment</td>
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<tr>
<td>Comprehensive assessment in a stroke unit</td>
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<tr>
<td>Preventing and treating complications</td>
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<td>Hospital Discharge or transfer to rehabilitation</td>
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**Triage nursing in the emergency room:**

"*Time is brain*" is a useful phrase to help persuade health professionals identify suitable patients quickly. Emergency room triage nurses need to follow an appropriate "fast-track" protocol to activate the acute stroke team. The triage guideline for the Western General Hospital, Edinburgh, is shown in Table 4.

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<thead>
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<th>Table 4. An example of an emergency room triage nurse protocol for thrombolysis</th>
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<tr>
<td>Clinical signs of definite acute stroke</td>
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<td>Time of onset known</td>
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<tr>
<td>Time from stroke onset &lt; 5 hours</td>
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<tr>
<td>If Yes to all three questions contact acute stroke team</td>
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Initial triage nursing includes functional documentation of airway, breathing and circulation. Blood pressure, pulse, oxygen saturation and blood glucose estimation should be performed, and abnormalities treated according to local protocol and medical advice. An important stroke mimic is hypoglycaemia (Libman et al 1995). The Glasgow Coma Scale (GCS) should be recorded and vital signs monitored regularly. A peripheral Intravenous catheter should be inserted. Patients who are in acute urinary retention should be catheterised. Aspirin and heparin treatment should be avoided during the first 24 hours after treatment with thrombolysis. (The National Institute of Neurological...
Disorders and Stroke rt-PA Stroke Study Group 1995

**Urgent skilled medical assessment in a safe environment:**

Patients who are being considered for thrombolytic treatment need an expert medical assessment to document the time of stroke onset and to determine the severity of the stroke. Other mimics of acute stroke include migraine, seizures, metabolic disturbances and brain tumours. (Libman et al. 1995) An important part of the clinical assessment is getting a confirmatory history from relatives (or ambulance staff). Relatives should be advised to remain with the patient until the medical staff have spoken with them and obtained consent for treatment if appropriate. During this time the nursing priorities should include monitoring oxygen saturation, documenting blood pressure, pulse and temperature.

**Communication and support:**

During this early period it is essential to prepare the patient and relatives for the next stage of assessment with clear and simple advice. Written information is helpful, for example, the IST-3 trial information leaflet (available on the British Medical Journal website at: [http://bmj.com/cgi/content/full/325/7361/415/DC1](http://bmj.com/cgi/content/full/325/7361/415/DC1)). Relatives should be encouraged to accompany the patient until eventual arrival on the stroke unit, as they are often required to help with consent issues for those who are drowsy, aphasic or confused. Nurses have an important role in relieving anxiety in the patients and relatives by the provision of information (both verbal and written), reassurance and explanation.

**Transfer to CT brain scanning:**

If the medical staff assess that the patient is potentially eligible for thrombolytic therapy an urgent computerised tomogram (CT) brain scan must be obtained. Patients should be transferred on a trolley (not a chair, even if only a mild stroke deficit) to facilitate transfer onto the CT scanning table. Valuable time is saved if patients can be transferred easily from trolley to CT scanning table and back onto the trolley at the end of the procedure. A nurse must accompany the patient to monitor his/her neurological status, vital signs and to assist in the transfers.

**Monitoring and nursing care prior to treatment:**

Vital signs need to be rechecked before treatment with thrombolytic therapy. American guidelines suggest that thrombolytic therapy is contraindicated if blood pressure is greater than 185/110 mmHg. (Adams Jr. et al, 1996) Some clinicians will initiate emergency blood pressure lowering in this situation, but this policy is controversial, as there is some data to suggest that lowering blood pressure in the acute phase of stroke is harmful. (Brott et al, 1998) Nursing staff have an important role in facilitating communication at all stages of the fast-tracking process.

**Treatment with thrombolysis:**

When patients are eligible and have consented to thrombolytic therapy, treatment must be given without delay. Consideration should be given to where therapy is started. If the...
acute stroke unit is a short distance away, patients should be urgently transferred to the unit. If the acute stroke unit is some distance from the CT scanner, a convenient treatment room should be identified. The treatment room should provide 24-hour access to alteplase (or trial treatment packs), giving set equipment and an intravenous infusion pump. Alteplase is given by an intravenous bolus injection followed by a 1-hour infusion. The dose is calculated at 0.9mg/kg body weight up to a maximum of 90mg, 10% is given over 1-2 minutes and the remaining 90% is infused intravenously over 1 hour. The patients’ weight should be estimated to calculate the correct dose. While the bolus dose is being administered over 1 - 2 minutes, the 1-hour infusion should be prepared. The infusion is best given by a syringe driver.

Monitoring and nursing care during and after treatment:

Blood pressure and pulse should be monitored at the start of treatment, at 30 minutes and at the end of treatment at 1 hour. Our experience has shown blood pressure cuffs can sometimes cause petechial subcutaneous bleeding; therefore automated blood pressure machines, that use high-inflation pressures, should be avoided. We, therefore, recommend that a handheld manual sphygmomanometer be used during thrombolytic treatment and in the 24 hours following treatment. The patient’s neurological status should be directly observed during the first 24-48 hours. The GCS should be part of a minimum nursing assessment and recorded on a bedside chart. The medical staff should be called if the GCS falls during this period. In our experience patients rarely deteriorate during the actual alteplase infusion but if the neurological deficit worsens, or if the patient becomes haemodynamically unstable, the infusion should be halted and the doctor called. The main risk of thrombolytic treatment is intracranial haemorrhage and if the patient deteriorates neurologically (Adams et al 1996) (e.g. the GCS falls) during or after treatment, an urgent CT brain scan should be performed to exclude haemorrhagic transformation of the cerebral infarct, or other intracranial bleeds. Thrombolysis with rt-PA is clot specific, i.e. it mainly exerts its effect within the thrombus (The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group (1995) so although the rt-PA has a very short half-life in the circulation (minutes), the drug will continue to act in a thrombosis for many hours. Therefore the potential haemorrhagic complications may be delayed for 24-48 hours.

At about 24-48 hours following thrombolysis treatment the excess risks of bleeding start to diminish and it is common practice to obtain a second CT brain scan to help exclude any intracranial bleeding complications. If there have been no bleeding complications, aspirin is usually started (or recommenced) (Chen et al 2000). Heparin is not used routinely as there is no evidence that early anticoagulation is required after thrombolysis for stroke, and early anticoagulation is not effective for ischaemic stroke. (Gubitz et al 2003)

Comprehensive assessment in a stroke unit:

The benefits of stroke unit care are applicable to patients with all types of stroke and it is important that all patients who are considered for thrombolysis have access to stroke unit care (or stroke team care). The treatment benefits of being in a stroke unit are
considerable (equivalent to about 60 per 1,000 extra independent survivors compared to about 20-30 per thousand survivors for early thrombolysis of acute myocardial infarction). (Stroke Unit Trialists'2001) (Fibrinolytic Therapy Trialists' (FTT) Collaborative Group 1994) Hospitals without a stroke unit should invest in stroke services prior to setting up a stroke thrombolysis service. A major feature of the stroke units in the randomised controlled trials was comprehensive assessment by trained multi-disciplinary staff.(Stroke Unit Trialists'2001)

**Preventing and treating complications:**

Nurses have a major role to play in the prevention of complications following thrombolysis for acute ischaemic stroke. Patients need to be carefully observed to identify any signs of bleeding or bruising. Invasive procedures such as urinary catheterisation should be avoided if possible, to avoid causing any trauma which might result in bleeding. Care must be taken when removing indwelling intravenous catheters, as there may be excessive bleeding. During this risky period nursing care plans or nursing pathways need to pay particular attention to patient safety. This is especially important if the patient has sensory inattention or neglect. Consideration should be given to providing one-to-one nursing for the initial 24 hours of treatment. In general, there should be no restrictions on usual early rehabilitation strategies for patients.

**Hospital Discharge or transfer to rehabilitation:**

Patients who continue to need nursing support and rehabilitation should be nursed in a stroke rehabilitation unit. Hospitals without well-organised stroke services need to invest in these before even considering introducing thrombolytic therapy. If this unit is off the main acute hospital site it is very important to ensure a good handover of care. Patients who regain full independence on the acute stroke unit will need information about their stroke, counselling regarding modifiable risk factors e.g. smoking and this can be reinforced using written material and videos from the Stroke Association and Chest, Heart and Stroke, Scotland.

**CONCLUSIONS**

This paper has outlined the rationale for introducing thrombolysis for acute ischaemic stroke in the UK and has discussed the nursing issues that need to be considered when writing a local protocol and developing a thrombolysis service. Education was an important theme to emerge from our research, and new stroke services should ensure that resources are allocated for continued professional development for stroke nurses. The introduction of a thrombolysis service will also need investment in nursing time and expertise, with appropriate staffing levels to manage the detailed nursing described in this paper. The continued development of stroke units within the United Kingdom should facilitate the introduction of a thrombolysis service.

We would welcome comments and contributions from other with similar experience in the UK.

**Acknowledgements**
This work was supported by the Stroke Association grant TSA04/99 "Thrombolysis for acute ischaemic stroke: pilot and service development phase of the Third International Stroke Trial (IST-3)", University of Edinburgh and the Scottish National Health Service (Dr Lindley).

We thank the patients and their relatives who agreed to participate in IST-3 and to the many hundreds of NHS and University staff who have contributed their time and effort to this project.

### Key Points

- **Thrombolysis for acute ischaemic stroke is a promising treatment requiring further development before becoming a routine treatment in UK hospitals.**

- **In the UK, the Third International Stroke Trial (IST-3) is the major ongoing trial of alteplase, the most promising thrombolytic agent.**

- **This study identified many barriers to a routine stroke thrombolysis service in the UK NHS, including lack of available beds, knowledge and perceived fears of treatment.**

- **Solutions to many of the identified barriers were identified and implemented, such as regular education updates for stroke service staff and the routine use of stroke pathways or protocols.**

- **This research has led to the development of core nursing requirements that are practicable for the UK NHS.**

### Appendix: IST-3 Stroke Nurse Collaborative Group

Julie Rycarte, Addenbrookes Hospital, Cambridge  
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Diane Rennie, Western General Hospital, Edinburgh  
Pat Taylor, Western General Hospital, Edinburgh
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Fibrinolytic Therapy Trialists' (FTT) Collaborative Group (1994) Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of
early mortality of early mortality and major morbidity results from all randomised trials of more than 1000 patients. *Lancet* 343: 311-22.


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<thead>
<tr>
<th>Table 5  Trials of thrombolysis for acute ischaemic stroke.</th>
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<td>Abe 1981 (Abe 1981)</td>
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<td>Atarashi 1985 (Atarashi et al. 1985)</td>
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<td>Ohtomo (Atarashi, Otomo, Araki, Itoh, Togi, &amp; Matsuda1985)</td>
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<td>Mori (Mori et al. 1992)</td>
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<td>Haley (Haley et al. 1993)</td>
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<td>JTSG (Yamaguchi et al. 1993)</td>
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<td>ECASS 1 (European Cooperative Acute Stroke Study Group 1995)</td>
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<td>Morris (Morris et al. 1995)</td>
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References


Organisations

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The development of a stroke nurse protocol for delivering thrombolytic therapy for patients with acute ischaemic stroke in United Kingdom hospitals

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