



**Irish Heart Foundation:
Council for Stroke**

**National Clinical Guidelines and
Recommendations for the Care of
People with Stroke and Transient
Ischaemic Attack**

**Revised Version
March 2010**

Foreword

18 months ago the Irish Heart Foundation published an audit of stroke services in the Republic of Ireland. The audit revealed what many had suspected. Adequate services and facilities to prevent, assess and treat the yearly toll of 10,000 victims of stroke are not available to most of our population. Even when supposedly available they are often seriously deficient. Only one hospital had a stroke unit. The Rehabilitation services were often poorly organised and uncoordinated. The end result was that most patients with acute stroke received care which was less than optimal and were not accorded the timely rehabilitation which plays a major part in preventing long-term disability.

The Stroke Council of the Irish Heart Foundation addressed the issues raised by the audit. It set up a working party to produce a comprehensive strategy for the development of a service in line with best international practice adapted to Irish conditions. The result, prepared over the last 18 months is this document. It sets out a strategy for the prevention, treatment and management of stroke. It shows that strokes may be prevented, that warning signs are often ignored and that simple population educational measures can be very effective in reducing numbers of victims. The establishment of proper assessment units for the prompt management of patients suffering transient ischaemic attacks is one of the key points of this preventive strategy. Prompt treatment reduces mortality from acute stroke and disability levels amongst survivors. The key to this is rapid assessment of the stroke victim, the provision of thrombolytic therapy where appropriate and the organisation of Accident and Emergency departments to deal effectively with the victims and to direct them to designated stroke units. Such units provide immediate care, close monitoring of and appropriate intervention in the evolving stroke. The physical grouping of patients in such units ensures that rehabilitation can be provided in a timely fashion and the many disciplines involved can be organised in such a way as to ensure that this is done to provide optimal benefit. The patient can progress seamlessly from the acute event through early rehabilitation into properly organised appropriate rehabilitation programs and back to the community. Stroke at this stage has elements of a chronic illness, and ongoing nursing, medical and therapist support is required, both at home, and for an important minority of those affected, in nursing homes. The report deals with the role of allied and health professionals, nurses, doctors and primary care centres in this process.

Central to this concept is the creation of stroke networks. Networks embrace all the hospitals, services and individuals providing care at every stage of the process. Care of the acute stroke victim begins in the ambulance, continues through thrombolysis, early recognition and assessment in the accident and emergency departments, stroke unit and the provision of internationally acceptable levels of ongoing care. Such a service could save up to 350 lives a year and substantially reduce the number of those suffering from major disability.

As medical director of the Irish heart foundation I have watched with admiration the way in which so many people, far too numerous from me to acknowledge individually, have worked together to produce this report. They are drawn from all the disciplines associated with the care of the stroke patient and were joined by others

whose interest lies outside this immediate field but who have special expertise in preventive medicine and in the organisation of health care delivery. Their contribution to the writing of the report is obvious. What is less obvious is the assiduous attendance of all concerned at the many meetings which were held over 18 months and at the two days which were spent at a major meeting of all the participants during the spring of this year. All this on top of demanding “day jobs”! The successive chairs of the stroke Council, Prof. Des O'Neill and Dr. Frances Horgan have made an especially important contribution in stimulating thought and coordinating the efforts of all those involved and I must acknowledge the extraordinary contribution of Dr. Joseph Harbison who was responsible for drafting the initial report, revising it, editing and finally bring it to completion within the timeframe that had been envisaged originally. All involved have done a major service to sufferers from stroke and cardiovascular disease.

It is to be hoped that this report will act as a catalyst to stimulate the provision of proper services for all victims or potential victims of stroke. . Reorganisation and Transformation of health care delivery are catchphrases which have been used since the institution of the Health Service Executive. This report gives the Executive an opportunity to implement a program of transformation which will not only greatly improve care for all but will do so at a lesser cost to the exchequer. This opportunity must not be missed.

Dr. Brian Maurer
Medical Director
Irish Heart Foundation
28th October 2009

Introduction.

Stroke is the third most common cause of death and the most common cause of acquired major physical disability in Ireland. There is considerable evidence supporting the benefits of coordinated stroke care in reducing death and levels of disability for stroke survivors. The recent Irish Heart Foundation National Audit of Stroke Care Report (April 2008) confirmed the impression of the professionals working in the field that stroke services in Ireland are so poorly organised that they are largely ineffective. Stroke units were virtually non-existent and under resourced, patients had limited access to acute rehabilitation while continuing care and long term recovery programmes were haphazardly organised. As a result many stroke survivors are left with avoidable and unduly prolonged disability. There is an urgent need to establish coordinated stroke services. This will require a reorganisation of the present uncoordinated structures, the provision of stroke networks and the adoption of treatment protocols and standards of stroke care which conform to international best practices and major investment in proper facilities.

These guidelines have been prepared by the Council on Stroke of the Irish Heart Foundation, the Council on Stroke was formed in 1997 and is composed of representatives of 15 medical and associated disciplines. The aim of these guidelines is to equip health professionals with the knowledge of what best stroke care should be and to evaluate their role in working together to improve outcomes for stroke patients and their families. The recommendations included in these guidelines are based on the best evidence we have at our disposal. Much of this evidence is of the highest quality, derived from randomised controlled trials or large observational studies and as such is very powerful and robust. However, this quality of evidence is not available for all topics and the evidence supporting some recommendations, especially those marked **(I)**, may be that of expert opinion rather than trial based data. Accordingly, such recommendations may be seen in the context of courses of action that would be supported by the majority of specialists in that area and that exceptions to all these may be necessary in the case of individuals. The guidelines are not intended to be encyclopaedic or infallible and in specific circumstances it may be justifiable, appropriate and in the patients best interest for the specialist to act outside them, particularly in cases where they feel that the individual patients situation or condition falls outside that reflected in the studies from which the guidelines are derived. This acknowledged the guidelines represent standards against which the care of the majority of people with stroke can be measured.

The Irish Heart Foundation Council on Stroke is a body comprising representatives from fifteen different professional organisations involved in the care of individuals with stroke and patient advocates from the Volunteer Stroke Scheme. All these representatives give freely of their time to work for people who have suffered stroke. We hope that the combined efforts of all these representatives in association with the contributions of additional delegates who attended National Stroke Guidelines Meeting (April 2009) and all contributors to these guidelines will stimulate, drive and guide much-needed improvements in stroke care in Ireland.

**Dr Frances Horgan
Chairperson,
IHF Council on Stroke,
October 28th 2009**

Glossary of Source Guidelines

- A** Australian Guidelines encompassing:
Stroke Foundation: Clinical Guidelines for Acute Stroke Management, 2008
Stroke Foundation: Clinical Guidelines for Stroke Rehabilitation and Recovery, 2005
Stroke Foundation: Dietetics Concise Guidelines - Stroke Rehabilitation and Recovery
Stroke Foundation: Occupational Therapy Concise Guidelines - Stroke Rehabilitation and Recovery
Stroke Foundation: Physiotherapy Concise Guidelines - Stroke Rehabilitation and Recovery
Stroke Foundation: Speech Therapy Concise Guidelines - Stroke Rehabilitation and Recovery
Stroke Foundation: Clinical Guidelines for Stroke and TIA Management - General Practice, 2008
- C** Canadian Best Practice Recommendations for Stroke Care, 2008
- D** Royal Dutch Society for Physical Therapy: Clinical Practice Guidelines for Physical Therapy in Patients with Stroke, 2004
- E** European Stroke Organisation: Guidelines for the Management of Ischaemic Stroke, 2008
- H** Creating Cardiovascular Health. Cardiovascular Health Policy. Department of Health and Children, draft October 2009
- I** Irish Heart Foundation Stroke Council Expert Opinion 2009
- N** National Institute of Clinical Excellence Guidelines 2008
- R** Royal College of Physicians: National Clinical Guidelines for Stroke, 3rd edition, 2008
- S64** Scottish Intercollegiate Guidelines Network: (SIGN Guideline 64) Management of Patients with Stroke: Rehabilitation, Prevention and Management of Complications, and Discharge Planning. Published 2002, Updated 2006
- S78** Scottish Intercollegiate Guidelines Network: (SIGN Guideline 78) Management of Patients with Stroke: Identification and Management of Dysphagia. Published 2004.
- S108** Scottish Intercollegiate Guidelines Network: (SIGN Guideline 108) Management of Patients with Stroke: Assessment, Investigation, Immediate Management and Secondary Prevention. Published 2008
- U** American Heart Association Guidelines 1994-2008
- Z** Stroke Foundation: New Zealand Protocols for the Management of Stroke and TIA, 2006
Stroke Foundation: New Zealand Guideline for the Assessment and Management of People with Recent TIA, 2008

Abbreviations

ACLS	Advanced cardiac life support
ADLs	Activities of daily living
ARR	Absolute risk reduction
ASPECTS	Alberta Stroke Programme Evaluation of CT Score.
CAS	Carotid artery stenting
CEA	Carotid endarterectomy
CEMRA	Contrast-enhanced MR angiography
CPK	Creatine phosphokinase
CT	Computerised tomography
CTA	CT angiography
DVT	Deep vein thrombosis
DWI	Diffusion weighted imaging
EADLs	Extended activities of daily living
ED	Emergency department
EIC	Early ischaemic changes
FAST	Face, Arm, Speech Test
FEES	Fiberoptic endoscopic evaluation of swallowing
FES	Functional electrical stimulation
FFP	Fresh frozen plasma
GCS	Glasgow Coma Scale
IA	Intra-arterial
ICA	Internal carotid artery
ICH	Intracerebral haemorrhage
ICP	Intracranial pressure
IHF	Irish Heart Foundation
IV	Intravenous
LFTs	Liver function tests
LMWH	Low molecular weight heparin
MAP	Mean arterial pressure
MCA	Middle cerebral artery
MDT	Multidisciplinary team
MR	Modified-release
MRI	Magnetic resonance imaging
mRS	Modified Rankin (Global Disability) Scale
NASCET	North American Symptomatic Carotid Endarterectomy Trial
NG	Nasogastric (tube)
NIHSS	National Institute of Health Stroke Scale
NINDS	National Institute of Neurological Disorders and Stroke
NNT	Number needed to treat
PADLs	Personal activities of daily living
PE	Pulmonary embolism
PEG	Percutaneous endoscopic gastrostomy
RCT	Randomised controlled trial
ROSIER	Recognition of Stroke in the Emergency Room
rt-PA	Recombinant tissue plasminogen activator
SAH	Subarachnoid haemorrhage
SNP	Stroke network partnership
SSRI	Selective serotonin reuptake inhibitor
TIA	Transient ischaemic attack
TED(S)	Thrombo-embolic Deterrent (Stockings)
TPN	Total parenteral nutrition

Index

	Page
Organisation of Services: Nationally and Locally	11
Goals of Service Organisation	12
Stroke Network Partnerships	12
National Forum, Curricula and Audit Database	13
Local Hospital Organisation	14
Stroke Unit: Definition and Requirements	15
Stroke Units: Designation and Process	16
Staffing	16
Stroke Unit Governance	17
Pre-hospital Stroke Care, Public and Patient Education	20
Public Education and Awareness	21
Professional Education	21
Emergency Medical Services: Community	21
Post-stroke Education	22
TIA Management	24
TIA Definition	25
Service Requirements	25
Assessment	25
Imaging	25
Investigation	26
Patient Care and Assessment	27
Basic Principles of Care	28
Management	28
Physiological Monitoring	28
Hypertension in Acute Stroke	29
Acute Diagnostic Imaging	30
Anti-platelet Therapy Immediately Following Cerebral Infarction	31
Neurosurgical Issues	31
Intracerebral Haemorrhage	32
Subarachnoid Haemorrhage	33
Cervical Arterial Dissection	34
Cerebral Venous Thrombosis	34
Deep Venous Thrombosis and Pulmonary Embolism	34
Drugs Affecting Recovery	35
Early Assessment	35
Communication	36
Vulnerable Adult/Child Protection	36
Early Positioning and Mobilisation	37
Bladder and Bowel Management	37
Urinary Incontinence	38
Bowel Care	38
Pressure Area Care	39

Palliative Care	39
Depression	39
Pain: Musculoskeletal Pain	40
Pain: Central Post-Stroke Pain	40
Cognitive Deficits and Dementia	41
Rehabilitation	42
Rehabilitation Approach	43
Rehabilitation Training	44
Post-acute Rehabilitation	44
Treatment: Timing/Intensity/Frequency of Rehabilitation.	44
Goal Setting	45
Cognition	45
Attention and Concentration	46
Memory	46
Executive Function	46
Apraxia	47
Prevention and Management of Shoulder Pain and Subluxation	47
Upper Limb Management: Upper Limb Re-education	48
Upper Limb Management: Mental Practice	48
Upper Limb Management: Task-Specific Training	48
Upper Limb Management: Impaired Motor Control	48
Impaired Sensation	48
Impaired Tone: General Principles	49
Impaired Tone: Splinting and Stretching	49
Cardiovascular Fitness During Inpatient Rehabilitation	50
Swelling of the Extremities	50
Strength Training - Resisted Exercise	50
Sitting, Sit-to-Stand and Standing	50
Balance Impairment, Falls and Fractures	51
Walking	51
Ankle Foot Orthoses	52
Functional Electrical Stimulation (FES)	52
Mobility Aids, including Wheelchair Mobility	52
Functional Transfer Retraining	52
Vision and Perception: Visual Field Deficit	52
Vision and Perception: Agnosias	53
Vision and Perception: Unilateral Neglect	53
Personal Activities of Daily Living (PADLs)	53
Extended Activities of Daily Living (EADLs)	
(Domestic and Community)	54
Counselling	54
Advocacy	55
Carer Involvement	55
General Management of Aphasia and other Communication	
Impairments	57
Communication Disorders	57
Mental Capacity	57
Dysarthria	59

Apraxia of Speech	59
Cognitive Communication Disorders resulting from Non-dominant Hemisphere Stroke	59
Including People with Aphasia and Communication Disorders in Research	60
Evaluating and Stopping Treatment	60
Follow-up Rehabilitation Treatment	61
Rehabilitation in Extended Care Settings	61
Dysphagia and Nutrition	62
Hydration	63
Nutrition	63
Artificial Nutrition Support	64
Ongoing Monitoring of Nutrition	64
Feeding Methods	64
Oral Care	65
Dysphagia: Acute Assessment	66
Clinical Bedside Assessment	67
Instrumental Assessment	68
Dysphagia: Acute Management	68
Dysphagia: Long-term Management	69
Self-Feeding	70
Long-term PEG Feeding	70
Discharge from Hospital and Returning to the Community	72
Pre-discharge Needs Assessment	73
Early Supported Discharge Team in the Community	73
Information Provision Pre-discharge	74
Community Care	74
Discharge Planning and Transfer of Care: Carer Education	75
Discharge Planning and Transfer of Care: Personal and Environmental Equipment and Adaptations	75
Vocational Activities	76
Leisure Activities	76
Sexuality	77
Driving	77
Quality Markers in Community Stroke Care	78
Primary and Secondary Prevention of Stroke	79
Primary Prevention	80
Diet	80
Secondary Prevention	80
Self-management and Support	81
Activities of Daily Living and Exercise	82
Secondary Prevention: Early Secondary Prevention with Antiplatelet Therapy <7-14 Days after Non-Cardioembolic TIA or Ischaemic Stroke of Arterial Origin	82

Secondary Prevention: Empirical Treatment Options for Acute Management of Patients with TIA or Ischaemic Stroke Onset while on Aspirin Monotherapy	83
Secondary Prevention: Long-Term Antiplatelet Therapy >7-14 days after Non-Cardioembolic TIA or Ischaemic Stroke	83
Secondary Prevention: Oral Anticoagulation after Cardioembolic TIA or Ischaemic Stroke with Atrial Fibrillation or Flutter	84
First Cardioembolic TIA - No 'High risk' Factors	84
'High Risk' Cardio-embolic TIA Patients with Atrial Fibrillation / Flutter e.g. ≥ 1 TIA on Antiplatelet Therapy; Left Atrial Appendage Thrombus	85
Minor Ischaemic Cardioembolic Stroke with Small Infarct on CT/MRI	85
Minor/Major Cardioembolic Stroke with Moderate/Large Infarct on CT/MRI	85
Where Anticoagulation is Contraindicated in Cardioembolic TIA/Ischaemic Stroke	85
Secondary Prevention with Statin Therapy following TIA and Ischaemic Stroke	85
Choice of Statin and Monitoring suggestions	86
Lipid Targets	86
Statins in Primary Intracerebral Haemorrhage	87
Secondary Prevention: Blood Pressure	87
Carotid Endarterectomy (CEA) in Symptomatic Patients	88
Timing of Surgery	89
Indications for Carotid Endarterectomy in Asymptomatic Patients	89
Carotid Artery Endovascular Treatment in Symptomatic Carotid Stenosis	89
Carotid Artery Endovascular Treatment in Asymptomatic Carotid Stenosis	90

Appendix 1: Acknowledgements.

Appendix 2: National Thrombolysis Guidelines for Cerebral Infarction 91

Organisation of Services: Nationally and Locally

Goals of Service Organisation.

At national level, the planning and development of stroke services must address all elements of care of patients with cerebrovascular disease and stroke from prevention, acute treatment and non-acute treatment, to rehabilitation, and continuing and palliative care. Leadership and organisation of such care should be coordinated and patient-centred, and health services must facilitate and promote all components of stroke care including

- Public awareness of stroke symptoms and signs
- Emergency response to stroke
- Emergency treatment of stroke (including thrombolysis)
- Acute stroke unit treatment
- Acute stroke multidisciplinary rehabilitation
- Non-acute and community multidisciplinary rehabilitation
- Secondary prevention and chronic disease management.
- Provision of support and information to patients and carers. **(H)**

For this to be effective it will require involvement of a range of organisations and services including. Primary care and public health services (including health promotion units), emergency medical services including the Pre-Hospital Emergency Care Council (PHECC), acute hospital services, non-acute hospital services including rehabilitation hospitals and day hospitals, community rehabilitation and nursing services, psychiatric and palliative care services, continuing care providers and voluntary agencies including stroke and carer advocacy groups. **(H)**

Stroke Network Partnerships

- Organisation of stroke services should be structurally consistent throughout Ireland with allowances made for variations in population demographics and service location. The national Cardiovascular Health Policy recommends reorganisation of stroke services to provide consistent, comprehensive services throughout the patient journey. It recommends that such services be organised through the creation of stroke network partnerships (SNPs). Each SNP should provide services for between 400,000 and 500,000 people. The development of SNPs will involve the creation of partnerships between ‘local’ stroke centres and ‘regional’ stroke centres and should actively involve pre-hospital emergency care, community services and service users. Each SNP should be established in a manner consistent with the recommendations of the national policy document, should have an integrated structure and should develop co-ordinated pathways and protocols for stroke care. **(H)**
- Each SNP should appoint a lead clinician or lead clinicians with responsibility for promoting development of coordinated hospital and community stroke services including review of adequacy of services, audit, research and education in conjunction with the relevant local and national health service

commissioners. Medical, nursing and allied health professional ‘leads’ for stroke from individual stroke centres within the SNPs should meet regularly with representatives from HSE hospital and community management. Lead Clinicians should inform and advise on clinical service and manpower needs, and lead on the development of a plan for the network, seeking to agree a representative position on key issues. Each SNP should decide an agreed appointment process and tenure of the lead clinician taking into due consideration the need for fair representation of all specialities involved in stroke care. **(H)**

- Amongst the responsibilities of the SNPs will be improvement of both national and local public awareness and health promotion regarding prevention of stroke and cerebrovascular disease, and they should specifically work with local health promotion units to develop an organised regional strategy for improving public education regarding cerebrovascular disease. They should work to develop community structures, including specialised early supported discharge teams and day hospitals with specialist stroke input within each SNP to facilitate supported discharge and ongoing rehabilitation. They should also involve state and voluntary agencies in developing vocational training structures (including driving assessments and re-training) for patients after stroke within each SNP. **(H)**
- National stroke organisation must support the development of models of care within each SNP to address the ongoing need for assessment and treatment in stroke patients. Acting through SNPs it must also ensure patients in the community have adequate access to
 - Ongoing stroke specialist input as required
 - Secondary prevention advice and treatment
 - Psychiatric and Clinical psychology services
 - Pain and palliative medicine and spasticity services
 - Information about support agencies
 - Specialist advice on lifestyle, recreation, driving and sexuality after stroke
 - Specialist advice on financial management
 - Specialist advice on vocational issues and training services. **(H)**

National Forum, Curricula and Audit Database

- A national advisory body for stroke service development should be established, involving all stroke care disciplines. This role is currently fulfilled by the IHF Council on Stroke.
- In conjunction with the specialist and multidisciplinary representative bodies involved in stroke care, a core curriculum of training in stroke should be developed for all disciplines, with certification of competency through relevant postgraduate authorities.

- A centralised, shared database for audit of all aspects of stroke care should be established to inform risk management and quality assessment of services and promote stroke research. **(H)**

Local Hospital Organisation

All hospitals receiving acute medical admissions that include patients with potential stroke should have on-site or immediate access to

- a specialist neurovascular service, alone or as part of an SNP, to assess and initiate management of patients within 24 hours of transient cerebrovascular symptoms (transient ischaemic attack (TIA), stroke with transient overt signs) **(H)**
- computerised tomography at all times **(H)**
- carotid duplex sonography or computerised tomographic angiography / magnetic resonance angiography, available to appropriate stroke patients on an urgent basis within the institution or as part of the SNP **(H)**
- a specialist, acute stroke unit or comprehensive stroke unit (incorporating acute care and rehabilitation) with capacity to monitor and regulate basic physiological functions such as heart rate and rhythm, arterial oxygen saturation, blood pressure and blood glucose **(H)**
- a 24 hour per day thrombolysis programme for acute ischaemic stroke alone or as part of an SNP (using telemedicine solutions or a ‘treat and return’ model as appropriate) **(H)**
- a specialist stroke rehabilitation ward or immediate access to one **(H)**
- defined pathways of care with regional stroke centres (where applicable) and tertiary specialist diagnostic, intervention and neurosurgical facilities. **(H)**

All hospitals receiving acute medical admissions that include patients with potential stroke should have available the following structures, personnel and resources:

- An organised EMS pathway, with the emergency department (ED) to fast-track all stroke patients
- Round the clock on-call availability of an acute stroke specialist (usually but not exclusively a geriatrician or neurologist) either on-site or as part of an SNP
- A clinical lead for stroke (usually but not exclusively a geriatrician or neurologist)

- Close interdisciplinary working between geriatricians/ stroke physicians, neurologists and physicians in rehabilitation medicine with supporting protocols, administrative and management structures.
 - A clinical nurse specialist with responsibility for stroke
 - A core multidisciplinary team for stroke including speech and language therapy, physiotherapy, occupational therapy, clinical nutrition, social work and clinical psychology.
 - A specialist multidisciplinary stroke rehabilitation team
 - Access for appropriate patients to psychiatry, clinical and neuropsychology services either ‘in-house’ or as part of the SNP (regional stroke centres should have neuropsychology available on site).
 - Access to local specialist input from other disciplines such as pharmacy, palliative medicine, recreational therapy, dental and oral hygiene, orthotic and podiatry services.
 - A clinical stroke service development and audit committee involving representatives of all disciplines
 - Provision of an annual audit report on key indicators of stroke care as in the National Audit on Stroke Care, consistent with agreed national indicators
 - A weekly interdisciplinary neurovascular conference (alone or as part of a wider network) to discuss cases, review imaging and form consensus opinion on management where appropriate (e.g. carotid surgery).
 - An ongoing education and professional development programme for all staff involved in stroke care within institutions and as part of the wider SNP.
 - Appropriate outreach, liaison and joint CPD with community services to ensure stroke-aware services.
 - All clinicians should be involved in audit of stroke care and should use the results to plan and execute service improvements. Agreed performance measures should be in place at all points in a stroke service to enable this.
- (H, C, I)**

Stroke unit: Definition and Requirements

- All hospitals providing care for acute stroke patients must make available immediate access to a specialist, acute stroke unit or comprehensive stroke

unit (providing acute care and rehabilitation) with the capacity to monitor and regulate basic physiological functions such as heart rate and rhythm, arterial oxygen saturation, blood pressure and blood glucose. **(H)**

- A stroke unit consists of a discrete area of a hospital ward that exclusively or principally takes care of stroke patients and is adequately staffed by a specialist multidisciplinary team. **(E, I)**

Stroke Unit: Designation and Process

- Acceptable stroke unit organisational structures are comprehensive stroke units with dual acute care and rehabilitation functions or acute stroke units with separate specialised stroke rehabilitation ward/units. **(H, R, E)**
- Stroke units should be large enough to accommodate all acute suspected neurovascular/stroke admissions to the hospital. **(H, R)**
- Stroke units must have an operational policy to ensure that beds are available to receive acute suspected neurovascular and stroke admissions to monitored beds on the unit. **(H)**
- Stroke units should have the capability to perform continuous ECG and physiological monitoring (blood pressure, SaO₂, glucose) and monitoring of neurological status. **(H, E, R)**
- Stroke units admitting acute strokes must be able to deliver intravenous thrombolysis and monitor patients for complications post-administration. **(H)**
- Stroke units should have early comprehensive multidisciplinary assessment (including therapy assessment within 48 hours) of all acute stroke patients on admission using recognised assessment tools. **(H)**
- Stroke care pathways should be available for the acute phase of stroke. **(N, H)**
- Cases of paediatric stroke should be admitted to a specialised paediatric unit experienced in the management of stroke in children. **(H)**

Staffing

- Stroke units must have immediate access to a consultant specially trained in the acute management of stroke patients including delivery of thrombolysis on a 24/7 basis. **(H)**

- Stroke unit care should involve integrated working between specialists including Geriatric / Stroke Physicians, Neurologists and Physicians in Rehabilitation Medicine. **(H)**
- Stroke units should be adequately staffed by nurses specially trained in the management of patients with acute stroke. **(H)**
- Stroke units should have adequate specialist medical and nursing staff to ensure appropriate patient assessment, treatment and monitoring. **(H)**
- Stroke unit care must be underpinned by a comprehensive specialist multidisciplinary team including speech and language therapy, physiotherapy, occupational therapy, clinical nutrition, social work and clinical psychology. **(H)**
- All disciplines within the multidisciplinary team must have adequate staff time and resources to ensure patients have timely and appropriate assessment and rehabilitation. **(H)**
- Determination of required staff, resources and numbers should take into account international and national recommendations and relative state of development of national and local community rehabilitation services. **(H)**
- Prompt access to additional specialist advice and in particular cardiology, radiology, haematology, psychiatry, palliative care and pharmacy services is essential for stroke units at regional and comprehensive centres. **(H)**
- Stroke units should have easy and defined pathways for access to services supplying: orthotics; orthoptists; specialist seating; patient information, advice and support; assistive devices; vocational training including driving assessment and retraining programmes. **(H)**

Stroke Unit Governance.

- Stroke units should have a lead clinician with an appropriate work plan to facilitate service delivery, teaching, audit and research and administrative duties.
- Stroke Units <10 beds should have a designated CNM1 and >10 beds a CNM2 supported by a Clinical Nurse Specialist OR Nurse Practitioner in Stroke.
- Specialist Therapists: Although detailed exploration of workforce planning is outside the scope of this document, a mix of therapy grades is required to deliver optimum care to the person who has had a stroke. This includes basic grade, senior and clinical specialist posts.

- 'A specialist is defined as a healthcare professional who has in relation to the problem concerned, the relevant knowledge, engages in evidence based practice, has accumulated a level of experience above the routine for managing the problem and maintains that specialism through continuing education'. (RCP Guidelines 2009)
- In the context of these guidelines the term “Specialist” implies a number of competencies
 - Advanced knowledge and skill level
 - Skills in clinical leadership
 - A responsibility to undertake and participate in research
 - Design of protocols, local service standards
 - Development of systems to ensure continuing professional
 - Development in stroke across staff and undergraduate level. **(I)**
- Consideration should be given to the role of stroke service co-ordinator to facilitate rapid triage and assessment, thrombolysis, bed identification, admission to stroke unit and discharge planning.
- The stroke unit multidisciplinary team should meet weekly to exchange clinical information, agree management plans and set rehabilitation goals with patients and carers (including discharge planning).
- Stroke unit care should be supported by appropriate data management resources (institutional or as part of a wider stroke network partnership) to facilitate audit and monitoring of key performance indicators.
- Stroke units should have a programme to support ongoing teaching and training of all staff involved in stroke care, including Advanced Cardiac Life Support (ACLS) and National Institute of Health Stroke Scale (NIHSS) certification, physiological monitoring interpretation, stroke complications and assessment scales in stroke.
- Stroke units should have agreed protocols for acute stroke assessment and treatment, management of complications, symptom relief, palliative care and provision of information to patients and carers. **(H)**
- Organisation of neurosurgical services for stroke must ensure
 - Stroke Network Partnerships have an agreed service plan with tertiary neurosurgical provider.
 - Stroke Network Partnerships have agreed pathways of urgent referral of appropriate cases for neurosurgical evaluation.
 - Each hospital within a SNP has a high speed communication link for transmission of neuro-images to neurosurgical centre.
 - Each SNP to agree protocol for management of subarachnoid haemorrhage, suspected vasospasm, ‘malignant’ cerebral oedema, posterior fossa/cerebellar haemorrhage, and obstructive hydrocephalus with neurosurgical centre.
 - Where a SNP does not have facilities to perform cerebral angiography, intra-arterial thrombolysis or ‘rescue’ clot retrieval (where appropriate) a

service plan and agreed protocol should be agreed with neurosurgical or neuroradiological provider.

- Strong consideration should be given to the appointment of an interventional neuroradiologist to each regional stroke centre within each SNP. **(H)**

Pre-hospital Stroke Care, Public and Patient Education

Public Education and Awareness

- Members of the public should be able to recognise and identify stroke symptoms and signs.
- Continuous public education programmes should emphasise that stroke is a medical emergency for which immediate medical attention should be sought by dialling 999 or 112. **(A, C, I)**
- Public education should include information that stroke can affect persons of any age – from newborn and children to adults. **(C)**

Professional Education

- Education programmes should be put in place to increase stroke awareness amongst all health professionals. These should emphasise that stroke is a medical emergency where urgent assessment and treatment can lead to improved survival and reduced disability. **(N, C)**

Emergency Medical Services: Community

- All patients with suspected stroke should be admitted directly to a specialist acute stroke unit following initial assessment either from the community or from the emergency department. **(R, N)**
- Community services should have a link to hospital programmes for hyper-acute management of TIA and stroke. **(R, N, I)**
- Priority EMS dispatch is recommended for acute stroke. **(R, N, I)**
- Patients with signs and symptoms of hyper-acute stroke (onset within 4.5 hours) should be transported to the nearest hospital providing emergency stroke care. **(R, N, I)**
- Ambulance transport protocols should take account of
 - Time of symptom onset and anticipated transport time being within the therapeutic time window
 - Any additional acute care needs of the patient. **(R, N, I)**
- Paramedical staff should use a rapid assessment tool (e.g. the Face Arm Speech Test (FAST)) to facilitate early recognition of stroke. **(R, N)**

- Paramedical staff should pre-notify the receiving hospital emergency department of any incoming FAST positive patient to facilitate early medical assessment and access to rapid neuro-imaging. **(R, N, I)**
- The emergency department medical staff should utilise a standardised, rapid clinical assessment tool such as the ROSIER (Recognition of Stroke in the Emergency Room) Scale (Appendix 1) to facilitate their rapid recognition of acute stroke. **(R, N)**
- It is recommended that remote or rural areas have access to such options as telemedicine and helicopter transfer to facilitate access to rapid assessment and treatment. **(R, U, N, I)**

Post-Stroke Education

- Patient, family and caregiver education is an integral part of stroke care that should be addressed at all stages across the continuum of stroke care for both adult and paediatric patients. Education includes the transfer of information and skills, and may include additional training components as required to transfer skills for self/patient management for both adult and paediatric stroke patients and their families. **(C)**
- Education that is integrated and coordinated should be provided in a timely manner across the continuum of stroke care for all patients with stroke or at risk for stroke, as well as their families and caregivers. **(C)**
- Patients and their caregivers should be offered education programmes to assist them in adapting to their new role. **(C)**
- Educational content should be specific to the phase of care or recovery across the continuum of stroke care and appropriate to patient, family and caregiver readiness and needs. **(C)**
- The scope of the educational content should cover all aspects of care and recovery, including the nature of stroke and its manifestations, signs and symptoms; impairments and their impact and management, including caregiver training; risk factors; post-stroke depression; cognitive impairment, discharge planning and decision making; community resources, and support programmes; and environmental adaptations and benefits. **(C)**
- Education should be interactive, timely, up-to-date, provided in a variety of languages and formats (written, oral, aphasia friendly, group counselling approach), and specific to patient, family and caregiver needs and impairments. The provision of education should ensure communicative accessibility for stroke survivors. **(C)**

- Clinicians and/or teams should develop processes for routine patient, caregiver and family education in which designated team members are responsible for provision and documentation of education. **(C)**
- Stroke services should consider identifying a specific team member to be responsible for providing information to the patient and family/caregiver about the nature of the stroke, stroke management rehabilitation and outcome expectations, and their roles in the rehabilitation process. **(C, A)**
- Patient and family education should be documented in the patient's medial record to prevent the occurrence of duplicate or conflicting information from different disciplines. **(A)**

TIA Management

TIA Definition

For patient care, service planning and research the traditional clinical definition of transient ischaemic attack (TIA) is recommended i.e. ‘episodes of temporary and focal cerebral dysfunction of vascular origin...variable duration.. commonly lasting 2-15 minutes but occasionally as long as 24 hours. No residual neurological deficit’ (i.e. all symptoms and signs resolved) National Institute of Health 1975.

In some contexts (e.g. clinical care where early MRI has been performed, selected research settings), a tissue-based definition may be appropriate.

Service Requirements

- Service planning and resource allocation for patients with TIA should take into account epidemiological data on TIA incidence, and referrals to TIA services for non-cerebrovascular transient symptoms. **(I)**

Assessment

- All patients with probable TIA should be assessed by a physician who has received specialist training in stroke and TIA management. **(I)**
- Patients with TIA should be referred to a hospital with a specialist stroke service for immediate assessment, investigation, and treatment. **(I)**
- Non-randomised studies suggest that stroke risk is substantially reduced in patients with TIA who are immediately assessed *and treated* by a specialist stroke service in outpatient, day care, and stroke unit settings. As available data do not indicate that any one of these service models is superior to another, all are acceptable provided that access is available to appropriate early diagnostic investigations. **(I)**
- When combined with clinical assessment by a trained physician, clinical prediction scores for stroke risk after TIA such as ABCD2 may be valuable aids, particularly for identification of patients at highest stroke risk. Their role in the identification of low-risk patients requires further study before being considered as the sole basis for non-urgent assessment of individual patients with TIA. **(I)**

Imaging

- Brain imaging is clinically useful in the management of individual patients and should be performed following TIA. Either MRI with diffusion-weighted

imaging and T2* (time constant, gradient Echo) or CT is reasonable, although evidence indicates higher sensitivity of MRI for focal cerebral pathology. **(I)**

- Vascular imaging of the carotid arteries should be performed urgently (as soon as possible and no later than 72 hours) following confirmed TIA, using carotid ultrasound and/or MR, CT or invasive angiography. **(I)**

Investigation

- All patients with TIA should have 12-lead ECG. 24-hour Holter ECG monitoring should be performed when arrhythmias are suspected and no other causes of stroke are found. Echocardiography is recommended in selected patients (evidence of cardiac disease, suspected cardiac, aortic, or paradoxical embolism). **(I)**
- All patients with TIA should have a general medical assessment, including fasting lipid profile, full blood count and electrolytes, and investigation for diabetes (fasting glucose and/or oral glucose tolerance test, as appropriate). **(I)**

Patient Care and Assessment

Basic Principles of Care

- It is recommended that patients with acute stroke should be assessed in hospital. Any patient with a stroke who for whatever reason cannot be admitted to hospital and who is not receiving palliative care should be seen by the specialist teams at home or on an out-patient basis as soon as possible for diagnosis, treatment, rehabilitation and risk factor reduction at a standard comparable to other patients. **(R, I)**
- All people with acute stroke not admitted to hospital, who have residual impairments, should undergo a comprehensive outpatient assessment including assessment of function, cognition, depression, driving fitness, and potential for rehabilitation, as soon as possible or within 2 weeks. **(C)**
- In assessing the patient the multidisciplinary team place special emphasis on risk factors for stroke recurrence, medical comorbidities, level of consciousness and cognitive status, swallowing assessment, skin assessment, risk of DVT, mobility with respect to the patient's needs for assistance in movement and emotional support for the family and caregiver. **(U, I)**
- At every stage in the process, from admission to long-term support in the community, patients and carers need to be provided with the fullest possible information, and encouraged to take the maximum responsibility for their own recovery. **(A)**

Management

- All patients should be reviewed immediately by a physician expert in stroke.
- Initial assessment should include a complete history and physical examination including a neurological examination. Admitting clinicians should seek to investigate, determine and record:
 - Possible underlying cardiovascular causes
 - Localisation of the cerebral area likely to have been affected
 - Treatable risk factors. **(R, I)**
- All patients should have their clinical course monitored and any patient whose clinical course is unusual or inconsistent with the initial diagnosis of stroke should be fully reassessed and investigated as appropriate for possible alternative diagnoses. **(R)**

Physiological Monitoring

- Any patient who has residual symptoms or disability once immediate diagnostic and treatment procedures are completed should be transferred to a

unit that provides specialised management of any potential problems (i.e. an acute stroke unit, or high dependency unit), if not already there. **(R, E)**

- The patient's physiological state should be monitored closely to include:
 - Blood glucose
 - Blood pressure
 - Oxygenation
 - Nourishment and hydration
 - Temperature. **(R, E)**

- People who have had a stroke should receive supplemental oxygen only if their oxygen saturation drops below 95%. The routine use of supplemental oxygen is not recommended in people with acute stroke who are not hypoxaemic. **(R, E)**

- People with acute stroke should be treated to maintain a blood glucose concentration between 4 and 11 mmol/L. **(R, E)**

- Optimal insulin therapy, which can be achieved by the use of intravenous insulin and glucose, should be provided to all adults with diabetes who have threatened or actual myocardial infarction or stroke. Critical care and emergency departments should have a protocol for such management. **(R, E)**

- Paracetamol should be used to control pyrexia but routine use of high dose paracetamol as prophylaxis is not recommended. There is no evidence available to support the active cooling of stroke patients using other methods. **(I)**

Hypertension in Acute Stroke

- Anti-hypertensive treatment in acute stroke is recommended only if there is a hypertensive emergency or one or more of the following serious concomitant medical issues:
 - Hypertensive encephalopathy
 - Hypertensive nephropathy
 - Hypertensive cardiac failure/myocardial infarction
 - Aortic dissection
 - Pre-eclampsia/eclampsia
 - Intracerebral haemorrhage with blood pressure over 180/100 mmHg.
 - Some specialists advocate cautious reduction of blood pressure in cerebral infarction if it exceeds (220/120 mmHg). **(R,I)**

- Blood pressure reduction to 180/105 mmHg or lower should be considered in people who are candidates for thrombolysis. **(R)**

- Patients taking antihypertensive therapy before stroke should continue to do so unless they are significantly hypotensive. **(I)**

- Later control of blood pressure is discussed in the chapter on prevention.

Acute Diagnostic Imaging

- All radiology departments involved in providing acute stroke services should fulfil the basic three requirements of acute stroke imaging. These are:
 - To confirm the diagnosis and determine the type of stroke either ischaemic or haemorrhagic
 - To exclude other conditions that can mimic stroke or present with stroke- like symptoms
 - To evaluate the appropriateness of acute treatment such as thrombolysis.
 - To fulfil these requirements a hospital needs to provide 24 hour access to CT. **(I)**
- Expert clinical assessment is essential to avoid inappropriate imaging and wasted resources. Clinical referral for acute stroke imaging should only come from a designated stroke team or within an agreed stroke pathway, both during and outside of normal working hours. Each individual centre will decide on the make up of their stroke team to allow for the considerable local variation of expertise. **(I)**
- Studies considered urgent should typically be performed as emergencies in the next slot during normal working hours. Outside normal working hours, studies should be performed within 60 minutes of being requested. Urgent out of hours scanning for people with acute stroke is indicated if any of the following apply:
 - Indications for thrombolysis or early anticoagulation treatment
 - On anticoagulant treatment
 - A known bleeding tendency
 - A depressed level of consciousness (Glasgow Coma Score below 13).
 - Unexplained progressive or fluctuating symptoms
 - Papilloedema, neck stiffness or fever
 - Severe headache at onset of stroke symptoms. **(R, I)**
- For all people with acute stroke without indications for immediate brain imaging, scanning should be performed as soon as possible (within a maximum of 24 hours) after onset of symptoms. **(R, I)**
- CT reports should particularly pay attention to the presence of haemorrhage, signs of acute infarction and the volume of tissue involved. Reports should also particularly pay attention to the timing of the onset of symptoms and the timing of the scan. There are considerable medico-legal implications in the provision of acute stroke imaging. Radiology reports need to be provided in the acute setting. Where instant reporting facilities are not available a dated and timed radiology report should be made in the medical chart.**(I)**

- Rapidly accessible MRI should be available as a problem solver in cases such as delayed or atypical clinical presentation and in addition, where there is still diagnostic uncertainty after CT scanning. **(I)**
- Early follow-up imaging of the carotid arteries is essential. This can be done using ultrasound, CTA or CEMRA with the aim of identifying those with carotid stenosis who will benefit from rapid carotid intervention. **(I)**
- To ensure high quality clinical outcomes each radiology department shall engage in service training, multidisciplinary follow-up and clinical audit of their practices. **(I)**

Anti-platelet Therapy Immediately Following Cerebral Infarction

- All people presenting with acute stroke in whom a diagnosis of primary intracerebral haemorrhage has been excluded by brain imaging should be given:
 - Aspirin 300 mg orally if they are not dysphagic or
 - Aspirin 300 mg rectally or by enteral tube if they are dysphagic. **(R, I)**
- Thereafter aspirin 300 mg should be continued until two weeks after the onset of stroke symptoms, at which time definitive long-term anti-thrombotic treatment should be initiated. (see section on early secondary prevention). **(R,I)**
- People being discharged before two weeks can be started on long-term treatments earlier. **(R)**
- Any person with acute ischaemic stroke for whom previous dyspepsia associated with aspirin is reported should be given a proton pump inhibitor in addition to aspirin. **(R)**
- Any person with acute ischaemic stroke who is allergic to or genuinely intolerant of aspirin should be given an alternative antiplatelet agent (see section on early secondary prevention). Intolerance is defined as either likely hypersensitivity to aspirin-containing medicines or history of severe dyspepsia induced by low-dose aspirin. **(R, I)**
- Anticoagulation treatment should not be used routinely for the treatment of acute stroke. **(R)**

Neurosurgical Issues

- People with middle cerebral artery (MCA) infarction who meet all of the criteria below may be considered by specialist services for referral for

decompressive hemicraniectomy. They should be referred and discussed within 24 hours of onset of symptoms and treated within a maximum of 48 hours:

- Aged 60 years or under
- Clinical deficits suggestive of infarction in the territory of the middle cerebral artery.

In addition they should have:

- A score on the National Institute of Health Stroke Scale (NIHSS) of above 15
 - Decrease in the level of consciousness to give a score of 1 or more on item 1a of the NIHSS
 - Signs on CT of an infarct of at least 50% of the MCA territory, with or without additional infarction in the territory of the anterior or posterior cerebral artery on the same side, or infarct volume greater than 145 cm³ as shown on diffusion-weighted MRI. **(R)**
- People who are referred for decompressive hemicraniectomy should be monitored by trained professionals skilled in neurological assessment. **(R)**
 - Stroke services should agree protocols for the monitoring, referral and transfer of people to regional neurosurgical centres for the management of symptomatic hydrocephalus following stroke. **(I)**

Intracerebral Haemorrhage

- Clotting levels in people with a primary intracerebral haemorrhage who were receiving anticoagulation treatment before their stroke (and have elevated INR) should be returned to normal as soon as possible, by reversing the effects of the anticoagulation treatment using a combination of prothrombin complex concentrate and intravenous vitamin K. **(R)**
- People with intracerebral haemorrhage should be monitored by specialists in neurosurgical or stroke care for deterioration in function and referred immediately for brain imaging when necessary. **(R)**
- Previously fit people should be considered for surgical intervention following primary intracranial haemorrhage if they have hydrocephalus. **(R)**
- People with any of the following rarely require surgical intervention and should receive medical treatment initially:
 - Small deep haemorrhages
 - Lobar haemorrhage without either hydrocephalus or rapid neurological deterioration
 - A large haemorrhage and significant prior comorbidities before the stroke

- A Glasgow Coma Scale of below 8 unless this is because of hydrocephalus. **(R)**
- Patients with significant posterior fossa haemorrhage or cerebellar infarction should be discussed with neurosurgical specialists and closely monitored to outrule brainstem compression or hydrocephalus. If this is suspected posterior decompression should be considered. **(I)**

Subarachnoid Haemorrhage

- Every patient presenting with sudden severe headache and an altered neurological state should have the diagnosis of haemorrhage investigated by:
 - Immediate CT brain scan (followed by CT or MR angiogram if acute SAH is confirmed)
 - Lumbar puncture if the CT brain scan is negative and does not show any contraindication.
 - Spectrophotometry of the cerebrospinal fluid, for xanthochromia. **(R)**
- Every patient diagnosed as having a subarachnoid haemorrhage should be started on oral nimodipine 60mg four hourly unless there are specific contraindications. **(R)**
- They should not be given anti-fibrinolytic agents or steroids. **(R)**
- They should always be referred to a specialist service, usually neurosurgical, for further investigation and, if appropriate, definitive treatment. **(R)**
- They should be transferred to the specialist neuroscience service within 24 hours, if appropriate and be provided with all supportive care needed. **(R)**
- In the specialist service the patient should have:
 - Imaging of all cerebral arteries (unless they have already had a CT or MR angiogram)
 - Specific treatment of any aneurysm related to the haemorrhage by endovascular embolisation or surgical clipping if appropriate. **(R)**
- After any immediate treatment, all patients should be observed for the development of treatable complications, especially hydrocephalus. **(R)**
- Every patient should be assessed for treatable risk factors, and have these treated. **(R)**
- Every patient who has any residual symptoms or disability should be referred for and transferred to specialist rehabilitation as soon as possible after definitive treatment. **(R)**
- Every patient with a strong family history (one other affected first-degree relative and/or a history of polycystic renal disease) should:

- Be advised that their family may be at increased risk of subarachnoid haemorrhage
- Be considered for a referral to a neurovascular and/or neurogenetic specialist for up-to-date information and advice. **(R)**

Cervical Arterial Dissection

- Any patient suspected of having arterial dissection should be investigated with appropriate imaging (e.g cross-sectional MRI and MR angiography including fat suppressed T1 and T2 images). **(R, E)**
- People with stroke secondary to acute arterial dissection may be treated with either anticoagulants or antiplatelet agents. Confirmation of most appropriate treatment is awaited from trials in progress. **(R, E)**

Cerebral Venous Thrombosis

- Any patients suspected of having cerebral venous thrombosis should be investigated by appropriate cross-sectional imaging techniques (e.g. MRI, CT or MR venography). **(R)**
- People diagnosed with cerebral venous sinus thrombosis (including those with secondary cerebral haemorrhage) should be given full-dose anticoagulation treatment (initially full-dose low molecular weight heparin e.g. enoxaparin 1.5 mg/kg/day or unfractionated IV heparin (target APTT ratio 2.5, range: 2-3.0), and then warfarin when stable (target INR 2.5, INR 2–3)) unless there are comorbidities that preclude its use. **(I, R)**

Deep Venous Thrombosis and Pulmonary Embolism

- Anti-platelet therapy should be used for patients with ischaemic stroke, this may help to prevent DVT/PE. **(A)**
- No therapy has been found effective in prevention of thromboembolism in stroke patients and clinicians should exercise a high level of vigilance for the symptoms of DVT or pulmonary embolism. The following therapies may be considered for selected patients at especially high risk of DVT/PE:
 - LMWH in prophylactic doses
 - Anti-thrombotic stockings in patients without significant peripheral arterial disease or skin problems. **(A, I)**
- People with ischaemic stroke and symptomatic proximal deep vein thrombosis (DVT) or pulmonary embolism should receive anticoagulation treatment in

preference to treatment with aspirin unless there are other contraindications to anticoagulation. **(A)**

- People with haemorrhagic stroke and symptomatic deep vein thrombosis or pulmonary embolism should have treatment to prevent the development of further pulmonary emboli using a caval filter where possible. If insertion of a caval filter is impossible, the benefits and risks of anticoagulation need to be carefully weighed up by the stroke specialist / treating physician **(I, A)**

Drugs Affecting Recovery

- The following drugs should not be given with the goal of enhancing recovery outside the context of clinical trials:
 - Amphetamines
 - Bromocriptine and other dopamine agonists
 - Piracetam
 - Meprobamate
 - Fluoxetine and other SSRIs. **(R)**
- Benzodiazepines and other CNS depressants should be prescribed with caution to stroke patients. **(R)**

Early Assessment

- All patients should be assessed within three hours of admission for their:
 - Ability to swallow, using a validated swallow screening test (e.g. 50-ml water swallow) administered by an appropriately trained person
 - Ability to communicate their needs
 - Immediate needs in relation to mobilisation, moving and handling
 - Bladder control
 - Risk of developing skin pressure ulcers
 - Capacity to understand and follow instructions
 - Nutritional status
 - Ability to hear, and need for hearing aids
 - Ability to see, and need for glasses. **(R)**
- All patients should receive an initial physiotherapy, occupational, nutrition and speech and language therapy assessment using an agreed procedure or protocol within 24-48 hours of admission with a full assessment (including goal setting), completed within 5 working days, and this should be documented in the notes. **(N, R, C, I)**
- Inpatient social work assessment should be carried out within two to five days of admission and prior to discharge. **(C, I)**

- People with acute stroke not admitted into hospital should have a social work assessment as soon as possible but within a period of no longer than two weeks. **(I)**
- All stroke patients referred to a social worker should be undergo a comprehensive psychosocial assessment and intervention. **(A, I)**
- At all times the patients views on the involvement of their family and other carers should be sought to establish if possible the extent to which the patient wants family members involved. In general it is recommended that families, significant others and caregivers should be involved in the assessment process. **(R, A)**

Communication.

- Any patient found to have aphasia on screening or suspected to have it on clinical grounds should have a formal assessment of language and communication by a speech and language therapist. **(R)**
- When a patient has been found to have aphasia a speech and language therapist should:
 - Explain the nature of the impairment to the patient, family and treating team
 - Establish the most appropriate method of communication and then inform (and if necessary train) the family and treating team
 - Re-assess the nature and severity of the loss at appropriate intervals. **(R)**
- Any patient whose speech is unclear or unintelligible so that communication is limited or unreliable should be assessed by a speech and language therapist to determine the nature and cause of the speech impairment. **(R)**

Vulnerable Adult/Child Protection

- Each member of the multi-disciplinary team in their assessment of and interactions with stroke patients and their families should be aware of their statutory responsibilities, relevant policies and best practice guidelines regarding the protection of vulnerable adults and children. **(I)**
- Where adult or child welfare/protection concerns are identified by members of the multi-disciplinary team the Social Worker should be informed as soon as possible. The Social Worker should carry out a risk assessment and involve other members of the multi-disciplinary team as appropriate. **(I)**

- Where the risk assessment indicates it members of the multi-disciplinary team should liaise with/refer to the relevant authorities e.g. senior case workers for elder abuse and child protection services. **(I)**

Early Positioning and Mobilisation

- Early mobilisation can be defined as “the act of getting a patient to move in the bed, sit up, stand, and eventually walk.” People with acute stroke should be mobilised as soon as possible within the first three days after stroke (when their clinical condition permits) as part of an active management programme of a specialist stroke unit. **(C, S108, S64)**
- Every patient with mobility limitation should be assessed by a specialist physiotherapist to determine the most appropriate and safe methods of transfer and mobilisation. **(R)**
- People with acute strokes should be assisted to sit up as soon as possible in line with correct rehabilitative handling (when their condition permits) and be provided with an appropriate seating system that matches the patient’s needs. **(R, I)**
- When lying or sitting, patients should be optimally positioned so as to minimise the risk of complications such as aspiration, shoulder pain, contractures, swelling of the extremities and skin pressure ulceration. **(R)**
- Nurses and care staff should be given training on how to position patients who cannot position themselves after stroke. **(R)**
- Visual and written information, individualised to the patient, should be made available to staff and carers concerning optimal positioning and handling. **(R)**

Bladder and Bowel Management

There is suggestive evidence that professional input through structured assessment and management and specialist continence nursing may reduce incontinence and related symptoms after stroke. Structured assessment and physical management have been shown to improve continence rates in both inpatients and outpatients. **(E)**

- All wards and stroke units should have established assessment and management protocols for both urinary and faecal incontinence, and constipation. **(C)**
- Urinary and faecal incontinence should be managed by high levels of nursing care in the acute phase. **(R)**

- Patients should be advised about the most suitable clothing to manage in the toileting task, if this is identified as a factor contributing to incontinence, or decreased independence in toileting. **(I)**
- Every effort should be made to facilitate quick access to toilet facilities within the hospital setting. This should include instruction for each patient in how to use the call bell, as well as consideration of the accessibility of the toilet for the patient, given any potential limitations in mobility. **(I)**
- Patients should be assessed for and provided with any equipment they require to manage independence in toileting or in self-management of incontinence both in hospital and on discharge to the community setting. **(I)**

Urinary Incontinence

- All patients with loss of control of the bladder at two weeks should:
 - Be reassessed for other causes of incontinence, which should be treated if identified **(R)**
 - A portable bladder ultrasound scan can be used to assist in diagnosis and management of urinary incontinence
 - Have an active plan of management documented
 - Be offered simple treatments first, such as bladder retraining, pelvic floor exercises and external equipment.
- The use of indwelling catheters should be avoided. If used, indwelling catheters should be assessed daily and removed as soon as possible.

Bowel Care

- A bowel management programme should be implemented in stroke patients with persistent constipation or bowel incontinence.
- All patients with a loss of control over their bowels at two weeks should:
 - Have a documented, active plan of management
 - Be referred for specialist treatments if the patient is able to participate in treatments
 - Only be discharged home with continuing incontinence after the carer (family member) or patient has been fully trained and adequate arrangements for continuing supply of continence aids and services are confirmed and in place.
- Patients with troublesome constipation should:
 - Have a prescribed drug review to minimise use of constipating drugs
 - Be given general advice on diet, fluid intake and exercise
 - Be offered oral laxatives
 - Be offered rectal laxatives only if severe problems remain.

- Functional continence issues should be considered, such as access to bathrooms, management of clothing. **(I)**

Pressure Area Care

- A tailored, individual management plan should be used for those assessed at an increased risk of developing pressure ulcers. Careful monitoring should also be incorporated with a frequency moderated by individual risk factors for development of pressure areas. **(I)**
- All patients unable to mobilise independently should have a pressure care risk assessment completed by trained personnel. **(A)**
- Patients should be provided with a pressure relieving mattress as an alternative to a standard hospital mattress if required and reassessed as needed. **(E)**
- Patients should be provided with a pressure relieving cushion if sitting out. This should be assessed in conjunction with provision of appropriate seating to reduce pressure, shear and friction forces. **(E, I)**
- In addition:
 - Patients should be repositioned frequently **(E)**
 - They should have nutritional status optimised (see separate chapter)**(E)**
 - Their sacral skin should be moisturised and the skin of the incontinent patients must be kept dry. **(E)**

Palliative Care

- All staff who care for patients with life-limiting, non-malignant diseases including severe stroke, should work in a collaborative manner so that the patients' care needs are met in appropriate settings. **(H)**
- Acute stroke patients should have access to specialist palliative care services as needed. **(A)**
- People with stroke who are dying and their families should have care that is consistent with the principles and philosophies of palliative care. **(A)**

Depression

- All stroke patients should be considered to be at high risk of depression, and should be screened using validated tools, at regular intervals. **(C)**

- Screening should take place at all transition points and whenever clinical presentation indicates including admission to acute care particularly if any evidence of depression or mood change, periodically during inpatient rehabilitation and following discharge to the community. **(C, R)**
- Patients identified should be referred to psychiatrist or clinical psychologist and treated as appropriate using antidepressants if no contraindication exists. **(C, R)**
- Routine use of prophylactic antidepressants is not recommended. **(C)**
- When a trial of antidepressants is indicated, selective serotonin reuptake inhibitors (SSRIs) may be favoured in this patient population. **(C)**

Pain: Musculoskeletal Pain

- Every patient with significant motor loss after stroke should be asked whether they have any musculoskeletal pain. **(R)**
- All patients complaining of or experiencing pain should have the cause of the pain diagnosed by someone who can distinguish the various specific, treatable causes. **(R)**
- Any patient with musculoskeletal pain should be assessed to determine whether improvement in movement, posture or moving and handling techniques can reduce the pain. **(R)**
- Any patient continuing to experience pain should be offered pharmacological treatment with simple analgesic drugs taken regularly:
 - e.g. Paracetamol, up to 1 g four times daily
 - Non-steroidal anti-inflammatory drugs should typically be avoided in patients with cerebrovascular disease on antiplatelet or anticoagulant therapy **(I)**
- Any patient whose pain is still not adequately controlled should be referred to a specialist service. **(R)**

Pain: Central Post-Stroke Pain

- Every patient should be asked if they are experiencing neuropathic pain on at least two occasions after stroke, and central post-stroke pain should be diagnosed by someone who can distinguish between the specific causes. **(R)**
- Any patient with neuropathic pain should receive treatment with one or more of:
 - Antidepressants

- Anticonvulsants. **(R)**
- Any patient whose neuropathic pain is not controlled after several weeks should be referred to a specialist in pain management. **(R)**

Cognitive Deficits and Dementia

- All patients at risk should be screened periodically for cognitive impairment, using a simple, standardised screen. **(R, C, I)**
- Management should include aggressive vascular risk factor management, if activities of daily living are impaired, implement remedial, adaptive or compensatory strategies, implement an individualised client centred approach, implement rehabilitation if appropriate in relation to patients and caregiver goals, pharmacotherapy should be considered by experts in this field. **(C)**
- All individuals planning to return to cognitively demanding activities, e.g. work or driving, should receive a formal cognitive assessment. **(C, I, R)**

Rehabilitation

Rehabilitation Approach

- Every person with stroke involved in the rehabilitation process, should participate in setting goals unless they choose not to or are unable to participate because of the severity of their cognitive and linguistic impairments. Those with severe cognitive and linguistic impairments will require a specialist approach to consent and intervention in rehabilitation. Patients with a communication disability (aphasia, dysarthria, apraxia of speech) should have the goal setting process adapted to facilitate their participation. **(N, R, I)**
- All members of a stroke service should use an agreed consistent approach, ensuring the patient is given the same advice and taught the same technique to ameliorate or overcome difficulties. **(R)**
- Stroke rehabilitation should encompass both restorative and compensatory approaches that match the needs of the patient throughout the recovery process. **(I)**
- The members of the stroke service should give as much opportunity as possible for a patient to practise repeatedly and in different settings any tasks or activities that are affected.
- The members of the stroke service should work within their own knowledge, skills, competence and limits in handling patients and using equipment, being taught safe and appropriate ways to move and handle specific patients if necessary. **(R)**
- Any patient whose recovery appears delayed or limited should be assessed for changes in self-identity, self-esteem and self-efficacy (as well as changes in mood). **(N, R)**
- A stroke rehabilitation service should:
 - Agree on standard sets of data to be recorded and collected routinely and protocols to determine the proposed use of that data
 - Use tools that are easily understood, valid and reliable
 - Determine when it is appropriate to use more complex tools and what specific training is needed to use them
 - Measure function and quantify changes at regular, appropriate intervals. **(R)**
- Clinicians should use standardised, valid assessment tools to evaluate the patient's stroke-related impairments and functional status. **(C, A, R)**

Rehabilitation Training

- Staff involved in the rehabilitation of stroke patients should have specialist expertise in both stroke and rehabilitation. Education programmes and information should be provided for staff, patients and carers. **(R, I)**
- Each stroke rehabilitation unit and service should be organised as a single team of staff with specialist knowledge and experience of stroke. **(R)**
- Each specialist stroke rehabilitation service should in addition have an education programme for all staff providing the stroke service and offer training for junior professionals in the speciality of stroke. **(R)**.

Post-acute Rehabilitation

- All stroke patients who need rehabilitation should be referred to a specialist team on a geographically defined unit after admission to acute care: this may be integrated with the acute elements of the stroke unit. **(R, A, C)**
- Stroke rehabilitation teams should be trained in team working processes. **(I)**
- Patients should be screened for impairments. **(R)**
- Realistic goals agreed with patient and carers should guide the use of specific treatment modalities. **(R)**
- Goals should be evaluated at regular intervals and progress should determine when treatments are stopped. **(R)**
- Team members should communicate with the patient and family at frequent intervals about the nature of the patient's impairments, progress with goals and the reason for stopping any treatments. **(R)**

Treatment: Timing/Intensity/Frequency of Rehabilitation

- Patients should undergo as much therapy appropriate to their needs as they are willing and able to tolerate and in the early stages they should receive a minimum of 45 minutes daily of each therapy that is required. **(I, R)**
- The team should promote the practice of skills gained in therapy into the patient's daily routine in a consistent manner and patients should be enabled and encouraged to practise that activity as much as possible. **(I, R)**
- Therapy assistants may facilitate practice but should work under the guidance of a qualified therapist. **(I, R)**

- Facilities should be provided to enable patients to make contact directly with specialist stroke rehabilitation services if problems arise or recur. **(R)**
- Every patient involved in the rehabilitation process should have their wishes and expectations established and acknowledged
- Rapid access back to specialist rehabilitation should be available for patients no longer under planned rehabilitation care if there is evidence of change in their functional status. **(R, I)**

Goal Setting

- Established goals should be defined by both single clinicians and also the whole team and should be documented, with specified, time-bound measurable outcomes. **(R)**
- Set goals should be used to guide and inform therapy and treatment. **(R)**
- Every patient should:
 - As set out above, participate in the process of setting goals unless they choose not to or are unable to participate because of the severity of their cognitive and linguistic impairments. Patients with a communication disability (aphasia, dysarthria, apraxia of speech) should have the goal setting process adapted to facilitate their participation.
 - Be given help to understand the nature and process of goal setting, and be given help (e.g. using established tools) to define and articulate their personal goals
 - Have goals that are meaningful and relevant to the patient, are challenging but achievable, including both short-term (days/weeks) and long-term (weeks/months) targets. **(N, R, I)**
- Goal setting should include family members where appropriate and acceptable to the patient. **(R)**
- Achievement should be evaluated using goal attainment. **(I)**

Cognition

- All stroke patients should be screened using a simple, standardised screen. **(R)**
- A more detailed cognitive assessment should be used where patients are not progressing as expected in their rehabilitation. **(R)**
- A patient's cognitive status should be considered by all MDT members when planning and delivering treatment. **(R)**

- Where cognitive impairments persist, an assessment of safety risks should be part of the discharge plan. **(R)**
- Individuals planning to return to cognitively demanding activities e.g. work or driving should receive a formal cognitive assessment. **(R)**

Attention and Concentration

- Focused, sustained and divided attention should be formally assessed with patients who are easily distracted or unable to concentrate. **(R)**
- Cognitive demands should be reduced in patients with impaired attention. **(R)**
- Compensatory strategies should be taught with repeated practice of activities being learned. **(R)**

Memory

- Formal testing using a standardised assessment should be completed with patients complaining of memory impairment or who have difficulty learning and remembering. **(R, I)**
- Patients found to have memory impairment should:
 - Have therapy sessions tailored to capitalise on preserved abilities
 - Be taught compensatory techniques
 - Be taught approaches aimed at directly improving their memory
 - Receive therapy in an environment that is as usual for the patient as possible. **(R, I)**

Executive Function

- Patients who demonstrate difficulty with decision making, planning or initiating a task or who demonstrate disinhibition of inappropriate verbal or behavioural responses should be formally assessed. **(R)**
- Patients should be taught compensatory techniques (e.g. use of electronic pagers or organisers, written checklists). **(R)**
- Nature and extent of the impairment, and ways of supporting the person with executive disorder should be explained and discussed with family and staff. **(R)**

Apraxia

- Any patient experiencing difficulty in executing tasks despite adequate limb movement should be assessed for the presence of apraxia using a standardised approach. **(R)**
- Any patients found to have apraxia should be given therapy or taught compensatory strategies specific to the identified deficits **(R)**
- Apraxia should be explained to the patient and their family, and treating team. **(R)**
- Test results should be combined with behavioural observations for a proper evaluation of apraxia and its impact on ADL. **(I)**

Prevention and Management of Shoulder Pain and Subluxation:

- During the acute phase, particular emphasis should be directed at prevention of shoulder pain, including the prevention of subluxation, as once present, it can be particularly problematic and no clear interventions currently exist. **(A)**
 - Therapists should consider advising the use of slings for standing or walking. **(D)**
 - Staff and caregivers should be trained to ensure that everybody handles and positions the weak arm correctly, avoiding mechanical stress (excessive range of movement, tension). **(R)**
 - Correct positioning of the arm should be implemented, using firm arm supports, an arm trough or a lapboard in sitting. **(A, N)**
 - The shoulder should not be passively moved beyond 90° of flexion and abduction unless the scapula is upwardly rotated and the humerus is laterally rotated. **(C)**
 - Overhead arm pulleys should not be used. **(R)**
- Every patient who develops shoulder pain should:
 - Have its severity assessed, recorded and monitored regularly. **(R)**
 - Have suitable preventative measures put in place. **(R, I)**
 - Be offered regular simple analgesia (e.g. paracetamol, topical non-steroidal anti-inflammatory drugs). **(R)**
 - Be treated through gentle stretching and mobilisation techniques focusing especially on external rotation and abduction. **(C)**
- Any patient with persistent, more troublesome shoulder pain should be considered for one or more of:
 - treatment with high-intensity transcutaneous nerve stimulation
 - shoulder strapping
 - electrical stimulation but only if they also have significant subluxation. **(R)**

Upper Limb Management: Upper Limb Re-education

- Patients who have some arm movement should be given every opportunity to practice activities within their capacity. Practice time should be maximised in individuals with arm movement. **(R)**
- Constraint-induced movement therapy should only be offered to patients after stroke who:
 - Had their stroke at least two weeks before it is offered
 - Have at least 10 degrees of voluntary finger extension
 - Have intact cognition
 - Are able to walk independently. **(R)**
- Bilateral arm training involving functional tasks and repetitive arm movement to improve dexterity and grip strength should be tried in any patient with continuing limitation on arm function after four weeks post-stroke. **(R)**

Upper Limb Management: Mental Practice

- Mental practice of an activity should be taught and encouraged as an adjunct to conventional therapy, to improve arm function. **(R)**

Upper Limb Management: Task-specific Training

- Task-specific training should be used to improve activities of daily living. **(R)**

Upper Limb Management: Impaired Motor Control

- All patients should have their motor function assessed using a standardised measure.
- Assessors should be experienced in assessing neurodisability.
- Exercises and activities should be taught to increase voluntary motor control and strength. **(R)**

Impaired Sensation

- All patients should be asked about altered or lost sensation on the affected side. If necessary, a more formal assessment of sensory loss should be undertaken.

- Any patient who has marked sensory loss in the presence of good motor function should be taught how to take care of the limb and how to avoid accidental injury. **(R)**
- Sensory-specific and sensory-related training and cutaneous electrical stimulation and conventional therapy may be used to increase tactile and kinaesthetic sensation. **(A)**

Impaired Tone: General Principles

- Any patient with motor weakness should be assessed for the presence of spasticity as a cause of pain, as a factor limiting activities or care, and as a risk factor for the development of contractures. **(R)**
- In any patient with spasticity, local and general factors that may cause increased tone (e.g. pain) should be identified and alleviated. **(R)**
- In any patient where spasticity is causing concern, simple procedures to reduce spasticity should be used, including exercise, stretching and positioning. **(R)**
- For more active treatments, specific goals should be set and monitored using appropriate clinical measures (e.g. numerical rating scales, the Ashworth scale). **(R)**
- Intramuscular botulinum toxin may be used to alleviate troublesome focal spasticity. **(R, I)**
- Monotherapy with baclofen, gabapentin or tizanidine should be trialled in patients with painful or activity-restricting generalised spasticity. **(R, I)**

Impaired Tone: Splinting and Stretching

- Passive and active joint movement needs to be assessed as a prelude to any treatment or preventative actions. **(A, R, I)**
- For any patient whose range of movement at a joint is reduced or at risk of becoming reduced. A programme of gentle stretching and mobilisation in the correct alignment of all affected joints on a daily basis should be taught to the patient and/or carers. **(A, R, I)**
- Management may include prolonged positioning of muscles in a lengthened position to maintain range of motion. **(A)**
- Daily programme of mobilising as outlined above is required where a loss of range of movement has occurred or is at risk of occurring. **(R)**

- Inflatable arm splints enveloping the hand, forearm and elbow, and resting wrist and hand splints should not be used routinely. **(A, R)**
- Serial casting to be considered where passive stretching alone does not control contractures. **(R)**

Cardiovascular Fitness During Inpatient Rehabilitation

- All patients should participate in aerobic training as soon as possible after stroke, unless there are contraindications unrelated to stroke and this should be included as part of their inpatient rehabilitation programme. **(R)**
- Pre-exercise assessment should include a complete history and physical examination with special emphasis on risk factors for stroke recurrence, risk of DVT and mobility with respect to the patient's needs for assistance in movement. **(U)**

Swelling of the Extremities

- Intermittent compression should not be used to treat a swollen hand. **(R)**
- In the absence of further evidence, patients with swollen extremities should not be offered the following:
 - Electrical stimulation
 - Continuous passive motion in elevation
 - Pressure garments. **(R, I)**

Strength Training - Resisted Exercise

- Resisted exercise should be used to improve strength in targeted muscles and improve gait speed and endurance. **(R)**

Sitting, Sit-to-stand and Standing

- Task-specific practice of sitting, sit-to-stand and standing should be provided for people who have difficulty with these tasks. **(A, R)**

Balance Impairment, Falls and Fractures

- An assessment of falls risk is recommended for every stroke patient, taking into account the patient's current physical, cognitive and perceptual functioning. **(R, I)**
- Any patients with significant impairment in maintaining their balance should be given intensive progressive balance training. **(R)**
- Any patients with moderate to severe limitation of their walking ability should be given a walking aid to improve their stability. **(R)**
- Multifactorial interventions, including an individually prescribed exercise programme, may be provided for people who are at risk of falling, in order to prevent or reduce the number and severity of falls. **(A)**
- Individual home hazard assessment and modification has been shown to be effective at reducing falls in older people and should therefore be completed for individuals deemed at risk of falling. **(A)**
- Exercise, calcium supplements and bisphosphonates improve bone strength and decrease fracture rates in stroke patients and should be considered in patients at risk of osteoporotic fracture. **(E)**

Walking

- Every patient who has limited mobility following stroke should be assessed by a physiotherapist with specialist expertise to guide management. **(R)**
- Patients should be taught and encouraged to practise as much as possible any aspects of mobility judged to be within their safe capability such as moving around the bed, transfers from bed to chair and from chair to chair (or toilet), walking, indoors and then outdoors, and using stairs. **(R)**
- Patients whose recovery is slow or limited should be offered more intense therapy which should include one or more of the following:
 - Specify additional therapy allowing increased practice (any mobility problem). **(A)**
 - Treadmill retraining with partial body support given in the first three months for patients with some ability to walk independently. **(A)**
 - Cueing of cadence. **(A, R)**
 - Task-specific training for gait speed and endurance. **(A, R)**

Ankle Foot Orthoses

- An ankle-foot orthosis should only be used to improve walking and/or balance and should be tried in patients with foot drop. **(R)**
- Orthoses should be evaluated on an individual basis before long-term use and always be custom fitted. **(R)**

Functional Electrical Stimulation (FES)

- FES of the leg should only be considered and used for individual patients who have foot drop impeding gait not satisfactorily controlled using orthoses and have demonstrable gait improvement from its use. **(R, I)**
- Patient selection for FES for foot drop should involve an MDT specialising in rehabilitation with arrangements in place for consent and audit. **(N)**

Mobility Aids, including Wheelchair Mobility

- Patients with limited mobility should be assessed for, provided with and taught how to use any mobility aids, including a wheelchair, needed to facilitate safe independent mobility outside therapy sessions. **(R)**

Functional Transfer Retraining

- All functional transfers the patient may need to complete on discharge should be assessed and practised. This includes, but is not limited to, bath, shower, toilet and car transfers. **(I)**

Vision and Perception: Visual Field Deficit

- Every patient with a suspected stroke should be tested for a visual field deficit. **(R, I)**
- Patients with a visual field deficit are to be informed and drivers informed of consequences for driving. **(R, I)**
- Any patient whose visual field deficit causes practical problems should be taught compensatory techniques. **(R)**

Vision and Perception: Agnosias

- Any patient having difficulty recognising people or objects should be assessed formally. **(R)**
- They should have the impairment explained to them and their family. **(R)**
- They should be taught compensatory strategies to overcome the impairment. **(I)**

Vision and Perception: Unilateral Neglect

- Any patient with a stroke affecting the right hemisphere should be considered at risk of reduced awareness on the left, and should be tested formally if this is suspected clinically. **(R)**
- Any patient with suspected or actual impairment should be formally assessed using a standardised test battery and should also be assessed clinically in terms of the impact of this on functional performance. **(R)**
- The assessment battery, together with clinical observations should provide information concerning how the neglect affects intrapersonal, near extra-personal and far extra-personal space. **(I)**
- Any patient shown to have impaired attention on one side should be taught compensatory strategies. **(R)**
- All staff and visitors should be advised to approach the patient and position themselves on the patient's affected side to increase the patient's awareness of their affected side. **(I)**

Personal Activities of Daily Living (PADLs)

- Patients with difficulties in occupational performance in daily activities should be treated by a specialist occupational therapist in the context of a multidisciplinary assessment. **(R, A, I)**
- Patients with confirmed difficulties in occupational performance in personal tasks, instrumental activities, vocational activities or leisure activities should have a management plan formulated and documented to address these issues. **(A, I)**
- The occupational therapist should advise staff and carers on techniques and equipment to maximise outcomes relating to functional performance in daily activities, sensorimotor, perceptual and cognitive capacities. **(A, I)**

- Specific treatments that should be offered (according to need) include:
 - The opportunity to practise activities in the most natural (home-like) setting possible
 - Assessment for and provision of and training in the use of equipment and adaptations that increase safe independence
 - Training of family and carers in facilitating the patient's independence and in assisting where full independence is not possible. **(R)**

Extended Activities of Daily Living (EADLs) (Domestic and Community)

The phrase 'extended activities of daily living' encompasses two domains: domestic activities and community activities.

- Any patient who has had a stroke should be asked to what extent previous extended activities have been limited by the stroke.
- Any patient whose activities have been limited should be assessed by an occupational therapist with expertise in neurological disability
- They should be taught how to achieve activities safely and given opportunities to practise under supervision, if activities are potentially achievable
- Patients should be assessed for, provided with and taught how to use any adaptations or equipment needed to achieve safe activities
- Where a patient cannot undertake a necessary activity safely themselves, then alternative means of achieving the goal must be put in place to ensure safety and well-being. **(R)**

Counselling

- Stroke survivors and their caregivers should have their individual psychosocial and support needs reviewed on a regular basis. **(C)**
- Disciplines involved in caring for people with stroke including clinical psychologists and social workers provide support, counselling and information to those with stroke and their families regarding options to optimise physical, emotional, social and spiritual well-being. Such counselling services should be available to all stroke survivors and their families and may take the form of:
 - An active educational counselling approach
 - Information supplemented by family counselling
 - Problem-solving counselling approach. **(A, I)**

and may address issues pertinent to them which may include:

- Adjustment to illness/disability

- Impact of illness on relationships
 - Loss and bereavement
 - Coping strategies
 - Pre-existing issues/problems. **(I)**
- People with communication deficits after stroke should not be excluded from counselling services. Close liaison with a speech and language therapist is recommended to ensure that the most appropriate method of communication is used in the counselling process. **(I)**

Advocacy

- Whenever possible social workers should empower patients and families to advocate for themselves. **(I)**
- Where appropriate and with consent social workers should advocate directly on behalf of stroke patients and families with the multi-disciplinary team and external individuals/agencies. **(I)**

Carer Involvement

- Patient's views on family and carer involvement should be sought to establish the extent to which the patient wants family involvement. **(R)**
- The carer(s) of every patient with a stroke should be involved in the management process from the outset, specifically as an additional source of important information about the patient both clinically and socially. **(R)**
- Carers should be given accurate information about the stroke, its nature and prognosis and what to do in the event of a further stroke. **(R)**
- Carers should be offered emotional and practical support as required. **(R, I)**
- With the patient's agreement, family carers should be involved in all important decisions as the patient's advocate if necessary. **(R)**
- Stroke survivors and their families should be provided with timely, up-to-date information in conjunction with opportunities to learn from members of the multidisciplinary team and other appropriate community service providers. Simple information provision alone is not effective and education should be actively delivered. **(C, I)**
- During the rehabilitation phase, carers should be encouraged to participate in an education programme that:
 - Explains the nature of stroke and its consequences
 - Teaches them how to provide care and support

- Gives them opportunities to practise care with the patient
 - Emphasises and reiterates all advice on secondary prevention, especially lifestyle changes. **(R)**
- Carers of patients unable to transfer independently should receive training in moving and handling and the use of any equipment provided until they are demonstrably able to transfer and position the patient safely in the home environment. **(R)**
- At the time of transfer of care to the home setting, the carer should:
 - Be offered an assessment of their own support needs by social services
 - Be offered the support identified as necessary
 - Be given clear guidance on how to seek help if problems develop. **(R)**
- After the patient has returned to the home (or residential care) setting, the carer should have their need for information and support reassessed whenever there is a significant change in circumstances (e.g. if the health of either the patient or the carer deteriorates).

General Management of Aphasia and other Communication Impairments

- Management of aphasia and other communication impairments should occur in the context of the International Classification of Functioning and Disability (ICF, WHO) and ensure that the person is treated in a holistic manner appropriate to their needs. **(I)**
- Speech and language therapists should be sensitive to the timing and appropriateness of treatment, where other issues may be a priority for the person. **(I)**
- There should be systems in place to ensure that treatment may be offered at a later stage when the person is able to engage in speech and language therapy. **(I)**.
- Clinicians assessing, using standardised assessments and screening tools to evaluate stroke related impairments in patients with any level of aphasia, are recommended to consult with a speech and language therapist as to their likely suitability and in the determination of reliability of results given the individuals speech or language deficit. This is particularly the case for tools which rely on intact verbal skills and caution should be exercised in interpreting the results of such tools. **(I)**

Communication Disorders

- All patients presenting with a left hemisphere stroke should be screened for aphasia using a formal screening tool such as the Frenchay Aphasia Screening Test or Sheffield Aphasia Screening Test. **(R, I)**
- Any patient found to have aphasia on admission should have a full formal assessment of language and communication by specialist speech and language therapists.
- When a patient has been found to have aphasia, a speech and language therapist should explain the nature of the impairment to the patient, family and treating team. **(R, I)**
- Patients should be re-assessed as to the nature and severity of the dysphasia at appropriate intervals. **(R, I)**
- Any patient with aphasia should:
 - Be given treatment aimed at reducing identified specific language impairments while continuing to progress towards goals
 - Be considered for early intensive (2-8 hours/week) speech and language therapy if they can tolerate it
 - Be assessed for alternative means of communication (e.g. gesture, drawing, writing, use of communication aids) and taught how to use any that are effective.
- All people interacting regularly with a person who has aphasia or communication problems should be taught the most effective communication techniques for that person. **(R, I)**
- Such education should be interactive, timely, up-to-date, provided in a variety of languages and formats (written, oral, aphasia friendly, group counselling approach), and specific to patient, family and caregiver needs and impairments. The provision of education should ensure communicative accessibility for stroke survivors. **(C,I)**
- Any patient with chronic aphasia should be considered for and if appropriate referred for a further episode of therapy of specific treatment (in a group setting or one-to-one). **(R, I)**
- Patients with aphasia should have their need and the need of the family for social support and stimulation assessed formally, and met if possible (e.g. by referral to voluntary sector groups). **(R, I)**

Mental Capacity

- All patients should be assumed to have the capacity to make decisions on their own care unless demonstrated otherwise. **(R)**

- The patient's mental capacity should specifically be considered and documented when they are being asked to agree to a procedure that involves significant risk, noting that judgements on capacity must relate to the specific decision being made. **(R)**
- In cases of doubt the clinician should determine that the answer to all four of the questions below is positive before concluding that the patient has competence:
 - Does the patient understand the information relevant to the decision?
 - Has the patient retained the information relevant to the decision?
 - Can the patient use or weigh up the information when making a decision?
 - Can the patient communicate their decision by some reliable means? **(R)**
- In patients where the answer to one or more of the above questions is negative or uncertain it is necessary to determine if the reason for this is due to lack of capacity or aphasia or both. **(R)**
- If the patient has aphasia it is essential that decisions about mental capacity are taken in conjunction with an MDT including a speech and language therapist. **(I)**
- If the primary reason for apparent lack of capacity is found to be a language or communication disorder, attempts should be made to overcome this and speech and language therapists involved in attempting to establish effective communication. **(I)**
- A second opinion should be sought if there is doubt or if assistance is needed in determining the presence or absence of capacity. **(R)**
- Level of patient capacity may differ dependent on the level of recovery of language skills and the difficulty of the decision being considered. Capacity should be reviewed regularly and prior to all major treatment decisions. **(I)**
- For any patient judged not to have capacity any decision that can be postponed until the patient might have regained capacity should be postponed. **(R)**
- Clinicians assessing, using standardised assessments and screening tools to evaluate stroke related impairments in patients with any level of aphasia, are recommended to consult with an speech and language therapist as to their suitability and in the interpretation of results. This is particularly the case for tools which rely on intact verbal skills and caution should be exercised in interpreting the results of such tools. **(I)**

Dysarthria

- Any patient whose speech is unclear or unintelligible so that communication is limited or unreliable as deemed by the patient or a member of the MDT should be assessed by a speech and language therapist to clarify the nature, severity and cause of the speech impairment. **(R, I)**
- Any person who has dysarthria following stroke sufficiently severe to limit communication should be taught techniques to improve the clarity of their speech and be assessed for compensatory alternative and augmentative communication techniques (e.g. letter board, communication aids) if speech remains unintelligible. **(R)**
- The communication partners (e.g. family, staff) of a person with severe dysarthria should be taught how to assist the person in their communication. **(R)**

Apraxia of Speech

- Any patient who has marked difficulty articulating words should be formally assessed for apraxia of speech and treated to maximise intelligibility. **(R)**
- Any patient with severe communication difficulties but reasonable cognition and language function should be assessed for and provided with appropriate alternative or augmentative communication aids. **(R)**
- The communication partners (e.g. family, staff) of a person with severe apraxia of speech should be taught how to assist the person in their communication. **(R, I)**

Cognitive Communication Disorders resulting from Non-dominant Hemisphere Stroke

Although language centres are found in the dominant (typically left) cerebral hemisphere, cognitive deficits following non-dominant hemisphere stroke can affect attention (including visuospatial neglect), memory, problem solving, reasoning, organising, planning and awareness of deficits. These may impact on communication by decreasing the efficiency and effectiveness of comprehension, expression and pragmatics. Specific language deficits often affect non-literal language, alternative meanings and other subtleties of language.

- If there is any suspicion that such deficits may be present patients should be referred to a speech and language therapist for assessment. **(I)**
- The speech and language therapist should identify any specific deficits that are present along with preserved abilities. **(I)**

- The treatment plan should be based on each individual's goals and needs to address the deficits that diminish that person's ability to communicate efficiently and effectively. **(I)**
- Since cognitive communication deficits are often unfamiliar to the general population information and counselling should be given to family members and caregivers about a patient's abilities and deficits. **(R,I)**
- Close liaison between speech and language therapists with occupational therapists, Clinical Psychologists and the MDT is recommended in assessing such patients due to the complex nature of cognitive deficits that occur in this group. **(I)**

Including People with Aphasia and Communication Disorders in Research

- There is a tendency to exclude subjects with aphasia and communication disorders from research trials where consent is difficult to obtain. We strongly recommend that patients with aphasia should not be excluded from research studies for this reason alone. Involvement of a speech and language therapist is recommended in this process and prior engagement with relevant research ethics committees should also be undertaken to ensure the feasibility of ongoing clinical research to benefit patients with aphasia. **(I)**

Evaluating and Stopping Treatment

- Withdrawal of rehabilitation may occur appropriately when the person with stroke wishes to exit a formal rehabilitation programme or no new achievable goals can be identified by the person with stroke or the carer in discussion with the therapist **(A, R, I)**
- Continuous or intermittent input from the rehabilitation team may remain necessary over long periods of time depending on goals being addressed. When a therapist or team stops giving rehabilitation, the therapist or service should:
 - discuss the reasons for the decision with the patient
 - ensure that any continuing support the patient needs to maintain and/or improve is provided
 - teach the patient and, if necessary, carers and family how to maintain health
 - provide clear instructions on how to contact the services for reassessment
 - outline what specific events or changes should trigger contact. **(A, R, I)**

Follow-up Rehabilitation Treatment

- Primary care providers should address stroke risk factors, ongoing rehabilitation needs, continue treatment of comorbidities and other stroke sequelae. **(C, U)**
- Any patient with residual impairment at the end of initial rehabilitation should be offered six monthly reviews and offered referral to specialist services if there are new problems or a change in physical or social environment. **(R)**
- Any stroke survivor with declining activity at 6 months or later should be assessed for appropriate targeted rehabilitation. **(C)**
- Stroke survivors and their caregivers should have their individual psychosocial and support needs reviewed on a regular basis. **(C)**
- Patients should be facilitated to directly access specialist care long after a stroke. **(R, I)**
- People with stroke and their carers should have access to respite care. This may be provided in their home or in an institution. **(A)**
- People with mobility difficulties should be offered an exercise programme and monitored throughout the programme. **(C)**
- Exercise programmes should be considered and tailored to the individual following appropriate assessment, starting with low intensity physical activity and gradually increasing to moderate levels. **(R)**
- Patients with aphasia should be taught supportive conversation techniques. **(C)**
- Patients with swallow impairment should be offered swallow therapy and reassessment as required. **(C)**

Rehabilitation in Extended Care Settings

- Organisations and staff responsible for the commissioning of healthcare should ensure that people with stroke who are in care homes or who are unable to leave their own home have access to specialist stroke services after discharge from hospital. **(R)**
- All staff in nursing homes, care homes and residential homes should be familiar with the common clinical features of stroke and the optimal management of common impairments and activity limitations. **(R)**
- Residents in extended care should have the same access to care as any community resident. **(R)**

Dysphagia and Nutrition

Hydration

- All people with acute stroke should have their hydration assessed on admission, reviewed regularly and managed so that normal hydration is maintained. **(R)**
- Until a safe swallowing method has been established, all patients with identified swallowing difficulties should receive hydration (and nutrition after 24–48 hours) by alternative means. **(R)**
- Fluid balance should be monitored carefully when modified consistency drinks and enteral input are given. **(R)**

Nutrition

- The essential role of adequate nutrition in optimising patient care needs to be recognised. **(I)**
- People with acute stroke who are unable to take adequate nutrition and fluids orally should be referred to a dietitian for detailed nutritional assessment, individualized advice and monitoring. **(R)**
- Nutrition screening should be established within 48 hours of admission to hospital. Screening should be repeated weekly for inpatients. **(R, S78)**
- Every patient who requires food or fluid of a modified consistency should be referred to a dietitian. **(R)**
- Screening should assess body mass index (BMI) and percentage unintentional weight loss and should also consider the time over which nutrient intake has been unintentionally reduced and/or the likelihood of future impaired nutrient intake. The Malnutrition Universal Screening Tool (MUST; Malnutrition Advisory Group 2003), for example, may be used to do this. **(R, S78)**.
- When screening for malnutrition and the risk of malnutrition, healthcare professional should be aware that dysphagia, poor oral health, reduced intake of food and liquid, and reduced ability to self-feed will affect nutrition in people with stroke.
- Screening for malnutrition and the risk of malnutrition should be carried out by healthcare professionals with appropriate skills and training. **(R, S78)**
- In order to facilitate patients to optimise oral intake a protection of mealtimes should be encouraged in all settings so as to avoid patient distraction at these crucial times. During this time all ward activity aside from essential interventions should be avoided and all appropriate staff (nursing and health care assistants) should be available in adequate numbers to assist and encourage oral intake as this is an integral part of their role. **(I)**

- Stroke patients may take longer to finish activities of daily living including feeding and this should be recognised and allowed for in all settings. **(I)**

Artificial Nutrition Support

- People with acute stroke who are unable to take adequate nutrition and fluids orally should be considered for tube feeding with a nasogastric tube within 24 hours of admission. The decision should be made in consultation with the multidisciplinary team, the patient and their carers/family. **(R, S78, I)**
- As with hydration, until a safe swallowing method has been established, all patients with identified swallowing difficulties should receive nutrition by alternative means which should be started within 24-48 hours. **(R, I)**
- Nutrition support should be initiated for people with stroke who are at risk of malnutrition. This may include oral nutrition supplements, specialist dietary advice and/or tube feeding. **(R)**
- Regular review by the dietitian is essential. If the micronutrient intake in modified consistency diets is inadequate, a complete oral multivitamin and mineral supplement should be considered. **(N)**

Ongoing Monitoring of Nutrition

- Routine nutritional monitoring is recommended as it contributes to improvements and ensures that dysphagia is not associated with under nutrition. **(S78)**
- After discharge, unintentional weight loss and older age may indicate nutritional risk in stroke patients and changes in body mass should be monitored. **(S78)**
- A named professional should have specific responsibility for anyone discharged home on artificial nutrition. There should be liaison with the relevant community dietitian prior to discharge. **(I)**

Feeding Methods

- Patients with dysphagia who are unable to meet their nutritional requirements orally should be referred immediately for nutritional assessment by a dietitian. **(S78)**

- It is important to note that length of time required for swallow rehabilitation varies between cases. Therefore, decisions regarding feeding methods require close collaboration between dietetics, speech and language, medical and nursing colleagues to ensure that swallow rehabilitation and prognosis are considered in each individual case. **(I)**
- People with acute stroke who are unable to take adequate nutrition and fluids orally should be considered for nasogastric tube feeding with 24 hours of admission. **(R, I)**
- These patients may be considered for the additional use of a nasal bridle if the nasogastric tube needs frequent replacement, to reduce the inappropriate use of total parenteral nutrition (TPN), early inappropriate PEG placement, and prolonged periods of starvation in this group. **(R)**
- Gastrostomy feeding should be considered for patients who need but are unable to tolerate nasogastric tube feeding within the first four weeks, are unable to swallow adequate food and fluid orally at 4 weeks or are at long-term high risk of malnutrition. **(R)**
- The decision to place a PEG should balance the risks and benefits and take into consideration individual patient needs. Patients should also be given the opportunity to decide whether they want to go ahead with a procedure. **(I)**
- The patient's and carer's perceptions and expectations of PEG feeding should be taken into account and the benefits, risks and burden of care fully explained before initiating feeding. **(I)**
- Communication, cognitive function and the capacity for decision making should be routinely assessed in patients with dysphagia. Information should be provided to patients with communicative or cognitive impairment in an appropriate manner (e.g. aphasia friendly literature). **(S78)**

Oral Care

- All stroke patients should have an oral/dental assessment, which includes screening for obvious signs of dental disease, level of oral care and appliances, upon or soon after admission. **(R)**
- All patients who are not swallowing, including those with tube feeding should have oral and dental hygiene maintained (by the patient or carers) through regular (four-hourly) brushing of teeth, dentures and gums with a suitable cleaning agent (toothpaste or chlorhexidine gluconate dental gel) and removal of secretions. **(R)**
- All patients with dentures should have their dentures put in appropriately during the day, cleaned regularly, checked and replaced by a dentist if ill-fitting, damaged or lost. **(R)**

- All patients with swallowing difficulties and/or facial weakness who are taking food orally should be taught or helped to clean their teeth or dentures after each meal. **(R)**
- Staff or carers responsible for the care of patients disabled by stroke should be trained in assessment of oral hygiene, selection and use of appropriate oral hygiene equipment and cleaning agents, and in recognition and management of swallowing difficulties or dysphagia. **(R, I)**

Dysphagia: Acute Assessment

- All stroke patients should be screened for dysphagia before being given food or drink. **(S78)**
- Clinical history taking should take into account comorbidities and other risk factors (e.g. smoking or respiratory disease) to identify increased risk of developing aspiration pneumonia. **(S78)**
- The screening process is used to identify those patients who should be referred for full clinical assessment by a professional skilled in the management of dysphagia; currently these are almost exclusively specially trained speech and language therapists. If the screening procedure does not identify any difficulties, the patient can be allowed to eat and drink, avoiding unnecessary restrictions on oral intake while awaiting a full clinical assessment. **(S78, I)**
- Screening tests are based on identified risk factors and should be carried out by healthcare professionals trained in the procedure. In the acute setting, this is usually a trained nurse but may also be another member of the MDT **(S78)**
- Training of the MDT in swallow screening procedures is carried out by an SLT. A training package should include:
 - Risk factors for dysphagia
 - Early signs of dysphagia
 - Observation of eating and drinking habits
 - Water swallow test
 - Monitoring of hydration
 - Monitoring of weight and nutritional risk**(S78, I).**
- Following basic dysphagia training speech and language therapists are not qualified to conduct or interpret videofluoroscopies independently. They are however expected to be aware of the need for further instrumental assessment e.g. videofluoroscopy, fiberoptic endoscopic evaluation of swallowing (FEES). **(I)**

- Speech and language therapists who carry out videofluoroscopies or FEES are required to have the appropriate training to be competent as defined by professional and regulatory bodies. **(I)**
- A water swallow test should be used as a part of the screening for aspiration risk in stroke patients. **(S78, 1)**
- Referral to a speech and language therapist should be made if the patient fails the screening test or if difficulties arise subsequent to passing the screening test. **(S78)**
- Patients not fit for full screening procedure should be monitored daily to avoid delay in referral for full clinical assessment by a speech and language therapist. **(S78, I)**
- A typical swallow screening procedure should include:
 - Initial observation of the patient's consciousness level
 - Observation of the degree of postural control
 - If the patient is able to actively cooperate and is able to be supported in an upright position the procedure should also include:
 - Observations of oral hygiene
 - Observations of control of oral secretions
 - If appropriate, a water swallow test
 - Screening protocols must include a clear pathway of action for all possible outcomes (e.g. onward referral, nil by mouth, commence oral diet). **(S78)**
- Patients who are nil by mouth or are on a modified diet should continue to receive clinically essential medication by an appropriate route as agreed by their physician and pharmacist. **(S78, I)**
- Medications for pre-existing conditions that list dysphagia as a potential side effect should be excluded (e.g. bisphosphonate and potassium supplements, refer to the manufacturer's recommendations). **(S78)**

Clinical Bedside Assessment

- If the admission screen indicates problems with swallowing, the person should have a specialist assessment of swallowing preferably within 24 hours of admission and not more than 72 hours afterwards. **(R)**
- A standardised clinical bedside assessment should be used by a professional skilled in the management of dysphagia (currently a trained speech and language therapist). **(I)**
- The clinical bedside assessment developed and tested by Logemann or a similar tool is recommended. **(S78)**

- Patients with dysphagia should be monitored daily in the first week to identify rapid recovery. Observations should be recorded as part of the care plan.

Instrumental Assessment

- Clinical bedside assessment may be used to determine the need for, and appropriateness of, additional instrumental assessment. **(S78)**
- The limitations of clinical testing, e.g. poor detection of silent aspiration and poor information on the efficacy of an intervention, mean that a reliable, timely and cost effective instrumental swallow evaluation should be available and easily accessible for all patients following acute stroke. **(S78)**
- The modified barium swallow test (videofluoroscopy) and fiberoptic endoscopic evaluation of swallow are both valid methods for assessing dysphagia. The clinician should consider which is the most appropriate for different patients in different settings. **(S78)**
- Standard criteria should be followed for performing and interpreting the results of radiological and fiberoptic assessments **(S78, I)**.
- There is insufficient evidence to recommend cervical auscultation for evaluating risk of aspiration and pharyngeal stage dysphagia. **(S78)**
- Changes in oxygen saturation can occur for a variety of reasons and cannot at this stage be related to the presence of dysphagia or aspiration. **(S78)**

Dysphagia: Acute Management

- Diet modification and use of postures or manoeuvres have been shown to be effective in specific individuals using videofluoroscopy and are standard management of dysphagia following stroke. **(S78)**
- Advice on diet modification and compensatory techniques should be given following full swallowing assessment. **(S78)**
- Texture modified food should be attractively presented and appetising. Patients should have a choice of dishes. **(S78)**
- Close liaison with nursing colleagues (who take primary responsibility for maintaining good oral hygiene in the patient with dysphagia) is recommended. **(I)**

Dysphagia: Long-term Management

- An inability to eat and drink normally may affect patient morale, lead to feelings of isolation and could contribute to clinical depression. Healthcare professionals should be aware of the importance of the social aspects of eating and drinking. **(S78)**
- Patients with persistent dysphagia should be reviewed regularly, at a frequency related to their individual swallowing function by a professional skilled in the management of dysphagia. In Ireland, currently only speech and language therapists with specific (IASLT defined) post-qualification training meet this standard. **(I)**
- Patients with persistent dysphagia should have their nutritional status reviewed regularly by a dietitian. **(S78)**
- Communication, cognitive function, and the capacity for decision making should be routinely assessed in patients with dysphagia. Information should be provided to patients with communicative or cognitive impairment in an appropriate manner (e.g. aphasia friendly literature). **(S78)**
- There should be collaboration between hospital and community speech and language therapists in order that patients living in the community have access to instrumental assessment measures such as videofluoroscopy where necessary. **(I)**
- Assessment results and management recommendations should be carefully documented and communicated to the relevant health professionals, carers and patients. **(S78)**
- Staff, carers and patients should be trained in feeding techniques. This training should be provided by expert staff including a speech and language therapist with appropriate post-qualification dysphagia training.
- Elements of training should include:
 - Modifications of positioning and diet
 - Food placement
 - Management of behavioural and environmental factors
 - Delivery of oral care
 - Management of choking
 - Identification of signs and symptoms of dysphagia, e.g. recurrent respiratory tract infections, wet vocal quality etc. **(S78, I)**
- A small number of patients with persistent dysphagia recover late and benefit from review and change in the management of their feeding. Regular review over the longer term is considered good practice. **(I)**

Self-Feeding

- Time should be protected for staff to assist patients with eating, drinking and swallowing if required (e.g. protected mealtimes). **(I)**
- A full assessment of the person's ability to self-feed should be conducted, inclusive of all stroke patients and not solely those with dysphagia. **(I)**
- This assessment should include the following self-feeding issues, as well as the eating and swallowing issues already outlined in detail: **(I)**
 - The patient's position for feeding, including consideration of both the chair and table or tray
 - Use of cutlery, including spreading, cutting, and transport of food to the mouth
 - Suitability of drinking vessels, from both feeding and swallowing perspectives
 - Fatigue in the eating task
 - Eating speed.
- Any recommended equipment to assist with feeding should be provided, both in the hospital, and on discharge. **(I)**

Long-term PEG Feeding

- Patients requiring long-term tube feeding should be reviewed regularly by a specialist speech and language therapist to assess for return of functional swallow.
- Patients requiring long-term tube feeding should also be reviewed regularly by a dietitian to ensure that nutritional requirements are being met and have not changed.
- Adequate training in feed administration and equipment use should be provided to the patient and/or carer by appropriately trained staff.
- Adequate time needs to be given to ensure competence with feeding.
- Ongoing support from health professionals after initiating feeding is essential and there should be an infrastructure to support enterally fed patients in all settings. **(S78, I)**
- Post-discharge, patients on enteral tube feeding should be reviewed by the community dietitian:
 - Home visit within 5 working days of discharge
 - Telephone contact as required
 - Review appointment at 4 weeks (domiciliary/ hospital out-patient)
 - Review as appropriate with telephone contact as required – minimum twice yearly. **(S78)**

- Communication, cognitive function, and the capacity for decision making should be routinely assessed in patients with dysphagia. Information should be provided to patients with communicative or cognitive impairment in an appropriate manner (e.g. aphasia friendly literature). **(S78)**

Discharge from Hospital and Returning to the Community

Pre-discharge Needs Assessment

- Discharge planning is an ongoing process and should commence as early as possible following admission. **(I)**
- Before discharge (or home trial) from inpatient care and, where appropriate, a home assessment should be carried out by specialist therapists, typically an occupational therapist, to ensure safety and community access. Optimal independence will be facilitated through home modification and adaptive equipment, as required. **(A, I)**
- All members of the multidisciplinary team should be actively involved in the discharge planning process. **(S64, I)**
- The social worker should have a wide knowledge of resources in the community so that he/she is able to advise the team and the patient about what is available for the patient on discharge. **(S64, I)**
- It is also recommended that acute care hospitals and rehabilitation facilities maintain up-to-date information on community resources at the local and national levels, provide this information to the stroke patient and families/caregivers, and offer assistance in obtaining needed services. **(U, R, I)**
- After leaving hospital, stroke survivors must have access to specialised stroke care and rehabilitation services appropriate to their needs. **(C)**
- Patients should only be discharged early (before end of acute rehabilitation) if there is a specialist stroke rehab team of similar intensity available to continue rehabilitation in the community from the day of transfer and if the patient is able to transfer safely from bed to chair and other problems can be managed at home. **(R)**
- Before discharge, people with stroke and their carers should have the opportunity to identify and discuss their post-discharge needs (e.g. physical, emotional, social financial) with the interdisciplinary team. **(A, R, S64)**
- Family and team planning should occur in the context of regular MDT meetings to discuss issues and patient progress, set team and rehabilitation goals, set care plans, determine supports available post-discharge and involve patient and family in conferences. **(C, I)**
- All equipment necessary for a safe discharge should be in place. **(R)**

Early Supported Discharge Team in the community

- Early supported discharge services and transition planning should be provided by a well-resourced, coordinated, specialist multidisciplinary team with age

appropriate expertise and equivalent skills and resources in stroke care and rehabilitation comparable in expertise and competency to hospital team. **(R,I, C)**

- Early supported discharge teams should target stroke survivors with mild to moderate disability.
- The multidisciplinary team should meet at least once a week for the interchange of information about individual patients. **(R)**
- Patients requiring early supported discharge (ESD) services should not typically be referred to generic (nonspecific) community services. **(C)**
- Post-discharge: If there is cause for concern, a key worker should be responsible for the appropriate referral of the patient to the correct team member or agency for assessment or treatment of the problem. SNPs should consider the appointment of stroke coordinators in this respect. **(S64, I, H)**.

Information Provision Pre-discharge

On or before discharge from hospital, patients should be given information about and contact details for all relevant statutory, public and voluntary services. Where appropriate referrals should occur in advance of or at point of discharge. Patients should also be given appropriate information and assistance to access all financial benefits and entitlements. Typically this is done by a social worker working in the context of a multidisciplinary team. It is emphasised that the above applies to all discharges not exclusively early supported discharges **(I)**

Community Care

- Commissioning organisations, the Health Service Executive (HSE) at the time of writing, should ensure that their commissioning portfolio encompasses the whole stroke pathway from prevention through acute care, early rehabilitation and initiation of secondary prevention on to palliation, later rehabilitation in the community and long-term support. **(R)**
- The quantity of services commissioned should be based on an estimate of the needs of the population covered, derived from the best available evidence. **(R)**
- Organisations and individuals with responsibility for health commissioning including SNPs, should ensure that there are formal protocols between health organisations and social services that facilitate seamless and safe transfers of care between the different providers as appropriate. **(R, I)**
- Out of hours stroke care services should be available in the community. **(R)**

- Commissioners should also ensure that:
 - People dying with stroke receive palliative care from the acute stroke service
 - Adequate support services are available to patients with long-term disability covering the full spectrum of needs (e.g. nursing, therapy, emotional support, practical and carer support). **(R)**
- Stroke patients should be able to easily access a broad spectrum of care services locally, i.e. conveniently and close to home. **(H, I)**
- Each specialist stroke rehabilitation service should in addition have agreed pathways for seamless access to services supplying: pharmacy; orthotics; orthoptists; specialist seating; patient information, advice and support; and assistive devices. **(R)**
- Stroke patients living in other community environments such as nursing homes or sheltered accommodation should also have access to community stroke services. **(I)**

Discharge Planning and Transfer of Care: Carer Education

- Therapists should provide specific training for carers before the patient's discharge home. This should include training, as necessary, in personal care techniques, physical handling techniques, ongoing prevention and other specific stroke-related issues. **(A, I)**

Discharge Planning and Transfer of Care: Personal and Environmental Equipment and Adaptations

- Every patient should have their need for specialist equipment including a wheelchair (attendant, manual and/or motorized) assessed individually in relation to their particular limitations and environment. **(R)**
- All aids, adaptations and equipment should be:
 - As appropriate as possible for the patient's physical and social context
 - Of known safety and reliability, and
 - Provided as soon as possible. **(R)**
- All people (patient or carers) using any equipment or aids should be:
 - Trained in its safe and effective use
 - Given details on who to contact, and how, in case problems arise. **(R)**
- The equipment should be of known (certified) reliability and safety. It should be assessed regularly to check it is being used safely and effectively, it is still needed, and it is still safe. **(R)**

- Prescription and provision of equipment should be based on a careful assessment of the patient and their particular impairments, and the physical and social environment in which it is to be used **(R,I)**

Vocational Activities

- Every person should be asked about the vocational activities they undertook before the stroke. **(R)**
- Patients who wish to return to work (paid or unpaid employment) should have their work requirements established with their employer (provided the patient agrees). **(R, A)**
- They should be assessed cognitively, linguistically and practically to establish their potential. This may include a workplace assessment if required. **(R, A, I)**
- They should be advised on the most suitable time and way to return to work, if this is practical and be referred to a specialist in employment for people with disability if extra assistance or advice is needed. **(R, A)**
- Vocational issues for younger persons with stroke need to be appropriately addressed in conjunction with employers and training services. **(H)**.
- The person and their employer should be advised regarding any grants that may be indicated to subsidise phased return to work, to modify the workplace or to purchase equipment that may be needed to facilitate return to work. **(I)**

Leisure Activities

- Targeted occupational therapy may be used to increase participation in leisure activities. Patients who wish to return to or take up a leisure activity should have their cognitive and practical skills assessed, and should be given advice and help in pursuing their activity if appropriate. **(R, A)**
- People with stroke should be offered advice on, and treatment aimed at, achieving their desired level of social activities. **(Z)**
- People who are living in the community at any point after their stroke should have access to interventions to improve fitness and mobility. **(A)**
- All people with stroke should be provided with access to public transport to facilitate participation in leisure and social activities. **(Z)**

Sexuality

- People with stroke and their carers should be offered the opportunity to discuss issues relating to sexuality with an appropriate health professional. **(A, Z)**
- Written information addressing issues relating to sexuality post-stroke should be made easily available. **(A, Z)**
- Advice about sexuality should cover both physical aspects (e.g. positioning, sensory deficits, erectile dysfunction, drugs) and psychological aspects (e.g. communication, fears, altered roles and sense of attractiveness). **(A, Z)**

Driving

- Before they leave hospital (or the specialist outpatient clinic if not admitted), every person who has had a stroke or TIA should be asked whether they drive or wish to drive. Options should be discussed regarding driving and advice given to the patient. **(R, A, Z)**
- The person or team responsible for any patient who wishes to drive should consider the patient's capacity to drive safely and ask about and identify any absolute bars to driving for example significant visual field defect or reduction in visual acuity, any epileptic seizure within the last 12 months, (excluding a seizure within the first 24 hours after stroke onset) and disorders of attention, especially unilateral neglect. **(R, A, Z, I)**
- Findings and conclusions with respect to driving assessment should be written down and recorded, the GP should be informed and a written record given to the patient. **(R, A, Z)**
- Any person who wishes to return to driving should be advised that:
 - They will need sufficient muscle control to control the car, with or without adaptations
 - They will also need sufficient cognitive ability to drive safely on a busy road
 - Clinic-based assessments of cognitive skills may predict failure of an on-the-road assessment but are of low predictive accuracy
 - Advice on mechanical adaptations can be obtained from various sources
 - On-the-road assessments are the best way to assess ability if there is any doubt
 - They should inform their insurance company about their stroke before returning to driving. **(R)**
- Assessment of fitness to resume driving should have two phases; an off-road test (with emphasis on assessment of physical, behavioural, cognitive,

visuoperceptual function) and an on-road or in-car assessment of actual driving. **(I)**

- The patient should be advised about alternative transport options if it is not possible to return to driving whether in the short or longer term. **(I)**
- Information regarding driver rehabilitation should be offered to the patient if indicated following on-road assessment. **(I)**

Quality Markers in Community Stroke Care

- The following should be used as quality markers in community stroke care:
 - Availability of information advice, support
 - Seamless transfer of care
 - Long-term care and support
 - Assessment and review by primary care service (especially general practitioner) within 6 weeks of discharge and yearly thereafter
 - Participation in the community
 - Return to work
 - Leadership and skills of professionals, i.e. all patients with stroke or high risk of stroke should receive care from staff that are skilled, competent and experienced. **(A)**

Primary and Secondary Prevention of Stroke

Primary Prevention

- To maintain consistency in the management of patients at risk of cardiovascular disease and stroke across Ireland we recommend that clinicians follow the current European Guidelines on Cardiovascular Disease Prevention in Clinical Practice. These are accessible free of charge on <http://www.escardio.org/guidelines-surveys/esc-guidelines/Pages/cvd-prevention.aspx>. **(E, I)**

Diet

- Dietary recommendations for primary prevention are as per the secondary prevention recommendations. **(I)**
 - In addition, oily fish 1-2 portions per week are recommended. **(I)**
 - Lifestyle management should include a healthy diet low in salt and saturated fat, high in fruit and vegetables and rich in fibre. **(I)**
 - Increasing fruit and vegetable consumption is recommended to reduce risk of stroke or TIA and we recommend consumption of a minimum of 5 portions of fruit & vegetables per day. **(I)**
 - Folic acid supplementation may help reduce homocysteine levels but have not been shown to influence risk of stroke. **(R, I)**
 - There is currently insufficient evidence to recommend vitamin therapy to prevent recurrent stroke. **(I, S78)**
- Recommended dietary components include **(E, I)**

Total fat	< 30% dietary energy
Saturated fat	< 10% dietary energy
Polyunsaturated fat	Oily fish > once per month
Trans fat	< 2% dietary energy
Salt	< 6g/day
Fruit & Vegetables	> 400g/day
Obesity & Overweight	BMI 18.5-24.9kg/m ²
Dietary fibre	> 25g/day
Folate from food	> 400µg/day

- Patients and individuals at risk of cardiovascular disease, who are overweight, should be targeted with interventions designed to reduce weight and to maintain this reduction. **(R, S78)**.

Secondary Prevention

- Persons at risk of stroke and those who have had a stroke should be assessed for and given information on risk factors, lifestyle management issues (exercise, smoking, diet, weight, alcohol, stress management) and should be

counselled on possible strategies to modify their lifestyle and risk factors. **(C, Z)**

- Tobacco smokers should be given specific advice and support to stop smoking. They should be given the opportunity to attend specialist stop smoking services if they wish to do so. **(I)**
- Particular targeting of advice should be directed at those with pre-existing dietary risk factors including:
 - Diabetes
 - Hypertension
 - Hyperlipidaemias
 - Overweight and obesity.
- Interventions should be individualised and may be delivered using behavioural techniques (such as education or motivational counselling). **(N)**

Self-management and Support

- Patients should be encouraged to take responsibility for their own health and be supported to identify, prioritise and manage their risk factors. **(S108, N)**
- People with stroke who do not have cognitive impairment should be made aware of the availability of generic self-management programmes before discharge from hospital and be supported to access such programmes once they have returned to the community. **(N)**
- Stroke-specific programmes for self-management may be provided to people who require more specialised programs. **(N)**
- A collaboratively developed self-management care plan may be used to harness and optimise self-management skills. **(N)**
- Interventions should be individualised and may be delivered using behavioural techniques via a group or on a one-to-one basis. **(A)**
- Motivational interviewing and counselling based on the individual situation of the patient and his or her readiness to adopt behaviour changes increases likelihood of these changes taking place and shared decision making can facilitate the maintenance of measures agreed upon. **(E)**
- It is recommended that motivating and supporting people to change behaviour should be achieved through:
 - Helping them understand the short, medium and longer term consequences of their health-related behaviours for themselves and others
 - Feel positive about the benefits of health-enhancing behaviours and changing their behaviour
 - Plan their changes in terms of small, manageable steps over time

- Recognise how their social contexts and relationships may affect their behaviour, and identify and plan for situations that might undermine the changes they are trying to make
- Plan explicit 'if-then' coping strategies to prevent relapse
- Make a personal commitment to adopt health-enhancing behaviours by setting (and recording) goals to undertake clearly defined behaviours, in particular contexts, over a specified time
- Share their behaviour change goals with others. **(I)**

Activities of Daily Living and Exercise

- People who are living in the community more than 6 months after their stroke should have access to interventions to improve fitness and mobility. **(N)**
- All patients should be advised to take regular exercise as far as they are able: the aim should be to achieve moderate physical activity (sufficient to become slightly breathless) for 20-30 minutes each day. **(N)**
- Exercise programmes should be tailored to the individual following appropriate assessment, starting with low intensity physical activity and gradually increasing to moderate levels. **(R)**
- The combination of comorbidities, neurological deficits, and emotional barriers unique to each stroke survivor requires an individual approach to safe exercise programming. **(U)**
- Subsets of stroke survivors (e.g. those with depression, fatigue syndrome, poor family support, or communication, cognitive or motor deficits) will require further evaluation and subsequent specialisation of their rehabilitation programme. **(U)**
- To enhance exercise compliance, the issues of family support and social isolation need to be addressed and resolved. **(U)**
- Physical activity and exercise training recommendations for stroke survivors should be viewed as one important component of a comprehensive stroke and cardiovascular risk reduction programme. **(U)**

Secondary Prevention: Early Secondary Prevention with Antiplatelet Therapy <7-14 Days after Non-Cardioembolic TIA or Ischaemic Stroke of Arterial Origin

- Following exclusion of intracerebral haemorrhage or alternative neurological diagnosis with neuroimaging (CT or MRI) as per TIA and acute stroke guidelines, start 300 mg of Aspirin PO, via NG tube, or PR immediately after the confirmation of TIA or acute ischaemic stroke onset, unless intolerant of or allergic to Aspirin. **(N, I, R, E)**

- Continue 300mg of Aspirin daily for 2 weeks, while long-term secondary preventative antiplatelet regimen is planned. **(N, I, R, E)**
- If Aspirin intolerance or allergy is known or strongly suspected, a Clopidogrel 300mg loading dose followed by 75mg daily should be considered. **(I, C)**
- If Aspirin and Clopidogrel intolerance or allergy is known or strongly suspected Dipyridamole MR 200 mg BD should be considered. **(R, I)**

Secondary Prevention: Empirical Treatment Options for Acute Management of Patients with TIA or Ischaemic Stroke Onset while on Aspirin Monotherapy.

- Following urgent investigation of the patient to determine the cause of the TIA or ischaemic stroke and to determine whether an alternative anti-thrombotic regimen is required:
 - Add Dipyridamole MR 200mg daily for 7 days, increasing to 200mg BD thereafter and continue Aspirin 75mg daily. Physicians may opt for full dose Dipyridamole immediately in certain circumstances, depending on physician preference, but titration may reduce the incidence of side-effects with Dipyridamole therapy. **(I)**

or

 - Change to Clopidogrel monotherapy 75mg daily and stop Aspirin after 5 days of clopidogrel therapy, especially if the patient has had a TIA or stroke with a history of ischaemic heart disease. **(GCP, I)**

Secondary Prevention: Long-Term Antiplatelet Therapy > 7-14 days after Non-Cardioembolic TIA or Ischaemic Stroke

- Aspirin and Dipyridamole MR combination therapy, Aspirin monotherapy, or Clopidogrel monotherapy are acceptable options for long-term secondary prevention. However there is evidence for increased efficacy of Aspirin and dipyridamole MR combination therapy over aspirin alone. **(I, E, R)**
- If the combination of Aspirin and Dipyridamole is chosen, add Dipyridamole MR 200mg once daily from day 7, and increase to Dipyridamole MR 200mg twice daily on day 14, and then reduce the Aspirin dose to 75mg daily. This protocol is recommended in preference to a combined Aspirin 25mg/Dipyridamole MR 200mg preparation taken twice daily, because this preparation only provides a total daily Aspirin dose of 50mg. If the combined Aspirin/Dipyridamole preparation is used, then addition of an additional Aspirin 75mg daily should be considered. Based on preliminary data from the EARLY trial, physicians may opt to commence dipyridamole MR within 24 hours of TIA or stroke onset. **(I)**
- For patients who are intolerant of the addition of Dipyridamole MR, it is reasonable to continue Aspirin at a dose of 75-300mg daily. **(I)**

- If Aspirin monotherapy is chosen, 300mg of Aspirin daily should be continued until day 14 initially and then continued at 75-300mg daily. **(I, R)**
- If Clopidogrel monotherapy is chosen, 75mg daily should be prescribed as above. **(I)**
- For patients who are intolerant of, or allergic to Aspirin, long-term treatment with 75mg of Clopidogrel daily should be considered. Intolerance is defined as either likely hypersensitivity to aspirin-containing medicines or history of severe dyspepsia induced by low-dose aspirin. **(I, R, E)**
- For patients who are intolerant of Aspirin and Clopidogrel, Dipyridamole MR 200mg BD monotherapy should be considered. **(I, R, E)**
- Aspirin and Clopidogrel combination therapy is not recommended for routine long-term secondary prevention, unless both are essential for cardiac reasons e.g. following recent coronary artery stenting. **(I)**

Secondary Prevention: Oral Anticoagulation after Cardioembolic TIA or Ischaemic Stroke with Atrial Fibrillation or Flutter.

- Oral anticoagulation is recommended for patients with cardio-embolic TIA or ischaemic stroke associated with persistent or paroxysmal atrial fibrillation or atrial flutter, unless specific contraindications exist, e.g. falls, uncontrolled seizures, high risk of bleeding, non-compliance, alcohol dependence, etc. It is reasonable to treat patients with atrial fibrillation and atrial flutter in the same manner. **(I, R, E)**
- Use dose-adjusted Warfarin: target INR of 2.5 (range: 2.0-3.0). **(I)**

First Cardioembolic TIA - No 'high risk' factors

- Exclude intracranial haemorrhage or contraindication to anticoagulation with urgent CT or MRI of brain.
- Commence Aspirin 300mg daily and dose-adjusted Warfarin and when INR consistently ≥ 2.0 , stop Aspirin. **(I)**

'High Risk' Cardio-embolic TIA patients with atrial fibrillation / flutter e.g. ≥ 1 TIA on antiplatelet therapy; Left atrial appendage thrombus

- Consider initial Enoxaparin 1mg / kg BD, or unfractionated IV Heparin (Target APTT Ratio 2.5, range 2.0-3.0). **(I)**
- Start Warfarin when stroke specialist considers clinically stable. **(I)**

- Stop Enoxaparin or Heparin when INR > 2.0. (I)

Minor Ischaemic Cardioembolic Stroke with Small Infarct on CT / MRI

- Commence Aspirin 300mg daily. (I)
- Consider early dose-adjusted Warfarin if clinically stable e.g. between 48 hours and day 7, after evaluation of risk-benefit ratio of anticoagulation with stroke specialist. (I)
- When INR consistently \geq 2.0, stop Aspirin. (I)

Minor/Major Cardioembolic Stroke with Moderate / Large Infarct on CT / MRI

- Avoid routine early oral anticoagulation for 1st 7 days. (I)
- Start Aspirin 300mg daily initially after symptom onset. (I)
- Start Warfarin day 7 (target INR 2.5, Range 2 - 3.0) if clinically stable and no significant haemorrhagic transformation on interval brain CT. (I)
- Stop Aspirin when INR consistently \geq 2.0. (I)

Where Anticoagulation is Contraindicated in Cardioembolic TIA / Ischaemic Stroke

- Long-term empirical anti-thrombotic treatment options include: Aspirin monotherapy or Clopidogrel monotherapy or Aspirin 75mg daily and Dipyridamole MR 200mg BD but there is little evidence to make a conclusion as to the superiority of any therapy above another. (I)
- Data are considered insufficient to make a definite recommendation regarding long-term combination therapy with Aspirin 75mg and Clopidogrel 75mg in patients intolerant or unwilling to take Warfarin. This combination antiplatelet regimen cannot be routinely recommended at present (I)

Secondary Prevention with Statin Therapy following TIA and Ischaemic Stroke

- Statin therapy should be considered in all patients with atherothromboembolic / thrombotic TIA or ischaemic stroke unless contraindicated, or

subjects have lipid values below current recommended treatment levels, with due consideration for co-existent vascular disease burden. **(I)**

- Optimal time to commence Statins following TIA or ischaemic Stroke is unknown but there is no evidence to support the commencement of Statins in the acute phase (< 24-48 hours) after TIA or ischaemic Stroke. **(I)**
- It is reasonable and important to commence Statins approximately 4 weeks after TIA or ischaemic stroke based on evidence from the SPARCL trial. **(I)**
- Advice when to commence Statins should be clearly planned at initial stroke prevention clinic assessment or before discharge from hospital. **(I)**
- Patients with TIA or ischaemic stroke on prior statin treatment should continue treatment if necessary. **(I)**

Choice of Statin and Monitoring suggestions

- Whilst all statins reduce total and LDL cholesterol to varying extents, their action in secondary prevention following TIA or ischaemic stroke may extend beyond their lipid-lowering properties. At the time of guideline publication, only one trial with a specific statin, Atorvastatin, has been shown to reduce the risk of recurrent ischaemic stroke and other vascular events in patients with ischaemic cerebrovascular disease. **(I)**
- Other statins, especially Simvastatin 40 mg daily, may also be considered as cholesterol-lowering therapies. Simvastatin reduced the risk of major vascular events in ischaemic cerebrovascular disease patients between 40 - 80 years of age in the Heart Protection Study.
- Individual physicians should choose a statin depending on the patient's medical status, co-morbidities and co-existing medication **(I)**
- The SPARCL and HPS Trials did not titrate the statin dose in patients with ischaemic cerebrovascular disease to achieve specific lipid targets, and further evidence regarding 'lipid target-adjusted lipid-lowering therapy' following TIA or stroke is awaited.
- Physician-directed lipid goals, which require further clarification in ischaemic cerebrovascular disease, should be aimed for in conjunction with lifestyle modification and adherence to evidence-based nutrition guidelines. **(I)**
- It is recommended to start with a low dose e.g. Atorvastatin 10 mg – 20 mg nocte, and titrate in increments up to 80 mg nocte, as tolerated, to achieve physician-directed lipid targets depending on initial lipid profile. **(I)**

- Patients should be monitored for adverse effects of statins, especially older patients, or patients on multiple other medications. Regular monitoring of CPK and LFTs and lipid profile and lipid profile is recommended. **(I)**
- If statins are contraindicated, not tolerated or have inadequate lipid-lowering effects at good therapeutic doses, replacement with, or addition of alternative lipid-lowering agents should be considered. **(I)**
- In some cases, referral to a specialist Lipid Clinic is advised e.g. where lipid targets are not met or where first line lipid lowering agents are not tolerated **(I)**

Statins in Primary Intracerebral Haemorrhage

- Statins should be avoided after primary intracerebral haemorrhage, unless risk of further ischaemic events outweighs the risk of recurrent haemorrhage. **(I)**

Secondary Prevention: Blood Pressure

- It is recommended that blood pressure be checked regularly. Blood pressure lowering is recommended after the acute phase, including if tolerated in patients with normal blood pressure. **(I, E)**
- Antihypertensive therapy can be safely commenced, or resumed if discontinued, 7 - 14 days following stroke. **(I)**
- Blood pressure should be checked. It is recommended that high blood pressure should be managed with lifestyle modification and individualised pharmacological therapy. **(E)**
- There is evidence that modest reductions in blood pressure significantly reduce risk of recurrent stroke. This is the case even in subjects who were within normotensive limits at time of presentation. Recommended blood pressure treatment goals are systolic blood pressure <135/85 mmHg for non-diabetic subjects and <130/80 for diabetic subjects. **(E, I)**
- For prehypertensive (120-139/80-90 mmHg) with congestive heart failure, history of coronary heart disease, diabetes, or chronic renal failure cautious introduction of antihypertensive medication is also recommended and may reduce risk of recurrence. **(E, I)**
- Care needs to be taken in subjects with known severe bilateral carotid stenosis especially with symptoms of haemodynamic ischaemia, and blood pressure in this group should not typically be actively reduced below 140/90 mmHg. **(I)**

Carotid Endarterectomy (CEA) in Symptomatic Patients

- It is not always possible to establish a relationship between symptoms and carotid disease, and it is largely a clinical judgement. Intervention is indicated for patients with focal cerebral events in the carotid territory or transient monocular blindness (amaurosis fugax). **(I)**
- Intervention for cerebral hypoperfusion symptoms should be decided upon on a case by case basis. **(I)**
- Patients with symptomatic severe ($\geq 70\%$ by NASCET criteria) carotid artery stenosis should be considered for carotid endarterectomy, unless contraindicated. **(I, R, E, U)**
- Intervention for patients with symptomatic moderate (50-69%) carotid stenosis should be discussed by the stroke specialist and vascular surgeon on an individual case-by-case basis, and the merits of optimal medical treatment versus carotid intervention considered.. **(I, R, E, U)**
- Surgery is not indicated in patients with symptomatic carotid disease with $<50\%$ stenosis. **(I, R, E, U)**
- The combination of 2 non-invasive imaging modalities e.g. colour Doppler ultrasound with either contrast-enhanced MRA or CTA has been shown to improve diagnostic accuracy in assessing the severity of carotid stenosis. Consideration should be given to combining these imaging modalities before making a final decision re intervention. In selected cases, the stroke specialist and vascular surgeon may require formal catheter angiography to accurately quantify the severity of carotid stenosis before deciding upon intervention **(I)**
- It is advised that each patient being considered for carotid intervention be discussed at a Neurovascular MDT involving the Vascular Surgeon, Neurologist/Stroke Physician (+ Neuroradiologist if available) **(I)**.

Timing of Surgery

- Carotid endarterectomy should be performed within 2 weeks of symptom onset for greatest benefit; however, surgery is indicated up to six months from last symptom in patients with severe carotid stenosis. **(I, R)**
- Meta-analysis data indicate that if carotid endarterectomy is being considered in patients with symptomatic moderate carotid stenosis, it should be performed within 2 weeks of symptom onset. **(I)**
- While early surgery yields greatest benefit in terms of the prevention of recurrent stroke, surgery may be delayed following established stroke where the infarct is of considerable size, there is evidence of oedema or mass effect or the patient has little residual function or recovery on the affected side as randomised controlled trials excluded these patients. **(I)**

Indications for Carotid Endarterectomy in Asymptomatic Patients

- Male patients <75 years with 60-99% stenosis if the audited risk associated with surgery in the operating centre is <3%.
- The benefit from carotid endarterectomy in women with asymptomatic severe carotid stenosis appears less than in male patients, and all such cases should be discussed at a neurovascular MDT prior to deciding on intervention versus optimal medical management.(I)

Carotid Artery Endovascular Treatment in Symptomatic Carotid Stenosis

- Trial data indicate that carotid endarterectomy is a safer procedure, with better medium-term outcomes than carotid endovascular therapy/stenting in most circumstances. Situations where carotid endovascular therapy/stenting may be considered as an alternative include:
 - o Previous neck dissection
 - o Previous cervical irradiation
 - o Prior carotid endarterectomy and restenosis
 - o Presence of a high carotid bifurcation
 - o Intracranial extension of carotid lesion
 - o Tandem lesions
 - o Contralateral laryngeal nerve palsy
 - o In the context of a randomised trial. (I)

Carotid Artery Endovascular Treatment in Asymptomatic Carotid Stenosis

- No long-term benefit has been demonstrated with carotid endovascular therapy/stenting over carotid endarterectomy in patients with asymptomatic severe carotid stenosis. Asymptomatic patients should not undergo carotid endovascular therapy/stenting except in the context of a randomised controlled trial, or if they are at high risk of stroke and carotid endarterectomy is contraindicated. If endovascular therapy/stenting is considered in such cases, the peri-procedural complication rate with endovascular therapy/stenting must also be < 3%. (I)

Appendix 1

Acknowledgements.

The Irish Heart Foundation Council on Stroke Guidelines Group would like to thank all those who participated in the long and arduous process of compiling, writing and reviewing the guidelines. These individuals included Khalil Amir, Neil Austin, Libby Bailey, Peter Boers, Michael Boland, Sinead Boyd, Ciara Breen, Carmel Brennan, John Buckley, Margaret Cagney, Aisling Carey, Aine Carroll, Simone Carton, Donal Cassidy, Breda Cleary, Niamh Coffey, Ronan Collins, , John Connaughton, Anne Copeland, Leslie Corcoran, Clare Corish, Catherine Cornall, Aisling Creed, Morgan Crowe, Paul Crowley, Nora Cunningham, Dervilla Danaher, Jane Dawson, Mark Delargy, Noddy Dempsey, John Devlin, Mary Diskin, Christine Donnellan, Elizabeth Doyle, Rachael Doyle, Susie Doyle, Catherine Duignan, Pauline Dunne, Mary Durkin, Ineke Durville, Marianne Falconer, Martin Feeley, Livinia Finnegan, Evelyn Flavin, Helen Flynn, Rose Galvin , Henry Gibbons, Mary Gorman, Marion Greene, Joe Harbison, Serena Hatton, Karina Healy, Siobhan Healy, Aisling Heffernan, Orla Holt, Frances Horgan, Tim Jackson, Siobhan Jennings, Anne Jennings , Eamonn Kavanagh, Paul Kavanagh, Aine Kearns, Vincent Keaveney, Zara Keaveney, Peter Kelly, Regina Kiernan, Marie Kilty, Justin Kinsella , Anne Marie Langan, Peter Langhorne, Cora Lavin, Julie Lynch, Timothy Lynch, Bridie Lyons, Linda Lyons, Aisling Macklin, Lisa Masterson, Brian Maurer, Ruth Maxwell, Claire McAleer, Dominick McCabe, Suzanne McCabe, Patricia McCormack, Cara McDonagh, Bob McDonnell, Jacinta McElligott, Rory McGovern, Aine McNamara, Una Moffatt, Jacinta Morgan, Ann Moriarty, Eileen Moriarty , Joan Moroney, Wendy Moynan, Brian Mullen, Martin Mulroy, Patricia Munnely, Ken Mupleter, Ina Murphy, Paddy Murphy, Sean Murphy, Anna Murphy , Imelda Noone, Anne O'Loughlin, Aine O'Riordan , Patricia O'Connor, Mary O'Dowd, Michelle O'Keefe, Caroline Oliver, Mary O'Mahoney, Tom O'Malley, Des O'Neill, Michael O'Shea, Patrick Plunkett, Claire Prendergast, Irene Reid, Niamh Ruddle, Dan Ryan, Suz-Ann Scott, Julie Shanahan , Kim Sheil, Emer Shelley, Sheila Sheridan, Emma Stokes , Suzanne Timmons, Oliver Tobin, Sinead Twomey, Derick Wade, Eugene Wallace, Suzanne Walsh and Anne Winters.

We would also like MSD Ireland Ltd who funded the development of the guidelines and the first National Guidelines meeting by means of an unconditional grant.

Whilst various clinicians in the writing group have been in receipt of grants and honoraria from various sources. No participant in the creation of these guidelines process declared a significant conflict of interest with respect to the content of these guidelines.

Appendix 2

National Thrombolysis Guidelines for Cerebral Infarction

Contents

Thrombolysis: Inclusion / Exclusion Criteria
Thrombolysis Assessment Guidelines
Dosage chart for rt-PA
Recognition of stroke in the Emergency Room (ROSIER)
Modified Rankin Scale
Thrombolysis Screening and Follow-up

Schedule from Admission to Hospital
BP Control Before, During and after Thrombolysis
Post Stroke Thrombolysis Care
Indications for Urgent CT Scan following Thrombolysis
Risk factors for Symptomatic ICH post rt-PA

Adverse Events
Management of Complications of all Stroke Patients
Brain Oedema / Increased Intracranial Pressure
Malignant Middle Cerebral Artery Infarction

Early Ischaemic Change on CT
Intra-arterial Thrombolysis
Evidence for Intravenous Thrombolysis in Ischaemic Stroke
Alteplase in Acute Stroke: Information for Patients

Documentation
Useful Addresses
Writing Group
Acknowledgements
Disclaimer

THROMBOLYSIS: INCLUSION / EXCLUSION CRITERIA

INCLUSION CRITERIA. Guidelines ANSWER TO THE FOLLOWING QUESTIONS MUST BE YES.

		YES	NO
1.	Clinical diagnosis of acute ischaemic stroke causing a measurable neurological deficit.		
2.	Clearly defined onset of symptoms < 3 hours prior to initiation of thrombolysis. Data from ECASS III indicate benefit up to 4.5 hrs after symptom onset, but license awaited for treatment between 3-4.5 hours. Individual clinicians to make evidence-based decision on treatment in this situation.		
3.	CT brain excluding intracranial haemorrhage, with no CT neuro-imaging contraindication to treatment. 5 mm sections are preferred, but no thicker than 10 mm. CT screening should be performed < 1hour prior to initiation of thrombolysis.		
4.	Risks and benefits explained to patient or relative		

EXCLUSION CRITERIA Guidelines.

ANSWER TO ALL OF THE FOLLOWING QUESTIONS MUST BE NO

1.	Symptom of stroke onset > 4.5 hours prior to starting infusion, or time of symptom onset unknown		
2.	Severe stroke as assessed clinically (e.g. National Institute of Health Stroke Score >25) (NIHSS)		
3.	Symptoms rapidly improving before start of infusion (more than 50% improvement in NIHSS).		
4.	Unconscious patient		
5.	Fixed head or eye deviation – caution		
6.	Pre- stroke Rankin > 3. Life expectancy less than one year from another cause		
7.	Seizure at onset of stroke - caution		
8.	Symptoms suggestive of subarachnoid haemorrhage, even if the CT scan is normal.		
9.	Infective endocarditis, pericarditis or presence of ventricular aneurysm related to recent M.I.		
10.	Recent (< 7 days) traumatic external heart massage		
11.	Recent puncture of a non-compressible blood vessel (e.g. subclavian or jugular vein puncture, arterial puncture at a non compressible site, or lumbar puncture within 7 days		
12.	Trauma with internal injuries, surgery or visceral biopsy within previous 4 weeks		
13.	Serious head trauma or neurosurgery within the previous 3 months		
14.	Any history of central nervous system neoplasm, aneurysm, AVM; definite or suspected prior intracranial haemorrhage		
15.	Pregnancy, or childbirth within the previous 4 weeks		
16.	Active GI or GU bleeding within 21 days or recent severe or dangerous bleeding at another site		
17.	Abdominal aortic aneurysm		
18.	Proliferative diabetic retinopathy		
19.	Acute pancreatitis		
20.	Severe liver disease, incl. hepatic failure, cirrhosis, portal hypertension, oesophageal varices and active hepatitis		
21.	Blood Glucose <3 mmols/l or >22 mmols/l with resolution of symptoms when corrected		
22.	Hereditary or acquired bleeding disorder		
23.	Uncontrolled hypertension (systolic > 180mmHg or diastolic > 105mmHg)		
24.	Platelet count <100 x 10 ⁹ /L (Normal range: 150–450 x 10 ⁹ /L)		
25.	Haematocrit <25%		
26.	Current anticoagulant therapy (excepting INR<1.4 whilst on warfarin)		
27.	Administration of heparin within the previous 48 hours with an elevated APTT		
28.	Previous Stroke AND Diabetes – consider each case individually		
29.	Previous stroke within 3 months (as per EMEA licence - relative contraindication)		
30.	Age ≥ 80 yrs is outwith EMEA provisional licence and a relative contraindication – Individual clinicians to decide on case-by-case basis		
31.	Peritoneal dialysis or haemodialysis		
32.	Neoplasm with increased bleeding risk		

C.T CAUTION CRITERIA ATTENDING STROKE SPECIALIST AND RADIOLOGIST SHOULD CHECK THE FOLLOWING C.T CAUTIONS

1.	High density lesion consistent with intracranial haemorrhage		
2.	Hypodensity in >1/3 M.C.A. territory or ASPECTS Score < 7/10 (difficulty with reproducibility and reliability – patients with hypodense areas were included in the NINDS trial within 3 hours)		
3.	Extensive CT changes of evolving infarction or mass effect on CT		

rt-PA ASSESSMENT GUIDELINES

AIM - ARRIVAL TO DRUG ADMINISTRATION ≤ 30 mins

TIME IS BRAIN

NAME.	
D.O.B.	
HOSP. No	

DATE		BLOODS TAKEN AT	
ONSET TIME		CT SCAN AT	
ADMISSION TIME		DRUG AT	

SITS REGISTRATION NUMBER

ON ARRIVAL TO A&E	
If approximate onset time is <2.30 hrs : Take blood for urgent FBC, U&E, GLUCOSE, CLOTTING & GROUP + HOLD. Ensure that Responsible Consultant is aware that the patient may be suitable for thrombolysis Speak to the on call radiologist to request an urgent C.T. Scan Record baseline observations and commence continuous monitoring	[] [] [] [] []
WITHIN 20 MINUTES OF ARRIVAL	
Determine definite onset time A word of caution with right sided strokes (i.e. left hemiparesis etc.) they can be unreliable with time of onset and don't appreciate early signs of stroke. Get collateral if possible If collateral is not immediately available from the patient or relative, contact the person who contacted the GP or ambulance service. IF NECESSARY SPEAK TO THE GP OR AMBULANCE CREW. Confirm that consent/assent can be obtained Check availability of rt-PA Insert 18G I.V. cannulas into both arms	[] [] [] [] [] []
WITHIN 45 MINUTES OF ARRIVAL	
Chase blood results Record NIHSS, pre-stroke Rankin and Barthel Confirm that the patient meets all of the inclusion and none of the absolute exclusion criteria Calculate dose of rt-PA from either actual or estimated body weight. (See weight / dose chart)	[] [] [] []
FOLLOWING DRUG ADMINISTRATION	
Complete assessment details, ensure N.I.H. and Rankin are recorded in notes Check that the following information has also been recorded in the patients notes: Name of the Doctor obtaining verbal consent / assent Name(s) of the Doctors responsible for reading C.T. scan Dosage of rt-PA given	[] [] [] []

TIME IS BRAIN

NAME.	
D.O.B.	
HOSP. No	

DATE		BLOODS TAKEN AT	
ONSET TIME		CT SCAN AT	
ADMISSION TIME		DRUG AT	

SITS REGISTRATION NUMBER

ON ARRIVAL TO A&E	
<p>If approximate onset time is <2.30 hrs (4:00 hours on granting of new licence) :</p> <p>Take blood for urgent FBC, U&E, GLUCOSE, CLOTTING & GROUP + HOLD.</p> <p>Ensure that Responsible Consultant is aware that the patient may be suitable for thrombolysis</p> <p>Speak to the on call radiologist to request an urgent C.T. Scan</p> <p>Record baseline observations and commence continuous monitoring</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
WITHIN 30 MINUTES OF ARRIVAL	
<p>Determine definite onset time</p> <p>A word of caution with right sided strokes (i.e. left hemiparesis etc.) they can be unreliable with time of onset and don't appreciate early signs of stroke. Get collateral if possible</p> <p>If collateral is not immediately available from the patient or relative contact the person who contacted the GP or ambulance service. <u>IF NECESSARY SPEAK TO THE GP OR AMBULANCE CREW.</u></p> <p>Confirm that consent/assent can be obtained</p> <p>Check availability of rt-PA</p> <p>Insert 18G I.V. cannulas into both arms</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
WITHIN 45 MINUTES OF ARRIVAL	
<p>Chase blood results</p> <p>Record NIHSS, pre-stroke Rankin</p> <p>Confirm that the patient meets all of the inclusion and none of the exclusion criteria</p> <p>Calculate dose of rt-PA from either actual or estimated body weight. (See weight / dose chart)</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
FOLLOWING DRUG ADMINISTRATION	
<p>Complete assessment details, ensure N.I.H. and Rankin are recorded in notes</p> <p>Check that the following information has also been recorded in the patients notes:</p> <p style="padding-left: 20px;">Name of the Doctor obtaining verbal consent / assent</p> <p style="padding-left: 20px;">Name(s) of the Doctors responsible for reading C.T. scan</p> <p style="padding-left: 20px;">Dosage of rt-PA given</p>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

BODY WEIGHT/DOSE CHART FOR rt-PA
(Actilyse)

DRUG DOSAGE AND ADMINISTRATION

Body Weight (Stones)	Body Weight (Kg)	Total rt-PA Dose (mg)	10% Bolus (ml)	90% IV Infusion (ml/hr)	No. of 50 mg rt-PA vials needed
6 st 4	40	36	4	32	1
6 st 8	42	38	4	34	1
7 st	44	40	4	36	1
7 st 3	46	41	4	37	1
7 st 7	48	43	4	39	1
7 st 12	50	45	5	40	1
8 st 2	52	47	5	42	1
8 st 6	54	49	5	44	1
8 st 12	56	50	5	45	2
9 st 1	58	52	5	47	2
9 st 6	60	54	5	49	2
9 st 10	62	56	6	50	2
10 st	64	58	6	52	2
10 st 5	66	59	6	53	2
10 st 9	68	61	6	55	2
11 st	70	63	6	57	2
11 st 4	72	65	6	59	2
11 st 9	74	67	7	60	2
12 st	76	68	7	61	2
12 st 3	78	70	7	63	2
12 st 8	80	72	7	65	2
12 st 12	82	74	7	67	2
13 st 3	84	76	8	68	2
13 st 7	86	77	8	69	2
13 st 12	88	79	8	71	2
14 st	90	81	8	73	2
14 st 6	92	83	8	75	2
14 st 11	94	85	8	77	2
15 st 2	96	86	9	77	2
15 st 7	98	88	9	79	2
15 st 10	100	90	9	81	2

PATIENTS MUST BE CONTINUOUSLY MONITORED PRIOR TO AND DURING DRUG ADMINISTRATION and for at least 24 hours following administration.

- Total dose: 0.9mg/kg**
MAXIMUM DOSE IS 90 MG.
(See body weight/dose chart)
- Should be** prescribed by, and administration supervised by, a Doctor from the stroke team.
- 10% of total dose given as an I.V. push over 2 minutes supervised by a Doctor from the stroke team.**
- Give remaining 90% of dose I.V over 60 minutes via infusion pump.**
- Observe patient for any deterioration during infusion.**

Recognition Of Stroke In the Emergency Room (ROSIER Test)

Date and time of assessment: _____

Date and time of symptom onset: _____

Glasgow Coma Scale: Eyes = _____ Motor = _____ Visual = _____
 Total: _____

BP: _____

Capillary Glucose: _____

	Yes	No (0)
1. Loss of consciousness or syncope	<input type="checkbox"/> (-1)	<input type="checkbox"/>
2. Seizure activity	<input type="checkbox"/> (-1)	<input type="checkbox"/>
Is there a <u>new acute onset</u> or on awakening from sleep of		
3. Asymmetric facial weakness	<input type="checkbox"/> (+1)	<input type="checkbox"/>
4. Asymmetric arm weakness	<input type="checkbox"/> (+1)	<input type="checkbox"/>
5. Asymmetric leg weakness	<input type="checkbox"/> (+1)	<input type="checkbox"/>
6. Speech disturbance (dysphasia or dysarthria)	<input type="checkbox"/> (+1)	<input type="checkbox"/>
7. Visual field defect	<input type="checkbox"/> (+1)	<input type="checkbox"/>

**Total Score _____ (- 2 to 5)

** Contact the Stroke-Service if Rosier score is between 1 and 5.

Reference

Nor AM, Davis J, Sen B, Shipsey D, Louw SJ, Dyker AG, Davis M, Ford GA. (2005) The Recognition of Stroke in the Emergency Room (ROSIER) scale: development and validation of a stroke recognition instrument. *Lancet Neurology*; 4(11):727-34.

Modified Rankin Scale

SCORE	DESCRIPTION
0	No symptoms at all

- 1 No significant disability despite symptoms; able to carry out all usual duties and activities
- 2 Slight disability; unable to carry out all previous activities, but able to look after own affairs without assistance
- 3 Moderate disability; requiring some help, but able to walk without assistance
- 4 Moderately severe disability; unable to walk without assistance and unable to attend to own bodily needs without assistance
- 5 Severe disability; bedridden, incontinent and requiring constant nursing care and attention
- 6 Dead

TOTAL (0–6):

rt-PA Subject Data

Addressograph

Date of onset	
Time of onset	
Date of admission	
Time of admission	
Time bloods obtained	
Time C.T. obtained	
Weight (Actual / Estimated)	

	N.I.H. (Current)	Rankin (Historic)	Barthel (Historic)
Baseline			
Initials			

3 months			
Initials			

6 months			
Initials			

12 months			
Initials			

Thrombolysed	Yes [] No []
C.T. read by	
Consent obtained by	
Drug prescribed by	
Dosage	
Time of administration	
Exclusion reason	

	time		time		time			
Blood Pressure								
Heart rate								
Temp								
BM								
Complications								
	0hrs		24 hrs		48hrs			
CT head scan								
	Baseline	Initials	3 Month	Initials	6 Month	Initials	12 Month	Initials
Due Date								
Actual Date								

Schedule from admission to hospital:

- Pulse, BP, Oxygen Saturations, Temperature and Glasgow Coma Scale.

ALL Strokes: Every 15 minutes for first hour
- Hourly for 4 hours
- 4 hourly for 24 hours.

POST rt-PA: - every 15 minutes for first hour
- every 30 minutes x 6 hours
- every hour x 17 hours.

- Capillary glucose
 - Admission and 4 hourly if abnormal or diabetic.
 - 12 hourly if normal and non diabetic.
- ECG -Continuously for 24 hours.

Blood Pressure Control Before, During and After rt-PA Treatment

Whether to lower blood pressure to <180/105 to permit treatment is controversial. If **systolic BP > 180mmHg and or diastolic BP >105mmHg** for more than two readings 5 minutes apart, Labetolol 10mg IV bolus slowly over 1-2 minutes can be given and repeated once again after 20-30 minutes. Monitor BP every 5 minutes during Labetolol treatment. Alternatively Nicardipine starting at a drip of 5mg/hour and titrated up to a maximum of 15mg/hour can be given or Isosorbide dinitrate at 2mg/hour and titrate against blood pressure

If the above measures do not bring BP below 180/105, rt-PA should not be given.

NOTE: it is extremely important to lower blood pressure if it rises to a systolic BP > 180mmHg or a diastolic BP >105mmHg post-thrombolysis – see Adverse Events Number 4.

Post STROKE Thrombolysis Care

General Management

- Bed rest for 24 hours (may not be essential if patient very stable)
- Pulse oximetry - maintain O₂ saturations above 95%
- Maintain normal temperature. Paracetamol if temp > 37.5⁰C
- Blood Glucose: maintain blood glucose < 10 mmol/l using IV insulin if necessary
- DVT prophylaxis – above knee TED stockings
- No arterial punctures, NG tubes or central lines for 24 hours
- No urinary catheters for at least 1 hour after infusion ended
- Falls Risk Assessment and Prevention measures
- Avoid suctioning whenever possible, caution giving mouthcare
- No Aspirin, Clopidogrel, Dipyridamole or anticoagulant (heparin, low molecular weight heparin or warfarin) for 24 hours
- Repeat CT head at 24-36 hours
- Hydration / Nutrition.

STOP the rt-PA infusion IF:

- Anaphylaxis.
- BP systolic <100
- BP systolic rises to >180/105 mmHg sustained after 5 minutes, or associated with neurological deterioration of any sort
- Major systemic bleeding
- Neurological deterioration of 2 points on GCS eye/motor scale.

Indications for urgent repeat CT Scan following Thrombolysis in Acute Ischaemic Stroke patients

Any signs and symptoms suggestive of intracerebral haemorrhage or massive infarct swelling:

Signs and symptoms of intracerebral haemorrhage:

- New acute headache or worsening severity of headache
- Acute hypertension
- Nausea and vomiting
- Agitation
- Seizure.

Neurological deterioration is classified as significant if there is:

A deterioration of ≥ 2 points on the Glasgow Coma Score

A drop in the NIHSS ≥ 4 points

NB. Take note of any potential motor signs on the opposite side to the patient's initial presenting weakness.

Discuss concerns immediately with Consultant Stroke Physician.

Contact on call haematologist for advice regarding the reversal of rt-PA if CT scan confirms bleeding.

NOTE: Many causes of neurological deterioration following thrombolytic therapy are not due to intracerebral haemorrhage.

Independent Risk Factors for Symptomatic Intracerebral Haemorrhage Post-Thrombolysis

- Baseline symptom severity

The following are not firmly evidence-based but are surrogate markers for more severe strokes:

- Elevated serum glucose
- History of diabetes
- Advanced age
- Smoker
- Increased time to treatment
- Previous aspirin use
- High systolic blood pressure

- Low platelet count
- History of congestive cardiac failure
- Low plasminogen activator inhibitor activity
- National Institute Neurological Disease Severity (NINDS) protocol violations
- Large baseline diffusion weighted imaging (DWI) lesions on (MRI) with early reperfusion.

Adverse Events

1. Haemorrhage

rt-PA is rapidly cleared from the plasma. Fibrinogen is depleted in the first few hours (<40% at 4 hours) but is back to 80% of normal by 24 hours. Bleeding after 36 hours is rarely due to rt-PA.

Some patients who bleed post rt-PA deteriorate so dramatically that reversal is unlikely to change outcome. Also, some patients have clinically silent haemorrhage on CT that is only found on follow-up scanning at 24-36 hours when their neurological status has slowly deteriorated. Neurological deterioration may be due to the original infarct which has either become swollen or more established, or it may contain a small amount of haemorrhage that may not be the cause of deterioration.

A. Symptomatic Intracranial Haemorrhage

This complication of stroke thrombolysis occurs in about 1 in 15 patients (6-7%).

Suspect if headache, nausea and vomiting, fall in GCS, new focal neurological signs or acute hypertension.

Nursing Action

IMMEDIATELY Discontinue rt-PA infusion if still running

- **Call for immediate Stroke Service team member/ medical review.**

Action by medical staff

- ABC and full Medical and Neurological reassessment
- Assess patient fully, including documenting new neurological deficit
- Check fibrinogen, PT, APTT, FBC, group and save, TT (thrombin time – not available in all labs)
- Arrange urgent CT head scan
- Inform Stroke Service Consultant.

If Bleed Confirmed Consider:

Discuss with Consultant Haematologist on-call and discuss CT with Neurosurgery

Consider treatment with:

- *Fibrinogen 3-4 grams IV (aim for fibrinogen levels > 1.5 g/L); 4 grams of fibrinogen will elevate plasma fibrinogen by 1g/L.
- If fibrinogen not available, then use fresh frozen plasma 15mls/Kg; 1300 mls of FFP is equivalent to approx. 3 grams of fibrinogen.
- Platelets 2 pools (= 10 units) for platelet dysfunction and not thrombocytopenia, as rt-PA can impair platelet function.

Of note rt-PA may go on acting in the thrombus for many hours and fibrinogen or other therapeutically administered compounds may have little effect. Also these patients are pro-thrombotic and there are reports of myocardial infarction following fibrinogen administration to reverse cerebral post-thrombolysis coagulation defects.

In extreme circumstances, and only within the 1st 1-2 hours of discontinuation of rt-PA in a patient with severe intracranial bleeding, may consider an anti-fibrinolytic i.e. Tranexamic acid, This may also increase the risk of subsequent thrombosis, so must be discussed with Stroke Specialist and Consultant Haematologist.

* Every hospital administering rt-PA should ensure Blood Bank have fibrinogen stock
If real concern about cerebral bleeding, an urgent fibrinogen level can be run, but if any delay in processing and if a symptomatic intracranial haemorrhage is confirmed, fibrinogen may be used before the lab result is available.

B. Extracerebral Bleeding

Nursing Action

- IMMEDIATELY Discontinue rt-PA infusion if still running
- Perform full set of observations
- Administer O2 15 litres via non re-breathing mask
- Raise foot of bed if BP < 100 mmHg systolic.

Call for immediate Stroke Service team member / senior medical review

Action by Medical Staff

-ABC; Assess for shock

-Use mechanical compression of haemorrhage wherever possible

-Two large peripheral venous cannulas; FBC, U+E, Cr, PT, APTT, fibrinogen, group and crossmatch

-Administer: IV crystalloid 500 ml fluid challenge, if simple measures have failed to improve BP.

If Bleed Confirmed:

- Discuss with Consultant Haematologist on-call Vascular or General Surgery/Gastroenterology (as appropriate).
- *Fibrinogen 3-4 grams IV (aim for fibrinogen levels > 1.5 g/L)
- If fibrinogen not available, then use fresh frozen plasma 15mls/Kg
- Platelets 2 pools (= 10 units)
- Packed RBC must be started immediately as per IBTS guidelines

2. Anaphylaxis

Nursing Action

Suspect if

- Rapid fall in BP
- Urticarial rash (rapidly developing, red, blanching, often slightly raised i.e. wheals)
- ANGIOEDEMA, swelling of tongue or around mouth / lips new wheezing or breathlessness.

Action:

- IMMEDIATELY Discontinue rt-PA infusion if still running
- Assess and Protect Airway
- Call for immediate senior review from Medical Registrar
- Elevate foot of bed if Hypotensive and administer high flow oxygen – 15litres
- Inform STROKE-SERVICE consultant/registrar.

Action by Medical Staff

-ABC and ensure two large cannulae *in situ*

- **Adrenaline IV should only be given by experienced specialists.**

- If shocked (BP < 100mmHg systolic and not responding to above measures) give 100 µg Adrenaline as **slow IV bolus** diluted down the concentration to 1:10 000

Adrenaline solution. as follows:

- Use 1ml diabetic syringe. Draw up **0.1 mls** (100 µg) of Adrenaline 1:1000 from ampoule, make up to final volume 1 ml using 0.9% sodium chloride: final solution contains 100 µg adrenaline in 1 ml (1: 10 000 solution)
- IV volume replacement with crystalloid 500 ml fluid challenge
- Hydrocortisone 200 mgs stat. and Chlorpheniramine 10 mg IV
- FBC, U+E, Cr, PT, APTT, fibrinogen, group and save.

Orolingual Angioedema

Oral-lingual oedema can be potentially life threatening but is usually mild transient and rarely causes airway compromise unlike anaphylaxis. The risk is higher in patients taking ACE inhibitors (report of minor transient oroingual angioedema in 9 /176 patients taking ACEI) and signs of ischaemia in the insular and frontal cortex on initial CT. The reaction is often contralateral to the ischaemic hemisphere. If there are no other signs of angioedema or anaphylaxis it would seem reasonable to continue the rt-PA infusion.

3. Hypotension

More frequent occurrence than anaphylaxis and may be transient

Nursing action: Administer oxygen 15 litres and raise feet if BP <100 systolic

Action by medical staff

ABC, Assess for shock.

FBC, U+E, Cr, PT, PTT, fibrinogen, group and save

Administer: IV volume replacement with 500mls crystalloid challenge and monitor BP every 5 minutes.

4. Uncontrolled hypertension (Target BP is < 180/105)

Labetalol 10mg IV over 1-2 mins. May repeat or double every 10mins to max of 300mg, or give initial dose then infusion at 2-8 mg/min

OR Isosorbide dinitrate at initial dose of 2mg/hour and titrate against blood pressure (similar to heart failure)

OR Nicardipine 5mg/hour IV infusion, may increase by 2.5 mg/hour every 5 mins to max 15 mg/hour (AHA guidelines, 2005 update, Stroke 2005; 36: 916-21).

Diastolic >140: Sodium nitroprusside 0.5 mcg/kg/min infusion and titrate (AHA guidelines, 2005 update, Stroke 2005; 36: 916-21).

It is extremely important to keep BP < 180/105 during and after thrombolysis. The guidelines for these drugs are based on current practice in well established acute stroke units. However the evidence for each individual drug is lacking.

5. Seizure during rt-PA infusion

Stop infusion, treat seizure

Repeat CT scan – if no bleed then consider restarting infusion

Management of Complications

General Considerations : ALL Stroke Patients

This document outlines the action to take in the event of an abnormal reading/parameter while monitoring a patient in the acute phase after stroke.

Any Unexpected Fall in GCS or Increased Drowsiness

Immediately check and document

- Pulse, temperature, BP, O₂ saturations, capillary glucose and ECG
- Ask for medical review
- Consider intracerebral haemorrhage (especially if thrombolysed in previous 36 hours), haemorrhagic transformation, seizures, sepsis, dehydration, drug reaction, cardiac failure, dysrhythmia, MI, DVT/PE, metabolic derangement, urinary retention etc.

Hypoxia (O₂ Saturation <95%)

- Check airway, reposition and suction if needed
- Give O₂ by mask or nasal cannulae and titrate to achieve saturations >95%
- If persistent and/or needing >24% O₂, ask for medical review.

Rapid Fall in Blood Pressure or Systolic BP <100 mmHg

Ensure accurate reading (caution in AF - needs repeating)

- Check manually if in any doubt
- Raise foot of bed
- Administer 24% O₂ even if normal saturations
- Medical review
- Consider drug effects and may need IV 0.9% saline or colloid
- Consider pressor agents.

As autoregulation is lost in the ischaemic brain, a drop in blood pressure will reduce flow to the penumbral regions. Mean arterial pressure (MAP) should ideally be at pre-stroke levels (as a general guideline an MAP of 130 mmHg in hypertensive patients and 110 in normotensive patients in the first 24 hours).

Rise in Blood Pressure above 220 mmHg systolic or 120 mmHg diastolic (Note: BP of < 180/105 applies only to patients with acute ischemic stroke who are receiving or have received thrombolysis)

- Repeat and monitor every 15 minutes
- Check if any distress or pain (e.g. may indicate urinary retention), which may be the underlying cause
- If persists, ask for medical review.

Labetalol 10mg IV over 1-2 mins. May repeat or double every 10 mins to max of 300 mg; or give initial dose then infusion at 2-8 mg/min

OR Nicardipine 5 mg/hour IV infusion, may increase by 2.5 mg/hour every 5 mins to max 15 mg/hour

OR Isosorbide dinitrate at initial dose of 2mg/hour and titrate against blood pressure

Aim for only 10-15% reduction in BP.

DO NOT use rapid acting calcium antagonists

Pyrexia

Cool and remove clothing/bedclothes. Use sponging / cooling blankets if necessary. Give paracetamol 1 gm oral/PR.

Ask for medical review if persists or $>38^{\circ}\text{C}$
Take cultures- urine sputum and blood.

Abnormal Capillary Glucose

<3 - give glucose orally (50-100mls Lucozade)
IV dextrose 50% if unable to give orally or hypostop IM
3-4 – check again in 10 minutes
 >17 - ask for medical review. Need to consider insulin infusion
Continue to monitor capillary glucose closely.

Abnormal Heart Rate/Rhythm

<50 or >120 , new irregular pulse. Perform immediate 12 lead ECG and ask for medical review.

Brain Oedema or Increased Intracranial Pressure (ICP)

Space-occupying brain oedema is a main cause of early deterioration and death in patients with large supratentorial infarcts. Life-threatening brain oedema usually develops between the 2nd and 5th day after stroke onset, but up to one third of patients can have neurological deterioration within 24 hours after symptom onset.

Malignant Middle Cerebral Artery Infarction

Large infarctions in the MCA territory may develop space-occupying brain oedema, leading to midline shift, raised ICP and herniation. This can occur in patients < 70 years. The clinical course is deterioration of consciousness, respiratory insufficiency and signs of brain stem herniation usually within 2 to 5 days. The mortality is 50-80%. Early identification of patients at risk is advised. Treatment should begin before herniation occurs. Dominant-hemisphere stroke can be left aphasic. Talk to family about quality of life after stroke survival versus death.

Predictors of Increased Risk of Malignant Middle Cerebral Infarction

Clinical: Young age, history of hypertension, heart failure, elevated white cell count, coma on admission, nausea, vomiting or SBP > 180 mmHg within first 24 hours.

Radiological: Hyperdense MCA sign, $> 50\%$ MCA hypodensity, involvement of additional vascular territory, local brain swelling or midline shift.

Medical Therapy

- Head positioning at an elevation of up to 30 degrees to help venous drainage.
- Analgesia, avoid noxious stimuli, appropriate oxygenation and normalize body temperature
- Osmotic agents e.g. mannitol is first line medical treatment if clinical or radiological signs of space-occupying oedema. Mannitol 25-50 g every 3-6 hours or 0.5-1 g/kg over 30-60 minutes and 0.25 g/Kg every 6 hours aiming to increase baseline osmolality by 10%. Check osmolality every 12 hours and hold mannitol if osmolality >315 osmol. Max dose is 2 g/Kg in 24 hours (level IV evidence). Alternatively I/V glycerol (4 x 250 ml of 10% glycerol over 30-60 min) can be used
- Mild hyperventilation including those with herniation syndrome (Level IV). Thiopental as a bolus acts quickly, significantly reduces ICP and can be used to treat acute crisis
- Dexamethasone and Corticosteroids should **not** be given
- Hypotonic and glucose-containing solutions should be avoided.

Hypothermia

Mild hypothermia (35⁰C) in addition to decompressive surgery produced a trend towards a better clinical outcome than decompressive surgery alone (P=0.08). Brain temperature between 32-33⁰C reduces mortality in patients with severe MCA infarcts, but may cause severe side effects (arrhythmia, sepsis) including recurrent ICP crisis during rewarming.

Decompressive Surgery

Surgical decompressive therapy within 48 hours after symptom onset is recommended in patients < 60 years of age with evolving malignant MCA infarcts (Class 1, level A). A pooled analysis of 93 patients (DECIMAL, DESTINY and HAMLET trials) had an increased survival (NNTs 2, 4, and 2 respectively) and mRS <4 or mRS<3 compared to control group at 1 year. There was no increase in proportion of patients who survived surgery in a very dependent state (mRS 5). A systematic review of 12 observational retrospective studies showed that timing of surgery, side of infarct, signs of herniation before surgery and involvement of other vascular territories did not significantly affect outcome.

Criteria for Consideration of Decompressive Surgery or Hemicraniectomy

Age less than 60. Age above 50 is a poorer predictor of outcome

NIHSS > 15

Decrease in the level of consciousness to give a score of ≥ 1 on item 1a of the NIHSS
Infarct signs on CT of at least 50% of the MCA territory, with or without additional infarction in the territory of the anterior or posterior cerebral artery on the same side, or 145 cm³ infarct volume on diffusion-weighted MRI.

< 45 hours from onset (surgery should be undertaken < 48 hours from onset)

>7.5 mm midline shift; > 4 mm midline shift with lethargy.

Contact neurosurgery early if above criteria are identified by the Stroke Physician or if there is concern about an evolving malignant MCA syndrome. Surgical decompression should be considered for space occupying cerebellar infarcts that evolve and compress the brainstem although RCTs are lacking (Class III level C).

Surgery should be performed before signs of herniation develop. The prognosis among survivors can be very good even in patients who are comatose before surgery.

Early Ischaemic Changes in Acute Stroke

- The non-contrast CT scan is still regarded as the most important assessment tool in the investigation of patients with suspected acute stroke
- 5 mm sections are preferred but no thicker than 10 mm
- CT screening should be performed no longer than one hour prior to initiation of thrombolysis
- Early treatment appears to be more critical to outcome from thrombolysis than early ischaemic changes (EIC) on CT.

In 15 studies looking at interobserver agreement, early infarction signs had only a sensitivity of 66% and a specificity of 87%. κ statistics for interobserver agreement tend to be poor to moderate. 31% of patients in the NINDS Trial had evidence of EIC on CT and this was not a modifier of treatment effect ¹.

While early infarction signs are associated with a poor outcome, there was no evidence that thrombolysis worsened functional outcome in the presence of early infarction signs in the NINDS or streptokinase trial. In the NINDS trial there was no detectable interaction between early infarction signs within 3 hours after stroke and alteplase treatment for any clinical outcomes, including deterioration at 24 hours, death at 90 days, four clinical scales, lesion volume or symptomatic intracerebral haemorrhage at 36 hours ¹.

Early Ischaemic Changes on CT

Low Density

Loss of gray/white differentiation (focal or diffuse area in cerebral or cerebellar hemisphere)

Loss of insular ribbon, obscuration of sylvian fissure

Loss of basal ganglia

Loss of lentiform nucleus

Volume loss should be less than 100ml

Brain Swelling

Loss of sulci / cortical sulcal effacement

Effacement of ventricles

Hypodensity is associated with the most severe reductions in cerebral blood flow and volume on perfusion imaging. Brain swelling without hypoattenuation is thought to be indicative of a more moderate or less prolonged hypoperfusion and potentially viable tissue.

Hypodensity in Greater than 1/3 of the Middle Cerebral Artery (MCA) Territory

Involvement of more than 1/3 of MCA territory indicates early ischaemic involvement of 2 or more different lobes of the cerebral hemisphere and basal ganglia plus insular cortex. Greater than 1/3 of the MCA territory has been found to be more specific for detection of important early infarction signs at CT within hours of stroke

while use of the ASPECTS score was more sensitive. Hypoattenuation of $> 1/3$ of MCA artery has been an exclusion criterion for thrombolysis in some randomised controlled trials (ECASS 1 and 11) but not within 0-3 hours in the NINDS Cohort. While patients with hypodensity in $> 1/3$ of MCA artery with > 3 hours onset should be excluded as this may represent more irreversible ischaemia, the matter is more open to debate in those with < 3 hours of stroke onset.

Alberta Stroke Program Early CT Score (ASPECTS)

ASPECTS systematically scores each of 10 regions of the MCA territory combining localization and volume into a semi-quantitative topographical score². A score of 1 is given for a normal region and 0 for a region showing signs of ischaemia. Only new areas of ischaemia are scored.

The 10 regions are:

- **Subcortical structures – 3 points** (caudate nucleus, lentiform nucleus, and internal capsule – genu and posterior limb only)
- **MCA cortex - 7 points** (insular cortex, M1 through M6).

A score of 10 implies no new signs of ischaemia. The lower the score indicates more progressive ischaemic change³. Hyperdense artery is recorded but not a component of the ASPECTS. The ASPECTS does not include anterior cerebral artery, posterior cerebral artery or basilar artery occlusion. Training is required for use of the ASPECTS.

ASPECTS score ≤ 7 indicates significant ischaemic damage and denotes a sharp increase in the risk of death or functional dependence. The original study was observational and these data should be used cautiously as this has not been replicated in other studies. Patients with a baseline ASPECTS > 7 were 3 times more likely to be independent with thrombolytic therapy compared to controls while patients with ASPECTS ≤ 7 were less likely to benefit from treatment and no more likely to be independent than controls¹. However when the < 7 group were further divided into ASPECTS 3 - 7 improved outcome was observed (36% vs. 23%; 3 month mRs ≤ 1). The extent of ischaemic change predicted the likelihood of benefit with a trend to a lower number needed to treat (NNT) with ASPECTS > 7 (absolute risk reduction, ARR 10%, NNT = 5) compared to ASPECTS 3 - 7 (ARR 13%, NNT = 8). Patients with a CT ASPECTS < 3 had a non-significantly higher rate of mortality and symptomatic intracerebral haemorrhage with rt-PA although numbers were small and there is not sufficient evidence to exclude patients from rt-PA on the basis of extensive EIC³.

Hypoattenuation of thirds of the MCA territory and the use of the ASPECTS score are semi-quantitative in nature. Hypoattenuation of the basal ganglia (measured in Hounsfield units) is quantitative. The rest of the above parameters are qualitative.

Hyperdense Artery

Plain CT can be abnormal within 3 hours of onset in 75% of patients with MCA stroke². A nonrandomised study compared outcomes of 83 patients with or without hyperdense (MCA) artery sign on initial CT scan treated with either IV or IA rtPA. An improvement in the NIHSS was noted with intra-arterial rtPA irrespective of the presence or absence of hyperdense artery sign. A less favourable outcome was noted in patients with a hyperdense MCA sign who received IV rt-PA that in those without a hyperdense MCA sign⁴.

Intra-arterial Thrombolysis (European Stroke Guidelines 2008)

Can be considered within 6 hours (after detailed discussion between the stroke specialist and interventional neuroradiologist involved in the patient's care) in the following:

- Acute MCA occlusion
- Extracranial internal carotid artery occlusion
- Intracranial carotid artery 'T' occlusion
- Basilar artery occlusion.

Intra-arterial thrombolysis of proximal MCA occlusion using pro-urokinase (PUK) within 6 hours was significantly associated with a better outcome in the PROACT 11 trial. A benefit for patients with proximal MCA occlusions was also noted in MELT (urokinase) trial. Pro-urokinase is not available and intra-arterial thrombolysis with rt-PA is not substantiated by RCTs but observational data are available for comparison⁵. A randomised trial comparing standard intravenous rt-PA with combined intravenous and intra-arterial approach (IMS3) has begun. A systematic analysis found no significant differences between IV and IA thrombolysis for basilar artery occlusion⁶. IA thrombolysis for treatment of acute basilar occlusion with urokinase or rt-PA has shown encouraging results in observational studies but has not been tested in an adequately powered RCT.

Intra-arterial Recanalisation Devices

The MERCI (Mechanical Embolus Removal in Cerebral Embolism) trial showed recanalization of an intracranial artery following thrombus removal in 48% (68/141) of patients in whom the device was used \leq 8 hours of onset of stroke symptoms⁷. This may also be considered in selected cases after detailed discussion between the stroke specialist and the interventional neuroradiologist involved in the patients care if there is a contraindication to IV or IA thrombolysis

References

1. Wardlaw JM & Mielde O. Early signs of brain infarction at CT: observer reliability and outcome after thrombolytic treatment - systematic review. *Radiology* 2005; 235: 444-453.
2. Barber PA, Demchuk AM, Zhang J, Buchan AM. Validity and reliability of a quantitative computed tomography score in predicting outcome of hyperacute stroke before thrombolysis therapy: ASPECTS Study Group. Alberta Programme early CT Score. *Lancet*. 2000; 355: 1670-1674.
3. Demchuk AM, Hill MD, Barber PA, Silver B, Patel SC, Levine SR. NINDS rtPA Stroke Study Group, NIH. Importance of early ischaemic computed tomography changes using ASPECTS in NINDS rtPA Study. *Stroke* 2005; 36 (10); 2110-2115.
4. Agarwal P, Kumar S, Hariharan S, Eshkar N, Verro P, Cohen B, Sen S. Hyperdense middle cerebral artery sign: can it be used to select intra-arterial versus intravenous thrombolysis in acute ischaemic stroke? *Cerebrovasc Dis*. 2004; 17: 182-90.
5. European Stroke Organisation - Guidelines for Management of Ischaemic Stroke 2008-09-29. www.eso-stroke.org
6. Lindsberg PJ, Mattle HO. Therapy of basilar artery occlusion: a systemic analysis comparing intra-arterial and intravenous thrombolysis. *Stroke* 2006; 37: 922-928
7. Smith WS, Sung G, Starkman S, Saver JL et al. Safety and efficacy of mechanical embolectomy in acute ischaemic stroke: Results of the MERCI trial. *Stroke* 2005; 36: 1432-1438.

Evidence for Intravenous Thrombolysis in Ischaemic Stroke

Thromboembolic occlusion leading to ischaemia accounts for 80% of strokes. There is evidence¹⁻⁷ suggesting that administering the thrombolytic agent Recombinant Tissue Plasminogen Activator (rt-PA, Alteplase, Actilyse®) intravenously within 3 hours of symptom onset, to reperfuse blood vessels is effective in patients with acute ischaemic stroke. 19 RCTs have been conducted in ischaemic stroke, treating > 5000 patients, using different thrombolytic agents. The majority of the data comes from use of rt-PA used to treat nearly 3000 patients. Evidence from these trials suggests a net benefit from rt-PA with approx. **1 fewer patient dead or dependent at 3 months per 10 treated.** This is based on administering rt-PA **within 3 hours from symptom onset within strict clinical and laboratory criteria.** The recent ECASS-III trial found benefit in treating patients up to 4.5 hours⁸ but is not currently licensed. A further trial (IST-3) is looking at extending the therapeutic window to 6 hrs and newer agents (e.g. desmoteplase) are showing promise at wider therapeutic windows.

Intravenous rt-PA has been licensed in Europe since 2002. It is subject to strict criteria to ensure safe administration as per the trial protocols which showed its benefit. The rate of cerebral haemorrhage is related, in part, to the frequency of incorrect administration. To ensure safe practice in the UK, enrolment in a prospective audit SITS-MOST www.acutestroke.org (closed Oct 2006) was a requirement for a centre to be able to deliver rt-PA under license. Enrolment in SITS-ISTR would be desirable in an Irish setting.

Numbers Needed to Treat (NNT)

- **To Cure if within 90 minutes** **1 in 8**
- **To Cure if within 3 hours** **1 in 10**
- **To Cure if within 4.5 hours** **1 in 14**
- **To derive some benefit** **1 in 2-3**

Numbers Needed to Harm (NNH)

- **To do worse** **1 in 35**
- **To kill or leave permanently disabled** **1 in 100**

REFERENCES

1. The ATLANTIS, ECASS, and NINDS rt-PA Study Group Investigators. Association of outcome with early stroke treatment: pooled analysis of ATLANTIS, ECASS, and NINDS rt-PA stroke trials. *Lancet* 2004; **363**: 768 – 74.
2. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. Tissue Plasminogen activator for acute ischemic stroke. *N Engl J Med* 1995; **333**: 1581– 87.
3. Hacke W, Kaste M, Fieschi C, et al. for the ECASS Study Group. Intravenous thrombolysis with recombinant tissue plasminogen activator for acute hemispheric stroke: the European Cooperative Acute Stroke Study (ECASS). *JAMA* 1995; **274**: 1017 – 25.
4. Hacke W, Kaste M, Fieschi C, et al. Randomised double-blind placebo-controlled trial of thrombolytic therapy with intravenous Alteplase in acute ischaemic stroke (ECASS II). *Lancet* 1998; **352**: 1245–51.

5. Clark WM, Albers GW, Madden KP, et al. The rt-PA (Alteplase) 0- to 6-hour acute stroke trial, part A (A0267g): results of a double-blind, placebo-controlled, multicenter study. *Stroke* 2000; **31**: 811–16.
6. Clark WM, Wissman S, Albers GW, et al. Recombinant tissue-type plasminogen activator (Alteplase) for ischemic stroke 3 to 5 hours after symptom onset. The ATLANTIS Study—a randomized controlled trial. *JAMA* 1999; **282**: 2019–26.
7. Marler JR, Tilley BC, Lu M, et al. Early stroke treatment associated with better outcome: the NINDS rt-PA Stroke Study. *Neurology* 2000; **55**: 1649–55.
8. Hacke W, Kaste M, Bluhmki E et al, for the ECASS Investigators. Thrombolysis with Alteplase 3 to 4.5 Hours after acute ischaemic stroke. *N Engl J Med* 2008; **359**: 1317– 29.
9. Saver JL. Number needed to treat estimates incorporating effects over the entire range of clinical outcomes. Novel derivation method and application to thrombolytic therapy for acute stroke. *Arch Neurol*. 2004; 61:1066-1070.
10. Saver JL. Hemorrhage after thrombolytic therapy for stroke: the clinically relevant number needed to harm. *Stroke*. 2007; 38: 2279-2283.

Alteplase in Acute Stroke: Information for Patients

This leaflet contains information about Alteplase (rt-PA) to treat acute stroke.

It tells you: How the medicine works
 When the medicine may or may not be used and about any side effects

Why have I been given this leaflet?

The information in this leaflet will help you to remember what your doctor has told you about this medicine. It may also help you to decide whether you want to go ahead with this treatment.

What is Alteplase and how does it work?

Alteplase is a medicine which dissolves blood clots which are stopping the blood circulating. It is used routinely after heart attacks and it has now been shown to be effective in treating acute stroke. Alteplase is not able to dissolve all blood clots because they vary in size and strength. The sooner treatment with Alteplase is started, the better the chance of a good recovery from the stroke. Alteplase treatment must be started within 3 hours of stroke symptoms coming on.

Alteplase is given through a drip into a vein in the arm. All patients who choose to have alteplase will be monitored very closely and will have a follow-up brain scan 22-36 hours after the treatment. Otherwise their care will be the same as for all other people who have had a stroke.

One in three patients will show some improvement with the drug and one in ten people will have a dramatic improvement. One in thirty five people will be worse after the drug and one in 100 will die or be left permanently disabled as a result of the drug.

When should Alteplase not be used?

Alteplase should not be used when there is a high risk of bleeding. Tell your doctor if any of these conditions apply to you:

Severe liver disease

Diabetic with poor vision

Cancer

Bacterial endocarditis

Acute pancreatitis

Recent severe bleeding

Stomach or duodenal ulcers in the last 3 months

Any invasive medical procedure in the last 10 days

Any other condition that gives you a tendency to bleed

Major surgery or traumatic accident in the last 3 months

Taking drugs to thin the blood (e.g. warfarin tablets or heparin injections)

Are there any side effects?

Most medicines cause side effects. Alteplase treatment can sometimes cause bleeding, fever (high temperature), low blood pressure for a short time, nausea (feeling sick) and vomiting (being sick). Rarely it causes seizures (fits) or allergic reactions.

Occasionally bleeding into the brain happens after a stroke because the stroke has damaged blood vessels in the brain. **This can result in a bigger stroke, or even death.** This bleeding happens more often if Alteplase treatment is given. **In other words, Alteplase increases the chance of bleeding into your brain in the short-term but increases your chance of recovering fully from your stroke in the long-term. Bleeding may also occur into the spinal cord and other organs.**

How can I find out more?

If you have any further questions or concerns, please speak to your doctor.

Documentation should include:

Time of onset, time of arrival, time of completion of work-up
Writing should be legible and signed
Examination findings including NIHSS score
Diagnosis and differential diagnosis
Proposed treatment and why it should or should not be given
Informed consent, potential benefits, potential risks and complications

Guidelines will change as the licence for thrombolysis changes**Useful Addresses:**

SITS-ISTR: www.acutestroke.org
ASPECTS: <http://brainomix.com/strokeaspects.html>
European Stroke Organisation: www.eso-stroke.org
American Heart Association: www.americanheart.org
ISPGM: www.ispgm.ie

Writing Group

Dr. Rachael Doyle, St. Columcille's and St. Vincent's University Hospital
Dr. Ronan Collins, Adelaide and Meath Hospital, Dublin, incorporating the National Children's Hospital
Dr. Joe Harbison, St. James's Hospital
Dr. Christina Donnellan, South Tipperary General Hospital

Correspondence to: **Rachael.doyle@hse.ie**

Contributors**Stroke Council representing**

Irish Society of Physicians in Geriatric Medicine
Irish Neurological Association

also

Faculty of Radiologists
Association of Emergency Medicine

Acknowledgements

We would like to thank Professor Joanna Wardlaw, Professor of Neuroradiology and Honorary Consultant Neuroradiologist, Department of Clinical Neurosciences, University of Edinburgh. Professor Gary Ford, Jacobson Professor of Clinical Pharmacology at the University of Newcastle and Director of the UK Stroke Network Research for reviewing the guidelines. We would like to thank Dr. Karen Murphy Consultant Haematologist, St. Vincent's University Hospital and Dr. Barry White, Consultant Haematologist, St. James's Hospital and Director of National Centre for Coagulation Disorders for reviewing the management of haemorrhagic complications.

Disclaimer

This document is intended as a guideline only. An extensive literature search has been carried out and the guidelines follow current recommendations at time of publication and reflect a 'middle ground'. Training is required for administration of thrombolysis. The practice of thrombolysis in acute stroke is wide and varied and depends on local expertise. Trials in the area of thrombolysis are ongoing. Guidelines will change.

Guidelines will not cover all complex clinical cases. The guidelines should be used with sound clinical judgement and treatment individualised to patients.