The diagnosis and management of stroke and transient ischaemic attack
Version history

<table>
<thead>
<tr>
<th>Version</th>
<th>Status</th>
<th>Date</th>
<th>Editor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Final</td>
<td>14th December 2016</td>
<td>Guidelines Team</td>
<td>Final version for publication.</td>
</tr>
<tr>
<td>1.1</td>
<td>Final</td>
<td>19th March 2017</td>
<td>Guidelines Team</td>
<td>Minor updates to Section 2.</td>
</tr>
</tbody>
</table>

Acknowledgements

The following individuals are recognised for their contribution to the successful implementation of the National Guidelines project.

Healthcare Quality Management and Patient Safety Department of the MOPH:

- **Ms Huda Amer Al-Katheeri**, Acting Director & Project Executive.
- **Dr Alanoud Saleh Alfehaidi**, Guideline & Standardisation Specialist.
- **Dr Ilham Omer Siddig**, Guideline & Standardisation Specialist.
- **Ms Maricel Balagtas Garcia**, Guideline & Standardisation Coordinator.
- **Dr Rasmeh Ali Salameh Al Hunelti**, Research Training & Education Specialist.
- **Mr Mohammad Jaran**, Risk Management Coordinator.

Hearst Health International:

- **Dr Mehmood Syed**, Middle East Clinical Director & Project Clinical Lead.
- **Mr Michael Redmond**, Clinical Programmes Manager.
- **Ms Deepti Mehta**, Editorial and Research Manager.
- **Ms Rebecca Cox**, Editorial and Research Team Leader.
- **Ms Shuchita Deo**, Lead Editorial Assistant.
- **Ms Siobhan Miller**, Editorial Assistant.
- **Ms Fatima Rahman**, Editorial Assistant.
- **Ms Tahmida Zaman**, Editorial Assistant.
- **Ms Emma Ramstead**, Information Specialist.
- **Dr Amy Glossop**, Clinical Editor.
- **Dr Zara Quail**, Clinical Editor.
- **Dr Sabine Fonderson**, Clinical Editor.
## Table of contents

1  Information about this guideline ................................................................. 5  
   1.1  Objective and purpose of the guideline ............................................ 5  
   1.2  Scope of the guideline ..................................................................... 5  
   1.3  Editorial approach ........................................................................... 5  
   1.4  Sources of evidence ........................................................................ 6  
   1.5  Evidence grading and recommendations ........................................ 6  
   1.6  Guideline Development Group members ........................................... 7  
   1.7  Responsibilities of healthcare professionals ..................................... 8  
   1.8  Abbreviations used in this guideline .............................................. 8  

2  Organisation of care in Qatar .................................................................... 9  
   2.1  Role of the Ministry of Public Health ............................................... 9  
   2.2  Provision of care ............................................................................. 9  

3  Key recommendations of the guideline .................................................... 10  

4  Background information .......................................................................... 13  
   4.1  Definitions ...................................................................................... 13  
   4.2  Aetiology ........................................................................................ 13  
   4.3  Risk factors .................................................................................... 14  

5  Presentation ............................................................................................... 14  
   5.1  Symptoms and signs of acute stroke .............................................. 14  
   5.2  Face, Arm, Speech Test (FAST) screen ........................................ 14  

6  Emergency department assessment and management ............................. 15  
   6.1  Initial assessment .......................................................................... 15  
   6.2  Risk assessment of patients with TIA ............................................. 16  
   6.3  Neuroimaging ................................................................................. 16  
   6.4  Other investigations ...................................................................... 17  

7  Specialist management of acute stroke ................................................... 17  
   7.1  Pharmacological treatment of acute ischaemic stroke ..................... 17  
      7.1.1  Thrombolysis .......................................................................... 17  
      7.1.2  Acute anti-thrombotic therapy ............................................... 18  
   7.2  Endovascular management of acute ischaemic stroke .................... 18  
   7.3  Management of intracerebral haemorrhage ..................................... 19  
      7.3.1  Management of ICH ................................................................ 19  

8  Care in the specialised stroke unit ............................................................ 20  
   8.1  Physiological monitoring ................................................................ 20  
   8.2  Swallowing assessment .................................................................. 20  
   8.3  Assess for and manage complications .......................................... 21
8.4 Further investigation ................................................................. 21
8.5 Stroke rehabilitation ................................................................. 22
9 Secondary prevention of stroke and TIA ........................................... 22
9.1 Provide information regarding stroke ........................................... 22
9.2 Lifestyle advice ........................................................................... 22
9.3 Glycaemic control in diabetic and pre-diabetic patients ............... 23
9.4 Blood pressure management ....................................................... 23
9.5 Lipid management ....................................................................... 23
9.6 Anti-thrombotic therapy ............................................................... 24
9.7 Anticoagulation in stroke prevention .......................................... 24
10 References ................................................................................... 25
1 Information about this guideline

1.1 Objective and purpose of the guideline

The purpose of this guideline is to define the appropriate diagnosis and management of strokes and transient ischaemic attacks in adults. The objective is to improve the appropriateness of investigation, prescribing and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary/generalist care and secondary/specialist care settings.

1.2 Scope of the guideline

Aspects of care covered in this guideline include the following:
- Assessment of transient ischaemic attack (TIA) and acute stroke.
- Indications for neuroimaging.
- Pharmacological management.
- Care in specialised stroke units.
- Secondary prevention of TIA and stroke.

Aspects of care not covered in this guideline include the following:
- Primary prevention of stroke or TIA.
- Detailed recommendations on neuro-surgical techniques.

1.3 Editorial approach

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this guideline, has involved the following critical steps:

- Extensive literature search for well reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising physicians and subject matter experts from across provider organisations in Qatar.
- Independent review of the guideline by the Clinical Governance body appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Explicit review of the guideline by patient groups was not undertaken.

Whilst the MOPH has sponsored the development of the guideline, the MOPH has not influenced the specific recommendations made within it.
1.4 Sources of evidence
The professional literature published in the English language has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a clinical editor and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals (i.e. journals that are read and cited most often within their field).
3. Address an aspect of specific importance to the guideline in question.

Where included, the ‘goal length of stay’ stated within this guideline is supported by and validated through utilisation analysis of various international health insurance databases. The purpose of database analysis is to confirm the reasonability and clinical appropriateness of the goal, as an achievable benchmark for optimal duration of inpatient admission.

1.5 Evidence grading and recommendations
Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.
In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A1 (RGA1):** Evidence demonstrates at least moderate certainty of at least moderate net benefit.
- **Recommendation Grade A2 (RGA2):** Evidence demonstrates a net benefit, but of less than moderate certainty, and may consist of a consensus opinion of experts, case studies, and common standard care.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C1 (RGC1):** Evidence demonstrates a lack of net benefit; additional research is recommended.
- **Recommendation Grade C2 (RGC2):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.

### 1.6 Guideline Development Group members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the Clinical Governance Group. The GDG members have reviewed and provided feedback on the draft guideline relating to the topic. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Naveed Akhtar</td>
<td>Consultant Neurologist</td>
<td>Hamad Medical Corporation</td>
</tr>
<tr>
<td>Dr Mohamed Al-Khaled</td>
<td>Consultant Neurologist</td>
<td>Al Ahli Hospital</td>
</tr>
<tr>
<td>Dr Abdulhak A. Sadalla Alnuemi</td>
<td>Consultant Internal Medicine</td>
<td>Al Emadi Hospital</td>
</tr>
<tr>
<td>Dr Ahmed M. Hussein Babiker</td>
<td>Head of Registration Section &amp; Clinical Pharmacist</td>
<td>Dept of Pharmacy and Drug Control, MOPH</td>
</tr>
<tr>
<td>Dr Sherif El Tawdy</td>
<td>Consultant Neurologist</td>
<td>Doha Clinic Hospital</td>
</tr>
<tr>
<td>Dr Joseph K. Johnson</td>
<td>Medical Officer</td>
<td>Qatar Petroleum</td>
</tr>
<tr>
<td>Dr Saadat Kamran</td>
<td>Senior Consultant Neurologist</td>
<td>Hamad Medical Corporation</td>
</tr>
<tr>
<td>Dr Daniel Kwabena</td>
<td>Consultant Family Medicine</td>
<td>Primary Health Care Corp</td>
</tr>
<tr>
<td>Dr Mohammed Lafta Saleem Mozan</td>
<td>Consultant Neurologist</td>
<td>Al Emadi Hospital</td>
</tr>
<tr>
<td>Dr Samar Ahmed M.E. Soliman</td>
<td>Specialist Family Medicine</td>
<td>Primary Health Care Corp</td>
</tr>
</tbody>
</table>

1 Dr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.
1.7 **Responsibilities of healthcare professionals**

This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or carers and should consider the individual risks and benefits of any intervention that is contemplated in the patient’s care.

1.8 **Abbreviations used in this guideline**

The abbreviations used in this guideline are as follows:

- **ACE**: Angiotensin converting enzyme
- **AF**: Atrial fibrillation
- **ARB**: Angiotensin receptor blockers
- **BMI**: Body mass index
- **BP**: Blood pressure
- **CBC**: Complete blood count
- **CTA**: Computed tomography angiogram
- **DASH**: Dietary approach to stop hypertension
- **DVT**: Deep vein thrombosis
- **ED**: Emergency department
- **FAST**: Face Arm Speech Test
- **GCS**: Glasgow Coma Scale
- **ICH**: Intracerebral haemorrhage
- **ICU**: Intensive care unit
- **INR**: International normalised ratio
- **MDT**: Multidisciplinary team
- **MRA**: Magnetic resonance angiogram
- **NGT**: Nasogastric tube
- **PE**: Pulmonary embolism
- **PPI**: Proton pump inhibitors
- **SBP**: Systolic blood pressure
- **TIA**: Transient ischaemic attack
- **tPA**: Tissue plasminogen activator
2 Organisation of care in Qatar

2.1 Role of the Ministry of Public Health

The Ministry of Public Health of Qatar (MOPH) has been given the responsibility to guide reform in Qatar in order to establish one of the world’s most admired and renowned healthcare systems. The MOPH’s role is to create a clear vision for the nation’s health direction, set goals and objectives for the country, design policies to achieve the vision, regulate the medical landscape, protect the public’s health, set the health research agenda, and monitor and evaluate progress towards achieving those objectives.

The MOPH has the dual mandate to develop policies and programmes to improve the people’s health so that they may enjoy longer and more productive lives, and to lay the foundation for a vibrant country for decades to come.

The MOPH does not provide clinical services. Instead its goal is to vest responsibility for care in the hands of both public and private sector healthcare institutions, whilst regulating, monitoring, and evaluating this care against agreed upon outcomes. The MOPH is committed to establishing an environment that promotes quality and wellness through policies in such areas as public health, health insurance, information technology, licensure and credentialing; and continuing medical education.

2.2 Provision of care

Healthcare provision in Qatar comprises of the following main entities:

- **Public Sector:**
  - Primary care health centres - provided by the Primary Health Care Corporation of Qatar.
  - Secondary and tertiary care hospitals and outpatient clinics - provided by the Hamad Medical Corporation (HMC).
  - Paediatric Emergency Care provided by specialist Paediatric Emergency Centres within HMC.
  - QP Clinics for personnel and families of Qatar Petroleum.
  - Sports Medicine centre provided by a specialist Sport Medicine Hospital – Aspetar.
  - Ministry of Interior clinics for personnel and families of Qatar’s police services.
  - Ministry of Defence clinics for personnel and families of Qatar’s armed forces.
  - Specialist obstetric, gynaecological and paediatric care provided by Sidra Medical & Research Center.

- **Private sector:**
  - A range of single-handed generalist and specialist clinics.
  - Polyclinics.
  - Specialist hospitals.

The aim of the MOPH’s National Health Strategy is to rebalance healthcare delivery with a greater emphasis on primary and community care and an expansion of the role played by the private sector.
3 Key recommendations of the guideline

The key recommendations of this guideline are:

Screening in a pre-hospital setting (see Section 5):
- The Face, Arm, Speech Test (FAST) is used to screen for possible stroke or TIA in a pre-hospital setting [2,9,12].
- If the FAST test is positive [2,9,12]:
  - Call the ambulance immediately.
  - Record the time of symptom onset, where known.
  - Do not delay ambulance transfer for any reason.
  - Ensure the person is taken immediately to the nearest hospital with facilities for stroke thrombolysis.
- Hospitals with facilities and expertise for stroke thrombolysis (but not thrombectomy), should initiate thrombolysis and transfer the patient immediately to an endovascular unit for assessment (i.e. ‘drip and ship’) [9,13,14].

Emergency department assessment and management (see Section 6):
- Hospitals with the capabilities for stroke thrombolysis should follow the guidelines outlined in Section 6. Other hospitals without thrombolysis capability should immediately transfer the patient to an appropriate stroke centre [R-GDG].
- Tele-stroke services can be used to remotely discuss the management of patients with stroke specialists if stroke services are unavailable at the receiving hospital [R-GDG].
- Initial assessment will include the following [9]:
  - Confirmation of focal neurological deficit.
  - Exclusion of hypoglycaemia.
  - Determining the time of onset of symptoms.
  - Arranging urgent CT scanning.
  - Informing the stroke team for assessment (on-site or via tele-stroke).
- Adults presenting at an ED with acute stroke should be admitted to a specialist acute stroke unit within 4 hours of arrival [15].
- Patients who are not eligible for thrombolysis/endovascular intervention, should still be assessed by a neurology stroke team within 24 hours of onset of symptoms [9][L1, RGA1].
- Patients who present within 72 hours of onset of acute symptoms, but in whom symptoms have resolved, should be assessed in the ED by a neurologist or stroke expert [R-GDG].
- Patients who present after 72 hours, should be assessed in a fast-track TIA outpatient clinic where available [R-GDG].
- If fast-track TIA clinics are not available, the patient should be risk-stratified for their risk of subsequent stroke. Validated scoring systems such as ABCD² can help to risk stratify patients but do not perfectly predict the risk of stroke [2,9].

Neuroimaging (see Section 6.3):
- Patients who present within 8 hours of onset of a suspected acute stroke, should receive neuroimaging within 20 minutes of arrival at the hospital [R-GDG].
- Patients who present after 8 hours of onset of a suspected acute stroke, should receive neuroimaging within 12 hours of arrival at the hospital, but as early as possible [2].
- Evaluation of suspected TIA patients in the ED, presenting within 72 hours of onset, should also undergo neuroimaging [R-GDG].
- Patients with the following should receive imaging immediately upon arrival at hospital [2]:
  - Indications for thrombolysis or early anticoagulation treatment.
  - Current anticoagulant treatment.
The diagnosis and management of stroke and transient ischaemic attack
(Date of next revision: March 2019)

- 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.

- If a haemorrhagic stroke is suspected, then CT scan should be the initial imaging modality [R-GDG].

Aspirin and anticoagulants (see Section 7.1.2):
- Administer aspirin to all patients presenting with acute stroke (after intracerebral haemorrhage has been excluded by CT brain scanning) [2,9,21].
- NB: Anticoagulation treatment should not be routinely used in the treatment of acute stroke [2,9,23], unless clinically indicated [2,9].

Thrombolysis (see Section 7.1.1):
- Thrombolysis with intravenous tissue plasminogen activator (IV tPA) [9,18-20]:
  - Should be offered and may be given to selected patients with acute ischaemic stroke within 4.5 hours after stroke onset, who satisfy the inclusion/exclusion criteria [18,19][L2, RGA2]:
    - IV tPA can be administered by the ED physicians in consultation with stroke specialists using the Tele-stroke service if the hospital does not have an on-site stroke team [R-GDG].
    - If IV tPA is administered in a non-stroke centre, the patient should be transferred immediately to a stroke centre for further evaluation and possible endovascular intervention [R-GDG].

Endovascular intervention (see Section 7.2):
- The following patients are eligible for endovascular intervention [24,25]:
  - All patients who present within 8 hours of symptom onset with [R-GDG]:
    - Large vessel occlusion on computerised tomography/magnetic resonance angiography (CTA/MRA); and
    - Evidence of significant salvageable brain tissue on imaging.
    - Irrespective of whether thrombolysis has been administered.
  - In case of transfer from another hospital, neuroimaging will be repeated prior to any intervention [R-GDG].

Intracerebral haemorrhage (see Section 7.3):
- The following patients should be considered for a neurosurgical opinion [2,9]:
  - Posterior fossa bleeds.
  - ICH with mid-line shift of >5 mm.
  - ICH with intra-ventricular extension.
  - ICH with hydrocephalus.
  - ICH with underlying brain tumours or vascular malformations.
  - ICH with decreased level of consciousness (GCS below 13).
  - All other patients should preferably be admitted to a stroke ward within 4 hours of arrival to the ED for ongoing monitoring [R-GDG].

Care in a specialised stroke unit (see Section 8):
- Care should preferably be provided in a specialised stroke unit comprised of a multidisciplinary team of professionals [9,26].
• Care should comprise of the following [9]:
  o Appropriate nursing care and physiological monitoring.
  o Access to speech and language therapy, including assessment and management of swallowing.
  o Further investigation of the aetiology and risk factors for the stroke.
  o Access to physiotherapy and occupational therapy.
  o Access to dietetic services, including nutrition screening.
  o Providing monitored care for stroke patients who require enhanced monitoring or who develop complications.
  o Prompt access to support from specialist critical care colleagues [R-GDG].
  o Good communications with patients, their families, and the patient’s primary care physician.
  o Regular MDT assessment and discussion as a key component of patient care.

Stroke rehabilitation (see Section 8.5):
• Should be provided by a specialised rehabilitation team skilled in the care of stroke patients. The rehabilitation team should be part of the Stroke Multidisciplinary Team (MDT) [9,17].
• Patients with neurological deficits from acute stroke, should be assessed by the rehabilitation team within a specialised stroke unit [9,17].
• All patients with neurological deficits should be transferred to a rehabilitation facility as soon as investigation of stroke aetiology and acute care is complete [R-GDG].

Secondary prevention (see Section 9):
• For every patient, an individualised and comprehensive secondary prevention strategy for stroke should be implemented as soon as possible following a TIA or stroke and prior to discharge from the hospital [9]. This should comprise of the following:
  o Patient information.
  o Lifestyle advice.
  o Glycaemic control in diabetic and pre-diabetic patients.
  o BP management.
  o Lipid management.
  o Anti-thrombotic therapy.
  o Anticoagulation in selected patients.
4 Background information

4.1 Definitions

Stroke:
• Stroke is defined as a syndrome with a rapid onset of focal neurological deficit of vascular origin [1].

Ischaemic stroke:
• Ischaemic stroke is defined as an episode of neurological dysfunction caused by focal cerebral, spinal, or retinal infarction [1][L2].

Transient Ischaemic attack:
• Transient ischaemic attack (TIA) is defined as a brief episode of focal neurologic dysfunction caused by ischemia, typically lasting less than one hour and without evidence of acute infarction [1,2][L2].

Intracerebral haemorrhage:
• Stroke caused by intracerebral haemorrhage is defined as a focal collection of blood within the brain parenchyma or ventricular system that is not caused by trauma [1][L2].

4.2 Aetiology

Ischaemic stroke or embolic TIA [3]:
• Arterial blood supply can be restricted or occluded by atherosclerosis and atherothrombosis.
• When vascular endothelium becomes damaged and weak, atherosclerotic plaques activate a cascade in which clot formation and emboli may be generated.
• The most common causes of damage to arterial endothelium are [3][L2]:
  o Increased low-density lipoproteins.
  o Smoking.
  o High blood pressure.
  o Diabetes mellitus.

Specific causes of intracerebral haemorrhage include [4][L1]:
• Arteriovenous malformations.
• Tumours.
• Enlarged vessels.
• Aneurysm.

The TOAST classification of ischaemic stroke aetiology is as follows [5]:
• Large artery atherosclerosis:
  o Extracranial or intracranial disease.
• Small artery occlusion.
• Cardioembolism:
  o Higher or lower risk cardiac lesions.
• Other demonstrated cause:
  o Non-atherosclerotic vasculopathies.
  o Prothrombotic disorders.
• Undetermined cause (cryptogenic):
  o Incomplete evaluation for cause.
Diagnostic studies were negative.
≥2 conflicting causes found.

### 4.3 Risk factors

The following factors are associated with an increased risk of stroke [6-8]:
- Increasing age – stroke typically presents at an earlier age in Qatar.
- Hypertension.
- Dyslipidaemia.
- Diabetes mellitus.
- Smoking.
- Atrial fibrillation.
- Previous history of stroke or ischaemic heart disease.
- Women taking oral oestrogen is associated with a small increase in the risk of venous stroke [8][L2].
- Obesity.

### 5 Presentation

#### 5.1 Symptoms and signs of acute stroke

Features of ischaemic or haemorrhagic stroke develop rapidly, are focal and include the following [1,2,9,10]:
- Unilateral numbness, weakness or paralysis of the face, arm or leg.
- Problems with speech and comprehension, e.g. aphasia or slurred speech.
- Problems with swallowing.
- Monocular symptoms:
  - Sudden onset vision loss.
  - Blurred vision.
- Acute new onset, severe headache.

Consider a posterior circulation strokes in patients with vascular risk factors who present with a combination of the following sudden onset symptoms [11]:
- Dizziness and balance difficulties.
- Diplopia.
- Vomiting.
- Altered consciousness.

#### 5.2 Face, Arm, Speech Test (FAST) screen

The Face, Arm, Speech Test (FAST) is used to screen for possible stroke or TIA in a pre-hospital setting [2,9,12]:
- New onset facial weakness:
  - Ask the patient to smile or show their teeth.
  - The FAST test is positive if there is new facial asymmetry, e.g. the mouth or eye droops.
- New onset arm weakness:
  - Raise the patient's arms to 90° if they are sitting, or 45° if they are lying.
  - Ask the patient to maintain the position when you let go.
The FAST test is positive if one arm falls or drifts down.

- Speech problems:
  - Assess patient's speech and determine whether it is slurred or the person has difficulty finding the name for commonplace objects, e.g. cup, table, chair, keys, pen.
  - If they have difficulty seeing, place the objects in their hands.
  - If they have a companion, check whether this is a new problem.
  - The FAST test is positive if there is a new unexplained speech problem.

If the FAST test is positive [2,9,12]:

- Call the ambulance immediately.
- Record the time of symptom onset, where known.

NB [9,13,14]:

- Do not delay ambulance transfer for any reason.
- Ensure the person is taken immediately to the nearest hospital with facilities for stroke thrombolysis.
- Hospitals with facilities and expertise for stroke thrombolysis (but not thrombectomy), should initiate thrombolysis and transfer the patient immediately to an endovascular unit for assessment (i.e. ‘drip and ship’).
- In the near future, it is expected that ‘stroke ambulances’ will be introduced in Qatar [R-GDG]:
  - Stroke ambulances are equipped for immediate portable CT-scanning and thrombolysis capability.
  - Once introduced, care pathways will be amended accordingly

6 Emergency department assessment and management

Hospitals with the capabilities for stroke thrombolysis should follow the guidelines below. Other hospitals without thrombolysis capability should immediately transfer the patient to an appropriate stroke centre [R-GDG].

Tele-stroke services can be used to remotely discuss the management of patients with stroke specialists if stroke services are unavailable at the receiving hospital [R-GDG].

6.1 Initial assessment

Patients with suspected acute stroke should be assessed by a physician in the emergency department (ED) within 10 minutes of arrival [R-GDG].

Initial assessment will include the following [9]:

- Confirmation of focal neurological deficit.
- Exclusion of hypoglycaemia.
- Determining the time of onset of symptoms.
- Arranging urgent CT scanning.
- Informing the stroke team for assessment (on-site or via tele-stroke).

Adults presenting at an ED with acute stroke should be admitted to a specialist acute stroke unit within 4 hours of arrival [15]. Tele-stroke services can be used to remotely discuss the management of patients with stroke specialists [R-GDG].
Patients who are not eligible for thrombolysis/endovascular intervention, should still be assessed by a neurology stroke team within 24 hours of onset of symptoms [9][L1, RGA1].

6.2 Risk assessment of patients with TIA
Patients who present within 72 hours of onset of acute symptoms, but in whom symptoms have resolved, should be assessed in the ED by a neurologist or stroke expert [R-GDG].

Patients who present after 72 hours, should be assessed in a fast-track TIA outpatient clinic where available [R-GDG].

If fast-track TIA clinics are not available, the patient should be risk-stratified for their risk of subsequent stroke. Validated scoring systems such as ABCD² can help to risk stratify patients but do not perfectly predict the risk of stroke [2,9]:
- ABCD² is calculated as follows:
  - Age ≥60 years - 1 point.
  - BP at presentation ≥140/90 mmHg - 1 point.
  - Clinical features:
    - Problems with speech - 1 point; or
    - Unilateral weakness - 2 points.
  - Duration of TIA symptoms:
    - 10-59 minutes - 1 point; or
    - ≥60 minutes - 2 points.
  - Presence of diabetes mellitus - 1 point.
- The total scores range from 0 (low risk) to 7 (high risk).

People with any of the following are at high risk of recurrent events and should be referred urgently to the ED for assessment [R-GDG]:
- ABCD² score of ≥3.
- Crescendo stroke (2 or more TIAs in a week).
- Atrial fibrillation.

6.3 Neuroimaging
Patients who present within 8 hours of onset of a suspected acute stroke [R-GDG]:
- Should receive neuroimaging within 20 minutes of arrival at the hospital.

Patients with the following should receive imaging immediately upon arrival at hospital [2]:
- Indications for thrombolysis or early anticoagulation treatment.
- Current 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.

Patients who present after 8 hours of onset of a suspected acute stroke, should receive neuroimaging within 12 hours of arrival at the hospital, but as early as possible [2].
If a haemorrhagic stroke is suspected, then CT scan should be the initial imaging modality [R-GDG]. A history of bleeding tendency, depressed consciousness, neck stiffness, progressive symptoms and papilloedema all raise the possibility of a haemorrhagic rather than ischaemic stroke [R-GDG].

Evaluation of suspected TIA patients in the ED, presenting within 72 hours of onset, should also undergo neuroimaging [R-GDG].

### 6.4 Other investigations
Other investigations to be performed at initial assessment include [2,9,16,17]:
- ECG.
- Chest radiograph.
- Blood glucose level.
  - NB: Hypoglycaemia can mimic a stroke and must be excluded in those with sudden onset of neurological symptoms.
- Complete blood count (CBC).
- Urea, electrolytes, and creatinine.
- Coagulation profile, especially if considering thrombolysis or if intracerebral haemorrhage is suspected.
- Lipid profile.
- Liver function tests.
- HBA1C.
- Troponin-T.

### 7 Specialist management of acute stroke
The following sections describe management of acute stroke by neurologists.

#### 7.1 Pharmacological treatment of acute ischaemic stroke

**7.1.1 Thrombolysis**
Thrombolysis with intravenous tissue plasminogen activator (IV tPA) [9,18-20]:
- Should be offered and may be given to selected patients with acute ischaemic stroke within 4.5 hours after stroke onset, who satisfy the inclusion/exclusion criteria [18,19][L2, RGA2]:
  - The risk of intracranial and systemic haemorrhage should be considered when deciding whether to offer IV tPA [L2, RGA2].
  - IV tPA can be administered by the ED physicians in consultation with stroke specialists using the Tele-stroke service if the hospital does not have an on-site stroke team [R-GDG].
  - If IV tPA is administered in a non-stroke centre, the patient should be transferred immediately to a stroke centre for further evaluation and possible endovascular intervention [R-GDG].
- Patients with an acute ischaemic stroke who are treated with thrombolysis should only be considered for antiplatelet treatment 24 hours after presentation, once significant haemorrhage has been excluded.
Informed consent [20]:

- Shared decision-making between the patient (and/or his or her surrogate) and a member of the health care team, should include a discussion of potential benefits and harms prior to the decision whether to administer IV tPA [L3, RGB].
- If the patient is unable to consent and no family member or surrogate is immediately available, then two treating physicians (at least one should be a neurologist) can provide consent for thrombolysis as it is the standard of care following best medical practice [R-GDG]:
  - If the patient is assessed using the tele-stroke system, the consent process should be initiated and signed by the ED physicians who are attending the patient, in agreement with the neurologist on tele-stroke.
  - Once the patient reaches the stroke centre, the neurologist will co-sign the consent form on behalf of the patient.

7.1.2 Acute anti-thrombotic therapy

Administer aspirin to all patients presenting with acute stroke (after intracerebral haemorrhage has been excluded by CT brain scanning) [2,9,21]:

- Give aspirin as soon as possible but ideally within 24 hours.
  - Administer aspirin 300 mg once as first dose.
  - Follow by aspirin 100 mg once daily for lifetime use.
  - Administer aspirin orally, if the patient has completed and passed a swallow assessment.
- If aspirin is not tolerated, use clopidogrel [22]:
  - Administer clopidogrel 300 mg once as loading dose
  - Followed by 75 mg daily for lifetime use.
- If clopidogrel is not tolerated, use either [9]:
  - Modified-release dipyridamole in combination with aspirin; or if not tolerated
  - Modified-release dipyridamole alone.
- Patients with acute ischaemic stroke and a history of dyspepsia should be treated with a proton pump inhibitor (PPI):
  - Esomeprazole and omeprazole should not be prescribed with clopidogrel.

For minor strokes and TIAs:

- Clopidogrel and aspirin can be combined for 3 weeks followed by continued antiplatelet monotherapy for life [22].

NB: Anticoagulation treatment should not be routinely used in the treatment of acute stroke [2,9,23], unless clinically indicated [2,9].

7.2 Endovascular management of acute ischaemic stroke

Eligibility for endovascular intervention [24,25]:

- All patients who present within 8 hours of symptom onset with [R-GDG]:
  - Large vessel occlusion on computerised tomography/magnetic resonance angiography (CTA/MRA); and
  - Evidence of significant salvageable brain tissue on imaging.
  - Irrespective of whether thrombolysis has been administered.
- Endovascular intervention is not routinely performed in the following patients but may be considered on an individual basis [R-GDG]:
  - Patients who present beyond 8 hours of symptom onset.
  - Patients with an unknown time of onset.
o Strokes on waking (wake-up strokes).

- In case of transfer from another hospital, neuroimaging will be repeated prior to any intervention [R-GDG].

Informed consent [1]:
- Informed consent is required for all cases, except where the patient and their family are unable to provide consent.
- Shared decision-making between the patient (and/or his or her surrogate) and a member of the health care team, should include a discussion of potential benefits and harms of endovascular intervention.
- If the patient is unable to consent and no family member or surrogate is available, then an interventionist and a neurologist can provide consent.

### 7.3 Management of intracerebral haemorrhage

The following patients should be considered for a neurosurgical opinion [2,9]:

- Posterior fossa bleeds.
- ICH with mid-line shift of >5 mm.
- ICH with intra-ventricular extension.
- ICH with hydrocephalus.
- ICH with underlying brain tumours or vascular malformations.
- ICH with decreased level of consciousness (GCS below 13).

All other patients should preferably be admitted to a stroke ward within 4 hours of arrival to the ED for ongoing monitoring [R-GDG].

#### 7.3.1 Management of ICH

Blood pressure control [2,4]:

- Anti-hypertensive treatment in acute stroke is recommended if there is a hypertensive emergency (i.e. systolic BP >200mmHg or diastolic BP >120mmHg) with one or more of the following serious concomitant medical issues:
  o Hypertensive encephalopathy.
  o Hypertensive nephropathy.
  o Hypertensive cardiac failure/myocardial infarction
  o Aortic dissection.
  o Pre-eclampsia/eclampsia.
  o Intracerebral haemorrhage.

- Blood pressure reduction to 185/110 mmHg or lower should be considered in people who are candidates for thrombolysis [2].

It is preferable for patients with ICH to have BP and cardiac monitoring for at least 48 hours, on a stroke ward [R-GDG].

- Patients who require intubation or arterial BP monitoring should be admitted to an intensive care unit (ICU).
8 Care in the specialised stroke unit

Care should preferably be provided in a specialised stroke unit comprised of a multidisciplinary team of professionals [9,26]. Care should comprise of the following [9]:

- Appropriate nursing care and physiological monitoring.
- Access to speech and language therapy, including assessment and management of swallowing.
- Further investigation of the aetiology and risk factors for the stroke.
- Access to physiotherapy and occupational therapy.
- Access to dietetic services, including nutrition screening.
- Providing monitored care for stroke patients who require enhanced monitoring or who develop complications.
- Prompt access to support from specialist critical care colleagues [R-GDG].
- Good communications with patients, their families, and the patient’s primary care physician.
- Regular MDT assessment and discussion as a key component of patient care.

8.1 Physiological monitoring

The patient should have physiological monitoring to detect any deterioration including [2,9]:

- BP:
  - BP should not be managed aggressively in an acute stroke for the first 3-4 days.
- Pulse rate:
  - Monitor for arrhythmias including atrial fibrillation.
- Respiratory rate.
- Oxygen saturation:
  - Provide supplemental oxygen only if the patient’s SpO₂ is <95% on air.
  - The routine use of supplemental oxygen in patients with normal peripheral oxygen saturations is not recommended.
- Blood glucose level:
  - Maintain a blood glucose concentration between 4-11 mmol/L.
- Temperature:
  - Monitor and treat febrile illness.
- Neurological observations [R-GDG]:
  - Monitor every 4 hours for the first 48 hours and according to the patient’s requirements.
  - Physician review should occur at least on a daily basis.

8.2 Swallowing assessment

Aspiration is a particular problem among people with stroke because of complicating dysphagia [2]. Keep the patient nil by mouth (including oral medication), until swallow screening is performed [9].

Consider the following [2,4,9,27]:

- If swallow disorder is suspected following initial screen, refer for specialist assessment, as soon as possible but within 24 hours.
- Provide medication by non-oral routes including nasogastric tube (NGT) or rectal.
- Patients may benefit from intravenous normal saline to maintain hydration.
- Do not use hypotonic fluids in patients with acute stroke.
- Screening for malnutrition should be carried out by appropriately trained individuals.
• Healthcare professionals should be aware nutrition will be affected by poor oral health and reduced ability to self-feed.
• Monitor weight and body mass index (BMI) at regular intervals.

8.3 Assess for and manage complications
Observe patients for the development of common early complications including [2,12]:
• Risk of falling.
• Early neurological deterioration.
• Hypo- or hyperglycaemia.
• Electrolyte disturbances.
• Aspiration pneumonia or other sepsis.
• Deep vein thrombosis (DVT) or pulmonary embolism (PE):
  o Use both of the following for VTE prophylaxis:
    ▪ LMWH or subcutaneous unfractionated heparin; and
    ▪ Pneumatic compression of the legs.
• Hypothermia or hyperthermia.
• Dehydration and malnutrition.
• Hypertension.
• Pressure ulcers.

NB [28]:
• Restraints should not be used.
• Routine use of Foley catheters should be discouraged and only used if there is documented urinary retention.

8.4 Further investigation
Carotid artery imaging [2,9,29][R-GDG]:
• All people with suspected anterior circulation stroke or TIA, who after specialist assessment are considered as candidates for carotid endarterectomy.
• Carotid duplex ultrasound should be performed within 24-48 hours.
• High risk patients (ABCD² of ≥3) should have carotid imaging in <24 hours.
• Carotid endarterectomy should be considered where carotid stenosis is ≥70-99%.
• In selected patients, carotid endarterectomy can also be performed in patients with stenosis of 60-70%.
• Other revascularisation procedures can be considered in younger patients.

Confirmatory imaging investigation is necessary to confirm the degree of stenosis including [1,2][L1]:
• Conventional four-vessel cerebral angiogram.
• MRA.
• CTA.

Vertebral artery imaging [30]:
• Can be performed by duplex ultrasound in patients with posterior circulation stroke or TIA.
• Further management may be addressed on an individual basis.

Echocardiogram [31]:
• Patients with ischaemic stroke or TIA should not routinely undergo transthoracic echocardiogram in the acute setting.
• In younger patients, transoesophageal echocardiogram may be considered to identify underlying cardiac pathology.

Holter monitoring [32]:
• Should be performed in all patients with ischaemic stroke or TIA for 24-48 hours to identify underlying arrhythmia as a possible cause of the stroke.
• Prolonged monitoring for up to 6 weeks (with weekly trace interpretation) will be introduced in Qatar in due course [R-GDG].

Screening for thrombophilic state [33]:
• May be appropriate for younger patients (age <50 years) with no other risk factors identified for ischaemic stroke or TIA.

8.5 Stroke rehabilitation
Stroke rehabilitation [9,17]:
• Should be provided by a specialised rehabilitation team skilled in the care of stroke patients. The rehabilitation team should be part of the Stroke Multidisciplinary Team (MDT).
• Patients with neurological deficits from acute stroke, should be assessed by the rehabilitation team within a specialised stroke unit.
• All patients with neurological deficits should be transferred to a rehabilitation facility as soon as investigation of stroke aetiology and acute care is complete [R-GDG].

9 Secondary prevention of stroke and TIA
For every patient, an individualised and comprehensive secondary prevention strategy for stroke should be implemented as soon as possible following a TIA or stroke and prior to discharge from the hospital [9].

9.1 Provide information regarding stroke
Information about stroke/TIA and risk factors should be [9]:
• Provided to patients in the hospital setting.
• Provided in an appropriate format for the patient.

All patients receiving medication for secondary prevention should [9]:
• Be given appropriate written and verbal information about the medication including dosage, timing and side effects.
• Have compliance aids (e.g. large-print labels and non-childproof tops) provided according to their individual needs and compatibility with safety in the home environment.

9.2 Lifestyle advice
Lifestyle advice should include the following [9,26,34-37]:
• Cessation of smoking.
• In those who consume alcohol, excessive intake should be discouraged.
• Reducing body weight for overweight or obese patients [34][L1].
  • Appropriate lifelong physical activity and/or exercise [26,34][L1, RGA2]:
- Aim for 30 minutes of moderate intensity aerobic activity at least 5 days per week.
  - Minimising saturated fat intake and eating a balanced diet, including:
    - Mediterranean/diet approach to stop hypertension (DASH) diet.
      - Low fat/dairy intake.
      - High fish, olive oil and nuts.
      - Eating ≥5 portions of fruit and vegetables a day.
      - Lower dietary salt intake to <2400 mg/day.
      - Reducing animal protein intake.

9.3 Glycaemic control in diabetic and pre-diabetic patients
Ensure good glycaemic control in all diabetic and pre-diabetic patients [34][L1, RGA1]:
- Check HBA1c.
- Consider altering hypoglycaemic medication and/or insulin.
- Provide education and support.

The target for glycaemic control is to keep HBA1c <7.0%, if this can be achieved without problematic hypoglycaemia [41]. Less stringent control may however be appropriate in elderly patients [R-GDG].

9.4 Blood pressure management
BP management in secondary prevention [9,38]:
- Initiate antihypertensive therapy in the acute setting for all patients following ischaemic stroke or TIA with a systolic BP (SBP) of ≥200 mmHg or a diastolic BP (DBP) of ≥120 mmHg.
- For patients with carotid artery stenosis of ≥60%, who are not appropriate for intervention, or who are awaiting intervention:
  - A target SBP of 140-150 mmHg is appropriate.
  - Sudden lowering of BP is not appropriate in these patients.

NB: Consider starting an angiotensin converting enzyme (ACE) inhibitor or an angiotensin receptor blockers (ARBs) in all patients following ischaemic stroke or TIA (at discharge from the stroke unit) unless contraindicated, as an independent secondary prevention strategy [R-GDG].

9.5 Lipid management
Lipid management [34,39,45]:
- High-intensity statin therapy should be initiated in all patients following ischaemic stroke or TIA, within 24 hours, irrespective of baseline lipid levels e.g.:
  - Atorvastatin 40-80 mg.
  - Rosuvastatin 20-40 mg.
- Targets for treatment in ischaemic stroke or TIA:
  - Aim for a reduction in LDL-C of ≥50% from the untreated baseline level; or
  - An absolute level of LDL-C of <1.8 mmol/L (if the baseline is unknown).
- In patients admitted with ICH [R-GDG]:
  - Initiation of statin therapy can be delayed until 2-4 weeks after the haemorrhage.
  - Any prior statin use can be stopped and reinitiated at 2-4 weeks after the haemorrhage.
9.6 Anti-thrombotic therapy

Antiplatelet therapy after acute treatment [2,21,40-42]:

- Aspirin should be continued for lifetime use at a dose of 100 mg once daily.
- If aspirin is not tolerated, use clopidogrel 75 mg once daily.
- If clopidogrel is not tolerated, use either:
  - Modified-release dipyridamole in combination with aspirin; or if not tolerated
  - Modified-release dipyridamole alone.
- Any patient with acute ischaemic stroke in whom previous dyspepsia is reported should be given a PPI in addition to the antiplatelet.
- Esomeprazole and omeprazole should not be prescribed with clopidogrel.

For minor strokes and TIs [22]:
- Clopidogrel and aspirin can be combined for 3 weeks followed by continued antiplatelet monotherapy for life.

9.7 Anticoagulation in stroke prevention

The following patients should be treated or continued on long term anticoagulants to reduce the risk of further stroke or TIA [34]:

- All patients with atrial fibrillation (AF).
- Patients with mechanical heart valves.
- Patients with a left ventricular thrombus.

The target for treatment should be [43,44]:

- International normalised ratio (INR) of 2-3 (unless specific indications for a higher INR e.g. those with mechanical heart valves).
- All patients should be encouraged to monitor INR closely with their physician or warfarin clinic.

Depending on the risk of bleeding, initiation or re-initiation of anticoagulation can be delayed for 7-14 days, in patients who have had a sizeable infarction [R-GDG].

Patients with non-valvular AF may be started on newer anticoagulants in preference to warfarin, including [41]:

- Rivaroxaban.
- Dabigatran.
- Apixiban.
10 References


