The assessment and management of neurological symptoms presents a particular challenge in the community, as the differential diagnosis may be wide and include potentially serious conditions. Whilst the practitioner may commonly encounter conditions such as stroke and the fitting patient, all patients will require careful assessment to avoid the pitfalls of missing a serious underlying diagnosis. Headache presents a particular diagnostic difficulty where the cause may range from the benign, to the life-threatening subarachnoid haemorrhage. Some neurological symptoms may be non-specific but indicate the possibility of rare conditions requiring urgent investigation and treatment. This first article will cover the primary survey positive patient including the unconscious patient, the fitting patient, and those patients presenting with headache as their main symptom. The second article will cover frequently encountered neurological symptoms and signs to enable the practitioner to develop a safe and comprehensive system to decide which patients need immediate treatment and/or referral and which may safely be treated at home.

THE PRIMARY SURVEY POSITIVE PATIENT

All patients should be assessed according to ABC principles in order to identify any immediately life-threatening conditions.

Box 1 Primary survey

If any observations below present treat immediately and transfer to hospital
- Airway Obstruction
- Respiratory rate <10 or >29 per minute
- O2 sats <93%
- Pulse <50 or >120
- Systolic BP <90 mmHg
- GCS <12

Neurological conditions can be immediately life-threatening by causing an ABC problem:
- Airway obstruction/compromise – loss of protective airway reflexes due to coma.
- Breathing difficulty/inadequacy – apnoea due to conditions affecting the respiratory centre—for example, brainstorm stroke, intracerebral haemorrhage; respiratory muscle weakness—for example, Guillain Barre, myasthenia gravis
- Circulatory compromise – septic shock secondary to CNS infection, hypertension, and bradycardia in patients at imminent risk of coning.

The two main categories of immediately primary survey positive patients seen by the community practitioner are the unconscious patient and the fitting patient.

THE UNCONSCIOUS PATIENT

The unconscious patient is traditionally defined as having a GCS of 8 or less. It is very difficult to make an accurate neurological assessment of these patients and they will require a full hospital assessment. Arrange a 999 paramedic ambulance to transfer these patients to hospital.

Priorities in management will follow ABC principles well described elsewhere in this series.

Airway
Ensure an adequate airway using routine airway opening manoeuvres augmented by an oropharyngeal or nasopharyngeal airway as appropriate. If there is any possibility of trauma then use a jaw thrust not a chin-lift, head-tilt. Give oxygen (15 litres via a non-rebreathing mask).

Breathing
Check the patient is breathing adequately. Hypoventilation will require bag/valve mask assistance. Check oxygen saturation by pulse oximetry.
Circulation
Check the pulse and if possible the blood pressure. Establish in vitro access if possible.

Disability
Measure the Glasgow Coma Score (GCS). If there is no response to pain check the tone in the limbs. When communicating the GCS score to secondary care it can be very usefully broken down into its separate components to give a clear impression of neurological status (Box 2). Check pupil size and reaction. A unilaterally dilated pupil may indicate an intracerebral haematoma, pinpoint pupils may indicate a pontine stroke or raise the suspicion of poisoning—for example, opiates. Bilateral dilated pupils may suggest poisoning with benzodiazepines or tricyclic antidepressants.

Box 2 Glasgow Coma Score

<table>
<thead>
<tr>
<th>Maximum Score</th>
<th>Minimum Score</th>
<th>A patient is defined as unconscious with a score of 8 or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Eye response
- 4 Open spontaneously
- 3 Open to command
- 2 Open to pain
- 1 No eye opening

Verbal response
- 5 Fluent and orientated
- 4 Confused speech
- 3 Inappropriate words
- 2 Incomprehensible sounds
- 1 No verbal response

Motor response
- 6 Obeys commands
- 5 Localising pain
- 4 Withdraws from pain
- 3 Flexion to pain
- 2 Extension to pain
- 1 No motor response

In addition to ABCD, E (exposure) and G (glucose) should be assessed to search for clues as to the possible underlying cause eg. a rash may suggest meningitis or septicaemia (fig 1), puncture marks may indicate a drug overdose (fig 2).

History
Try to gain as much information as possible to suggest possible causes of unconsciousness. Obtain a history of the episode from any witnesses; ask if they know of any previous medical history, prescribed medications, or history of illicit drug use. The main causes of unconsciousness are summarised in table 1.

Table 1 Common causes of unconsciousness

<table>
<thead>
<tr>
<th>Cause</th>
<th>Clinical clues</th>
</tr>
</thead>
</table>
| Vascular
| Intracerebral bleed | History of preceding sudden onset headache |
| Subarachnoid haemorrhage | Focal neurological signs |
| Stroke |                     |
| Metabolic
| Hypoglycaemia | History of diabetes mellitus |
| Severe hyperglycaemia (hyperosmolar non ketotic coma) | Always check the glucose |
| Severe hypotension |   |
| Poisoning
| Opiates | History of illicit drug use, alcoholism or mental health problems |
| Tricyclics | Presence of empty pill bottles |
| Benzodiazepines | Pin-point pupils (opiates) |
| Carbon monoxide (accidental or deliberate) | Dilated pupils (tricyclics or benzodiazepines) |
| Alcohol |   |
| Head injury
| | History of falls |
| | Scalp laceration, bruising or swelling |
| | Periorbital bruising |
| | Previous history of fits |
| Epilepsy
| Status epilepticus (non-convulsive) | History of prodromal illness |
| | Postictal |
| Infection
| Meningitis | Rash |
| | Encephalitis | Pyrexia |
| | Sepsis | Signs of septic shock (peripheral vasodilatation, tachycardia, hypotension) |
| Hypothermia | Temperature <35˚C |

Figure 1 Purpuric rash in meningococcal septicaemia.

Figure 2 Needletrack marks in intravenous drug user.
Airway management

Airway management in the fitting patient can be problematic due to jaw spasm, and a nasopharyngeal airway can be very useful if the fit is protracted with worsening airway compromise. Give oxygen and suction away any excess secretions. If possible place the patient on their side. Most fits will stop spontaneously. Do not forget to check the blood glucose.

If the fit is prolonged or recurrent, drug treatment may be required. Rectal diazepam is effective but it may be difficult to administer by a practitioner with no help. Intravenous diazems, lorazepam, or buccal midazolam are alternatives that may be used in accordance with local protocols.

Following cessation of the fit assess the patient for any obvious precipitating cause and for any injuries they may have sustained during the course of the fit. Common causes of fits are summarised in table 2. In patients with known epilepsy, fits may be precipitated by concurrent illness or changes in their medication. Injuries may include head and facial trauma, fractures, and burns. Rarely patients may sustain a posterior shoulder dislocation therefore shoulder movement should be checked.

If the patient is a known epileptic, has a single fit and has no previous history of fits, they may be safely left at home as long as there is family or carer support. If there is no previous history of fits, if the fit was unusual in any way, if there are abnormal examination findings or if there is concern about a possible precipitating cause, then the patient should be transferred to hospital for a full assessment.

**Febrile seizures**

A febrile seizure is any seizure occurring in an infant or young child (6 months to 5 years old) in conjunction with a fever or history a recent fever and without evidence of a previous febrile seizure or an underlying cause such as neurological disease or CNS infection. They are the most common seizures seen in the paediatric population in the prehospital setting, occurring in 2–5% of all children between the ages of 6 months and 5 years, therefore it is important that practitioners are familiar with the principles of their evaluation and management. Febrile seizures generally have...
HEADACHE

THE PRIMARY SURVEY POSITIVE PATIENT

A few patients will have obvious serious pathology on ABC evaluation. Any reduction in GCS, acute confusion, focal neurological signs, or petechial rash indicates the need for urgent transfer to hospital. Supportive treatment should be provided as described elsewhere.

Most patients, however, will not have any obvious signs of an immediately life-threatening problem. It is vital that these patients are assessed systematically in order to detect the small proportion of patients with serious pathology. The assessment of a patient with headache can be difficult for the most experienced clinician. Probably the most important factor in headache assessment is the history and time should be spent in specifically eliciting features of the history that may be ‘red flags’ mandating referral to hospital for further investigation and management. Important factors to consider in the history of a headache are summarised in table 3.

Table 3 Important factors in the history of a headache

<table>
<thead>
<tr>
<th>Factors to consider</th>
<th>Significance</th>
<th>Possible diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of onset</td>
<td>▶ Sudden onset, maximal severity &lt;15 minutes</td>
<td>▶ Subarachnoid haemorrhage</td>
</tr>
<tr>
<td></td>
<td>▶ Acute onset increasing in severity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▶ Subacute onset</td>
<td></td>
</tr>
<tr>
<td>Frequency and duration</td>
<td>▶ Important to distinguish types of recurrent headache</td>
<td>Primary headache syndromes: migraine cluster headache, tension headache, trigeminal neuralgia</td>
</tr>
<tr>
<td>Site and radiation</td>
<td>▶ Occipital radiating to neck</td>
<td>Subarachnoid haemorrhage</td>
</tr>
<tr>
<td></td>
<td>Unilateral</td>
<td>Migraine, trigeminal neuralgia</td>
</tr>
<tr>
<td>Previous headache history/change from usual pattern</td>
<td>▶ Worse headache ever</td>
<td>Subarachnoid haemorrhage</td>
</tr>
<tr>
<td>Time of onset</td>
<td>▶ Worse on waking</td>
<td>Raised intracranial pressure</td>
</tr>
<tr>
<td>Associated features</td>
<td>▶ Vomiting</td>
<td>SAH, meningitis, glaucoma</td>
</tr>
<tr>
<td></td>
<td>▶ Neck stiffness/Photophobia</td>
<td>SAH, meningitis</td>
</tr>
<tr>
<td></td>
<td>▶ Fever</td>
<td>CNS or ENT infection</td>
</tr>
<tr>
<td></td>
<td>▶ Other neurological symptoms</td>
<td>Intracerebral haemorrhage, stroke</td>
</tr>
<tr>
<td></td>
<td>▶ Proximal weakness/jaw claudication</td>
<td>Temporal arteritis</td>
</tr>
<tr>
<td></td>
<td>Visual/olfactory aura</td>
<td>Migraine</td>
</tr>
<tr>
<td>Aggravating/precipitating factors</td>
<td>▶ ↑ by head movement, coughing, straining</td>
<td>Raised intracranial pressure</td>
</tr>
<tr>
<td></td>
<td>Triggers eg cheese, chocolate, menstruation</td>
<td>Migraine</td>
</tr>
<tr>
<td></td>
<td>Resolves with simple analgesia</td>
<td>Unlikely sinister cause</td>
</tr>
<tr>
<td>Family history</td>
<td>▶ Subarachnoid haemorrhage</td>
<td>Subarachnoid haemorrhage</td>
</tr>
<tr>
<td>History of recent trauma</td>
<td>▶ Subdural haemorrhage</td>
<td>Subdural haemorrhage</td>
</tr>
<tr>
<td>Drug history</td>
<td>▶ Warfarin</td>
<td>Intracerebral haemorrhage</td>
</tr>
</tbody>
</table>

Box 4 Advice to parents following febrile seizures

▶ Febrile seizures occur in 2–5% of children aged 6 months to 5 years.
▶ They may appear frightening to observers but are generally harmless
▶ Simple febrile seizures often occur only once in the first 24 hours of a febrile illness. If the seizure recurs your child should be re-evaluated.
▶ A febrile seizure may manifest as body stiffening, twitching of the face or limbs, eye rolling, jerking of the arms or legs, staring or loss of consciousness. They generally last <1 minute but may last up to 1.5 minutes.
▶ Your child might appear not to be breathing and the skin colour may become darker. If so, call 999 and lay the child on the floor on his or her back. DO NOT place anything in the child’s mouth.
▶ Febrile seizures do not cause brain damage or paralysis
▶ Febrile seizures tend to run in families
▶ Febrile seizures can recur with subsequent febrile illnesses. Whilst paracetamol or ibuprofen may be used to try and decrease the temperature these have not been shown to prevent febrile seizures.

Sudden onset headache with maximal severity <15 minutes is a subarachnoid haemorrhage until proven otherwise.
Examination
Examination of a patient with headache should include a complete systems examination as well as a thorough neurological examination. Numerous non-neurological disorders and conditions affecting the eyes, ear, nose, and throat may cause a headache therefore the examination must include assessment of all the following:

Conscious level and mental state examination
Drowsiness or confusion all suggest intracranial pathology or infection. Such patients should be referred to hospital for a full assessment.

Speech
This can easily be assessed whilst taking the history from the patient. Any evidence of slurred speech (dysarthria), or difficulty in word finding (dysphasia) suggests the patient may have had a stroke.

Skull
The skull should be palpated for any areas of tenderness or swelling and inspected for bruising. Tenderness over the temporal area may suggest temporal arteritis and these patients must be referred for an urgent ESR.

Neck pain/stiffness
Neck stiffness may indicate meningeal irritation due to the presence of blood or infection. Ask the patient to put their chin on their chest to see if this increases pain. Kernigs and Brudzinski’s sign are useful tests for evidence of meningism.

Eyes
Check pupil reaction at the same time checking for any photophobia. Check for any restriction of eye movement (ophthalmoplegia) or diplopia (cranial nerves III, IV, VI) and nystagmus. Check visual acuity and if possible examine the fundi. Rarely serious eye problems such as glaucoma may present with severe headache. There will usually be abnormal eye signs including a red eye, cloudy cornea, irregular mid-dilated pupil and reduced visual acuity (fig 4). If there is any suggestion of glaucoma the patient must be referred immediately for an ophthalmology assessment.

ENT
Examine the ears and throat for any evidence of infection that may produce headache. Pain on percussion over the sinuses may indicate sinusitis.

General neurological examination
A full neurological examination should be performed as summarised in Box 6.

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Drowsiness or confusion all suggest intracranial pathology or infection. Such patients should be referred to hospital for a full assessment.

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signs that get worse as the day progresses. It may be associated with a history of depression or medication misuse. Analgesics are unhelpful if the headache is chronic. This diagnosis should not be made until all other causes of headache have been excluded by a thorough medical assessment and appropriate investigations.

Patients complaining of a headache shortly after a head injury may be managed at home if they are fully alert and orientated and have a normal neurological examination. They should be advised to seek medical attention if they have any of the following symptoms:

- vomiting
- increased drowsiness or unconsciousness
- severe or worsening headache
- double vision
- severe irritability or major change in behaviour
- fitting

Any patient who has suffered a significant loss of consciousness or amnesia should be assessed in hospital as they may require a CT brain in accordance with the NICE head injury guidelines. A patient complaining of increasing headache days or even weeks after a head injury, particularly if associated with other neurological symptoms or signs may have a subdural haematoma and should be referred for assessment.

### Box 6 General neurological examination

#### Signs of meningeal irritation
- Photophobia
- Neck stiffness
- Kernigs sign

#### Higher mental function
- GCS
- Mental state examination

#### Cranial nerves
- II – visual acuity and fields
- III, IV, VI – eye movements
- V– jaw power and face sensation
- VII– facial movements
- VIII–hearing
- IX–palate movements, swallowing
- XI– shrugging shoulders
- XII tongue movement

#### Limbs
- Power
- Tone
- Reflexes
- Sensation
- Co-ordination
- Balance and gait

### Box 7 International Headache Society diagnostic criteria for migraine

- Lasts 4–72 hours
- At least 2 of: unilateral location, pulsating quality, moderate to severe intensity, aggravation by routine physical activity
- At least 1 of: nausea/vomiting, photophobia, phonophobia
- At least 5 attacks fulfilling the above
- History and neurological examination do not suggest underlying organic pathology.

#### Pitfall

Beware diagnosing migraine if the attack has lasted longer than 72 hours or if there has been incomplete resolution between attacks. Similarly, if the patient says this is the worst episode they have ever had or if it is different from their usual headache pattern they will warrant hospital assessment.

### SUMMARY

Neurological emergencies are seen relatively common by the community practitioner and require careful assessment in order to identify potential serious pathology. Headache presents a particular diagnostic challenge and a good history and examination is vital to avoid missing potentially life-threatening conditions such as subarachnoid haemorrhage. This article aims to provide a system to guide assessment and management, however, it is clear that in most cases patients will require secondary care assessment. Neurological conditions are extremely frightening for both patients and carers who often fear they may be having a stroke or brain tumour, therefore reassurance and support is a crucial part of the primary care professionals role.

### Authors’ affiliations

J T Gray, C M Gavin, Hope Hospital, Salford, UK

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### REFERENCES

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