# Altered Conscious Level

## Definition / Supporting Information

An altered conscious level is a reduced awareness in oneself and / or in the environment.

A decreased conscious level is defined as being responsive only to voice or pain or being unresponsive on the AVPU scale, or a Glasgow Coma Score or modified Glasgow Coma Score of 14 or less.

## Essential History

**Ask about:**

- Circumstances of the onset of the neurological symptoms
  - Events and actions directly preceding the change in conscious level
  - Baseline state of functioning and responsiveness (especially for young children and children with chronic conditions)
  - Duration of symptoms
- Vomiting before or at presentation
- Headache before or at presentation
- Fever before or at presentation
- Convulsions before or at presentation
- Alternating periods of consciousness
- Trauma (see Head Injuries)
- Ingestion of medications, alcohol, or recreational drugs (see Drug Overdose and Poisoning)
- Presence of any medications in the child‘s home
- Any infant deaths in the family
- Safeguarding issues, preceding or elicited in history (see When to suspect child maltreatment [NICE clinical guideline CG89])

## ‘Red Flag’ Symptoms and Signs

Evaluation should progress only after the ABCs (airway, breathing, circulation, and cervical spine stabilisation) of resuscitation have been addressed. Recording of vital signs is particularly important as part of establishing a baseline with which future examinations can be compared for improvement or deterioration of the child’s clinical status.

**Ask about:**

- Vomiting before or at presentation

- Headache before or at presentation
- Fever before or at presentation
- Convulsions before or at presentation
- Alternating periods of consciousness
- Trauma (see Head Injuries)
- Ingestion of medications, alcohol, or recreational drugs (see Drug Overdose and Poisoning)
- Presence of any medications in the child's home such as opiates

**Look for:**

- Signs of shock (include tachycardia, prolonged capillary refill time, cool peripheries, and hypotension)
- Signs of meningitis (include stiff neck, bulging fontanelle, photophobia, Kernig's sign (see Bacterial meningitis and meningococcal septicaemia [NICE clinical guideline CG102])
- Abnormal responses on AVPU (Alert, responds to Voice, responds to Pain, Unresponsive) scale
  - V, P, or U on the AVPU scale is abnormal
- Reduced Glasgow Coma Score (GCS) and AVPU score
  - GCS of 14 or less is abnormal
- Presence of a purpuric rash
- Focal neurological deficit
- Hypertension, bradycardia, irregular respirations (Cushing triad)
  - Impending cerebral herniation
  - Appear late in the course of increasing intracranial pressure (ICP)

## Differential Diagnosis / Conditions

- Structural (anatomical) causes
  - Structural lesions are often characterised by:
    - Unequal or unreactive pupils or inability to abduct an eye
    - Focal neurological findings
      - Structural causes may occur without focality, such as acute bilateral cerebrovascular disease, or early acute hydrocephalus.
  - Cerebrovascular accident
  - Cerebral vein thrombosis
  - Increased intracranial pressure
    - Acute hydrocephalus
    - Intracerebral tumour
  - Subdural empyema

  - Trauma (see Head Injuries)
    - Intracranial bleeding
    - Diffuse cerebral swelling
    - Shaken baby syndrome
- Medical (toxic / infectious / metabolic) causes
  - Medical causes usually produce:
    - Dysfunction in both cerebral hemispheres
    - Preserved pupillary reflexes
    - Non-focal neurological findings
  - Shock (hypovolaemic, distributive, cardiogenic)
  - Anoxia
  - Convulsions
  - Diabetic ketoacidosis
  - Electrolyte abnormalities
  - Encephalopathy
  - Hypertension
  - Hypoglycaemia
  - Hypothermia or hyperthermia
  - Infection (sepsis)
  - Inborn errors of metabolism
  - Meningitis and encephalitis
  - Non-organic
  - Postictal state
  - Intoxication / poisoning

## Investigations

To be undertaken by non-specialist practitioners (eg, General Practitioner (GP) Team):

**Call for help and assess airway, breathing, circulation, and disability.**

- Rapid bedside glucose determination and treatment if capillary blood glucose is below 3 mmol/L
- Pulse oximetry

To be undertaken by specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Intensive Care Team(s)):

Evaluation should progress only after the ABCs (airway, breathing, and circulation) of resuscitation have been addressed.

- Capillary blood glucose
- Laboratory blood glucose

- Blood gas
  - Venous, arterial, or capillary pH
  - $pCO_2$
  - Base excess
  - Lactate
  - Carbon monoxide
- Urea and electrolytes
  - Sodium, potassium, and creatinine
  - Plasma lactate
  - Serum calcium
- Liver function tests
  - Aspartate transaminase or alanine transaminase
  - Alkaline phosphatase
  - Albumin or protein
- Full blood count and film
  - Haemoglobin
  - White cell count and differential
  - Platelet count
- Clotting screen if any evidence of bleeding diathesis or abnormal liver function tests
- Blood culture
- Urinalysis (dipstick at bedside) for ketones, glucose, protein, nitrites, and leucocytes
- 10 mL of urine to be saved for later analysis (including urine toxicology)
- Metabolic screen, if indicated including:
  - Plasma ammonia
  - Blood for save serum for later analysis (metabolic disease)
  - Urine for organic acids
- Blood alcohol level
- Lumbar puncture (LP) may be performed if encephalitis or meningitis is suspected.
  - It should be performed if the patient is stable and does not have focal neurological signs.
  - Do not perform LP if any of the following are present:
    - GCS < 13
    - Focal neurology
    - Widespread purpuric rash
    - Abnormal posturing
    - Hypertension
    - Dilated pupils
    - Papilloedema
  - A normal CT scan does not exclude raised ICP

  - Send CSF for herpes simplex virus polymerase chain reaction (PCR) if encephalitis is suspected
- Directed drug levels
  - If ingestion of a toxic substance is considered
  - Qualitative urine toxicology screening can identify a variety of commonly ingested agents, but its usefulness is limited by the delay until results are available.
  - Specialists at the local poison control centre can assist in the management of a suspected overdose. See Drug Overdose and Poisoning.
- Electrocardiography
  - Myocarditis
  - Dysrhythmias
  - A normal electrocardiogram finding does not rule out these disorders.
- Many serious drug overdoses have electrocardiographic findings.
  - Prolongation of the QRS interval with tricyclic antidepressants
  - Ischaemic changes with cocaine overdose
  - QT prolongation with neuroleptic overdose (phenothiazines, thioridazine, haloperidol, chlorpromazine)
- Additional investigations
  - Chest X-ray
  - Blood PCR for meningococcus and pneumococcus
  - Skin swabs if inflammation present
  - Joint aspiration if signs of septic arthritis present
  - Thick and thin films for malaria if travel to an endemic area

**Imaging**

- The decision whether to use computed tomography (CT) or magnetic resonance imaging (MRI) depends on a variety of factors.
  - Clinical situation
  - Stability of the patient
  - Availability of the test
- CT
  - Readily available in the setting of an acute change in mental status
  - Rapidly identifies acute intracranial bleeding, masses, or contusions in emergency situations
  - No sedation required in children > 4 years
- MRI
  - Uses no ionising radiation and thus poses reduced risk to the developing brain
  - Provides more detail of the soft tissues and better imaging of the brain parenchyma, cerebellum, and brainstem than CT

  - Sedation or general anaesthesia likely required in children < 6 years

## Treatment Approach

To be undertaken by non-specialist practitioners (eg, GP Team):

- Management is similar to that of any emergency condition (ie, ABC assessment)
- Primary objectives
  - Stabilise the child's clinical status
  - Correct any acute life-threatening conditions
    - Give glucose if blood glucose is under 3 mmol/L
    - Give antibiotics if purpuric rash is present
- Refer to secondary care for further assessment and treatment

To be undertaken by specialist practitioners (eg, Paediatric / Emergency Department Team(s)):

Manage a child with decreased conscious level and head injury according to Head injury: Triage, assessment, investigation and early management of head injury in children, young people and adults [NICE clinical guideline CG176].

- Airway
  - Consider intubation and ventilation if GCS < 8 or P/U on AVPU scale unless the child is showing signs of improvement.
- Breathing
  - Give high flow oxygen.
  - Rising $pCO_2$ will increase ICP (maintain between 4.5 and 5.0 kPA).
- Circulation
  - Consider 10 mL/kg crystalloid bolus if evidence of shock.
  - Follow by reassessment and administration of more fluid depending on signs.
- Disability
  - Consider glucose 5% bolus 2–4 mL/kg followed by infusion.
  - Neuroprotective measures with head in midline at 20 degree angle
  - Treat seizures if present (see APLS 'Fitting child' algorithm)
  - Consider 250–500 mg/kg or 3% sodium chloride 3 mL/kg if suspicion of raised ICP
  - Consider dexamethasone for life-threatening cerebral oedema:
    - Children < 35 kg: initially 16.7 mg, then 3.3 mg every 3 hours for 3 days, then 3.3 mg every 6 hours for 1 day, then 1.7 mg every 6 hours for 4 days, then decrease by 0.8 mg daily
    - Children > 35 kg: initially 20.8 mg, then 3.3 mg every 2 hours for 3 days, then 3.3 mg every 4 hours for 1 day, then 3.3 mg every 6 hours for 4 days, then decrease by 1.7 mg daily

  - Consider neurosurgical referral.
- Exposure
- Give IV ceftriaxone if a purpuric rash is present or sepsis is suspected
- If meningitis is suspected:
  - IV antibiotics should be administered without delay
- If herpes encephalitis is suspected:
  - Aciclovir should be started
- Consider referral to High Dependency Unit (HDU) or Paediatric Intensive Care Unit (PICU) depending on response to treatment and possible diagnosis.

**Raised intracranial pressure**

- Consider if:
  - The patient has a history of trauma (see Head Injuries)
  - The suspected cause is structural
  - Infection is present
- Head position
  - Should be elevated to 30 degrees and placed in a midline position
- Hyperventilation
  - Can be a temporising measure to reduce intracranial pressure
- Every effort should be made to:
  - Stabilise the child as soon as possible
  - Obtain head imaging
  - Consult with a neurosurgeon

## When to Refer

Refer urgently (arrange emergency transport) any child with altered conscious level to Emergency Department / Paediatric Specialist Team(s).

## ‘Safety Netting’ Advice

- If the child has a condition that may present with recurrent symptoms (eg, metabolic diseases), carers should be given clear instruction how to access health care.
  - Consider advising ‘alert’ bracelet.
  - Carers may be given a letter to be able to access specialist care directly where appropriate.

## Patient / Carer Information

***Please note: whilst these resources have been developed to a high standard they may not be specific to children.***

- Coma (Web page), the NHS website

# Resources

## National Clinical Guidance

Head injury: Triage, assessment, investigation and early management of head injury in children, young people and adults (Web page), NICE clinical guideline CG176, National Institute for Health and Care Excellence.

When to suspect child maltreatment (Web page), NICE clinical guideline CG89, National Institute for Health and Care Excellence.

Bacterial meningitis and meningococcal septicaemia: Management of bacterial meningitis and meningococcal septicaemia in children and young people younger than 16 years in primary and secondary care (Web page), NICE clinical guideline CG102, National Institute for Health and Care Excellence.

## Medical Decision Support

Recognition of Physical Abuse (Web page), RCPCH Child Protection Companion

## Suggested Resources

***Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.***

Head Injury (Web page – requires log-in), Spotting the Sick Child

Preventing SUDEP (Web page), Epilepsy Foundation.

The management of children and young people with an acute decrease in conscious level. RCPCH; 2015 update.

Advanced Paediatric Life Support: The Practical Approach (APLS). 5th ed. John Wiley & Sons (Wiley-Blackwell); 2011.

King M, Stevenson JBP, eds. A Handbook of Neurological Investigations in Children. MacKeith Press; 2009.

Forsyth R, Newton RW, eds. Paediatric Neurology (Oxford Specialist Handbooks in Paediatrics). OUP Oxford; 2012.

Kirkham FJ. Non-traumatic coma in children. Arch Dis Child. 2001;85(4):303-312. [PubMed]

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