

Guideline Review - The management of children and young people with an acute decrease in conscious level (RCPCH Guideline update 2015)

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Clinical Bottom Line

- A child with a decreased conscious level is at increased risk of morbidity and mortality and should be managed as a paediatric emergency
- Non-accidental injury and safeguarding concerns should always be considered in this patient group
- A systematic ABCDE approach should be used for assessment and management and core investigations performed
- All children should be assessed for evidence of raised intracranial pressure

About this guideline

This guideline provides an evidence and expert consensus based framework to assess and manage paediatric patients aged 4 weeks to 18 years with a decreased conscious level of unknown cause⁽¹⁾. The guideline provides a general overview of management, and readers are directed to national guidelines for detailed management of specific conditions (see resources for examples).

The following patient groups not included in this guideline:

- Neonates
- Pre-term infants on neonatal intensive care units
- Children with a known medical condition which can cause decreased conscious level (e.g. epilepsy), where an agreed management plan is in place for acute illness
- Children with a daily baseline score of GCS of less than 14 (e.g. children with epileptic encephalopathy, or minimally responsive state following acquired brain injury)

Due to varying levels of evidence underpinning this guideline, many recommendations are prefaced by the word 'consider', which is used to indicate that the recommendation is based on weak evidence, or on expert consensus.

Resources

The management of children and young people with an acute decrease in conscious level (2015) - full guideline and algorithm poster

<http://www.rcpch.ac.uk/improving-child-health/clinical-guidelines-and-standards/published-rcpch/management-children-and-you>

Hypoglycaemia: Investigation and Management – British Inherited Metabolic Diseases Group

<http://www.bimdg.org.uk/site/guidelines.asp>

NICE Guideline: Head injury: assessment and early management

<https://www.nice.org.uk/guidance/cg176>

NICE Guideline: Sepsis: recognition, diagnosis and early management

<https://www.nice.org.uk/guidance/ng51?unlid=280104107201611917351>

Meningitis (bacterial) and meningococcal septicaemia in under 16s: recognition, diagnosis and management

<https://www.nice.org.uk/guidance/cg102>

Diabetic Ketoacidosis (DKA) - British Society of Endocrinology and Diabetes endorsed guidance

http://www.bsped.org.uk/clinical/clinical_endorsedguidelines.aspx

Royal College of Physicians - stroke in childhood (2017)

<http://www.rcpch.ac.uk/stroke-guideline>

NICE guideline: Child maltreatment: when to suspect maltreatment in under 18s

<https://www.nice.org.uk/guidance/cg89>

Royal College of Psychiatrist's Practice standards for young people with substance misuse problems

<http://www.rcpsych.ac.uk/pdf/Practice%20standards%20for%20young%20people%20with%20substance%20misuse%20problems.pdf>

NICE guideline: epilepsy in children and young people

<https://www.nice.org.uk/guidance/qs27>

Carbon Monoxide Poisoning: Department of Health Guidance

<https://www.gov.uk/government/publications/carbon-monoxide-poisoning>

Key Issues

Decreased conscious level is defined as being unresponsive, or responding only to voice or pain on the Alert, Voice, Pain, Unresponsive (AVPU) scale, or a Glasgow Coma Score (GCS) or modified GCS of 14 or less (box 1).

The differential diagnosis to consider within the first hour and key management points are shown in Box 2.

Box 1: Scales for assessing consciousness

AVPU Scale – decreased consciousness = V or less

A = Alert, V = Responds to voice, P = responds to pain, U = unresponsive

Glasgow Coma Score (GCS)

Eye: 4 = Open, 3 = To command, 2 = To pain, 1 = no response

Motor: 6 = Obeys command, 5 = Localises, 4 = flexion withdrawal 3 = abnormal flexion, 2 = abnormal extension, 1 = No response

Voice: 5 = Converses, 4 = Confused, 3 = Inappropriate words, 2 = Incomprehensible, 1 = No response

Modified GCS Modifications for (children under 5 years or with developmental delay)

Eye: 4 = Open, 3 = To command, 2 = To pain, 1 = no response

Motor: 6 = Normal spontaneous movements, 5 = localised to supraorbital pain OR withdraws from touch, 4 = withdraws from nail bed pain 3= Abnormal flexion in response to pain 2 = Abnormal extension in response to pain 1 = no motor response

Voice: 5 = Orientated to sounds, interacts, normal vocalisation for patient, 4 = cries but consolable, inappropriate interactions 3 = inconsistently inconsolable, moaning, 2 = Inconsolable, agitated 1= No verbal response

Box 2: Differential Diagnosis for decreased conscious level

| Diagnosis | Assessment and Management Notes |
|------------------------------------|--|
| Shock | See emergency management section - Circulation |
| Raised Intracranial Pressure | See emergency management section – Disability |
| Seizure | |
| Post convulsion (post-ictal state) | |
| Trauma | |
| Sepsis | Diagnosis: Temperature > 38°C or <35.5°C or Tachycardia or Tachypnoea or White cell count > 12x10 ⁹ /L or < 4x10 ⁹ /L or Non-blanching rash |

| | |
|--------------------------|--|
| | <p>Investigations:</p> <ul style="list-style-type: none"> • Chest X-Ray, • Urine culture, • Blood PCR (meningococcus and pneumococcus), • Coagulation studies • Skin swab (inflamed areas), • Joint aspiration (if signs of septic arthritis) • Thick and thin film for malarial parasites (if foreign travel to endemic area) <p>Management: Follow NICE Sepsis guidelines (see resources)</p> |
| Acute Hydrocephalus | See RCPCH guidelines on childhood stroke (see resources) |
| Stroke | |
| Metabolic diseases | <p>Hypoglycaemia: See emergency management section (Disability)</p> <p>Diabetic Ketoacidosis: Use DKA guideline (see resources)</p> <p>Hyperammonaemia:</p> <ul style="list-style-type: none"> • free flowing sample required (arterial or venous), transported on ice. <p>Consider a level of > 100 micromol/L as abnormal and seek expert metabolic advice</p> |
| Intracranial infection | <p>Differential: Meningitis (Bacterial or TB), Intracranial Abscess, Herpes Simplex Encephalitis (HSE)</p> <p>Investigations: Lumbar puncture if no contraindications (see Box)</p> <p>Management:</p> <ul style="list-style-type: none"> • HSE: Aciclovir (duration decided by local infectious diseases expert) • Meningitis (Bacterial or TB): NICE guidelines (see resources) |
| Intoxication / poisoning | <p>Diagnosis: Alcohol intoxication was the most common cause of decreased consciousness identified in the 2011 multi-site audit(3).</p> <p>Investigations: Consider blood alcohol test when considered as a cause of decreased conscious level</p> <p>Management:</p> <ul style="list-style-type: none"> • Manage according to APLS principles – beware of respiratory failure and aspiration • Treat hypoglycaemia • Consider all likely contributory drugs |
| Hypertension | <p>Investigations</p> <ul style="list-style-type: none"> • Look for signs of raised intracranial pressure and papilloedema • Perform 4 limb blood pressure • Perform urinalysis for blood/protein • U+Es <p>Management</p> <ul style="list-style-type: none"> • Discuss with PICU/nephrology if decreases conscious level and blood pressure > 95th centile for age |

History Taking

The following should be ascertained, with the timing noted:

- duration of symptoms
- vomiting
- headache
- fever
- convulsions
- periods of fluctuating consciousness
- trauma
- ingestion of medications, alcohol or recreational drugs
- presence of medications in the child's home

Observations

Key observation parameters are specified in Box 3

Box 3: recommendations for observations and continuous monitoring

Record the following observations on first assessment and then repeat regularly

- heart rate
- respiratory rate
- oxygen saturations
- blood pressure
- physical appearance/state
- temperature

Consider measuring the following continuously:

- oxygen saturations
- continuous cardiac monitoring (ECG leads)

Record conscious level using AVPU or GCS:

- every 15 minutes if GCS is less than or equal to 12 or V on AVPU scale
- every 30 minutes if GCS is greater than 12

A decrease in AVPU or GCS indicates the need for an urgent medical review

Emergency assessment and management

A structured 'ABCD' approach should be taken for a child with a decreased conscious level.

Airway and Breathing

- Consider intubation if GCS is less than 8 (or patient is unresponsive to pain on the AVPU), unless the child is showing signs of improvement.
- Give 100% oxygen if oxygen saturations are 95% or less.

Circulation

Circulatory compromise should be considered if one or more of the following are present:

- Mottled, cool extremities
- Diminished peripheral pulses

Consider circulatory shock if one or more of the following are present:

- Systolic blood pressure is less than 5th percentile for age
- Decreased urine output less than 1 ml/kg/hour

In children with decreased conscious level and shock, consider the following diagnoses:

- Sepsis,
- Trauma,
- Anaphylaxis
- Heart failure

The following factors should be considered in treating shock:

- Administer a fluid bolus of 20 mL/kg of isotonic fluid if shock is present in a child with decreased conscious level unless ketoacidosis or raised intracranial pressure is present; in these circumstances give 10 ml/kg of isotonic fluid. Assess the response to the fluid bolus (e.g normalisation of tachycardia)
- Consider administering fluid boluses of up to and over 60 mL/kg, as guided by clinical response
- Consider intubation and ventilation if more than 40 mL/kg of fluid bolus has been given, to prevent uncontrolled pulmonary oedema developing. Children who have not responded to 40ml/kg fluid bolus should be monitored in an HDU / ITU setting

- Consider starting drug treatment to support the circulation (usually peripheral dopamine) and refer to paediatric intensive care if more than 40 mL/kg of fluid has been given with little clinical response

Disability

- Neurological status should be continually monitored (Box 1); deterioration in conscious level requires urgent reassessment (Box 1)
- As part of a careful general examination, assess all children for evidence of trauma from a collapse and request core investigations to detect any underlying medical cause (see box 6).
- The possibility of non-accidental injuries and safeguarding concerns should always be considered; use national guidance (see resources) to assess for alerting features

Blood glucose:

- Measure capillary glucose within 15 minutes of presentation
- If capillary blood glucose is ≤ 3 mmol/L give 2ml/kg of 10% dextrose intravenously and consider performing a hypoglycaemia screen (see box 4)
- An infusion containing 10% dextrose may then be needed to maintain CBG between 4 and 7 mmol/L
- Consider seeking urgent support from an endocrinology or metabolic specialist

Box 4: Hypoglycaemia screen recommendations

If blood glucose is < 3 mmol/L consider the following additional investigations

- Plasma insulin
- Plasma cortisol
- Plasma growth hormone
- Plasma free fatty acids
- Plasma beta-hydroxybutyrate (consider bedside ketone monitor)
- Plasma Acyl-carnitine profile (on blood spot card)
- Urine organic acids
- Plasma amino acids

Refer to the British Inherited Metabolic Disease Group (BIMDG) Recurrent Hypoglycaemia Guideline for further information (see resources)

Seizures

- Perform a detailed history and examination in a child during the first hour of a child in post-convulsive state, and consider observation alone if capillary glucose is normal without performing any other tests. Reassess the child if they have not awoken from the post-convulsive state within one hour
- A child presenting a prolonged seizure (lasting more than 5 minutes) should be managed as per APLS and local status epilepticus guidelines (see resources).
- In addition to checking the CBG, check plasma calcium and magnesium levels
- If seizures continue despite anticonvulsant treatment consider discussing with a paediatric intensivist, especially if:
 - Plasma sodium level less than 125 mmol/l
 - Ionized calcium level less than 0.75 mmol/l or plasma calcium level less than 1.7 mmol/l
 - A plasma magnesium level less than 0.65 mmol/l

Raised intracranial pressure

Signs of raised intracranial pressure are shown in Box 5. If increased intracranial pressure (ICP) is suspected:

- Request urgent cranial imaging and discuss with PICU
- Consider sedation, intubation and ventilation before imaging to maintain a PaCO₂ between 4.5 and 5 kPa
- Position the child's head in the midline with 20 degree upwards tilt
- Avoid internal jugular central lines
- Give restricted isotonic fluids
- Consider giving mannitol or hypertonic saline

Box 5: Signs of raised intracranial pressure

- Pupillary dilation (unilateral or bilateral)
- Pupillary reaction to light impaired or lost
- Bradycardia (heart rate less than 60 beats per minute)
- Hypertension (mean blood pressure above 95th centile for age)

- Abnormal breathing pattern
- Abnormal posture

Core Investigations

Suggested core investigations for a child with a decreased conscious level are shown in Box 6. If drug ingestion or overdose is suspected, consider saving a plasma sample for future toxicology analysis.

Box 6: core investigations

- Capillary and laboratory blood glucose
- Blood gas
- FBC, U&E, LFT + blood film
- Plasma ammonia + lactate
- Blood culture
- * Serum save sample
- Urinalysis
- 10 ml of urine to be saved for later analysis (including urine toxicology)

When to perform lumbar puncture

- A lumbar puncture should be performed when no acute contraindications exist (see box 7) for the following working diagnoses:
 - Bacterial Meningitis/Sepsis
 - Viral Encephalitis
 - Tuberculous Meningitis
 - Cause unknown

- A normal CT scan does not exclude raised intracranial pressure and should not influence the decision to perform lumbar puncture if other contraindications are present.
- The decision to perform a lumbar puncture in a child with a decreased conscious level should be made by an experienced paediatrician or consultant with paediatric experience who has examined the child.

Box 7: Contraindications for lumbar puncture

- Signs of raised ICP
- GCS of 8 or less
- Deteriorating GCS
- Focal neurological signs
- A convulsion lasting more than 10 minutes with a GCS of 12 or below
- Shock
- Clinical evidence of systemic meningococcal disease
- CT or MRI scan suggesting blockage or impairment of the cerebrospinal fluid pathways

NOTE:

- **Beware of performing lumbar puncture in children with abnormal clotting**
- **A normal CT scan does not exclude raised intracranial pressure**

Cranial Imaging

Carry out an urgent cranial CT or MRI scan when the child is stable if the working diagnosis is

- raised intracranial pressure
- intracranial abscess
- unknown cause of reduced GCS.

Consider performing a cranial MRI scan within 48 hours if the diagnosis is still uncertain

What to do if the cause is still unclear

Consider other causes:

- Deliberate harm/injury by others (safeguarding concerns)
- Overdose/ accidental ingestion of a toxic substance

- Sedation/anaesthesia/analgesia
- Carbon monoxide
- Hashimoto Encephalopathy

Consider performing additional tests in discussion with a specialist after reviewing core investigations if the cause of decreased conscious level remains unknown (eg EEG)

Critical Appraisal

The full guidelines has been summarised into a poster algorithm (see resources). However, there are some discrepancies between the two which may lead to variation of practice:

- This guideline directs readers to consider trauma, non-accidental injury and safeguarding concerns in a child with a decreased conscious level. These are not included as differentials in the summary poster
- The full guidelines states that a child in a post-convulsive state with a normal blood sugar may be observed with careful assessment in the first hour, whereas the summary poster implies performing core investigations in all cases.

In addition to the history taking points specified in this guideline, a wider approach should be taken, including asking about history of foreign travel, and enquiry into family and social factors including consanguinity, household composition (in consideration of non accidental injury), and drug and alcohol use.

Carbon monoxide poisoning is discussed in the guideline as a potential cause for altered consciousness but not included in the poster. However, given that the Chief Medical and Nursing Officers warn that carbon monoxide poisoning is likely to be under diagnosed and that children are at increased risk of death and neurological injury(5), there is a strong case for assessment and management of carbon monoxide poisoning being specifically addressed by including Carbon Monoxide blood levels as a core investigation.

WHAT SHOULD I START DOING

- Look for signs of raised intracranial pressure in all children with a decreased conscious level; consider intubating and ventilating patients in this group before cranial imaging.
- Perform investigations (Box 4) including a plasma ammonia level in all children with a decreased conscious level of uncertain cause.

- Ensure that the decision to perform a lumbar puncture in a child with a decreased conscious level is made by an experienced paediatrician or consultant who has also examined the child in conjunction with a review of available imaging
- Assess all patients for alcohol/drug intoxication – alcohol intoxication was identified as the most common cause of decreased consciousness in a national audit(3)
- Ensure there is detailed documentation of the history and examination. This will help with continuity of care and act as a medico-legal record.

WHAT SHOULD I CONTINUE TO DO

- Continue to consider non-accidental injury in all children presenting with a decreased consciousness level
- Take a careful and thorough history including family history and foreign travel
- Involve parents early and ensure they are informed of emergency and on-going management
- Take a blood glucose level in all patients with a decreased conscious level and consider a hypoglycaemia screen when blood sugar is < 3 mmol/L (box 3)
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References

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