Guideline

Infants and Children: Acute Management of Altered Consciousness in Emergency Departments

Summary Clinical practice guideline for the care of infants and children with altered consciousness in Emergency Departments.

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Branch contact 02 9391 9764

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Distributed to Divisions of General Practice, Government Medical Officers, NSW Ambulance Service, Ministry of Health, Private Hospitals and Day Procedure Centres, Tertiary Education Institutes

Audience Emergency Departments;Nursing;Medical;Clinicians

NSW GOVERNMENT Health

GUIDELINE SUMMARY

INFANTS AND CHILDREN: ACUTE MANAGEMENT OF ALTERED CONSCIOUSNESS IN EMERGENCY DEPARTMENTS

PURPOSE

The *Infants and Children: Acute Management of Altered Consciousness in Emergency Departments: first edition* Clinical Practice Guideline has been developed to provide direction to clinicians and is aimed at achieving the best possible paediatric care in all parts of the state. The Clinical Practice Guideline was prepared for the NSW Ministry of Health by an expert clinical reference group under the auspice of the state wide Paediatric Clinical Practice Guideline Steering Group.

KEY PRINCIPLES

This guideline applies to all facilities where paediatric patients are managed. It requires the Chief Executives of all Local Health Districts to have local guidelines / protocols based on the attached Clinical Practice Guideline in place in all hospitals and facilities required to assess or manage children with altered consciousness.

The clinical practice guideline reflects what is currently regarded as a safe and appropriate approach to the acute management of altered consciousness in infants and children. However, as in any clinical situation there may be factors which cannot be covered by a single set of guidelines. This document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. **It does not replace the need for the application of clinical judgement to each individual presentation.**

USE OF THE GUIDELINE

Chief Executives must ensure:

- Local protocols are developed based on the *Infants and Children: Acute Management of Altered Consciousness in Emergency Departments: first edition* Clinical Practice Guideline
- Local protocols are in place in all hospitals and facilities likely to be required to assess or manage paediatric patients with altered consciousness
- Ensure that all staff treating paediatric patients are educated in the use of the locally developed paediatric protocols.

Directors of Clinical Governance are required to inform relevant clinical staff treating paediatric patients of this new guideline.

REVISION HISTORY

Version	Approved by	Amendment notes
December 2014 GL2014_019	Deputy Secretary, Population and Public Health	New Guideline

ATTACHMENT

1. *Infants and children: Acute Management of Altered Consciousness in Emergency Departments: First Edition,* Clinical Practice Guideline.

NSW KIDS + FAMILIES

INFANTS AND CHILDREN

+

Acute Management of Altered Consciousness in Emergency Departments: first edition

CLINICAL PRACTICE GUIDELINE

Issue date: 15 December 2014

GL2014_019

NSW GOVERNMENT Health

healthy, safe and well

NSW Kids and Families
73 Miller Street
NORTH SYDNEY NSW 2060
Tel. (02) 9391 9000
Fax. (02) 9391 9101
www.kidsfamilies.health.nsw.gov.au

SHPN: (NKF) 140372.
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Further copies of this document can be downloaded from www.kidsfamilies.health.nsw.gov.au

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A revision of this document is due in 2019

CONTENTS

1 BACKGROUND

1.1 Purpose

These Guidelines are aimed at achieving the best possible paediatric care in all parts of the State. The document should not be seen as a stringent set of rules to be applied without the clinical input and discretion of the managing professionals. Each patient should be individually evaluated and a decision made as to appropriate management in order to achieve the best clinical outcome.

Field, M.J. & Lohr, K.N. (1990) define clinical practice guidelines as:

*'systematically developed statements to **assist** practitioner and patient decisions about appropriate health care for specific clinical circumstances.'*

(Field MJ, Lohr KN (Eds). Clinical Practice Guidelines: Directions for a New Program, Institute of Medicine, Washington, DC: National Academy Press)

It should be noted that this document reflects what is currently regarded as a safe and appropriate approach to care. However, as in any clinical situation there may be factors which cannot be covered by a single set of guidelines and therefore this document should be used as a guide, rather than as a complete authoritative statement of procedures to be followed in respect of each individual presentation. It does not replace the need for the application of clinical judgment to each individual presentation.

This document represents basic clinical practice guidelines for the management of altered consciousness in children in the emergency department. Local health districts and specialty health networks are responsible for ensuring that local protocols based on these guidelines are developed. Local health districts and specialty health networks are also responsible for ensuring that all staff treating paediatric patients are educated in the use of the locally developed paediatric guidelines and protocols.

In the interests of patient care it is critical that contemporaneous, accurate and complete documentation is maintained during the course of patient management from arrival to discharge.

Parental anxiety should not be discounted:

it is often of significance even if the child does not appear especially unwell.

1.2 Summary

Altered consciousness in a child is an uncommon but worrying presentation. Altered consciousness includes delirium as well as diminished consciousness. Delirium in the absence of fever should be of particular concern.

Initial emergency management along conventional ABCDEFG (Airway, Breathing, Circulation, Disability, Exposure, Fluids, Glucose) lines should be provided at the same time as initial assessment.

There are a number of specific treatments for conditions that cause altered consciousness, and any underlying cause(s) should be corrected as a matter of urgency.

The degree of altered consciousness can be quantified by various scales including AVPU (Alert, Voice, Pain, Unresponsive) and GCS (Glasgow Coma Scale), modified when necessary for the child under five years of age.

This guideline is intended to provide a quick and practicable approach to diagnosis and supportive management in any situation where professionals or the child's carers are concerned about a child's level of consciousness.

It is intended for use primarily at the point of first contact including ambulance, GP surgery or emergency department and to complement the Between the Flags paediatric Tier two education called DETECT Junior, as well as a number of existing NSW Emergency Paediatric Clinical Practice Guidelines (CPGs).

It also recognizes increased availability of point of care pathology testing in most health care facilities, making serum biochemistry results more immediately available.

1.3 Overview

The frequency and common causes of altered consciousness vary with age. An overall childhood incidence is reported of 60/100,000 child population p.a. with equal numbers due to head injury and non-traumatic causes[1]. In children in the first year of life the incidence of non-traumatic coma is as high as 160/100,000 p.a. See Table 1.Table 1:

Frequency and causes of non-traumatic coma.[1]

Age	Accident	Congenital	Epilepsy	Infection	Toxin	Metabolic	Others	Unknown
<1y	3.2%	17.2%	4.3%	50.5%	0%	4.3%	6.5%	14.0%
1-5y	11.2%	3.4%	13.5%	33.7%	10.1%	6.7%	4.5%	16.9%
6-12y	5.6%	7.4%	16.7%	31.5%	7.4%	5.6%	13.0%	13.0%
13-16y	6.5%	0%	4.3%	28.3%	34.8%	2.2%	10.9%	13.0%
Total	6.7%	8.2%	9.6%	37.9%	10.3%	5.0%	7.8%	14.5%

The overall mortality in this study was 127 (45%) out of 284 presentations. Overall, infection was the single commonest group of causes in the non-traumatic group, representing 38%. Toxins and epilepsy each accounted for an additional 10%. In a substantial number (14%) the cause remained unclear despite extensive investigation. Most congenital causes were complications of congenital heart disease, due to cerebro-vascular complications of congenital heart disease.

There is a measure of urgency in identifying and treating specific causes. Blood glucose levels should be measured at presentation. For assessment of a sick baby or child refer to *Recognition of the Sick Baby or Child in the Emergency Department* [2]. If sepsis is considered then manage according to the *Paediatric Sepsis Pathway* [3].

If bacterial meningitis rather than sepsis is the likely diagnosis, refer to *Infants and Children: Bacterial Meningitis* Clinical Practice Guideline[4]. Administration of appropriate antibiotics should be the highest priority, ideally with completion of the first dose within 30 minutes of presentation.

Fluid administration should take account of the risks of fluid overload in children with meningitis including raised intra-cranial pressure. Refer *to Infants and Children: Acute Management of Bacterial Meningitis* [4] for specific advice regarding management.

Imaging, CT (computed tomography) or MRI (magnetic resonance imaging) should be performed early if the diagnosis is uncertain after initial assessment, investigation and stabilisation [5]. The possibility of non-accidental injury should be considered, especially in

the young child with head or other traumatic injury. The retinae should be examined for possible hemorrhages as well as papiloedema.

Decisions regarding escalation of care should involve the most senior expertise available on site. Contact should be made with **NETS 1300 36 2500** if ongoing concern about diagnosis or management.

2 SCOPE

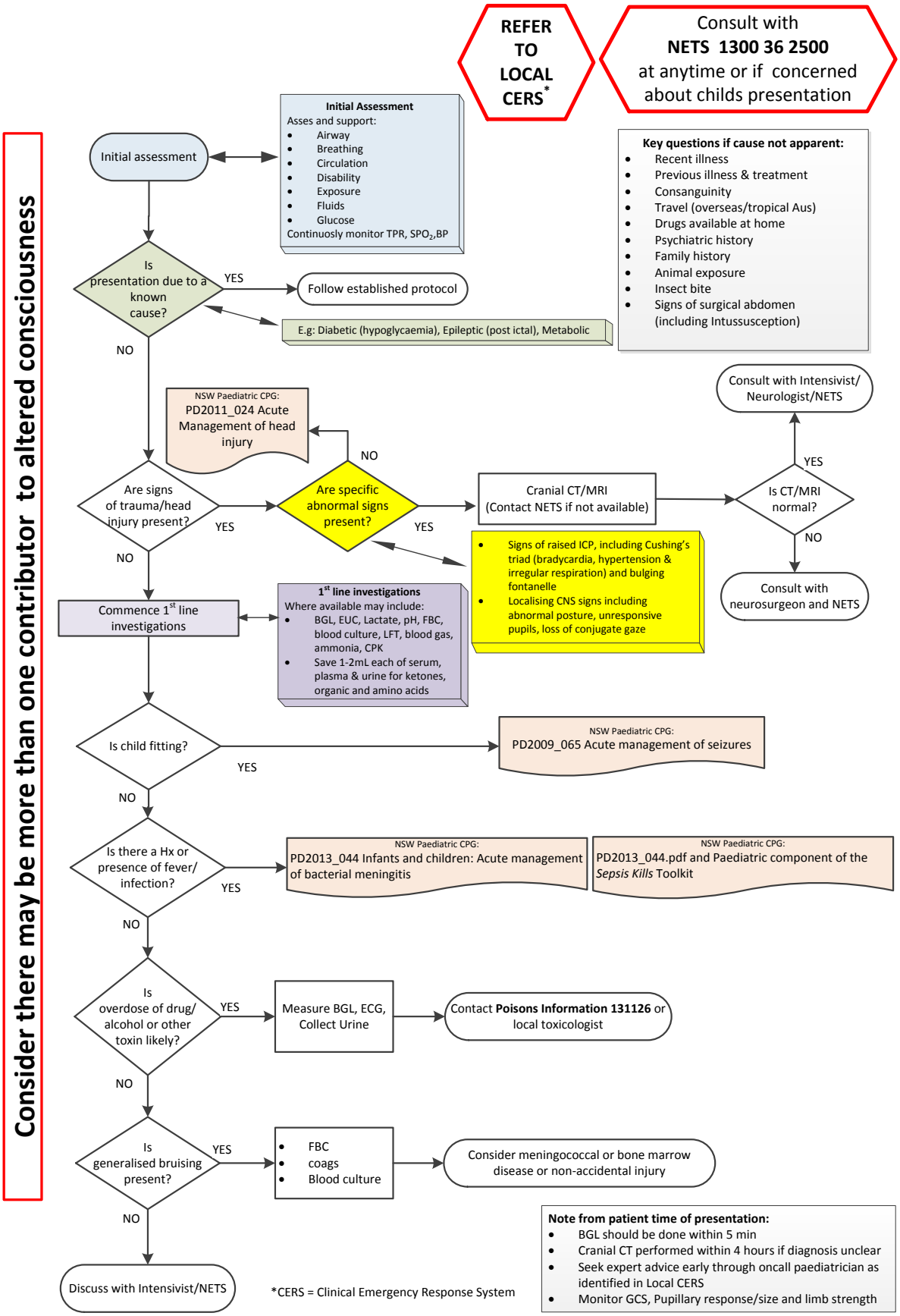
2.1 Entry criteria

The algorithm on the following page should be used for children less than 16 years of age who present (to an Emergency Department) with altered consciousness. This is defined as:

- Scoring < 15 on the GCS or Modified GCS
- Responding only to voice, pain or being unresponsive on the AVPU scale
- If the parent/carer expresses concern regarding their infant/child's level of consciousness
- Staff concern regarding child's level of consciousness.

Special considerations: *Infants/children with disabilities should be compared with their usual responsiveness. Parents are likely to best advise if their response is abnormal or reduced. GCS may be appropriate.*

2.2 Algorithm



3 PRINCIPLES OF PRACTICE

3.1 Minimising delay in initial diagnosis

The underlying cause of altered consciousness may be immediately apparent, for example following head injury. At other times the presence of other clinical features will suggest investigation of specific causes, for example of possible infection if there is fever. Abrupt onset of reduced consciousness may be a pointer to intra-cranial haemorrhage, seizure, arrhythmia, trauma or toxin.

Prior headaches, vomiting or diplopia (double vision) suggest raised intra-cranial pressure.

In the absence of specific pointers or a history of previous similar episodes, blood sugar should be measured without delay.

Key components of the neurological examination:

- Level of consciousness
- Muscle tone, posture, movement and reflexes
- Brainstem reflexes including pupillary responses and corneal reflexes.

Infection represents the most common cause after trauma. Early administration of antibiotics significantly improves the likelihood of good outcome for sepsis. This should be achieved within 60 minutes of presentation, with administration also of intravenous corticosteroids at or before the first dose of antibiotic.

3.2 Assessment and management

Initial management

Assessment and management should follow the structured approach of ABCDEFG. In particular determine Glascow Coma Score (GCS) or modified GCS for the child under five.

Assess for:

- Raised intra-cranial pressure (ICP) - Cushing's triad of bradycardia, raised blood Pressure and irregular respiration (note that these are late signs of raised ICP);
- Abnormal pupillary responses
- Loss of conjugate gaze
- Abnormal posture
- Ocular fundi for papillodema and retinal haemorrhage.

Ask about:

- Previous similar presentations
- Trauma
- Seizures
- Fevers
- Recent illnesses, including rashes

- Diarrhea and vomiting
- Exposure to drugs and medications, including:
    - Accidental overdose/poisons
    - Alcohol, recreational drugs
    - Oncology treatment.

Other questions to consider:

- Neurological-developmental disorder
- Consanguinity
- Family history of similar problems or acute life threatening event
- Exposure to contacts with illness
- Risk factors for HIV
- Recent travel
- Exposure to animals, including insect bites
- Immunisations/immune status.

Empirical treatment should include ceftriaxone and steroids followed by acyclovir, if an infectious cause cannot be ruled out.

3.3 Investigations

First line investigation and diagnostic tests:

Intravenous (IV) or intraosseous (IO) blood should be collected if possible, at cannulation, for:

- Culture
- Electrolytes, Sodium, Urea, Creatinine, Glucose (EUCG) full blood count (FBC)
- Blood gas analysis, including lactate
- Calcium
- Magnesium
- Ammonia – requires a fresh sample on ice for immediate analysis
- Creatine phosphokinase (CPK).

Blood should be taken for storage of serum, plasma and EDTA (for DNA storage)

Note: If IO samples “IO Sample” should be documented on the request form.

Urine (5-10mL) should be tested for:

- Sugar
- Ketones
- Drug screen

- Urine metabolic screen, note – urine metabolic samples need to be frozen immediately.

If bacterial meningitis is a possible cause and blood culture (2-10mL) cannot be collected ceftriaxone should be given IM without further delay and the child escalated to care in a more specialised unit.

Commence steroids if suspected/confirmed acute bacterial meningitis in the child ≥ 3 months of age and not pre-treated with parental antibiotics. Refer to *Infants and Children: Acute Management of Bacterial Meningitis* for specific advice regarding management.

Encephalitis is usually caused by viral infection or other inflammatory disease. Encephalopathy due to metabolic disorders, drugs or toxins typically have a more gradual onset and absence of fever, increased CSF (cerebrospinal fluid) white cell count or changes on MRI. Clinicians should be aware of the possibility of emerging infections, including currently enterovirus V71 and parechoviruses. United Kingdom data reports an annual incidence of acute encephalitis of 2.8/100,000 children and 8.7/100,000 for infants under one year [5].

Herpes simplex and Enterovirus are the most common viral causes of encephalitis in the immuno-competent child in Australia. Immuno-comprised children are more likely to develop encephalitis from other Herpes group viruses including Epstein-Barr, Cytomegalovirus and human herpes viruses 6 & 7. If the diagnosis or management are unclear on completion of the algorithm, expert advice should be sought from a paediatrician and/or intensivist.

CT scan should be performed, as soon as the child is stable with adequate airway protection, if the diagnosis remains unclear.

3.4 Ongoing management

Ongoing management should comprise continuing attention to ABCDEFG, detection and treatment of any identified cause and frequent observations documented on a NSW Health Standard Paediatric Observation Chart including a GCS. These observations should be repeated at least every 15 minutes while the child has altered consciousness.

Repeated observations should help identify any acute deterioration but remember that carer's perceptions of their ill child are also of great importance.

Investigation and further diagnostic tests for potential metabolic and endocrine causes.

Inborn errors of metabolism (also known as genetic metabolic disorders), though individually rare, may present at any age from infancy to adulthood. In many cases, episodes of serious clinical deterioration, potentially triggered by a number of factors, may result in acute presentation to the emergency department for urgent evaluation and, where needed, resuscitative therapies.

Triggering factors, depending on the underlying metabolic disorder, may include:

- Febrile illnesses with or without overt signs of sepsis
- Acute gastroenteritis
- Poor caloric intake for other reasons
- Excessive protein intake
- Excessive exercise.

Other clinical features that may be a clue to an inborn error of metabolism include:

- Unexplained heart failure
- Unexplained acute liver failure
- Unexplained cerebral oedema.

Biochemical clues that should raise a suspicion of an inborn error of metabolism include:

- Hypoglycaemia
- Metabolic acidosis, especially if the anion gap is increased
- Respiratory alkalosis
- Raised CPK (creatine phosphokinase) suggestive of rhabdomyolysis
- Hyperammonaemia
- Severe derangement of liver enzymes.

Early consultation with a metabolic physician (specialist in inborn errors of metabolism; on call 24 hr a day through NETS) is warranted, to provide advice on urgent metabolic investigations, and specific acute resuscitative therapies that may be appropriate.

Investigations which should be performed in any child presenting with acute encephalopathy, where an inborn error of metabolism is a possibility, include:

- Urine
  - Ketones
  - Urinary amino and organic acid screens (metabolic screen).
- Blood or plasma
  - Electrolytes, calculate anion gap
  - pH and blood gases
  - Glucose
  - Ammonium
  - Lactate and pyruvate
  - LFTs
  - FBC and film
  - Plasma amino acids†
  - Plasma carnitine and acylcarnitine profile†.

† When specifically indicated and following consultation with a metabolic specialist.

Endocrine causes of hypoglycaemia should also be considered. Further investigation of hypoglycaemia should include serum lactate, if not already performed, insulin, cortisol, growth hormone, free fatty acids, beta hydroxybutyrate, acyl carnitine, urinary organic and amino acids [5].

Identification of acute deterioration

Observations should be repeated frequently to identify potential deterioration.

As a minimum the following observations should be measured and recorded every 15 minutes whilst the child has altered consciousness and documented on an appropriate SPOC:

- Respiratory rate
- Heart rate
- Blood pressure
- GCS.

Oximetry should be monitored continuously to maintain oxygen saturations of greater than 94%.

Any concern by carer about deterioration should prompt immediate re-evaluation.

It is essential to mobilise appropriately skilled clinicians if an obtunded state exists as it will likely lead to inadequate airway reflexes or hypoventilation necessitating mechanical ventilation.

3.5 Psychosocial needs of the family

Family and carers should be kept fully informed of progress, including likely cause, the need for investigations, response to treatment and likely outcome. As with other resuscitation scenarios, they should be encouraged to stay with the child if they wish. Ideally a senior staff member or social worker should be specifically assigned to provide support. Good communication is always central to patient and carer perception of standard of care received, which is no less important when the outcome is poor or uncertain.

3.6 Discharge information and follow up

Discharge information will depend on the diagnosis, outcome and planned follow up. Particularly in the case of metabolic diseases that may recur it is essential that the carers should have a report detailing investigation and management of any suspected recurrence, for their own information and to guide emergency staff. This should include contact details of specialist clinicians responsible for long term management.

A copy of the discharge summary should be sent to the referring clinician as well as the child's general practitioner.

4 APPENDICES

4.1 Appendix 1: References

1. Incidence, aetiology and outcomes of non-traumatic coma; a population based study. *Arch Dis Child* 2001; 84, 193-9.

2. NSW Health, 2011, PD2011_038, Recognition of a Sick Baby or Child in the Emergency Department, 2011.

3. *Sepsis Kills Toolkit*, Paediatric Sepsis Pathway, Clinical Excellence Commission, 2013, *www.cec.health.nsw.gov.au/programs/sepsis*

4. NSW Health, 2013, PD2013_044 Infants and children: Acute Management of Bacterial Meningitis, 2013.

5. Stevens RD et al., Approach to the comatose patient 2006 *Critical Care Medicine* vol 34(1) p 31-41.

6. Jenke AC et al., Approach to the comatose child 2005 *Italian J Paediatrics* 31(5) p314-324

4.2 Appendix 2: Additional resources

Advanced Paediatric Life Support, The Practical Approach Fifth Edition, 2012, BMJ Books, Chapter 7

NSW Health, 2009, PD2009_065 Infants and Children: Acute Management of Seizures

NSW Health, 2011, PD2011_024 Infants and Children: Acute Management of Head Injury

Paediatric A&E Research group 'the management of a child (0-18) with a decreased conscious level, 2008 viewed 26.4.2013 http:ww.nottingham.ac.uk/paediatric-guideline/Guideline%20algorithm.pdf

Evaluation of stupor and coma in children, 2010 viewed 2.5.2013: http:www.uptodate.com American Academy of Pediatrics, 'Increased intra-cranial pressure: signs and symptoms viewed 25.7.2011, www.pediatriccareonline.org

Royal Children's hospital, Melbourne guideline 'Coma in children' http://www.rch.org.au/clinicalguide/guideline_index/Coma/

Thompson et al., 2012. Encephalitis in children, *Arch Dis Child*,; 97:150-161

BMJ Best Practice, assessment of coma viewed 2.5.2013

McKechnie MD et al., 2001, Assessment of the child with altered level of consciousness *Eur J Emergency Med* 8 (4) p251-252.

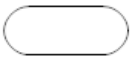
Festa, M., Leaver, J. (eds), 2012, *DETECT Junior manual*, Sydney: Clinical Excellence Commission.

UpToDate, 2013, Patient information: Coma (The Basics), Topic 83678, Version 1.0.

Huppatz C, et al. Etiology of encephalitis in Australia, 1990-2007.*Emerg Infect Dis*. 2009; 15: 1359-65.

4.3 Appendix 3: Algorithm Key

The following information provides the key to symbols used in the algorithms.

Terminal or terminator shape 

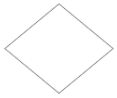
This shape tells you where the algorithm begins and ends. It shows the entry point of your algorithm and the exit point. Usually an algorithm has one starting point. However, an algorithm can have as many ending points as needed.

Rectangle 

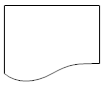
In most algorithms, the rectangle is the most common shape. It is used to show a process, task, action, or operation. It shows something that has to be done or an action that has to be taken. The text in the rectangle almost always includes a verb.

Lines with arrows

You read an algorithm by following the lines with arrows from shape to shape. The lines with arrows determine the flow through the chart. Algorithms are usually drawn from top to bottom or left to right.

Decision 

A decision asks a question. The answer to the question determines which arrow you follow out of the decision shape. The arrows flowing from the decision shape are usually labelled with Yes, No or True, False. But you can label them any way you want as long as the meaning is clear.

Document 

A rectangle with a curved bottom represents a document, additional information or report.

Predefined process 

This shape refers to a process (e.g. protocol, skill) that is defined elsewhere. This shape means that there is a document for the predefined process that has already been drawn and you should reference it for more information.

4.4 Appendix 4: Glasgow Coma Scale and modified Glasgow Coma Scale [6]

Glasgow Coma Scale		Modified Glasgow Coma Scale (<5yrs)	
Eye opening		**Eye opening**	
Spontaneously	4	Spontaneously	4
To speech	3	To speech	3
To pain	2	To pain	2
No response	1	No response	1
Best verbal response		**Best verbal response**	
Orientated and converses	5	Alert; babbles, coos, words to usual ability	5
Confused and converses	4	Less than usual words, spontaneous irritable cry	4
Inappropriate words	3	Cries only to pain	3
Incomprehensible sounds	2	Moans to pain	2
No response to pain	1	No response to pain	1
Best motor response		**Best motor response**	
Obeys verbal command	6	Spontaneously/obeys verbal command	6
Localises to pain	5	Localises to pain/withdraws to touch	5
Withdraws from pain	4	Withdraws from pain	4
Abnormal flexion to pain (decorticate)	3	Abnormal flexion to pain (decorticate)	3
Abnormal extension to pain (decerebrate)	2	Abnormal extension to pain (decerebrate)	2
No response to pain	1	No response to pain	1
Maximum score	**15**	***Maximum score***	**15**

4.5 Appendix 5: Expert Working Group

Dr Keith Howard	Paediatrician, Maitland Hospital (Chair)
Sarah Patterson	Project Officer, Paediatric CPGs, Clinical Excellence Commission (Secretariat) til February 2014
Paul Hunstead	Clinical NUM, Emergency, Sydney Children's Hospital's Network, Randwick
Rhonda Winskill	Paediatric Children's Healthcare Network CNC, Hunter New England LHD
Dr Richard Lennon	Paediatric Emergency Specialist, Royal North Shore Hospital
Leanne Crittenden	Northern Coordinator, Children's Healthcare Network
Darryn Binks	A/Manager Clinical Professional Development, Ambulance Service of NSW
Dr Chris Webber	NETS and Sydney Children's Hospitals Network, Randwick
Prof John Christodoulou	Director, Western Sydney Genetics Program, Sydney Children's Hospital's, Westmead Head, Discipline of Genetic Medicine, Sydney Medical School, University of Sydney
Dr Marino Festa	Paediatric Intensivist, Sydney Children's Hospital's Network, Westmead
Dr Murray Barrell	GPVMO Grafton
Jane Cichero	Paediatric Guideline Coordinator NSW Kids and Families (Secretariat) - February 2014

Acknowledgement given to the following people for their specific input:

Adam Moon	Coordinator Clinical Policies, Clinical Governance, Ambulance Service of NSW

4.6 Appendix 6: Glossary

ABCDEFG	Airway, Breathing, Circulation, Disability, Exposure, Fluids, Glucose
AVPU	Alert Verbal Pain Unresponsive
BGL	Blood glucose level
BP	Blood pressure
CERS	Clinical Emergency Response System
CNS	Central Nervous System
COAGS	Coagulation profile blood test
CPGs	Clinical Practice Guidelines
CPK	Creatine phosphokinase
CSF	Cerebrospinal fluid
CT	computed tomography
DETECT Junior	The Between the Flags Tier two paediatric education package for the recognition and management of the clinically deteriorating child. The program must be completed by clinicians that care for paediatric patients. DETECT stands for Detecting Deterioration, Evaluation, Treatment, Escalation and Communication in Teams. The DETECT Junior program comprises of a manual, eLearning material and a face-to-face workshop and was developed by clinical experts within NSW Health.
DNA	Deoxyribonucleic acid
ECG	electrocardiogram
EDTA	Ethylenediaminetetraacetic acid
EUC	Electrolytes, Urea, Creatinine
EUCG	Sodium, Urea, Creatinine, Glucose
FBC	Full Blood Count
GCS	Glasgow coma score
GP	General Practitioner
HIV	Human immunodeficiency virus
Hx	History
ICP	Intracranial pressure
IO	Intraosseous
IV	Intravenous
LFT	Liver Function Tests
MRI	Magnetic resonance imaging
NETS	Newborn and paediatric Emergency Transport Service
NV71	Norovirus 71
pH	pH scale measures how acidic or basic a substance is
SpO2	Oxygen saturation
SPOC	Standard Paediatric Observation Charts
TPR	Temperature, Pulse, Respiration