# Guideline for the management of a child aged 0-18 years with a decreased conscious level

Appendix C

## Guideline Development Group meetings and decision making

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## 1. Formation of Guideline Development Group

The Guideline Development Group (GDG) needed to be multidisciplinary due to the breadth of the scope of the guideline. Names were ascertained from individual stakeholder groups. The members were selected by personal invitation with an agreement on their part to contribute to the guideline development process over two years.

## 2. Members of the Guideline Development Group

| | |
|---|---|
| Dr Maria Atkinson | (Clinical Research Fellow, University of Nottingham) |
| Dr David Bond | (General Paediatrician, KingsMill Hospital, Mansfield) |
| Dr Jim Bonham | (Clinical Chemist, Sheffield Children's Hospital) |
| Dr Richard Bowker | (Clinical Research Fellow, University of Nottingham) |
| Mr Gordon Denney | (Lay representative) |
| Dr Mandy Hampshire | (Primary Care representative, Lecturer in Primary Care, University of Nottingham) |
| Miss Susie Hewitt | (Consultant / Head of service, Emergency Department, Derby Royal Infirmary, Derby) |
| Dr Monica Lakhanpaul | (Guideline Methodologist / Senior Lecturer in Child Health, University of Leicester) |
| Dr Ian Maconochie | (Consultant in Paediatric Emergency Department, St. Mary's, London) |
| Sr Sue Shipston | (Sister / Emergency Practitioner, Emergency Department, QMC, Nottingham) |
| Dr Stephanie Smith | (Consultant in Paediatric Emergency Department, QMC, Nottingham) |
| Prof. Terence Stephenson | (Chairman / Professor of Child Health and Dean of University of Nottingham Medical School) |
| Dr Harish Vyas | (Consultant in PICU, QMC, Nottingham) |
| Dr John Walter | (Consultant in Metabolic Medicine, Willink Institute, Manchester) |
| Dr William Whitehouse | (Senior Lecturer in Paediatric Neurologist, University of Nottingham) |
| Mr and Mrs Fountain | (Patient representatives, Nottingham) |

**The members of the Guideline Development Group stated that they had no conflict of interest with developing the guideline and any external funding body they were involved with.**

## 3. Meetings of the Guideline Development Group

The GDG met every three months to discuss the development process and the draft recommendations. Correspondence in between meetings was undertaken electronically within the group.

The meetings were held on the following dates:

17th December, 2003
23rd February, 2004
16th July, 2004
17th November, 2004
9th February, 2005
15th June, 2005
26th August, 2005

## 4. Minutes of meetings

Minutes of all decisions taken at the meetings were kept and publically available on the guideline web-site (www.nottingham.ac.uk/paediatric-guideline)

## Minutes of meeting 17th December, 2003

1. Present at meeting:

| | |
|---|---|
| Dr Maria Atkinson | (fellow) |
| Dr Richard Bowker | (fellow) |
| Gordon Denney | (lay representative/sponsor) |
| Dr Monica Lakhanpaul | (guideline methodologist) |
| Sr Sue Shipston | (nurse practitioner A+E) |
| Prof. Terence Stephenson | (chair) |
| Dr William Whitehouse | (paed. neurologist) |

Apolologies from:

| | |
|---|---|
| Dr David Bond | (general paediatrician) |
| Dr Jim Bonham | (clinical chemist) |
| Dr Ken Brown | (general practitioner) |
| Dr Ian Maconochie | (paed. A+E) |
| Dr Stephanie Smith | (paed. A+E) |
| Dr Harish Vyas | (PICU) |
| Dr John Walter | (metabolic medicine) |

Not yet appointed:

General A+E physician
Patient representative

2. Background to the guideline

It was explained that a grant from the National Reyes Syndrome Foundation had been awarded to develop an evidence-based problem orientated guideline, with the aim that a standard approach to the management of altered consciousness, and especially the rare metabolic encephalopathies, could be achieved to improve the outcome of these patients.

3. Scope of the guideline

After discussion, it was agreed that this should be a modular guideline consisting of two parts.
The first module will be limited to the management in the first hour or so after presentation. The second module will start after first line investigations have been processed.

The scope for module one of the guideline:

*What is the aim of the guideline (module one)?*

The guideline aims to standardise and improve the management and investigation of children presenting with an altered conscious level in the first hour after arriving at hospital.

*Who is the guideline (module one) written for?*

The intended users for this part of the guideline are first line admitting staff in hospital (i.e. Accident and Emergency senior house officers {A+E SHOs}, registrars and nurses, or SHOs and registrars admitting to an acute paediatric ward).

*Which patients should be included in the guideline (module one)?*

**Any paediatric patient presenting with or developing an altered conscious level of unknown cause will be included in the guideline**.
Excluded from the guideline will be those infants presenting immediately after birth and having not yet been discharged from hospital. This excludes infants with neonatal encephalopathy, which encompasses a large number of causes beyond the scope of the guideline.
Also excluded are patients above the age limit for admission to the local paediatric department.

Patients who are being treated for a *known cause* of their altered conscious level will be excluded from the guideline. This exclusion criteria was included to filter off some of the causes of altered conscious level which are secondary to traumatic brain injury (e.g. obvious signs of head injury) or systemic illnesses where altered consciousness may be the end stage (e.g. airway obstruction, severe pneumonia, hypovolaemic shock). It was agreed that providing evidence-based management guidelines for all these causes where altered consciousness is not primarily neurological in origin would create an unusable document in terms of size. However, it was felt that advice should be included in the guideline as to what these causes may be, how they could be picked up in the "Advanced Paediatric Life Support" primary survey and where guidance may be found (e.g. NICE guidelines CG24 "Head injury"). This advice should also address the need to re-examine the guideline if by treating an "obvious cause" the clinical course or recovery is atypical (e.g. a head injury secondary to a fall may have been precipitated by a primary encephalopathy).
The *exact* nature of the filtering process for those patients whose altered conscious level is not primarily neurological in origin has not been determined.

There was a discussion about other symptoms or signs which could be included as part of the entry criteria (e.g. focal neurological signs, seizures, altered behaviour) to ensure that the early stages of encephalopathy are not missed. However, it was agreed that in a problem-based guideline only one problem or presenting symptom/sign can form the entry criteria. If more than one symptom is included then the guideline becomes unmanageable (as each individual problem would need its own guideline) and more like a diagnosis-based guideline (the summation of features forms a diagnosis at the beginning of the guideline).

The definition of altered consciousness has been left open for the time being until the systematic literature search / formal consensus process has taken place.

*What are the end points for the guideline (module one)?*

The guideline will end when first line investigations have been sent, or are requested, and initial treatments have been started within the first hour or so after presentation. Within the first hour very few laboratory results will be back and the treatment options will be limited. The treatment options available for first line staff include anticonvulsants, intubation and ventilation, dextrose infusion, antibiotics, acyclovir, fluid and inotropic support, bicarbonate, and mannitol. More complicated treatments are unlikely to be available within the first hour after presentation, or would not be started until further test results are reviewed (again unlikely to be available within the first hour or so).
Further management decisions will therefore be covered in the second module after further test results are available and second line investigations have been considered.

The scope for module two of the guideline:

*What is the aim of the guideline (module two)?*

The guideline aims to standardise and improve the management and investigation of children in hospital with an altered conscious level, the cause of which remains unknown after first line investigations have been reviewed.

*Who is the guideline (module two) written for?*

The intended users for this part of the guideline are more experienced paediatric staff, paediatric intensivists, and metabolic medicine physicians.

*Which patients should be included in the guideline (module two)?*

All children whose altered conscious level remains undiagnosed following review of first line investigations.

*What are the end points for the guideline (module two)?*

There are many second line investigations available for this group of patients from electroencephalograms to mitochondrial enzyme assays. Some of these results will be available immediately and others will take weeks to come back. Treatment options also vary from acute intracranial pressure reducing measures to long term dietary management. The end points for the second module of the guideline was discussed and agreed to a general principle of appropriate tests being sent and appropriate treatment plans in place, but that the underlying diagnosis may not have been established by the end of the guideline (indeed "undiagnosed coma" may be the final clinical description for some of these patients).

4. Components of the guideline

As well as the 2 modules of the guideline, it was suggested that an information pack for hospital staff on how to take the various samples would be useful, and a patient / parent information leaflet would be produced. A programme for audit will be included in the guideline. The modular nature of the guideline would lend itself to being developed into a care pathway, which may be achieved by the end of the project.

5. Consensus process

After discussion it was agreed that a single Delphi panel would be used for both modules of the guideline. It was discussed that two different Delphi panels could be used for the two modules of the guideline - the thinking behind this being that there will be some very specialist knowledge required for the second module. However, panel members who feel they lack specialist knowledge for some questions will be able leave the answer blank (self selecting themselves out of the panel, but still contributing to the consensus process such as language of recommendations, etc.). The Guideline development group felt that having a single Delphi panel would improve the rigour of the guideline development process and include rather than exclude vital stakeholders.

6. Stakeholders and dissemination

Stakeholder groups need to be identified and comments on the guideline development invited from them. Involving stakeholder groups will improve the rigour of the guideline development process and also alert these groups to the existence of the guideline, thereby helping with dissemination. Other strategies to help disseminate the guideline should include a web-site, writing to the Royal colleges of the stakeholder groups, an article in CHERUB, local hospital magazines/news publications, and a public open day (as NICE / SIGN hold) half way through the development process.
Richard Bowker will write a progress report / publicity document for circulation.

Next meeting will take place at 2.00pm on Monday 23rd February, 2004 in the Postgraduate Education Centre of Queen's Medical Centre, Nottingham.

Minutes written up by Dr Richard Bowker, 22nd December, 2003

## Minutes of meeting 23rd February, 2004

| | | |
|---|---|---|
| Present at meeting: | Dr Maria Atkinson | (fellow) |
| | Dr David Bond | (general paediatrician) |
| | Dr Jim Bonham | (clinical chemist) |
| | Dr Richard Bowker | (fellow) |
| | Gordon Denney | (lay representative/sponsor) |
| | Sr Sue Shipston | (nurse practitioner A+E) |
| | Prof. Terence Stephenson | (chair) |
| | Dr William Whitehouse | (paed. neurologist) |
| Apologies from: | Dr Mandy Hampshire | (primary care) |
| | Miss Susie Hewitt | (general A+E) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Dr Ian Maconochie | (paed. A+E) |
| | Dr Stephanie Smith | (paed. A+E) |
| | Dr Harish Vyas | (PICU) |
| | Dr John Walter | (metabolic medicine) |

1. Minutes of last meeting

The minutes were passed from 17th December, 2003 without corrections.

2. Clinical questions to be answered by the guideline

Before the clinical questions were discussed, the final algorithm layout was commented upon. Comments were made about the overlap of clinical features (e.g. vomiting, seizures, headache) for many of the different diagnoses. Would it be possible to determine different treatments based on initial clinical features alone or would several different treatments need to be started and then stopped as the diagnosis became more certain? The example of acyclovir was cited. Currently, the use of acyclovir for potential herpes encephalitis is used by some clinicians in some circumstances in addition to antibiotics to treat meningitis. The decision to start acyclovir is often made on instinctive grounds rather than firm clinical features. If there is no evidence suggesting easy ways to determine who should or should not require acyclovir then it will be left up to the Delphi panel to provide clearer guidance than instinct (e.g. choose a level of consciousness or a period of decreased consciousness at which point treatments or tests should be triggered). The view of Dr Bowker was that until the evidence search was complete it would be difficult to comment on whether children presenting with an altered level of consciousness could be divided into different treatment groups based on their clinical features alone.

The discussion moved on to the proposed clinical questions, which had been circulated and placed on the web-site prior to the meeting. It was explained that the terms “rapid” and “delayed” bedside tests referred to the time period they take to come back from the laboratory, not the time they should be sent. Ideally, the smaller the number of separate venepunctures required the better, but the results of some tests will trigger the need to send further tests (e.g. the finding of hypoglycaemia will trigger a long list of metabolic / endocrine tests). The term “special” test was applied to a test which required discussion with another department and could not be performed at the bedside. This distinction was made for the purpose of guideline development and will be unlikely to feature in the final algorithm.

Clinical parameters of pulse, pulse oximetry and blood pressure were added to the list of presenting features to help differentiate sub-groups of children who can be treated differently.

The systematic search should also address the need for clotting studies, paracetamol and salicylate levels to be sent in a sub-population of children on presentation.

Saved samples of serum (rapidly spun down by the lab) and urine at the time of admission should be taken, so that they can be used later when further results are available. This point will go to the Delphi panel if evidence is lacking. Dr Bonham and Dr Whitehouse recommended that saved serum could be used for acyl carnitine, cortisol, and anti-epileptic drug levels at the time of admission.

The need for a chest radiograph in children with altered consciousness was questioned by Sr Shipston. The evidence search would help to determine the proportion of patients with altered conscious level without respiratory signs who had pneumonia, thereby allowing a judgement to be made as to whether a chest xray should be taken.

The need for creatinine kinase to be sent initially was questioned by Dr Bonham as it would not be helpful in directing treatments or further tests in the first hour. Creatinine kinase will not be reviewed by the guideline as a necessary test to be performed at first presentation. Similarly, urinary sulphites and urinary dinitrophenylhydrazine are redundant tests in the face of urine profiles of amino and organic acids. Testing for urinary reducing substances is not as accurate as performing a Gal-1-PUT assay, and it was explained by Dr Bonham that liver transaminases would be raised in galactossaemia. Liver function tests could therefore be used as a decision tool for sending a Gal-1-PUT rather than performing urinary reducing substances.

The importance of obtaining a urine sample for metabolic tests was agreed by all. The method of obtaining urine from small children was raised by Prof. Stephenson. Was it worth performing a suprapubic aspirate or catheter sample if the patient had not passed urine early after admission? This point and the time frame of waiting before collecting urine invasively will be left to the Delphi panel to decide.

The "special" tests to be reviewed will also include thyroid function and thyroid antibodies to rule out Hashimotos encephalopathy, and an autoimmune screen to rule out Lupus encephalopathy. The time line for performing these tests may be after the initial presentation. The "special" tests are likely to be directed by the results of previous tests rather than all patients having all the tests performed. As neuroimaging should be thought about early in the management of altered conscious level and CT is much more readily available than MRI, it was agreed that CT and MRI will be looked at separately.

Treatments to be reviewed for raised intracranial pressure should also include ventilation, hypothermia, paralysis, ventricular drainage valve, and subtemporal decompression as well as those already listed.

Considering Biotin and B12 treatments should be reviewed by the guideline, as a trial of these can be given whilst awaiting test results without causing harm.

Therapies such as carnitine and arginine are currently not given blindly, and therefore probably come outside the scope of the guideline. Similarly, NTBC therapy for Tyrosinaemia type II would be indicated once the diagnosis had been secured.

3. Delphi process

A brief discussion took place regarding the nature of the Delphi process. Delphi panel composition has to be carefully considered. With such a wide scope to this guideline the level of knowledge required to address many of the recommendations will have to be very broad. The development group felt that a panel of about 50 would be ideal, and that it should include a broad range of specialities. The difficulties of broad knowledge base though would reduce the number of panellists able to answer some of the questions. This would limit the validity of those recommendations and therefore undermine the guideline.

The guideline development group has not completed the discussions about the Delphi process. The final Delphi method will be published before it is started in the next 6 months. Further discussions will be done electronically.

4. Other business

The first module of the guideline will have to address all those who present with altered conscious level. The second module of the guideline will include the patients for whom, after initial investigation results are back, the diagnosis and treatment plan remains unclear. Prof. Stephenson felt that signposting to other guidelines for meningitis/encephalitis, raised intracranial pressure and sepsis would be necessary to reduce the breadth of the guideline.

Contraindications to performing a lumbar puncture should be addressed.

A method of encouraging the medical teams to continue to use the guideline after the initial presentation may be to produce a care pathway.

The patient representatives have now been identified and will be interviewed to gauge their views on the guideline and help with a patient / parent information leaflet. They do not wish to attend the guideline development group meetings, but will be able to have their voice heard through Dr Bowker.

5. Next guideline development meeting will be on Friday 16th July, 2004.

Minutes written by Dr Bowker 1st March 2004

## Minutes of meeting 16th July, 2004

| | | |
|---|---|---|
| Present at meeting: | Dr Maria Atkinson | (fellow) |
| | Dr David Bond | (general paediatrician) |
| | Dr Jim Bonham | (clinical chemist) |
| | Dr Richard Bowker | (fellow) |
| | Gordon Denney | (lay representative/sponsor) |
| | Sr Sue Shipston | (nurse practitioner A+E) |
| | Dr William Whitehouse | (paed. neurologist) |
| Apologies from: | Dr Mandy Hampshire | (primary care) |
| | Miss Susie Hewitt | (general A+E) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Dr Ian Maconochie | (paed. A+E) |
| | Dr Stephanie Smith | (paed. A+E) |
| | Prof Terence Stephenson | (chair) |
| | Dr Harish Vyas | (PICU) |
| | Dr John Walter | (metabolic medicine) |

1 Minutes of last meeting

The minutes of the last meeting 23rd February were approved without changes.

2 Latest draft algorithm

The latest draft algorithm was reviewed. Issues raised included the need for child protection to be addressed in the algorithm; overdoses of opiates and benzodiazepines should be included in the "no clinical clues" box; the terms "seizure", "fitting" and "ictal" should change to "convulsion"; and the "ongoing seizures" box should only include convulsive status with non-convulsive status becoming part of the "no clinical clues box".

3 Review the scope of guideline again

The end point of each management strategy was agreed upon.

"Shock" management will end after boluses of fluid and intubation without giving guidance on inotropic agents.

"Sepsis" management will end with tests sent and first line antibiotics given.

"Trauma" management will end with the recognition of trauma.

"Raised intracranial pressure" management will end with advice on who should have invasive intracranial pressure monitoring in place and what the goals of therapy should be aiming for.

"Intracranial infection" management will end with first line antibiotics / acyclovir started and which tests to do to diagnose the rarer infections.

"Metabolic Illness" management will end with the emergency treatments of raised ammonia, severe acidosis and ketosis, and hypoglycaemia with testing ongoing for definitive diagnosis of other possible metabolic causes of reduced conscious level.

"Ongoing convulsion" management will end with recognition of convulsive status.

"Post-convulsion" management will finish with recognition and recovery within a time frame before considering other causes.

"No clinical clues to cause" management will finish with tests being extended to look for rarer causes and supportive treatments started whilst awaiting those tests.

4 Evidence level system

The SIGN and the Oxford CEBM levels of evidence systems were reviewed. For the time being papers will be appraised using both systems and a decision will be taken which will be used for clarity later.

5 Paper appraisal – internal validation

All papers are appraised by Richard Bowker. Those papers appraised level A or B will be independently checked by another member of the guideline development group.

6 Delphi process and draft statements

Suggestions for Delphi panel members were welcomed as only half had been recruited by the stakeholder groups so far.

A decision to include patients and paediatric endocrinologists was made.

The “Don’t know” box should negate the need for highlighting groups of panellists to answer individual statements.

7 Any other business

Implementation would be aided by presentations at the Trent Paediatric Society meeting, publishing in Emergency nurse journal/Paediatric nurse, and an education day on reduced conscious level.

8 Next meetings

Tuesday 21st September, 2pm
Wednesday 17th November, 2pm
Wednesday 9th February, 2pm

Minutes written by Richard Bowker 20th July 2004

## Minutes of meeting 21st September, 2004

Meeting cancelled, as no further issues to discuss at this stage of the Delphi process and evidence searching.

## Minutes of meeting 17th November, 2004

| | | |
|---|---|---|
| Present at meeting: | Dr Jim Bonham | (clinical chemist) |
| | Dr Richard Bowker | (fellow) |
| | Gordon Denney | (lay representative/sponsor) |
| | Miss Susie Hewitt | (general A+E) |
| | Sr Sue Shipston | (nurse practitioner A+E) |
| | Dr Stephanie Smith | (paed. A+E) |
| | Prof Terence Stephenson | (chair) |
| Apologies from: | Dr Maria Atkinson | (fellow) |
| | Dr David Bond | (general paediatrician) |
| | Dr Mandy Hampshire | (primary care) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Dr Ian Maconochie | (paed. A+E) |
| | Dr Harish Vyas | (PICU) |
| | Dr John Walter | (metabolic medicine) |
| | Dr William Whitehouse | (paed. neurologist) |

1 Minutes of previous meeting

The minutes of the last meeting 16th July 2004 were approved without changes.

2 Update on progress

The searches which are now completed include the topics of shock, sepsis, trauma, meningitis, herpes simplex encephalitis, hyperammonaemia and hyperglycaemia.

Searches remain to be completed in the topics of raised intracranial pressure, convulsions, hypoglycaemia, and catabolic state (re-named "non-hyperglycaemic ketoacidosis").

The first round of the Delphi process has been completed and the results analysed.

3 Delphi round one analysis

Statements from round one had previously been defined as reaching consensus if >75% of responses ticked boxes 7, 8 or 9 (agree with the statement) or boxes 1, 2 or 3 (disagree with statement) on the nine-point Likert scale.

The following courses of actions were agreed by the guideline development group:

**a)** Those statements which reached consensus in agreement with the statement would be included in the guideline, unless there were significant comments made by the Delphi panel suggesting the statement should be re-worded and sent back to the panel in round two.

**b)** Those statements which reached consensus in disagreement with the statement would be excluded from the guideline.

**c)** Those statements which did not reach consensus, should be fed back to the panel in round two with a clarification of the same statement, with the statistical analysis of the level of agreement, with comments from the panel, and / or changes to the wording or substance of the statement.

**The statements which fell into category (a) were**:

***Stem****:* "Children with a reduced conscious level should be intubated if: …"

Several of the options were agreed upon (e.g. "their Glasgow coma score is 8 or less"), however, the majority of comments felt that the statement was too strong in its recommendation, and that individual cases need to be assessed.

*Change for round 2 :* "In children with a reduced conscious level, **consider** intubation if: "

***Stem****:* "Contraindications for lumbar puncture include:…"

Several of the options were agreed upon but some which were felt to be clear cut contraindications were not including "a Glasgow coma score less than or equal to 8". The comments from the panel had suggested that if the patient was stabilised and certain conditions / tests were met then they would L.P. at some stage in the management

*Change for round 2:* "**A lumbar puncture should not be performed as part of the initial acute management if**:…"

***Stem****:* "Children with a reduced conscious level and shock which has been unresponsive to 40ml per kg should be monitored on an intensive care unit."

Comments indicated that High dependency Units would be locally available and capable of monitoring these cases.
*Change for round 2:* "Children with a reduced conscious level and shock which has been unresponsive to 40ml per kg should be monitored on an intensive care unit or **high dependency unit**."

***Stem**:* "If the microscopy of a cerebrospinal fluid sample is abnormal, request a Zeihl-Neelsen stain"
Comments suggested a definition of abnormal should be included.
*Change for round 2*: To be discussed with microbiology stakeholder group.

***Stem**:* "The emergency treatment of hypoglycaemia in a child with a reduced conscious level is a bolus of 5ml/kg of 10% dextrose solution"
Comments from the metabolic medicine panellists recommend only using 2ml/kg to reduce the risk of triggering further insulin release in hyperinsulinaemic patients. The Guideline development group could not quantify the risk of triggering insulin release with this dose of glucose and what the evidence is for this. As APLS guidance is currently 5ml/kg and is well established in the training package a decision was made to check with the authors of the new APLS manual to determine that this is still going to be their advice.
*Change for round 2:* To be decided after further look at the evidence.

***Stem:*** A child with a reduced conscious level, a capillary/venous pH < 7.3 and ketones in the urine is in a catabolic state.
The guideline development group felt that this term was not useful as a "catabolic state" does not necessarily imply a pathological condition which needs special attention. The background to the statement is the need for some patients to be treated with insulin and dextrose to switch catabolism to anabolism (especially for excessive muscle / glycogen breakdown which can occur in metabolic conditions). The term "non-hyperglycaemic ketoacidosis" was agreed to be a better descriptive term.
*Change for round 2*: Any statement with the term "catabolic state" should be changed to "**non-hyperglycaemic ketoacidosis**".

**The statements which fell into category (c) were**:

***Stem:*** In a child 3 months of age or over with a reduced conscious level, a capillary glucose level of less than 3.5 mmol/l is low and should be investigated and corrected.
Comments ranged from 3.5 mmol/l being too high a cut off level to the reliability of various methods of performing a capillary bedside glucose test (BM stix are known to be unreliable at the lower range but electronic testing kits are more reliable but not as reliable as laboratory tests). The guideline development group agreed that the level of 3.5 mmol/l was too high (3rd centile for children) and that treatment need not be started until a reading of < 2.6 mmol/l was obtained. However, re-testing a capillary glucose within 10 minutes if the initial result was 2.6– 3.5 mmol/l would be reasonable. As the child has a reduced conscious level, the core investigations will be sent (agreed by the Delphi panel), which includes a laboratory blood glucose so the issues around accuracy of the test will be circumvented.
*Changes for round 2:* **In all children with reduced conscious level, a capillary glucose of less than 2.6 mmol/l is low and should be investigated further and corrected.**
**In children with a reduced conscious level, a capillary glucose of 2.6 – 3.5 mmol/l is borderline low and should be repeated within 10 minutes**.

***Stem***: During the first hour of the post-convulsion state, it may be appropriate to observe the child without initiating any tests or treatments.
Comments suggested that at least a capillary glucose should be performed in this circumstance.
Change for round 2: During the first hour of the post-convulsion state, it may be appropriate to observe the child without initiating any tests or treatments **if the capillary glucose is normal.**

***Stem:*** All children with reduced consciousness (except those patients within one hour post convulsion, who are clinically stable) should be investigated with the following tests at presentation: Plasma ammonia,
Plasma lactate,
1 – 2 ml of plain serum saved for later analysis,
urine for organic acids
CT scan,
LP (if not contraindicated)
Comments indicated that these tests were not sent as first line samples or further indications were required before automatically requesting the tests. The guideline development group discussed ammonia as one of the key investigations which has to be sent fresh (ie cannot be requested later from the

other samples), is a treatable condition, and the test is available (audit of northern NHS labs) – for round 2 the statement will be sent back to the panel with clarification of these points. Plasma lactate can be requested from the blood glucose sample agreed upon, urine for organic acids can be requested from the urine saved sample agreed upon – for round 2 these statements will not be included. 1-2ml of plain serum could be useful for serology tests and this point will be clarified in round 2. The CT scan and LP comments indicated that the panel wanted more details before requesting - for round 2 the panel will be asked for indications to perform these procedures.

***Stem****:* (Regarding shock) If more than 40 ml per kg of fluid has been given, the child should be intubated and ventilated to prevent uncontrolled pulmonary oedema developing.

Comments indicated that this statement was too strong.

*Change for round 2*: If more than 40 ml per kg of fluid has been given, **consider** intubating and ventilating the child to prevent uncontrolled pulmonary oedema developing.

***Stem:*** (Regarding shock) If more than 40 ml per kg of fluid has been given with little clinical response, inotropic support should be initiated.

Comments indicated that this statement was too strong and that the term "inotropes" is not a collective term (eg some may prefer to use vasopressor agents).

*Change for round 2*: If more than 40 ml per kg of fluid has been given with little clinical response, drug treatment to support the circulation should be considered.

***Stem*****:** If raised intracranial pressure is suspected, then the child should undergo the following treatments:

sedate, intubate and ventilate the patient to maintain the PaCO2 between 4.0 and 5.0 kPa

Administer a dose of 1g/kg of intravenous mannitol

Maintenance fluid should be administered at 70% / 100% of normal

Maintenance fluid should be 0.9% saline

Comments indicated that more than a suspicion of raised intracranial pressure was required for intubation and mannitol. In round 2 the panel will be asked for indications for these treatments which are available in the first hour. The volume of maintenance fluids provoked a split in the group: 100% maintenance runs the risk of worsening cerebral oedema while the 70% maintenance runs the risk of reducing the cerebral perfusion pressure. A continuous scale for fluid volume was suggested for round 2, with the mean value being the consensus figure. The type of fluid was not agreed upon therefore the comments will be fed back to the group in round 2.

***Stem:*** Patients with suspected raised intracranial pressure should have invasive intracranial pressure monitoring performed if…

Comments reflected the opinion that there was little evidence in this field and case by case assessment was required. The guideline development group decided that these statements were outside the scope of the guideline and so have been excluded from the guideline.

***Stem*****:** Herpes simplex encephalitis should be clinically suspected if two or more of the following are present: fever, convulsions, headache, vomiting, focal neurological signs.

Comments indicated that all these signs were too non-specific. The panel did agree to give aciclovir if there were no clinical clues to the cause of the reduced conscious level, but not if there were non-specific features of HSE. The guideline development group discussed this point and felt that advice on when to suspect HSE should be provided by the guideline and in its current form HSE is a diagnosis of exclusion rather than inclusion. The guideline development group wanted to find out if there were any validated algorithms available to put to the panel for round 2.

*Change for round 2*: To be decided after consultation with stakeholder groups.

***Stem:*** A child with a reduced conscious level who is in a catabolic state needs treating by the following algorithm…

Comments indicated that the algorithm was too aggressive and the panel was not familiar with this form of treatment. The guideline development group agreed to change "catabolic state" to "non-hyperglycaemic ketoacidosis".

*Change for round 2*: A child with a reduced conscious level who has non-hyperglycaemic ketoacidosis may benefit from an insulin infusion with a high dose dextrose infusion.

4 Delphi round two

Round two will begin as soon as possible, so the results can be discussed at the next guideline development group meeting.

5 Any other business

A time line for the investigations was proposed as a helpful tool for the guideline and this will be developed along with the algorithm.

The input from parents was acknowledged and thanked. Their contributions have been very important to the guideline project and have confirmed the need for a guideline of this nature. Their contributions continue to be welcomed.

A meeting with the trustees of the National Reye's Syndrome Foundation was suggested for September 2005, towards the end of the guideline project. Stakeholder groups would be invited to attend and comment on the guideline at this stage before the final draft version is produced.

The next meeting will be at 2pm on Wednesday 9th February, 2005 at QMC PGEC.

Minutes written by Richard Bowker 18th November, 2004

## Minutes of meeting 9th February, 2005

| | | |
|---|---|---|
| Present at meeting: | Dr Jin Bonham | (clinical chemist) |
| | Dr Richard Bowker | (fellow) |
| | Mr Gordon Denney | (lay representative/sponsor) |
| | Miss Susie Hewitt | (general ED) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Sr Sue Shipston | (emergency department practitioner) |
| | Prof Terence Stephenson | (chair) |
| | Dr William Whitehouse | (paed. neurologist) |
| Apologies from: | Dr Maria Atkinson | (fellow) |
| | Dr David Bond | (general paediatrician) |
| | Dr Mandy Hampshire | (primary care) |
| | Dr Ian Maconochie | (paed. ED) |
| | Dr Stephanie Smith | (paed. ED) |
| | Dr Harish Vyas | (PICU) |
| | Dr John Walter | (metabolic medicine) |

1. Minutes of last meeting
   The minutes of the last meeting 17th November 2004 were approved without changes.

2. Overview of the Delphi results round one and two

The GDG discussed all the statements which had reached consensus and those which had not reached consensus in rounds one and two. The GDG decided some statements, which had already reached consensus, should be altered for clarity and put back to the panel in round three. Some new statements were suggested for round three. Some statements which did not reach consensus should be altered and put back to the panel in round three. Some statements which did not reach consensus should be omitted from the guideline. And finally, some statements which did not reach consensus should be left to local policy decisions.

<u>Statements already reaching consensus</u>

Original statement:

"Children with a reduced conscious level should have the following observations made: heart rate; respiratory rate; oxygen saturation level; blood pressure; continuous cardiac monitoring; temperature."

Change to statement suggested as some of these are continuously monitored whilst others are recorded as isolated observations.

Original statement:

"In children with a reduced conscious level, a capillary glucose of <2.6 mmol/l is low and should be investigated further and corrected."

A discussion as to whether this should apply to children less than 4 weeks old (who may have a low cap. glucose due to feeding difficulties) concluded that the safe approach to take was to correct the hypoglycaemia with a bolus of dextrose plus infusion. A trial feed for an infant with a reduced conscious level could not be recommended by the guideline, but individual practitioners could deviate from the guideline on a case-by-case basis. No change to statement was made.

<u>New statements for round three</u>

A statement clarifying that a child needs to be roused from normal sleep before a Glasgow coma scale of less than 15 is documented was proposed by Dr Whitehouse.

A statement about the clinical clues for the suspected diagnosis of bacterial meningitis when neck stiffness is not present needs to be put to the panel (the evidence is only available for children who have neck stiffness).

A statement for acyl carnitines to be measured in hypoglycaemia cases and "cause unknown" was requested by Dr Bonham as this is a very easy test to perform and faster than urine organic acids in many centres.

Statements not reaching consensus in round two changed for round three

Original statement:
"In children with a reduced conscious level, a capillary glucose of 2.6-3.5 is borderline low and should be repeated within 10 minutes"
The feedback from the panel suggests that the timing of repeating the test is debatable and that the type of repeat test required is debatable.
Round three statement:
This will be divided into two separate statements, allowing a range of timings and reaffirming that the core investigations should be sent (which include a true glucose).

Original statement:
"Children with a reduced conscious level should be considered for intubation if their oxygen saturations are less than 92% despite high flow oxygen therapy"
Feedback from the panel suggest that further treatments need to be instigated.
Round three statement:
"Children with a reduced conscious level should be considered for intubation if their oxygen saturations are less than 92% despite high flow oxygen therapy and airway opening manoeuvres"

Original statement:
"Children with a reduced conscious level should be considered for intubation if they have signs of shock despite initial fluid resuscitation therapy"
Feedback suggested more clarity about the initial therapy.
Round three statement:
"Children with a reduced conscious level should be considered for intubation if they have signs of shock despite fluid resuscitation of 40ml/kg or more"

Original statement:
"Herpes simplex encephalitis should be suspected clinically in a child with a reduced conscious level if the child has had a prolonged convulsion with no other known precipitating cause, the child has focal neurological signs, the child has had a fluctuating conscious level for 6 hours or more."
Most of the statements nearly reached consensus. The statements will be fed back to the panel unchanged, with additional statements combining the symptoms.

Original statement:
"A child with a reduced conscious level and no obvious clinical sign pointing towards the cause should have the core investigations reviewed and the following additional tests should be requested: urine amino acids, an urgent EEG, serology for mycoplasma, ESR, thyroid function test"
The round 3 statements will confirm that the core tests have been reviewed without shedding light on the diagnosis, that these tests should be "considered" and the time frame of "urgent" for EEG. Note acyl carnitine will be added to the list for round three.

Statements not put forward to round 3

CT scan for sepsis, bacterial meningitis, prolonged convulsion or herpes simplex encephalitis. (A CT scan was agreed if the cause is unknown, raised ICP, or a suspected intracranial abscess, which would cover most eventualities).

Statements where consensus will not be reached

Fluid therapy in raised ICP was split down the middle 70% v 100% maintenance. A statement in the final guideline document will acknowledge this as an area for local discussion.
The dose of mannitol could not be agreed upon ranging from 0.25 g/kg – 1 g/kg. Again this will be acknowledged in the final guideline.

3. Delphi round three
   This will start shortly and hopefully be completed by the beginning of April 2005.

4. Audit points for the guideline
   The GDG were asked to think about what can be audited and what would be the suggested audit topics which the guideline can put forward as part of the implementation package.
   Suggested points included:

- The standard of capillary glucose being measured within 15 minutes of arrival

- The standard of an experienced paediatrician reviewing a child with a reduced level of consciousness and suspected sepsis within one hour of arrival
- The standard of the core investigations being performed for children with reduced conscious level within the first hour of presentation, especially whether a plasma ammonia is being requested.
- The standard of the observations recommended being documented by the nursing/medical staff.

Further audit points will be discussed at the next GDG meeting, so please continue to think about what can be audited and what should be audited.

5. The Trustees/Stakeholder meeting will take place on Friday October 7th at 11am – 2pm (lunch included). As well as an opportunity to inform the National Reyes Syndrome Foundation Trustees of the work achieved over the last two years, it will also be a forum for the stakeholder groups to comment on the final draft version before it goes to external validation.

   As well as the listed stakeholder groups (see website) invitations will be sent to the Delphi panellists, the NPSA, CHAI, Clinical directors group of RCPCH, the RCPCH representative for Dept. of Health, Patient representative groups, NHS risk managers forum, and the chair of Q.P.C. for the RCPCH.

Please note:
Next GDG meeting is on **Wednesday June 15th, at 11.00** in the PGEC at QMC.

Minutes written by Richard Bowker 14th February, 2005

## Minutes of meeting 15th June, 2005

| | | |
|---|---|---|
| Present at meeting: | Dr David Bond | (general paediatrician) |
| | Dr Richard Bowker | (fellow) |
| | Miss Susie Hewitt | (general ED) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Dr Stephanie Smith | (paed. ED) |
| | Prof Terence Stephenson | (chair) |
| | Dr Harish Vyas | (PICU) |
| Apologies from: | Dr Maria Atkinson | (fellow) |
| | Dr Jim Bonham | (clinical chemist) |
| | Mr Gordon Denney | (lay representative/sponsor) |
| | Dr Mandy Hampshire | (primary care) |
| | Dr Ian Maconochie | (paed. ED) |
| | Sr Sue Shipston | (emergency department practitioner) |
| | Dr John Walter | (metabolic medicine) |
| | Dr William Whitehouse | (paed. neurologist) |

1. Minutes of last meeting
   The minutes of the last meeting 9th February 2005 were approved without changes.

2. Overview of the final Delphi results
   The results of the third and final round of the Delphi process left the GDG with choices of recommendations (see below):

   (i) Bacterial meningitis: 2 statements reached consensus on how to suspect bacterial meningitis in the absence of neck stiffness:

   a) Children with reduced conscious level but no neck stiffness should be suspected of having bacterial meningitis clinically if they have fever and two of the following:
   rash
   irritability
   bulging fontanelle (75% agreement)

   b) Consider bacterial meningitis in children with a reduced conscious level without neck stiffness if they have a fever, a rash, a bulging fontanelle and or they are irritable. (83% agreement)

   The GDG agreed that statement (a) was preferable as it gave clear instructions as to when to "suspect" bacterial meningitis. The GDG felt that the wording of statement (b) should have led to 100% agreement as bacterial meningitis should always be "considered" in these patients.

   (ii) Herpes simplex encephalitis: after two rounds the Delphi panel had not agreed on which signs were indicative of HSE. Several statements reached consensus agreement in the third round:

   **"**Herpes simplex encephalitis should be suspected clinically in a child with a reduced conscious level *(and therefore aciclovir started)* if:"

   a) the child has focal neurological signs (84% agreement)
   b) the child has had a fluctuating conscious level for 6 hours or more (79% agreement)
   c) the child has had two or more of the following:
   a prolonged convulsion with no obvious precipitating cause
   focal neurological signs, including a focal convulsion
   a fluctuating conscious level for 6 hours or more (92% agreement)

   d) the child has had all of the following:
   a prolonged convulsion with no obvious precipitating cause
   focal neurological signs, including a focal convulsion
   a fluctuating conscious level for 6 hours or more (96% agreement)

e) the child has or has been in contact with herpetic lesions (84% agreement in round 2)

f) A child with a reduced consciousness and no obvious clinical signs pointing towards the cause should be started on acyclovir (81.8% agreement in round 1)

The GDG decided that statements (a) and (b) included more patients than (c) or (d) and it is sensible to encourage clinicians to suspect HSE in more children than less. The statement about "prolonged convulsion with no obvious precipitating cause" in (c) and (d) is covered by statement (f), i.e. if the cause of the convulsion is not known then the cause of the reduced conscious level is not known and the child will be suspected of having HSE. The final statement will read:

**"Herpes simplex encephalitis should be suspected clinically in a child with a reduced conscious level if one or more of the following 4 :**

**the child has focal neurological signs**
**the child has had a fluctuating conscious level for 6 hours or more**
**the child has or has been in contact with herpetic lesions**
**the child has no obvious clinical signs pointing towards the cause"**

3. Stakeholder comments

The stakeholder groups were asked to comment on the draft guideline recommendations and algorithm. Their input needs to be incorporated into the guideline without undermining the Delphi consensus process.

(i) Hypertensive encephalopathy

Hypertension had not been mentioned in the guideline due to the risk of confusing hypertension of raised ICP from hypertension of hypertensive encephalopathy. However, this was pointed out by a number of stakeholders to be a flaw in the guideline. The GDG reviewed the comments made by the stakeholders and decided that guidance on hypertension is required in the algorithm and therefore is part of the scope of the guideline. If there is no evidence available to guide detection or management of hypertensive encephalopathy then the statements from the stakeholders will be used to form a consensus statement from the GDG.

(ii) Pharmacy comments

The National paediatric pharmacy group commented that the doses and infusions should be clearly stated on the algorithm. A separate page will therefore be devoted to the calculations of infusions which have been mentioned in the guideline and are not readily available in an "off the shelf" preparation.

(iii) PICs / APEM comments

They felt that oxygen should be given to all children. The Delphi panel had agreed on the statement "Children with a reduced conscious level should be treated with high flow oxygen if their oxygen saturations are less than 95%". The GDG agreed that the statement by the Delphi panel did not prevent oxygen being given to those with oxygen saturations 95% or more. In the algorithm, a simple statement "Give oxygen" will be included to remind clinicians of the need to maintain oxygenation. The original Delphi statement will also remain.

(iv) APEM / RCPath comments

The recognition of shock does not include tachycardia. The Delphi panel agreed with the statement:

"Shock can be recognised clinically if one or more of the following signs are present in a child with reduced conscious level:

Capillary refill time > 2 seconds
Mottled cool extremities
Diminished peripheral pulses
Systolic blood pressure is less than 5$^{th}$ percentile for age
Decreased urine output <1ml/kg/hour"

The GDG agreed that tachycardia is a sign of shock and an early sign. However, the other signs of a compromised circulation are included in the Delphi statement. As the child already has a decreased level of consciousness the circulatory failure is likely to be well established and the pulse rate may even be normal or bradycardic by then. Tachycardia has therefore not been included in the definition.

(v) GDG comments

The recommendation to collect a urine sample on admission by urine bag would not be appropriate for older children. The statement has been changed from:

"As a non-sterile urine sample is required for these tests [the core investigations], a urine bag should be in situ as soon as the patient has had monitors attached"

to: "As a non-sterile urine sample is required for the core investigations, a technique for collecting urine should be in place as soon as the patient has had monitors attached, e.g. urine bag, clean catch collecting device, catheter"

4. Audit criteria

The list of audit criteria drawn up at the last meeting was discussed along with further suggestions from the GDG members. The final recommended audit criteria are:

| **Criterion** | **Exception** | **Definition of terms** |
|---|---|---|
| Percentage of children with a reduced conscious level having a plasma ammonia sent | Children within one hour post convulsion.<br>Children with trauma not related to a medical collapse. | Plasma ammonia result should be available in the notes or on the hospital results system |
| Percentage of children with a reduced conscious level having a sample of urine sent to clinical pathology to be saved for later use | Children within one hour post convulsion.<br>Children with trauma not related to a medical collapse | Saved urine sample sent should be documented in the notes or on the hospital results system |
| Percentage of children with a reduced conscious level who have their respiratory rate from admission documented in the notes | | |
| Percentage of children with a reduced conscious level who have their blood pressure from admission documented in the notes | | |
| Percentage of children with a reduced conscious level who have their GCS from admission documented in the notes | | |
| Percentage of children with suspected bacterial meningitis who were treated with intravenous dexamethasone before or with the first dose of antibiotics. | | Suspected bacterial meningitis is defined by a score of 8.5 or more using the clinical diagnostic decision rule below if the child has neck stiffness:<br>Symptom/sign Score<br>If GCS < 9 = 8<br>Neck stiffness present = 7.5<br>Duration of symptoms = 1 /each 24 hrs<br>Vomiting = 2<br>Cyanosis = 6.5<br>Petechiae = 4<br>Serum CRP = CRP value (g/dl) divided by 100<br>or<br>if the child does not have neck |

| | | |
|---|---|---|
| | | stiffness but has fever and two or more of the following:<br>rash<br>irritability<br>bulging fontanelle |

These audit criteria were selected as they were readily measurable and important markers of good practice. The criterion for dexamethasone given in suspected bacterial meningitis is based on level 1a evidence. These audit criteria were also selected as the GDG felt performance could be improved in these areas (personal experience).

5. Implementation strategies

   These will be further discussed at the next meeting.

6. GDG comments on the algorithm

   The new algorithm was discussed and several alterations have been suggested which will add to the clarity of the document. Recommendations based on level 1 evidence will be highlighted on the algorithm in such a way as to not affect the ease of use of the algorithm. Dr Bowker will make the necessary changes and pilot the algorithm in the next few weeks to highlight further adaptations.

The next GDG meeting is to be on the 26th August at 10am.

Minutes written by Dr Richard Bowker 15th June, 2005

## Minutes of meeting 26th August, 2005

| | | |
|---|---|---|
| Present at meeting: | Dr Richard Bowker | (fellow) |
| | Mr Gordon Denney | (lay representative/sponsor) |
| | Miss Susie Hewitt | (general ED) |
| | Prof Terence Stephenson | (chair) |
| Apologies from: | Dr David Bond | (general paediatrician) |
| | Dr Maria Atkinson | (fellow) |
| | Dr Jim Bonham | (clinical chemist) |
| | Dr Mandy Hampshire | (primary care) |
| | Dr Monica Lakhanpaul | (guideline methodologist) |
| | Dr Ian Maconochie | (paed. ED) |
| | Dr Stephanie Smith | (paed. ED) |
| | Sr Sue Shipston | (emergency department practitioner) |
| | Dr Harish Vyas | (PICU) |
| | Dr John Walter | (metabolic medicine) |
| | Dr William Whitehouse | (paed. neurologist) |

1. Minutes of last meeting
   The minutes of the last meeting 15th June 2005 were approved without changes.

2. Algorithm changes and options
   The views of stakeholders, guideline development group members and doctors who have piloted the guideline were discussed. Several changes have been agreed including: the order of the pages (front page now the overview algorithm – previously page 3); fewer abbreviations (and a box listing any abbreviations); and changes to emphasise the need to identify suspected problems concurrently not sequentially.

3. Care pathway feedback
   The care pathway has been generally well accepted. A few changes to the text were suggested. The pathway should be discussed with writers of successful care pathways, for further feedback.

4. Patient information leaflet feedback
   The pilot leaflet has now been reviewed by a number of patients and stakeholder groups. It has been well received. A few changes to the text were agreed upon by the GDG.
   Gordon Denney was unsure as to whether mention of the National Reye's Syndrome Foundation should be on the leaflet. After the changes to the text have been made, he will discuss with the Foundation their thoughts on this matter.
   The leaflet once finalised will be translated into a number of languages.

5. Implementation strategies
   Once the guideline technical document has been finalised (after the Public meeting), it will be sent for appraisal by the RCPCH and BAEM (British Association for Accident and Emergency Medicine). This may take a couple of months before the guideline has been fully appraised. Once appraisal has been completed, it can be disseminated widely. It is anticipated that dissemination will include journal publications, abstracts at conferences, and sending a guideline package to every Emergency department and Paediatric admissions unit in the UK.
   In the guideline package will be a letter explaining the guideline, a colour version of the algorithm and a CD. The CD will contain printable versions of the algorithm, the full technical document, a web-version which can be loaded onto local hospital intranets, a hand-held computer version for downloading to PDAs, a demonstration presentation of how to use the guideline (viewed at GDG meeting) and an education package (focussing on raised intracranial pressure and metabolic illnesses).

The public open day on 7th October aims to present the work to the Reye's Syndrome Foundation trustees, and to gather any further comments from the stakeholders who attend.

Next meeting is the Public Open Day Meeting on Friday 7th October, in The Child Health Lecture Theatre, **E Floor, East Block** from 11am to 2pm (lunch provided).

Minutes written by Dr Richard Bowker 26th August, 2005