

Adaptation of Evidence-based Clinical Practice Guidelines for Management of Altered Level of Consciousness in Children: An Emergency Guide

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Abstract

Background: We recently adapted the published Royal College of Pediatrics and Child Health (RCPCH) clinical practice guideline (CPG) for the management of children with an altered level of consciousness (ALOC) to the Alexandria University Children's Hospital (AUCH) context. It is hypothesized that adapting clinical practice guidelines (CPGs) to the local healthcare situation, rather than developing them, will increase their acceptance without putting a large strain on the resources. **Aim:** To present the adaptation pathway that was used to create the first local CPG in AUCH for the management of children with ALOC. **Methods:** For CPG adaptation, we utilized the 'Adapted ADAPTE' approach. We went over the entire process in depth, including the setup, adaptation, and finalization phases. **Results:** Eight major recommendations were adopted by the panel from one source (RCPCH) guideline. The recommendations included: (i) service organization and training, (ii) recognition of the health problem and referral, (iii) diagnostic approach (iv) providing support (v) management of ALOC, and (vi) indication to PICU admission (vii) recommended medications (viii) monitoring and follow up. **Conclusions:** The finalized CPG provides evidence-based guidelines to healthcare providers for the management of children with ALOC in AUCH. The initiative also established the efficacy of the 'Adapted ADAPTE,' as well as the importance of clinical and methodology expert panel collaboration for local CPG adaptation.

Keywords: ALOC, Lumbar puncture, Hypoglycemia, Shock

Introduction

Consciousness is defined as an individual's ability to perceive himself and their surroundings. The cerebral cortex, brainstem, and thalamus interact and act on the individual's conscious level, both anatomically and functionally⁽¹⁾. Altered level of consciousness (ALOC) can describe a range of symptoms including confusion, lethargy,

obtundation, stupor, or coma⁽²⁾. This can result from when central nervous system (CNS) insult such as hypoxia, traumatic injury, thromboembolism, infections, hemorrhage, or secondary to general disorders including metabolic disorders, intoxication, or neoplasms⁽²⁻⁵⁾. Recently, a variety of medical associations and health care organizations have recently produced clinical practice guidelines and best practice reco-

mmendations for several disorders. In the fields of medicine, psychology, education, and allied health, evidence-based practice has become the gold standard. To our knowledge, there is no guideline presented in the management of ALOC in our local context. This data clearly demonstrates the need for additional physician and patient education; nevertheless, before any guideline can be developed, clinicians must be satisfied that there is evidence from well-controlled clinical studies. Regarding the RCPCH guideline, a new clinical guideline on the management of ALOC in children has been published⁽⁶⁾. The RCPCH guideline exposed the inadequacies in ALOC management and services and made significant progress in addressing key concerns such as misdiagnosis and inadequate treatment. The need for services to assess the needs of everyone, to not discriminate in provision, and to work in conjunction with children with ALOC and their carers remains at the forefront of this recommendation. The clinical practice guidelines are defined as: “Systematically developed statements to assist the practitioner and the patient decisions about appropriate healthcare for specific clinical circumstances”^(7,8). The systematic method to considering the modification of a guideline (s) created in an organizational setting for use in a different one is known as guideline adaptation. Adaptation could be utilized instead of developing new guidelines or altering current guidelines to fit the local situation⁽⁹⁾. Given that, there were no published CPGs for ALOC management in AUCH, the presented CPG is proposed as a local CPG. This study aimed to present the adaptation pathway that was used to create the first local CPG in AUCH for the management of children with ALOC.

Methods

We utilized the ‘Adapted ADAPTE’ method⁽⁹⁾, the three phases were used with modifications in terms of the steps and tools to fit the local setting in the healthcare sector at the AUCH^(10,11). The Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument was developed to present the variability in guideline quality. The “AGREE instrument is a tool that assesses the methodology and transparency in which a guideline is developed”. The original AGREE instrument has been modified to the new AGREE II and includes a new User’s Manual⁽¹²⁾.

2.1 SET-UP Phase (phase one)

Phase one - SET-UP Phase

We listed the activities that should be performed before the adaptation process can begin. First and foremost, we developed a guideline adaptation group (GAG) comprised of clinical, methodological, managerial, and administrative competence. After that, we choose a CPG topic. The Alexandria Faculty of Medicine had the vision to create standards for the emergency management of children with altered levels of consciousness. The information officer conducted a comprehensive electronic search of the CPG issue and identified all relevant literatures. We used CPG sources such as print publications and online sites for CPG clearinghouses and well-known developers, as well as electronic databases, references list in retrieved CPGs (manual searches), and panel members' recommendations. The organizing group drafted a brief protocol explaining the steps that the panel would go through⁽⁹⁾ (Appendix 1) (Figure 1).

2.2 Quality appraisal of the guidelines (phase two)

The Adaptation Phase guided users through the steps of choosing a topic, finding particular health questions, searching

for and retrieving CPGs, evaluating CPG quality, currency, substance, consistency, and applicability, making adaptation decisions, and generating a draft adapted CPG. The PIPOH was utilized to help define the health questions and cover all essential areas:⁽⁹⁾ The elements of the PIPOH model included “the target patient population (P), intervention(s) (I), professionals and clinical specialties (P), outcomes (O), and healthcare setting or context (H)”. A search strategy has been generated based on the main question(s) defined in the Scope & Purpose Module. The group decided to start search the answers through CPG sites including the ECRI Guidelines Trust. (<https://guidelines.ecri.org/>), the Guidelines International Network ([\[i-n.net/\]\(http://www.g-i-n.net/\)\) and in the country-specific databases. The Appraisal of Guidelines Research & Evaluation. The \(AGREE\) II Instrument \(\[www.agreetrust.org\]\(http://www.agreetrust.org\)\) is a framework for evaluating CPG quality. Each CPG will be appraised by at least 4-6 appraisers, according to the panel. The results of the completed AGREE II instrument were totaled and tabulated in a spreadsheet. Strongly advise: if most items have high rates \(5 or 6\) and the bulk of domain scores are above 60%. It was strongly suggested to select the RCPCH. After the panel had decided on the content of the adapted guideline, the information officer developed a draft CPG for the panel to evaluate first. For the CPG contents and attributes/items, we used the Adapted ADAPTE as a template. \(Appendix 1\).](http://www.g-</p>
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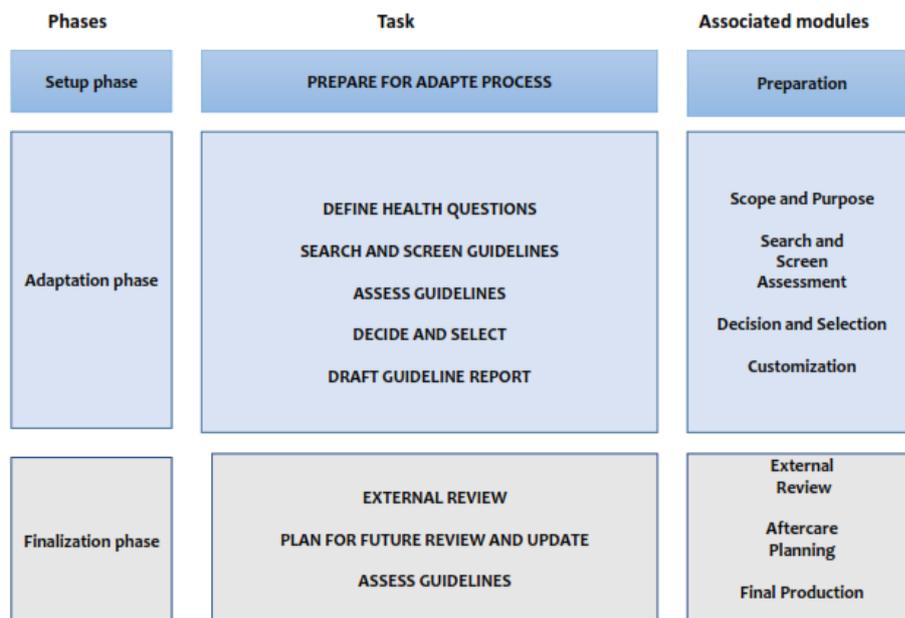


Figure 1: The phases of the adaptation process

2.3 Comparison of adapted guideline with its parental guidelines (phase three)

The citations of the original study utilized as the source for each suggestion in the parental CPGs were identified, checked, and reviewed. Then, among the references, we

chose the research design with the best quality as the representative level of evidence for each suggestion. Phase Three- Finalization Phase: Members of the AUCH Staff were included in this phase to examine their feedback on the adapted CPG's

final approval. Faculty staff members, decision makers, and senior pediatricians from the Alexandria University Children Hospital-Department of Pediatrics, Faculty of Medicine, Alexandria University made up the External Review Panel. (Appendix 1).

Results

3.1 The guidelines

From December 16, 2019, through December 30, 2021, the CPG adaptation process lasted two years. For planning, reviewing, and group discussions, five meetings were held. This is the first local CPG adaptation initiative employing the 'Adapted ADAPTE' to manage children with ALOC.

Phase one (set up)

The GAG was formulated in December 2019. ALOC was chosen as a high-priority health concern because of the wide diversity in practice and the lack of local CPGs for its treatment. The required resources and skills have been identified and assigned. A preliminary search for published CPGs was used to confirm the feasibility of the CPG adaptation method. Using the applicable CPG adaptation working plan template from the Adapted ADAPTE, the working plan was prepared and debated right away (Appendix 1,2)⁽¹⁰⁾.

3.2 Quality of the guidelines

Phase two (adaptation)

A systematic review for the recently published ALOC Source CPGs was conducted and published in a separate report for the first and second phases, which included the PIPOH model, eligibility criteria, results of the search and screen for Source CPGs, as well as the ratings and commentary of the AGREE II appraisal. Three ALOC CPGs recently developed and published by the RCPCH, Whittington Health, and New South Wales Health were appraised and reviewed. The RCPCH CPG outperformed the AGREE II

Instrument in all three standardized domain scores, and it covered all ALOC treatment choices. Following that, the RCPCH Source CPG's currency was assessed to confirm the validity and currency of its recommendations and evidence foundation, utilizing the associated CPG currency evaluation from the adapted ADAPTE. (Appendix 1, 2)^(10,13). We used the same structure of RCPCH's recommendation statements, which focused on the 'wording' of each suggestion rather than highlighting the evidence quality or recommendation grade, as other CPG developers might do. The rationale for this format has been clearly stated in the RCPCH website <https://www.rcpch.ac.uk/resources/management-children-young-people-acute-decrease-conscious-level-clinical-guide-line>. The panel decided to adapt the CPG Implementation tools provided by the RCPCH Source CPG. (Appendix 3)

Phase three (finalization)

Two members participated as the external review panel from the target audience of the CPG; Based on their expertise in caring for children with ALOC and in methodology of evidence-based CPGs, as well as their representation of different important healthcare sectors in AUCH. The comments from the external review panel were compiled using a template,⁽¹⁰⁾ amended, discussed, and included into the finished modified CPG full document's recommendations. The CPG recommendations were customized or adapted to account for disparities in health systems and delivery of healthcare services, particularly for children with ALOC, between the United Kingdom (UK) and the AUCH in Egypt. The parallels in both nations' health systems, which are nationalized healthcare systems in which the government provides the majority of healthcare services, aided in the adaptation of recommendations to the local environment⁽¹⁴⁾. The adapted

guideline recommends the followings for management of children with ALOC: (Appendix 2,4). Consider GCS, APVU for assessment of the level of consciousness and pediatric CAM-ICU for assessment of delirium. If the GCS less than eight or the child is non-responsive to pain on the "alert, verbal, pain, unresponsive" AVPU consider intubation. Consider measuring and recording of the oxygen saturation and offer oxygen if the saturation is = or < 95%. Perform a blood glucose level within 15 minutes of the beginning of symptoms. The initial clinical assessment includes: Recording the vital signs, physical appearance, and oxygen saturation is recommended. The following causes should be suspected in children with ALOC and start treatment within the first hour of presentation: Shock, Septicemia, Metabolic disorders, CNS infection, increased intracranial pressure, seizures, poisoning, Trauma, Raised blood pressure, Stroke. Consider saving a plasma sample for toxicological screen if this is suspected. A lumbar puncture and check CSF is recommended if intracranial infection is suspected. Measure the opening intracranial pressure if possible. Consider circulatory compromise if skin mottling, cold extremities or decreased peripheral pulsation has been observed. Administer 20 mL/kg of isotonic fluid if signs of shock are present. Consider requesting the following investigations from the saved samples if the blood glucose of less than 50 mg/dl (3mmol/L): Plasma hormones including insulin, cortisol and growth hormone, metabolic screen for plasma amino acids free fatty acids, beta-hydroxybutyrate, Acylcarnitine profile, Urine organic acids. If blood glucose is less than 50mg/dl (3mmol/l) administer glucose 10% 2ml/kg as an intravenous bolus. Then, administer dextrose 10% continuous infusion to maintain a blood glucose level between continuous infusion 4 and 7 mmol/L. Think about

bacterial meningitis one or more of the following signs and symptoms are present: non-blanching rash has been observed, presence of signs of meningeal irritation. The child is unconsciousness, or shocked, observed bulging anterior fontanelle, photophobia, toxic state, evidence of cranial nerve involvement and abnormal pupillary size or reflex. A positive CSF PCR result for herpes simplex virus is considered to confirm the clinical suspicion of herpes simplex encephalitis and if clinically suspected administer intravenous acyclovir "(20 mg/kg every 8 hours for children aged 1-3 months; 500 mg/m² three times a day if aged 3 months to 12 years; 10 mg/kg every 8 hours for children aged over 12 years)". Consider treating a child with seizures lasting more than five minutes and, check the plasma electrolyte level including calcium and magnesium. Additional tests are recommended to be performed in discussion with a specialist in pediatric neurology after reviewing all investigations while the cause of ALOC is still unknown or not clear. The investigations include: "Cranial CT or MRI scan, Lumbar puncture, Urine toxicology. Urine organic and plasma amino acids and Plasma lactate, EEG after the results of brain imaging has been revealed". During resuscitation and initial management of a child with an ALOC, the parents/carers should be allowed to attend with the child upon their request and to be kept updated and informed of the possible diagnosis and the management plan.

Discussion

In the present study we aimed to adapt EBCPG on the ER management of ALOC in children that could be applied in the local context; to achieve the standardization of pediatrician and specialists practice in the management of children with ALOC. Clinical practice ('guidelines') are statements

that have been methodically developed to help health practitioners and patients in making decisions regarding appropriate health care for specific clinical situations. Furthermore, guidelines have developed to address themes across the health care continuum and can play a significant role in health policy creation (e.g., health promotion, screening, diagnosis)⁽¹⁵⁾. The panel has decided to select the management of ALOC in children as the selected topic based on the high prevalence of ALOC in children in AUCH, economic burden, current very big variation in practice as showed in the previous survey, the likelihood that adapted clinical practice guideline will be effective in achieving the standardization and consistency of practice concerning management of ALOC in children and improvement of outcome for children with ALOC. To the best of our knowledge, we do not have any valid high-quality evidence-based clinical practice guidelines in this topic of ALOC in pediatrics, nor do we have the resources to develop denovo CPG of high quality, so adapting the currently available CPG to our local context is required in order to improve our clinical practice. The current study's adaption process provided two guidelines: NSW (GL2014 019) and RCPCH (2015 Update Revised 2019). The panel assessed both of them (NSW and RCPCH). The panel gave a score of (7) to RCPCH guideline and gave (6) to NSW guideline. The score obtained for both was the same score concerning their quality as revealed by AGREE II instrument. The panel decided to use RCPCH for formulation of a new adapted guideline as it is a complete guideline for achieving the stated objective of the present study. We formulated the adapted clinical practice guideline and there was a consensus on the recommendations evolved from the adapted guideline by the external reviewer committee. The adapted guideline

recommended performing a hypoglycemia screen if the blood glucose level is below 3 mmol/L (50 mg/dl) and then correct the blood glucose level immediately. Similarly, Abraham et al.⁽¹⁶⁾ found that performing a hypoglycemia check if the capillary blood glucose level is below 3 mmol/L and then immediately correct the blood glucose level using intravenous glucose 10% infusion. Also Abraham et al.⁽¹⁶⁾ indicated giving intramuscular (IM) or subcutaneous (SC) glucagon in the home settings. Concerning the Lumbar puncture indications, the adapted guideline recommended that it should not be performed as part of the initial acute management in certain circumstances such as a GCS = or < 8, shock, clinical presentation of meningococcal disease, impaired or lost pupillary reaction, if the signs of increased ICP are existing, or there is any evidence of suggesting blockage of the CSF pathways by neuroimaging studies. This is in agreement with a study conducted by Bowker et al.⁽¹⁷⁾ that stated that GCS less than 8, deteriorating GCS, focal neurological signs, seizure lasting more than 10 min and still has a GCS < 12, signs of elevated ICP, clinical evidence of systemic meningococcal disease, pupillary dilatation are contraindications for performing a lumbar puncture. Concerning the neuroimaging the adapted guideline recommended to carry out emergency neuroimaging scan when the child is stable if the working diagnosis is unknown or possible intracranial abscess or the cause is unknown. In accordance with our recommendations for best practices, According to Amorim et al. (2016)⁽¹⁸⁾, head tomography is required when there is a suspicion of an intracranial lesion and should be the first image evaluation ordered. Moore et al.⁽¹⁹⁾ further stated that MRI is not a standard evaluation performed in the emergency room. However, as noted in our recommendations, it may provide useful information on

the number, nature, and severity of the lesions, as well as enabling the identification of injuries not seen on a head CT, such as in cases of herpes simplex encephalitis or diffuse axonal injury. Regarding the management of Circulatory Shock, the adapted guideline recommended administering fluid boluses of up to 60 mL/kg to and consider intubation and ventilation if more than 40 mL/kg of fluid required. This matches with McKiernan and Lieberman (American academy of pediatrics)⁽²⁰⁾ considered that Treatment involves stabilization of the airway, provision of oxygen and adequate ventilation, establishment of vascular access, and aggressive fluid resuscitation. And add Further treatments for our guideline including transfusion of blood products with support with vasoactive medications, should be guided by the evolving clinical situation. In regard CNS infection the present adapted guideline recommended considering the diagnosis of bacterial meningitis in children presented with signs of meningeal irritation, elevated intracranial pressure, or suspected toxicity. Also, advised to perform LP whenever bacterial meningitis is suspected. Alamarat and Hasbun⁽²¹⁾ support our recommendations, reporting that repeat LPs are not generally suggested in patients who respond appropriately to antimicrobial therapy, except in the event of meningitis caused by *S. pneumoniae* and if the organism is cephalosporin-resistant. The guideline recommended performing CSF PCR to confirm the clinical suspicion of herpes simplex encephalitis and acyclovir should be commenced without delay even if a lumbar puncture is contraindicated. According to Britton et al.⁽²²⁾ seizure control, management of raised intracranial pressure, circulatory and respiratory support, nutritional support, skin integrity and pressure area care, and prevention of hospital-acquired infections are all things that

should be addressed. Patients with suspected meningo-encephalitis should be started on acyclovir, and antibiotics for possible meningitis or sepsis should be given within 20 minutes of presentation⁽²²⁾. Alcohol intoxication management had been omitted as it is not prevalent among children in our local context.

Conclusions

CPG adaptation as an alternative to new development has the advantage of lowering costs and avoiding unnecessary effort in CPG development, as well as considering the variety of institutional settings. The finalized CPG provides healthcare practitioners with the applicable guidance for the management of children with ALOC in AUCH. The project also highlighted the efficacy of the 'Adapted ADAPTE', tool.

Abbreviations: AGREE: Appraisal of guidelines for research and evaluation. ALOC: Altered level of consciousness. CNS: Central nervous system. CPG: Clinical practice guideline. CPGI: Clinical practice guideline implementation. CSF: Cerebrospinal fluid. GRADE: Grading of recommendations assessment, development, and evaluation. LP: Lumbar puncture. RCPCH: Royal College of Pediatric and child health.

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Contributions to the literature

For the establishment of evidence-based guidelines, adaptation of guidelines is a viable option to de novo development. For such projects to succeed, the guideline committee must include a balance of clinical and methodological experience. We report the process

and outcomes of a multidisciplinary interdisciplinary local guideline adaptation initiative for the management of children with ALOC. These findings support efforts to improve the adaptation or customization of ALOC clinical practice recommendations.

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