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PEDS CASES – ALTERED LEVEL OF CONSCIOUSNESS (2025 UPDATE)

Developed by Kennedy Lewis and Dr. McKenzie Simpson for PedsCases.com.
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INTRODUCTION:

Hello and welcome to PedsCases. I'm Kennedy Lewis, a medical student from the University of Saskatchewan, Regina chapter. Today, we'll be exploring pediatric altered level of consciousness.

I'd like to thank my supervisor, Dr. Mackenzie Simpson, the PedsCases team, and the previous contributors of this topic, Peter MacPherson and Dr. Melanie Lewis.[10] Without them, this episode wouldn't have happened!

To save breath, I will refer to altered level of consciousness as "ALOC". While we discuss the vast topic of ALOC, please keep in mind these disclaimers:

1. Depending on your level of training, some of the causes of ALOC we discuss today may be beyond what is expected for you to handle on your own. Always remember in medicine, asking for help is a sign of wisdom and insight!
2. Our approach is NOT all encompassing – it is foundational! Additional investigations, management, and causes may need to be considered.

OUTLINE:

To keep us oriented while we discuss ALOC, the key objectives that learners will be able to tackle following this podcast include:

1. Define ALOC
2. Develop an approach to ALOC
3. Discuss the pertinent investigations & management for common causes of ALOC

And don't forget: our script and show notes are available at PedsCases.com, so you can just focus on listening (at whatever speed that may be).

Without further ado, let's get into pediatric ALOC!

TERMINOLOGY

It is important to understand terminology that relates to ALOC, including how ALOC itself is defined: ALOC is defined as any change from a patient's baseline mental status and/or a Glasgow Coma Scale (GCS) <15.[1]

GCS is a method used to assess consciousness in patients over 2 years of age. In patients under 2 years, pGCS (aka the *pediatric* GCS) can be used. Both scales have eyes, verbal, and motor components accounting for 4, 5, and 6 points, respectively. This totals to a maximum score of 15. Unlike GCS, pGCS accounts for the limited language skills of those under 2 years.[2]

AVPU is an alternative method of assessing consciousness, and it is suitable for all ages, as it does not rely on any language skills.[1] It can be especially useful for situations involving language barriers.[1] Each letter of AVPU represents a level of response: A= alert, V = response to a verbal stimulus, P= response to a painful stimulus, and U = unresponsive.[1]

A few common terms relating to ALOC are:

- "Lethargy", which is when a patient's consciousness is slightly impaired, but they are responsive to verbal stimuli and can easily follow commands. Typically, GCS is ~13-15.[1, 12]
- "Stupor" describes a patient who is not completely unresponsive, but who has impaired consciousness. A GCS of 9-12 is often associated with this.[1, 12]
- "Coma" is used to describe a patient who cannot even be roused with a painful stimulus. GCS is <8 for these patients.[1, 12]

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DEVELOPING A DIFFERENTIAL WITH "DIMS"

For clarity, our approach will follow a sequence: differential diagnosis, primary assessment, history, secondary assessment, investigations, and management. Keep in mind that in reality, these steps may overlap. Ultimately, each step in your approach should aim to inform your clinical suspicions and next steps.

The first step in our approach is to develop a solid differential diagnosis, which we will consider using the "DIMS" mnemonic – however, it's important to use the method works best for *you*. DIMS stands for **Drugs**, **Infectious/Inflammatory**, **Metabolic/Endocrine**, and **Stroke/Seizure/Structural**.

- The **Drugs** category of DIMS should have you thinking about accidental ingestions, missed doses, and toxidromes. [6, 7]

- For the **Infectious/Inflammatory** category:
  - Consider CNS infections like meningitis or encephalitis, especially in babies who have not yet developed full immune systems. Shock and sepsis should also be on your radar. [7, 8]
  - Autoimmune causes, such as anti-NMDA encephalitis, is a contender to consider in the inflammatory category of DIMS. [7, 8]

- **Metabolic/ Endocrine** is the next category of DIMS.
  - Inborn errors of metabolism, renal failure, or hepatic failure should be included in the "metabolic" category. [6, 7]
  - For Endocrine, DO NOT miss hypoglycemia, which can overlap with DKA. [6, 7] The handy mneumonic ABCDFG should always be top of mind (Airway, Breathing, Circulation and **D**ON"T **F**ORGET **G**LUCOSE. Thyroid abnormalities and electrolyte abnormalities should also be considered. [6, 7]

- "S" stands for **Stroke, Seizure, and Structural**.[4]
  - Strokes are uncommon in previously healthy children, but they do occur, so don't forget about this S.
  - Seizures have various presentations. Keep in mind subclinical seizures, and post-ictal states. For more info, listen to the PedsCases episode covering pediatric seizures next.
  - Some structural causes include: tumors, masses, hydrocephalus, cerebral edema, or obstructed shunts. Remember, tumors and masses are often insidious in onset.

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PRIMARY ASSESSMENT: STABLE VS UNSTABLE

Next in our approach, we will go over primary assessment using "ABCDE & DFG", which allows us to determine if the patient is stable vs unstable.[10] Alternatively, the pediatric assessment triangle can be used, which is a hands-off method of determining patient stability.

ABCDE stands for airway, breathing, circulation, disability, and exposure – many of you probably already know that by heart, and we won't cover this in depth.

If you're wracking your brain about what "DFG" stands once again stands for "DON'T FORGET GLUCOSE!"[10] Getting a glucose level early on is important, as hypoglycemia is an easily reversible cause of ALOC.

Other elements included in the primary assessment that should be emphasized are:

- The importance of context when interpreting vitals! Ensure you're referring to the correct ranges for normal vitals based on a patient's age and clinical presentation.
- To avoid missing anything on physical exam, ensure to have the patient fully undressed at some point.[5] This can be stressful for the patient and/or their caregivers - it may help to explain what you're doing and why during the examination.

History

After establishing that the patient is stable, you can move into the next part of our approach – history. Pediatrics involves a wide range of stages and ages: with this in mind, you need to discriminate what to include and is pertinent on history. For example, in an older child, social history may be more relevant while Birth history and Developmental History may be less so.

Collateral history is often very helpful in pediatrics; depending on the situation, the patient may not be able to provide their own history. However, if the patient can give their own history, ensure they are comfortable doing so by keeping them involved and potentially asking caregivers to leave if the patient would prefer privacy.[3, 6]

As always, you want to include the patient's **presenting concern** in the history; keep it succinct, using the patient's words if possible.

For the **History of Presenting Illness (HPI)**, you are trying to determine what occurred before they presented. The main elements to tease out on HPI include: onset, duration, characteristics, timeline, and progression of the ALOC, especially in relation to any associated symptoms that may be present. Additionally, determine any aggravating or alleviating factors.

You should also inquire about previous episodes of ALOC, obtaining details such as when it happened, how it compared to their current presentation, and how/if it resolved.

The **Review of Systems (ROS)** is designed to uncover symptoms which may not have been explored yet. It is important to do a broad review of systems, but we cannot cover each system in today's episode.

- Your DIMS mnemonic can also help guide your ROS, where you can ask a few questions that explore each of the DIMS categories. Based on the patient's/family's responses, you can tailor your next questions and calibrate your clinical suspicions. For example: you can ask about viral/bacterial symptoms leading up to presentation, sick contacts, rashes, and neck stiffness to explore some potential causes of ALOC relating to the infectious category of DIMS.
- Some things to ask about include: confusion/difficulty concentrating, agitation, changes in behavior, weakness, lethargy, neck stiffness, rashes, nausea, vomiting, diarrhea, syncope, gait changes, seizures, headaches, photophobia, changes in vision, fever, cough and chest pain.[3]

The **Past Medical History** will give us an idea about the patient's baseline level of health.

- Determine: current or previous diagnoses, management of these, and how diagnosis occurred.
- If there has been a previous hospital admission or emergency department presentation, find out when, why, and for how long.[1]
- Inquire about previous testing, such as laboratory and imaging, as well as the results.
- Note previous procedures, instrumentation, surgeries, and any complications related to these.

For **allergies**: Do they have any? If so, what does that look like? Do they have an epi-pen?

In terms of **immunizations**, establish if they've received the recommended vaccinations for their respective age group. If they're behind in schedule, they may have more susceptibility to infectious causes of ALOC, such as meningitis and influenza.[4]

In the **medications**[6] part of our history, determine if the patient has taken any medications, have changed doses, or have missed doses.

- Regardless of the medication, determine the related "when", "what", "why" and amount.
- Missed doses or dose changes are most pertinent to ask about in patients with seizure disorders who are managed with medication.
- Inquire about complementary alternative medicines and/or non-prescribed substances

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The **social history**, consider the HEADSS mnemonic, which explores: **H**ome, **E**ducation/**E**mployment, **A**ctivities, **D**rugs, **S**uicidality and **S**exuality. Inquire about sick contacts as well.

- Home: Who lives with you at home? Do you feel safe at there?

- Education/Employment & Activities:
  - Do you have sick friends or teammates?
  - Have you been absent or struggling because of your ALOC?
  - Are you in any contact sports where you recently had head contact or concussion?

- Drugs:
  - Have you tried any drugs before? (If they have, get further information, such as what drugs, methods of consumption, amount, frequency, duration, safety of supply)
  - If you're suspicious of ingestion-induced ALOC, consider asking:
    - What medications are kept in the house? Remember, they could have taken somebody else's meds – you may not know what they ingested.
    - Was the ingestion intentional? Has this happened before?

- Sexuality/Suicidality:
  - Determine if the patient has any current or previous suicidal ideation, self-harm, and/or suicidal attempts.

If pertinent, also include a **travel history**.

The **family history** should include (but is not limited to) questions exploring cardiac-, immune-, neurologic-, endocrine-, metabolic-, and genetic-related conditions. Consider also asking about consanguinity. [1,6]

For the **birth history**[1,2] determine if the patient was healthy at birth, born at term or pre-term, if there were any substance exposures during pregnancy, if there were complications during pregnancy or birth, and if the patient was ever admitted to the NICU.

The aim of a **developmental history**[1,2] is to determine if the patient is meeting their milestones. You may ask if the caregivers have any concerns about the patient reaching their milestones. While nobody likes being compared to siblings, it can be helpful to do so when trying to determine if there are any causes for concern related to their developmental trajectory, a red flag in any developmental history is regression of developmental skills.

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SECONDARY ASSESSMENT

Now it's time for the secondary assessment, where we can focus on examining areas that may support or refute our top differentials.

For your **neurological exam** note - strength, tone, sensation, coordination, reflexes, gait, cranial nerves, cognition, pupils, speech and special exams.[1, 2]

- Note that cognitive assessment is more difficult and less accurate in younger children.
- On pupillary exam, look for:
    - PERRLA (aka, pupils are equal, round, and reactive to light + there is accommodation)
    - Extraocular movements
    - Nystagmus
    - Pupillary abnormalities will not be discussed in depth in today's episode, but they can be seen in toxidromes, and/or in herniation syndromes.
- Consider special exams, such as Kernig and Brudzinski, which assess for meningeal irritation.[2]

For HEENT: look for CSF leakage, erythema, bleeding, hematomas, scleral icterus, papilledema, and conjunctival injection. In infants, look for a bulging fontanelle.[1,2]

The **derm** examination involves checking for rashes, birth marks, jaundice, excoriations, signs of trauma, and any other abnormalities. Some notable findings are:

- Purpura and/or petechia, which may be associated with meningococcemia in a febrile patient. In an afebrile patient, it can indicate trauma (accidental or inflicted), or abnormal bleeding tendencies.[1]
- A vesicular rash may indicate HSV
- Café au lait spots may be manifestations of Neurofibromatosis Type 1

Consider a **Fluid status assessment**, especially if the patient has been febrile, and/or more susceptible to dehydration and electrolyte abnormalities.[3]

Don't overlook other systems; some ALOC-specific examinations to consider include: murmurs, arrythmias, perfusion, abnormal breathing patterns or sounds, organomegaly, ambiguous genitalia, and lymphadenopathy.

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INVESTIGATIONS

There are many investigations which can be useful for identifying causes of ALOC. Investigations should be guided by your history and physical examination. Some of the most commonly ordered are: [11]

- CBC + differential
- Electrolytes
- Renal function tests
- Liver enzymes and liver function tests
- Blood gas and serum osmolality
- Serum Ammonia & lactate
- Urine & serum toxicology screens
- Blood glucose (which you should have done already – remember, DFG!)[10]
- An Infectious workup varies depending on the situation, but may include:
    - Inflammatory markers (ie CRP) [2, 8]
    - Urine & blood cultures
    - Urinalysis[8]
    - Stool studies
    - NP swabs for viral studies
    - LP + CSF analysis: Include cell count, culture, protein, glucose, gram stain, and viral PCRs.[1] (Note that in some situations, such as suspicion for brain herniation, CT may be warranted prior to doing an LP)!

- Often, imaging is indicated in the workup of ALOC.
    - Typically, CT is preferred over MRI as it is more available, and faster than an MRI.
    - Other imaging may be warranted as well. For example, a CXR may be useful in a patient with respiratory and/or infectious symptoms.

- Additional investigations to consider are:
    - TSH, for thyroid-related disorders
    - EEG, if seizures are high on your differential
    - ECG, to investigate cardiac etiologies or to watch for toxidrome-associated changes in cardiac conduction.[7]
    - Coagulation studies
    - Pregnancy test, in any post-pubertal female.

MANAGEMENT

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By now, your differential should be significantly narrowed – and your management plan should reflect that! However, there are a few general management strategies to always keep in mind:

- You always want to stabilize your patient if they are unstable. You may want to consider intubation and/or supplemental oxygen, depending on the situation.

- In most cases of pediatric ALOC it is appropriate to consider establishing IV access early on. In pediatric we will often draw labs at the time of IV initiation to decrease the number of pokes.

Based on our DIMS categories, here are some basic management strategies to consider:

Drugs
- If you're suspicious of ingestion-related ALOC, involve poison control ASAP, provide supportive care, and administer antidotes if appropriate. Charcoal can be useful for managing ingestion, but it depends on the timing and type of ingestion.

Infectious/Inflammatory
- Infectious etiologies are mainly managed with antibiotics and/or antivirals, depending on the pathogen. If you suspect bacterial meningitis, DO NOT delay giving broad spectrum antibiotics; these can be narrowed down later, after cultures & sensitivities are obtained.[9]

- For inflammatory causes, IVIG, steroids, and/or plasmapheresis are some common methods of management, depending on the specific etiology.

For Metabolic/Endocrine: we want to address and correct what we can.

- For example, with hypoglycemia, appropriate management includes giving dextrose and correcting any electrolyte and/or acid-base disturbances[7]
- In a patient with an inborn error of metabolism, consider a consultation with a metabolic specialist and empiric treatment for a metabolic emergency.

Stroke/Seizure/Structural

- Stroke: consider consulting neurology, hematology, ICU, +/- neurosurgery.
- Seizure: anti-epileptic medication (refer to CPS statement).[13]
- Structural: consult neurosurgery, and potentially other specialties, as needed. If trauma is suspected, consider spinal precautions![5]
- ** Do not forget that abusive head trauma which often includes subdural hematomas and cerebral edema, can present as ALOS with no evidence of external trauma and a misleading history

Extras

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- Two causes of ALOC to watch for are increased intracranial pressure (ICP) and brain herniation - if left untreated, these can be fatal.

- Increased pressure in the brain has a plethora of manifestations, including: headache, papilledema, nausea, and vomiting. Cushing's triad is a notorious triad which can be a late sign of increased ICP; it is comprised of hypotension, bradycardia, and irregular respirations.

- Increased ICP that is inadequately managed can progress to brain herniation, of which there are various types and manifestations. Abnormal posturing (such as decorticate and decerebrate), pupillary abnormalities (fixed + dilated), a rapid decrease in consciousness, and respiratory arrest may be seen with herniation.

- Management for both requires a consultation with neurosurgery and PICU; the only difference is that the consultations for suspected ICP are URGENT whereas for suspected brain herniation the consultations are EMERGENT.

Summary & Conclusion

With that, we have covered all 3 of our objectives! We have defined ALOC and some of the terms used to describe it, and we've compared various methods used to assess consciousness, including: GCS, pGCS, and AVPU.

For our initial approach to ALOC, we used "DIMS" to build a broad differential. That stands for drugs, infectious/inflammatory, metabolic/endocrine, and stroke/seizure/structural. Next in our approach, we went through determining patient stability using ABCDE + DFG in our primary assessment.

The history component highlighted how a patient's age and presentation can influence the relevance of certain elements of a pediatric history. Our secondary assessment was discussed with an ALOC-focus, highlighting physical exams to consider performing to either support or refute our differentials.

For our investigations, we focused on commonly ordered labs, with mention of some situation-specific considerations.

Finally, we broadly covered methods of management for each category of the DIMS mnemonic and general management strategies that should be considered in all ALOC presentations. Additionally, we discussed management for situations when you are suspicious of trauma, increased ICP, and/or brain herniation.

Well, that concludes today's podcast. Thank you for listening, stay safe, and stay curious!

Citations

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