Topic Overview: Professional Entry Critical Care
Sub-Module: U1 – Altered Level of Consciousness
[Last Updated August 2013]

This handout is designed to partner the topic overview simulation session U1: Altered Level of Consciousness. This session involves a presentation, followed by a simulated scenario. Use this document to jog your memory or to aid in your reflection of the session, and the simulation.

We are targeting "higher level learning". This is the application of skills and knowledge within a contextualised event to, hopefully, improve performance and practice. Learning is further encouraged through discussion and also working through simulated scenarios. This session is also designed to allow you to put into practice knowledge and skills attained from this session and other learning environments (other EdWISE cardiac sessions, any associated eLearning, clinical placements, etc.).

As clinicians we should be constantly reviewing our own practices and looking for current best practice standards. During the feedback sessions we will facilitate this reflection but we would also encourage you to reflect on your experience in this session and think about any improvements that could be made to your own practice, the practice of your team or department or to any systems that you work within. Reviewing this handout may help you to do this.

Introduction
A patient presenting on the ward, on the street or in the ED with an altered level of consciousness can be difficult to assess, manage and diagnose. This module will describe a structured approach to these patients including: initial assessment; early investigations; differential diagnoses and initial management. It is important to remember that prompt treatment of these patients is vital and will be greatly improved by a multidisciplinary team approach.

Objectives for this module
- Describe a structured approach to patient presenting with an altered level of consciousness (LOC).
- Outline initial assessment of patient with altered LOCs
- Rationalise investigations to perform on patients with altered LOCs
- Provide a framework for thinking about potential differential diagnoses
- Discuss management options for some of the more common and/or serious pathologies presenting with an altered LOC
- Discuss the importance of communication, multidisciplinary teamwork, escalating concerns and handover when treating this patient population

Initial Assessment & Approach
The initial approach to the patient will be the same as for any critically unwell patient - DRS ABCDE (DEFG).

D - Danger

Is there any danger to you, your staff or the patient? If the patient has an altered LOC are they combative? Are they likely to put themselves, you or any of your team members at risk? Are they carrying a weapon or something that could be used as one? Have the police been involved? Is the patient handcuffed? Is the agent that has caused them to have an altered LOC likely to also affect you or your team?

R - Response

Is the patient responsive? Do they respond to your arrival to their bedside? Ask them a question!

S - Shout for Help

Think about help at this stage. Although it may not be appropriate to shout for help with every critically ill patient that you see, it is worth thinking about your need for help with every patient that you see. This will make it less likely that you forget

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this vital step when you are in need! It is also important to think about the likely journey that this patient will take. If they are likely to be suffering with a stroke or trauma - does your hospital have the appropriate skills and team available 24 hours? Is it likely that you are going to need to mobilise retrieval or specialist help? If so think of these early so that they are mobilised as early as possible.

A - Airway

Does the patient have an open and protected airway? If the patient is able to speak to you coherently and there are no added or abnormal sounds of breathing, then the likelihood is that they do. Ask the patient a question! If the patient is obtunded then airway opening manoeuvers may need to be attempted whilst help arrives. Oxygen can also be applied at this time via a non-rebreathing mask. If you are supporting the patient's airway you will require other members of the team to complete the initial assessment of the patient. Have a look in the airway. Is there any odour (alcohol, acetone, other)? Are there any tablets or foreign materials there that may account for the reduced LOC or may be endangering the airway? If so these may need to be carefully removed. If your patient has an altered LOC it may be that they will require airway support and protection. Many obtunded patients also suffer with airway obstruction (think of snoring and paradoxical respiration). Simple airway manoeuvers may help with the obstruction. It may be that the patient will require intubation and ventilation whilst the cause is found and managed. Intubation also protects the airway from foreign material. Patients with altered LOC may have reduced capacity to protect their own airway. If the patient is P or U on the AVPU scale or has a GCS of 8 or less (see Disability below), serious consideration should be given to intubating the patient for airway protection - even if their ventilation is adequate without!

B - Breathing

- Look - Are they breathing or trying to breathe? Is the chest expanding well and symmetrically? Are there any lumps, bumps, rashes, defects on the chest wall (remember that there is a front, a back and two sides to the chest)? Is the patient exerting themselves to breathe? Is there intercostal recession or tracheal tug? Are they sat upright gasping for breath and unable to answer your questions? What colour is the patient? Do they look pink and healthy, or blue, or grey? What is their respiratory rate? How does this compare to their previously charted rates?
- Listen - Can you hear any abnormal sounds of breathing from the bedside - wheeze, stridor, grunting, coughing, other? Now its time for your stethoscope. Remember to listen to the front, back and sides and compare left with right.
- Feel - Palpate the chest for lumps, bumps, rashes, deformity and tenderness. You may also be able to feel rubs, thrills, heaves or surgical emphysema. Your hands may also give you an indication of adequacy or work of breathing. Are the chests expanding equally on inspiration?
- Monitoring - A saturation probe can give you information about the patient's oxygenation and often the heart rate and rhythm. A good waveform may also indicate a decent perfusion pressure to that finger/ear. The saturation probe does not indicate the adequacy of ventilation so cannot tell us about the patient's carbon dioxide level. It is usually beneficial to administer supplemental oxygen to patients with a reduced level of consciousness. High flow oxygen via a non-rebreathing mask should be considered.

C - Circulation

- Look - What does the patient's skin look like? Are they flushed, pale, mottled, peripherally cyanosed? Look for indicators of adequate cardiac output and perfusion to distal organs (skin mottling, urine output, GCS) Are there any obvious sites of fluid loss - urine in catheter bag, vomit bowls, suction, input/output charts or blood? Are there any indications of fluid replacement or circulatory support - IV fluids, blood, or syringe drivers containing drugs acting upon the cadiovascular or central nervous systems? Does the patient have pitting oedema of dependent areas? Is this due to right-sided heart failure? Is their JVP normal?
- Listen - Auscultating the precordium can give you some vital clues - rhythm, rate, murmurs, clicks, pericardial rubs. You may also be able to hear crackles at the bases of the lungs that may indicate left ventricular failure.Feel - Feeling the temperature of the patient's hands and feet can give an indication of distal perfusion. You can compare central capillary refill times to peripheral.

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- Feel for pitting oedema and for calf tenderness. Palpating peripheral pulses is also important. This can give an indication of rhythm, rate, pulse pressure and character. You should also compare the pulse pressures in the peripheral pulses, you may be able to diagnose an aortic dissection! Absent pulses may be due to poor or obstructed vasculature or a low perfusion pressure. Palpating the liver may also give an indication of right-sided heart failure if it is enlarged and/or pulsatile.
- Monitoring can also give valuable information. The monitoring available will vary as to where the patient is and the appropriate monitors will be determined by the patient's illness. Saturation monitoring can give valuable information on heart rate and rhythm. This can be supplemented by 3 or 5 lead ECG and non-invasive blood pressure monitoring. Invasive monitoring may be available in some critical care areas. Information from these devices can be invaluable but should always been reviewed in the context of that particular patient and also the vital sign trends.
- IV access should be gained and bloods taken for analysis. IV fluids should be considered. If blood pressure is found to be low and refractory to fluid bolus then consideration should be given to inotropic support.

D - Disability

By the time you assess disability you may have a good idea of the patient's conscious level. If they are able to answer a question appropriately then they are likely to have an open airway with some amount of ventilation and perfusion to allow the delivery of oxygen and blood and glucose to the brain. It also means that the brain is functioning at a relatively good level. If the patient seems confused or obtunded then a more thorough investigation of the nervous system is required.

The use of the AVPU scale (**A**lert, **V**oice, **P**ain, **U**nresponsive) can give an indication to the patient's conscious level. A score of P or U should be a cause for concern. The Glasgow Coma Scale is a more in-depth assessment. It is made up of 3 categories - Eye response, Verbal response, Motor response it is scored from 3-15 with a score of 15 being normal and 3 meaning that the patient is completely unresponsive.

If the patient is able to obey commands it is often worth asking them to move each of their limbs in turn. This may indicate a weakness or paralysis of a muscle group or limb. Look for asymmetry in the face, body and limbs. If an abnormality is found then assessment of tone/reflexes/power and sensation are important additions to the examination. Patients with focal neurology should be assessed quickly and thoroughly so that a likely site of the pathology can be found and treated. If the patient has signs and symptoms suggestive of a stroke, early imaging and then treatment as required is vital to decrease loss of brain cells. This can make a huge difference to the patient's end quality of life!

Check the pupils for symmetry, size and response to light. Fundoscopy may give an indication of raised intracranial pressure or stigmata of disease (e.g. poorly controlled diabetes).

In every critically unwell patient check a blood sugar level **D**on't **E**ver **F**orget **G**lucose (**DEFG**). This is especially important in those with an altered LOC. Both hypo and hyperglycaemia can cause altered mental states and even coma.

Glasgow Coma Scale

Eye Scores
4 - Eyes open
3 - Eyes open to voice
2 - Eyes open to pain
1 - Eyes do not open to any stimulus

Verbal Scores
5 - Normal verbal response, orientated
4 - Confused speech
3 - Random words
2 - Incoherent words
1 - No verbal response

Motor Scores
6 - Obeys commands (e.g. touches nose if asked)
5 - Localises to painful stimulus (Classically this should be a painful stimulus above the clavicles. If the patient is able to move the hands above the level of the clavicles in response to the stimulus then they are localising to pain. A good jaw thrust is a good stimulus and will also help to open the patient's airway!)
4 - Flexes or withdraws to pain. Patient tries to move hand/finger when nail bed is compressed
3 - Abnormal flexion in response to pain. Flexor posturing; adduction of arm, internal rotation of shoulder, pronation of forearm, flexion of wrist. This is a decorticate response
2 - Extension in response to pain. Extensor posturing; external rotation of shoulder, supination of forearm, extension of wrist. This is a decerebrate response
1 - No motor response to pain.

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E - Exposure

With explanation to the patient and consideration for their dignity, expose the patient so that you can inspect all areas of their body. Looking for rashes, bumps, bruises, trauma, bleeding, drains, vascular access, etc. It is then important to cover the patient to maintain body heat and also dignity. Look for clues as to a cause of their altered LOC. Does the patient have IV track marks or other stigmata of IV drug abuse? Is there an empty pill packet or a note in their pocket or in their patient area? Do they have IV access? What drugs have we given to the patient recently? Is this iatrogenic? What is the patient's temperature? Are they wet with water/sweat/blood?

The **DRS ABCDE (DEFG),** with practice and good teamwork, should only take a few minutes. Any life threatening conditions should be identified and treated during this time. If anything potentially life threatening is seen, remember to call for help. A structured, thorough, team approach is what is needed for all critically ill patients!

History

During the initial assessment it is often possible to take a concise history from the patient this should include an **AMPLE** history.

- **A**llergies
- **M**edications:
  - This should include prescribed medications (along with compliance), over the counter and herbal/alternative medications along with street/illicit drugs. If the patient is diabetic - have they been taking their insulin/ hypoglycaemics as normal?
- **P**revious Medical History
  - History of previous similar episodes, drug/alcohol abuse, epilepsy, psychiatric history as well as respiratory, cardiovascular, endocrine pathologies. Any recent illnesses?
- **L**ast time the patient ate or drank
  - Including alcohol, drugs, etc.
- **E**vent (back ground to presentation).
  - This may be difficult to illicit directly from the patient due to their LOC. Is there a ward nurse, friend, family member or passer-by that witnessed any sudden changes? Any associated illnesses or injuries (those with seizure activity are at risk of trauma from uncontrolled limb movement)? Any prodrome? Any recent changes in personality or demeanor?

Aetiology of altered levels of consciousness

The level of consciousness of a person is really dictated by the function of the brain. If the brain is able to function normally then the LOC should be normal, for that person. Pathologies that can affect how our brains work can be split into two main categories: pathologies **directly** affecting the brain and pathologies **indirectly** affecting the brain

Pathologies that **directly** affect the brain:

- Trauma
- Infection
- Neurological
- Intracranial haemorrhage
- Intracranial space occupying lesion
- Seizure disorders
- Drug-related (toxicology)

All the pathologies above cause direct damage to the brain or hinder the brain from working correctly.

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Trauma

Direct injury to the brain - this causes damage/death to the structure injured (we can do little to protect the patients from the primary injury, other than legislation [e.g. wearing helmets and seat belts] and preventative education).

Subsequent to the primary injury is injury to brain tissue that was not directly damaged by the trauma termed secondary injury. This may be due to mediators released from the dead or dying cells (triggering apoptosis in near-by cells), tissue swelling and oedema associated with the primary injury or even bleeding from injured vessels. The swelling and bleeding will act to increase the pressure within the cranial vault. Especially in a closed head injury, this will lead to increase in intracranial pressure. This increased pressure will further damage brain cells via the direct of pressure or by pushing structures against the skull. The increased pressure will require the perfusion pressure to the brain to increase. If left long enough the pressure with the cranium will be so high as to limit blood flow to the brain thus starving the injured and uninjured brain cells of oxygen and glucose! It is possible to limit this secondary injury through timely medical and surgical management. For more information see http://www.itim.nsw.gov.au/wiki/Head_injuries. Also look at the EdWISE trauma module http://www.edwise.edu.au/site/index.php

Infection

Meningitis can be rapidly fatal and should be actively sought in an unwell patient with signs of meningism, infection or altered LOC. Altered LOC can be due to irritation of the brain by the infection, seizure activity or raised intracranial pressure from swelling of the meninges and brain. If meningitis is suspected antibiotics should be given immediately. Cefotaxime at 50mg/kg (up to 2gm) or Ceftriaxone 50mg/kg (up to 2gm) along with either 60mg/kg Benzylpenicillin (up to 2.4gm) or (amoxy)ampicillin at 50mg/kg (up to 2gm)[1]. Regimes may change depending upon the suspected organism and local guidelines. For more information on the treatment of meningitis download the Guidelines for the early clinical and public health management of meningococcal disease in Australia http://www.health.gov.au/internet/main/publishing.nsf/Content/BC329B583B663546CA25736D007674AA/$File/meningococcal-guidelines.pdf

Intracranial haemorrhage

If the haemorrhage is acute (and not from trauma) it is likely to be due to an aneurysm or from a vascular defect causing bleeding. Minor trauma may cause catastrophic intracranial haemorrhage, especially in those patients receiving anticoagulants (e.g. warfarin, aspirin, clopidogrel and dabigatran). The damage in these patients may again be due to pressure and swelling from the blood. There may also be damage to tissues “down stream” of the bleeding. If the bleeding results in a decreased flow to the distal tissues, these will begin to be damaged and die. The resultant release of mediators and toxins will also cause damage.

Space occupying lesion

These space occupying lesions are usually either tumours (primary or metastatic) or abscesses/infection. Damage can be directly from the “foreign” tissue or due to the increased intracranial pressure, as described above.

Seizure disorders

Seizures can be due to a number of processes including; underlying epileptiform pathology or trauma, infection, drugs and withdrawal from drugs. Seizures are the manifestation of markedly increased and erratic brain activity. They can take many forms from the classic tonic-clonic seizures to minute ticks or absence seizures (non-convulsive seizures). Damage to the brain, with resulting altered LOC, is due to this erratic activity and the metabolic demands of the brain cells involved. During a seizure the metabolic demands of the cells involved is many multiples higher than normal. These demands can be met for a short time but if the seizures are prolonged or repetitive then damage and death can occur. Even in seizures are short lived the erratic brain activity itself causes patients to have a reduced LOC for a time afterwards. This is known as the post-ictal period.

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Drug-related

Many drugs, both clinical and recreational, affect the central nervous system. Drugs may affect the LOC due to the direct effect of the drug on the brain - alcohol, midazolam, propofol, etc. Drugs, like alcohol, can have long term damaging effects to brain cells if used to excess for prolonged periods of time, resulting in permanently decreased LOC. Drugs may also be responsible for changes in LOC as their levels decrease within the brain. If a patient stops taking their anti-epileptic medication they will be at an increased chance of seizing. If a chronic alcohol drinker does not drink their usual amount of alcohol (e.g. admitted to hospital) they are also at an increased risk of seizing with an associated decrease in their LOC. Some drugs also decrease a patient's seizure threshold. This may cause a patient to have a seizure despite not having a history of epilepsy. It may also cause a previously well controlled epileptic to have a seizure despite previously therapeutic levels of their anti-epileptic medication. Examples of drugs that may effect the seizure threshold are; aminophylline, metronidazole, some penicillins, tricyclic antidepressants, local anaesthetics and hypoglycaemics.

Pathologies **indirectly** affecting the brain:

- Respiratory disease
- Cardiovascular disease
- Metabolic disorders
- Endocrine disease

The central nervous system can be affected by the other systems in the body. If the other systems are not functioning sufficiently to allow blood, oxygen, glucose to the brain, it will not function correctly either.

Respiratory disease

Acute hypoxia will lead to an altered LOC when the brain does not receive enough to function properly. As the brain is energy "hungry" anaerobic respiration will only keep the brain going for a limited amount of time. Good oxygen levels are required to allow aerobic respiration.

Hypercapnia can also affect the brain. Hypercapnia will cause an intracellular acidosis throughout all the cells of the body, rapidly. This will alter cellular metabolism and generally depress this. In the brain the hypercapnia will cause cerebral vasodilatation with resulting increased blood flow and increase in intracranial pressure. The hypercapnia will also be a potent respiratory stimulant. At high levels CO_2 has anaesthetic effects. These processes can cause disorientation, confusion, focal signs and even coma.

Cardiovascular disease

Perfusion to the brain is vital for optimum neurological function. It is this flow that delivers oxygen and glucose to the brain and removes the waste products and CO_2. If the cardiac output is low, for whatever reason, then perfusion to the brain will also be reduced. This will manifest as an altered LOC.

Metabolic disorder

Any metabolic disorder may alter cellular function in the body. The effect of this on the brain cells may well appear as changes in conscious levels. Examples of specific disease processes that may manifest with altered LOC include:

- Liver failure causing raised levels of ammonia (history and examination may point to this)
- Renal failure causing uraemia
- Hypo and hypernatraemia
- Severe acidosis or alkalosis
- Toxins from sepsis can also affect consciousness profoundly

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Endocrine disorders

- Addison's disease/adrenal insufficiency
- Hypothyroidism
- Diabetes
- Hypoglycaemia - the lack of glucose in the blood depresses the ability of the brain to function leading to decreased LOC and even coma
- Diabetic ketoacidosis - the high blood levels of glucose and dehydration cause an intracellular dehydration which along with the acidosis (ketoacids) may alter LOC
- Hyperosmolar nonketotic coma - severe hyperosmolar effects and dehydration cause altered brain function leading to decreased LOC.

Investigations

Investigations will commence as a part of the DRS ABCDE (DEFG) approach. When IV access is gained blood should be taken.

Blood Tests

- Blood sugar level (Don't Ever Forget Glucose)
- Full blood count - signs of infection, anaemia (if Hb is too low then not enough oxygen will be carried to the tissues - including the brain)
- Urea and electrolytes - uraemia, hypo/hypernatraemia, hyperkalaemia (associated with a low sodium may point towards Addison's disease), creatnine - may be raised in renal failure
- Liver function tests - Abnormal liver function may produce a high ammonia leading to the altered LOC. The liver is also responsible for the metabolism of many drugs and toxins. If it is not working correctly some drugs will remain in the system for longer and be more likely to cause changes in LOC - morphine, benzodiazepines. A low protein level will also affect the proportion of a drug that is bound to protein. This may make more of the drug available to the body's receptors leading to a more profound effect
- Coagulation tests - many patients are now on blood thinning medications for cardiovascular co-morbidities. This will increase their risk of intracerebral bleeding. Liver failure may also affect coagulation
- Blood cultures - any patient with an altered level of consciousness and a fever, or is hypothermic, should have blood cultures taken immediately and IV antibiotics administered
- Drug levels
- Paracetamol and salicylate levels in a suspected overdose
- Blood drug screen
- Drug levels - anticonvulsants
- Arterial or venous blood gases. Venous blood gases are very useful and often easier to obtain. If more information about ventilation is required, an arterial blood gas will be required

12 lead ECG

Drugs and metabolic conditions that can affect the brain may also affect the heart. A 12 lead ECG may be useful to diagnose any cardiovascular effects but also some toxins can lead to suggestive ECGs - peaked T-waves in hyperkalaemia, torsades de pointes in tricyclic overdose

Radiological investigations

- CXR - may show signs of infection, cause of hypovolaemia/hypoxia, site of primary malignancy
- CT Brain (and neck in trauma) - this may help to diagnose or exclude, cerebrovascular accidents (bleeding or thrombosis), space occupying lesions and trauma

Others

- EEG - can be useful in diagnosing non-convulsive status and to monitor treatment. May also point to the specific site of the disease
- Urine toxicology screen - suspected or unknown drug taking
- Urinalysis - infection, renal failure, ketones, sugar

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Management

The potential causes for altered levels of consciousness are multiple and it is out with the scope of this course to cover many of them. Here we will focus on strokes, epilepsy, meningitis and drugs (mainly alcohol).

As stated above the approach to the critically unwell patient should follow the DRS ABCDE (DEFG) structure. This is best accomplished by a multidisciplinary team with good communication and team support throughout. Early involvement of senior help and intensive care personnel is vital.

Stroke - cerebrovascular accidents

- More information can be found at the stroke foundation website
- http://strokefoundation.com.au/site/media/Clinical_Guidelines_Acute_Management_Recommendations_2010.pdf
- All patients suspected of having a stroke should have urgent imaging of their brain - CT or MRI [2].
- Patients who are candidates for thrombolysis should have the imaging immediately
- Different sites will have different criteria for thrombolysis or mechanical thrombectomy/thrombolysis
- Some sites may offer intra-arterial thrombolysis
- Antithrombotics
- Aspirin should be given orally as soon as possible after the onset of stroke symptoms - if the CT scan excludes a haemorrhagic cause. 300mg can be given orally or via a nasogastric tube [2]
- Blood pressure control
- If the patient is hypertensive this should be controlled. In a thrombotic stroke a blood pressure > 220/120 commencing or increasing antihypertensive therapy should be considered. This should be done cautiously and no more than my 10-15% [2]
- In a haemorrhagic stroke antihypertensives should be used to maintain a systolic blood pressure below 180mmHg. This may require invasive monitoring and IV medications [2]
- Surgical therapy
- In some large ischaemic strokes cerebral oedema may warrant a decompressive hemicraniectomy
- Some intracerebral bleeds may require surgical intervention - if the haematoma is larger than 3cm or if hydrocephalus is present
- Glycaemic control should be initiated to maintain euglycaemia
- Pyrexia should be treated with antipyretics (paracetamol)
- If seizures are present these should be controlled with appropriate anticonvulsant medication
- Stains can be continued or started in patients post stroke [2]

Seizures

Patients in the postictal phase after a seizure will have an altered LOC for a variable amount of time. The length of time will usually depend on the type of seizure and the length of time they were seizing for. These patients should be assessed using the DRS ABCDE approach and given supportive care as needed until they are fully conscious.

Patients who continue to seize continuously for 5 or more minutes without stopping or have recurrent seizures without returning to baseline (normal for them) between seizures are said to be in status epilepticus (SE). This is a medical emergency and should be treated as per the guidelines used in your institution. The NICE guidelines are used below for reference. The NICE pathway for epilepsy can be accessed here - http://pathways.nice.org.uk/pathways/epilepsy

- DRS ABCDE
- Limit damage to the patient whilst convulsing
- High flow oxygen with airway opening manoeuvers as needed
- Cardiovascular and respiratory monitoring
- IV access with blood taken for analysis

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- Administration of 50ml of 50% glucose and/or 250mg of IV thiamine if there is any indication of alcohol abuse or malnurishment [3]
- Administration of Lorazepam (0.1mg/kg)IV up to 4mg.
- If lorazepam is unavailable buccal midazolam can be administered
- Or IV diazepam 0.2 mg/kg
- This first line therapy can be repeated twice (including any drugs given prehospital, if the patient is presenting in the ED) [3]
- If seizure activity continues the second line therapy should be instituted
- Phenytoin or phosphenytoin
- Phenytoin - 15 mg/kg at 50 mg/min
- Phosphenytoin - 15-20 mg phenytoin equivalents/kg at 50-100 mg/min
- Sodium Valproate - 20-30 mg/kg at 3-6 mg/kg/min [3,4]
- If seizure activity continues IV propofol, thiopentone or midazolam [3,4]
- The doses and actions of these drugs will require the presence of personnel with advanced airway and critical care skills. These patients will likely require intubation, ventilation and invasive monitoring.
- Transfer to a critical care unit
- Institute EEG monitoring
- If the patient is known to suffer with epilepsy remember to take blood for levels of the medications they are prescribed

Meningitis

Meningitis is a killer of all ages. In children it is associated with a morbidity of around 20% and a mortality of about 5% [4]! As stated above antibiotics may need to be given as soon as it is suspected, even if blood cultures have not been taken! The antibiotics may lead to negative blood cultures but many organisms can still be detected via PCR. Presentation of these critically unwell patients may be in the community, to the ED or even inpatients.

The approach should be a coordinated multidisciplinary team approach using the DRS ABCDE (DEFG) structure. These patients may require advanced airway support, oxygen, IV access for blood sampling, IV fluids, central access for vasopressor therapy and fluid management as well as invasive blood pressure measurement.

Management should commence before meningitis is confirmed by laboratory testing, if the patient is critically unwell. Senior advice should be sought early!

- DRS ABCDE (DEFG) approach as above.
- Consideration of appropriate PPE covering droplet exposure for staff and family members [4]
- Blood cultures taken with IV access
- Lumbar puncture, if the patient is stable enough and **does <u>not</u> have any signs of raised intracranial pressure.**
- Urgent analysis of the LP samples [1,5]
- If CSF is turbid commence antibiotics prior to results
- Give steroids prior to antibiotics, if appropriate.
- If patient greater than 3 months old and suspected bacterial meningitis [5]
- Commence IV antibiotics
- Cefotaxime at 50mg/kg (up to 2gm) or Ceftriaxone 50mg/kg (up to 2gm) along with either 60mg/kg Benzylpenicillin (up to 2.4gm) or (amoxy)ampicillin at 50mg/kg (up to 2gm). Regimes may change depending upon the suspected organism and local guidelines [1]
- Addition of aciclovir if viral meningitis is suspected - 20mg/kg/dose [5]
- Addition of vancomycin if infection with a resistant strain of streptococcus pneumoniae is suspected [5]
- Treat seizure activity with benzodiazepines and antiepileptic medications as necessary
- Maintain euglycaemia

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- Supportive care as required
- Public health organisations may need to be contacted
- Contact tracing
- Irradication therapy may be needed for some contacts
- Isolation of patient may be required, particularly for meningococcal disease [1]
- Transfer of patients to a specialist centre may be required

Alcohol withdrawal

The use and abuse of drugs and alcohol is relatively common in most communities around the world. The drugs may be illicit or may be prescribed medications that find their way on to the street or to the wrong person. Here we will concentrate on alcohol withdrawal. For more information on the treatment of drug and alcohol withdrawal NSW guidelines can be found at - http://www0.health.nsw.gov.au/policies/gl/2008/pdf/gl2008_011.pdf

- Anyone who consumes more than the national recommended amounts of alcohol is at risk of withdrawal. [6] These patients should be monitored using an alcohol withdrawal rating scale
- Risk of major withdrawal (seizures or delirium) is greater in patients with an acute illness - infection, trauma, etc. [6]
- Seizures occur in 5% of patients. Risk is highest within the first 24 hours of withdrawal
- Withdrawal can be relative - if a patient has still been drinking alcohol but at significantly lower levels than normal withdrawal seizures and/or delirium can still occur [6]
- Management is as per management of status epilepticus, above
- Delirium Tremens is the most severe form of alcohol withdrawal. It usually develops after 2-5 days. Usually last for 3 days but may last for up to 14 [6]
- It is a medical emergency
- DRS ABCDE (DEFG) approach
- May require support from police/security
- May require pharmacological restraint or even anaesthesia to adequately manage in an intensive care setting
- Supportive treatment and reassurance is usually all that is needed for minor withdrawal
- If pharmacotherapy is required
- Diazepam is the drug of choice
- Diazepam loading should be considered in those with a significant risk of serious withdrawal. This can then be titrated to an alcohol withdrawal scale
- All patients being treated for withdrawal should also receive IV or IM thiamine to reduce the risk of Wernicke's encephalopathy [6]

There are many potential causes for an altered LOC in a patient. It is important to be structured in your approach to these patients, as initially information may be difficult to obtain. A thorough history, examination and investigation of the patient will usually give you in the in formation that you need to make a short list of differential diagnoses.

The use of good communication and team-work will help to manage these patients quickly and effectively in the critical situation.

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U1 Topic expert author: Morgan Sherwood

U1 Simulation session author: Morgan Sherwood

Professional Entry Module Expert Working Party and Peer Review Team
Shane Tan Simulation Fellow SCSSC
John Vassiliadis FACEM Royal North Shore Hospital

Educational consultants and editorial team:

Stephanie O'Regan Nurse Educator SCSSC
Leonie Watterson Director Simulation Division SCSSC
John Vassiliadis Deputy Director SCSSC

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