
# ALTERED LEVEL OF CONSCIOUSNESS

IT'S ALL ABOUT THE BRAIN!

## CEU SESSION FOR AUGUST

- As health care professionals, sometimes the hardest thing at a stressful scene is figuring out why a patient has an altered mental status
- We want to quickly treat the patient but may have limited information of what could possibly be wrong with him/her (we don't 'diagnose' in the field)
- What we will cover today:
- Recognize key history findings suggestive of different causes of altered mental status
- Recognize key physical signs & symptoms suggestive of different causes of altered mental status
- Perform critical interventions and treatments for high-risk causes of altered mental status.

# ESSENTIAL SKILLS

- ABCDE Assessment
- AVPU assessment / Glasgow Coma Scale
- Recovery position /Trendelenburg
- Pulse Oximeter and Oxygen administration.

## OVERVIEW: IT'S ALL ABOUT THE BRAIN

- **Altered mental status is a term used for a range of presentations:**
  - **Sudden or gradual changes in behavior**
- **May be due to medical or environmental conditions that affect the brain or trauma to the brain itself**
- **Can be chronic psychiatric problems or dementia but must rule out other life-threatening causes first**
- **Ask family about baseline mental status when possible.**

To get a baseline behavior - Ask a friend or family member "is this normal behavior?"

## EMS GOALS: ALTERED MENTAL STATUS

- **The goal of *initial assessment (BLS)* is to identify rapidly reversible causes of altered mental status, and to recognize dangerous conditions requiring immediate transport**
- **The goal of *acute management (ALS)* is to ensure that blood, oxygen and glucose reach the brain; and to protect the brain from additional injury.**

The goal of BLS is to recognize any reversible causes, and the goal of ALS is to keep the patient in a “holding pattern” until they get them to definitive care.

## EMS GOALS: THE ABCDE APPROACH

- **REMEMBER ……**
- **Always start with the ABCDE approach and treat life-threatening conditions**
- **Then take a SAMPLE history**
- **Then do a Secondary Examination.**

# EMS GOALS: THE ABCDE APPROACH

- **<u>Airway:</u>**
- **May not be able to protect their airway and may be at risk for choking**
- **<u>Breathing:</u>**
- **Hypoxia can cause ALOC**
- **Look for signs of difficulty in breathing or *cyanosis***
- **Slow, deep breathing can reflect diabetic ketoacidosis or poisoning**
- **Irregular breathing patterns can be traumatic brain injury.**

## EMS GOALS: THE ABCDE APPROACH

- **Circulation:**
- **Lack of perfusion to the brain causes ALOC**
- **Look for and manage signs of shock:**
  - **Skin signs**
  - **Low blood pressure**
  - **Elevated heart rate**
  - **Delayed capillary refill.**

## EMS GOALS: THE ABCDE APPROACH

- **Disability:**
  - **Check AVPU or GCS (for trauma)**
- **Check glucose:**
  - **Hypoglycemia can cause ALOC**
  - **Hyperglycemia and diabetic ketoacidosis can cause ALOC**
- **Check pupils:**
  - ***Very small pupils*: possible opioid overdose or pesticide poisoning**
  - ***Very dilated pupils:* possible stimulant drug use**
  - ***Unequal pupils:* possible head injury (increased intracranial pressure).**

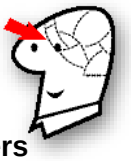
## EMS GOALS: THE ABCDE APPROACH

- Check strength and sensation:
  - Weakness or loss of sensation to one side: possible bleeding or blockage of blood vessel (CVA), systemic infection
- General muscle weakness: possible salt imbalance or other medical/environmental issue
- Look for abnormal repetitive movements or shaking on one or both sides (seizure).

## EMS GOALS: THE ABCDE APPROACH

- **Environment:**
- **Look for environmental causes of ALOC**
- **Check for infection, rashes, trauma, bites or stings, anaphylaxis**
- **Check arms for needle marks (may suggest drug use as a cause)**
- **Remember.. Altered patients may not report the history accurately.**

# ALWAYS CHECK FOR SCENE SAFETY



- Agitated and violent behavior is common
- Determine cause, prioritize the safety of the patient and providers
- Keep calm, work as a team
- Ensure the space is safe from weapons and you have an escape route
- Avoid making the patient feel threatened
- Do not sit too close and speak in a calm, sympathetic voice
- Explain what is happening
- Check vital signs, temperature and glucose; treat abnormalities
- Call for extra help early.

## SIGNS & SYMPTOMS OF ALOC

- Confusion
- Syncope (fainting)
- Unable to communicate effectively
- "Not acting like themselves"
- Lack of awareness of surroundings
- Inappropriate behavior
- Uncooperative/combativeness
- Seizures
- Unresponsiveness.

It can be subtle – simply "not acting right" or not answering your questions as quickly or completely as previously. Ask others who know this patient "is he/she usually like this?"

Not communicating correctly is one of our first clues – it can be unintelligible (possible stroke affecting the ability to talk), it can be inability to answer our 4 stupid questions (simply do not know what time or day it is) or it can be "word salad" where they are speaking words but the semantics make no sense (doormat…backstroke). Inappropriate behavior can go from restlessness to combative.

## CAUSES OF ALTERED MENTAL STATUS

- Head injury
- Seizures
- Shock
- High fever
- Infection
- Allergic reaction

- Poisoning
- Drug overdose/ underdose
- Low/high blood sugar
- Decrease in oxygenation
- ETOH
- Psychiatric conditions.

These are the major causes of an ALOC – but not all of them. Again – we do not diagnose, but we must assess. Especially important in ALOC is our scene safety

## CAUSES OF ALTERED MENTAL STATUS: AEIOU-TIPS

- A = Alcohol
- E = Epilepsy/ Environment (high altitude, HRI, hypothermia, dehydration)
- I = Insulin (diabetes)
- O = Overdose/Oxygen/Opioids
- U = Underdose/uremia
- T = Trauma/Temp (fever)
- I = Infection (septic shock)
- P = Psychosis/poison
- S = Stroke/seizure.

You can use AEIOU-TIPS (usually used in the hospital environment) but we really need some thing more concise for the out-of-hospital environment.

## ASSESSMENT OF ALOC – OUT OF HOSPITAL

- BSI
- Scene safety – *important with any ALOC!*
- Primary assessment:
  - ABCDE's first
- Determine level of responsiveness (AVPU)
- Monitor vitals especially LOR
- Position of comfort
- Oxygen if warranted (below 90%)
- Emotional support – patient advocacy
- ***Find the problem….***

Determining the LOR (AVPU) is in the "D" part of the primary assessment

How would you monitor the LOR? Talk to the patient!

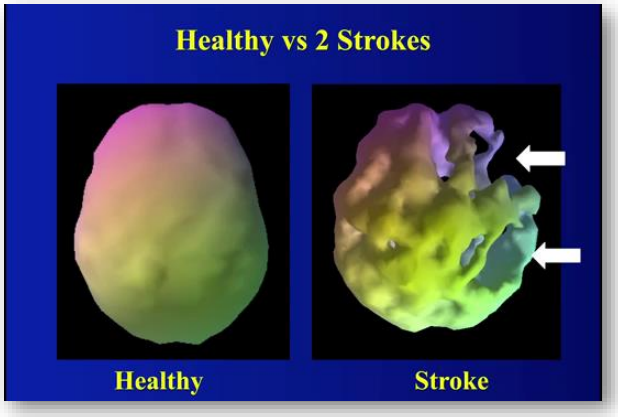
## AVPU – REVIEW

- Use AVPU scale to assess LOR:
  - A: Alert –
    - X 1 – oriented to _____
    - X 2 – oriented to _____
    - X 3 – oriented to _____
    - X 4 – oriented to _____
  - V: Responsive to _____
  - P: Responsive to _____
  - U: _____.

Person. Place, time and event; they can be AXO times zero too

## *WHAT CAN CAUSE ALOC ???*

- We can't look at the brain – this is diagnosis
- We can't look at the brain – but we can evaluate the patient's consciousness.



## *WHAT CAN CAUSE ALOC ???*

- We can't look at the brain – but we can evaluate the patient's *consciousness*
- What affects the brain – affects the level of consciousness: we can break down AEIOU-TIPS into four main causes:
- #1 : Hypoxia
- #2 : Chemical Interference
- #3 : Environmental Interference
- #4 : Neurological (including trauma)/Behavioral.

We can break all those AEIOU-TIPS causes down to about four main ones

## #1: HYPOXIA

- Hypoxia = not enough _____ to the body
- Some examples of *Hypoxia*:
  - Shock (hypoperfusion)
  - Drowning
  - COPD / asthma
  - Anaphylaxis
  - Cardiac insufficiency
  - Asphyxiation
  - Stroke (CVA).

This is the usual one – not enough **oxygen** to the brain. We will cover each of these in more detail later

Shock – not enough perfusion of blood/oxygen
Drowning – water preventing oxygen from entering the lungs
COPD/asthma like drowning
Anaphylaxis prevents air from getting to the alveoli
Cardiac – not enough blood out to the tissues
Asphyxiation – again, not enough oxygen to the brain
Stroke – pieces of the brain are hypoxic

## #2: CHEMICAL INTERFERENCE

- Some examples of *Chemical Interference:*
  - Drugs / alcohol
  - Medications (underdose or overdose especially opioids)
  - Hazardous materials/IDLH (carbon monoxide)
  - Hyperglycemia
  - Hypoglycemia.

Chemical interference – CO and CN and other poisons or drugs
Not enough or too much sugar

## #3: ENVIRONMENTAL INTERFERENCE

- Some examples of *Environmental Interference:*
  - Hypothermia
  - Hyperthermia/dehydration
  - High altitude.

Too cold or too hot or too high

## #4: NEUROLOGICAL INTERFERENCE

- Some examples of *Neurological Interference:*
  - Head injury
  - Spinal injury
  - Seizures
  - Stroke (CVA)
  - Behavioral (psychological) problems.

Let's take a closer look at some of these conditions

## SEIZURES

## SEIZURES

- Irregular electrical activity in the brain
- Random shaking movements , which may involve whole body (generalized) or loss of awareness (partial)
- Causes can be:
  - Epilepsy/Brain tumor
  - Drugs, ETOH or poisons
  - Infection (high fever)
  - Trauma/ Head injury
  - Stroke
  - Heat stroke.

## TREATMENT FOR SEIZURES

- Do not attempt to restrain patient
- Clear area to protect patient from injury
- Do not place anything in patient's mouth
- If patient is not breathing after seizure, begin rescue breathing
- If breathing is adequate, place patient in recovery position to maintain a clear airway
- *Patient can be combative after the seizure (postictal state).*

*What's Wrong with this Picture?*

Even trying to hold the patient's arm like this can lead to injury (either the patient, or you, or both)

## STROKE - CVA

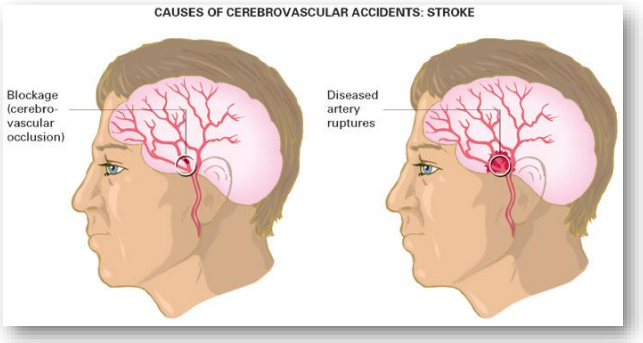
CEREBROVASCULAR ACCIDENT

Cerebro = the brain
Vascular = the blood vessels

Which means something is happening to the blood vessels in the brain

## STROKE (CVA)

- *Cerebrovascular Accident;*
- A blockage or rupture of blood vessel in the brain deprives a portion of the brain from an adequate supply of oxygen.




Two ways that a part of the brain can become hypoxic (as opposed to generalized hypoxia of the brain):
Ischemic – meaning lack of blood (oxygen) by an artery in the brain becoming blocked
Hemorrhagic – meaning lack of blood by an artery becoming ruptured

Can we tell which one in the field? NO – so do not give anything like aspirin in case it is the hemorrhagic type

## STROKE (CVA)

- Signs and symptoms:
  - Headache
  - Dizziness
  - Confusion
  - Unable to swallow/drooling
  - Numbness/paralysis
  - Usually on one side of the body

- Inability to speak
- Difficulty seeing
- Unequal pupil size
- Unconscious
- Convulsions
- Incontinence
- Respiratory arrest
- Cardiac arrest.

Where the problem occurred in the brain determines the S & S we will see

## ASSESSMENT OF STROKE PATIENT

- Assessment tools: Cincinnati Stroke Scale - F.A.S.T.
  - Facial Droop: have the patient smile or show his/her teeth
  - Arm Drift: have the patient hold both arms out and close his/her eyes
  - Speech Abnormality : observe for slurred, inappropriate or inability to speak
  - Time to transport to definitive care.

## ASSESSMENT OF STROKE PATIENT

- Transient Ischemic Attack (TIA) mimics these S & S, but may resolve in 12-24 hours
  - May be an indication of a CVA in the near future
  - Patient may want to go AMA (against medical advice) and not be transported
  - Try to persuade them to go.

## CARE FOR A STROKE PATIENT

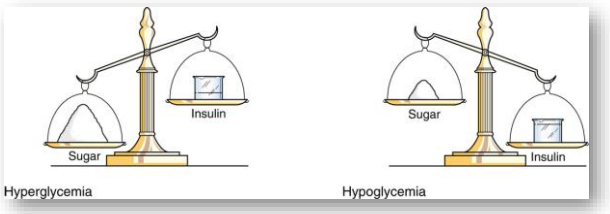
- Maintain an open airway
- Administer oxygen if PsO2 is below 90%
- Provide psychological support:
  - The rest of the brain is working just fine
- Place an unconscious person in recovery position
- Be prepared to provide rescue breathing, if necessary.

# DIABETES

THE GOLDILOCKS ZONE FOR SUGAR

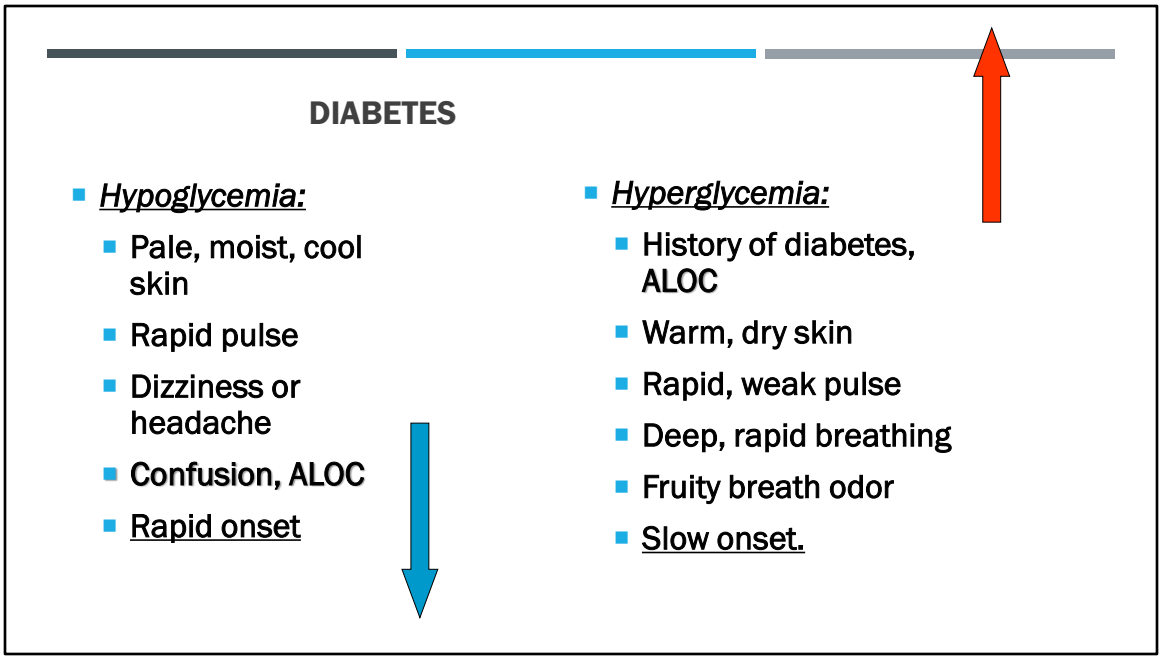
## DIABETES

- Common disease – becoming a *very* common disease
- Sugar (glucose) is needed by <u>all cells</u> of the body
- Insulin (a hormone produced by the pancreas) is needed to get the glucose into the cells
- Diabetes is a lack of insulin
- Normal blood glucose is 70 to 130 mg/dl (around 100).




Hyper glycemia is too much – above 140 or so (rare in non-diabetics)
Hypo glycemia is too little – below 60 or so (and can happen quickly)
Non-diabetic hypoglycemia (55 or less) can show as:
The symptoms include being

- Hungry
- Shaky
- Sleepy
- Anxious
- Dizzy
- Confused or nervous
- Sweaty
- Irritable




Do you see the similarity between the two? It is difficult to tell in the field where your patient lies. This is why we need the glucometer – as of yet it is an EMT/Paramedic skill, but FR need to know what the numbers mean (especially if a family member or the patient takes it)

## GENERAL BLS BLOOD GLUCOMETRY POLICY

Perform patient primary assessment first!

- Blood sugar testing is the only accurate method to determine if a patient is hypoglycemic or hyperglycemic:
  - *Symptoms are not specific*
- Hypoglycemia:
  - Blood glucose less than 60mg/dl
  - Characterized by: ALOC, seizures, combativeness, disorientation, diaphoresis, shaking
- Hyperglycemia:
  - Glucose above 140; Often triggered by an underlying infection
  - Characterized by: thirst and increased urination, confusion, dehydration, deep, and rapid respirations, nausea, vomiting, fruity odor on breath, unresponsiveness.

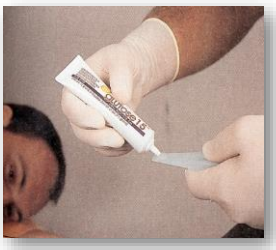
## CARE FOR A DIABETIC PATIENT

- Ask these questions:
  - Are you a diabetic? / Is the patient a diabetic?
  - Did patient take insulin/medication today?
  - Did patient eat today?
    (the "L" of SAMPLE).

Yes – SAMPLE history is really important here – ESPECIALLY the "L" - did they take their insulin, did they eat?

## CARE FOR A DIABETIC PATIENT

- If unconscious, monitor airway and breathing, give oxygen if warranted
- Alert incoming ALS
- If you suspect hypoglycemia (from history or glucometer reading), give patient sugar by mouth *if fully conscious and able to swallow*
- Remember safety – may "appear drunk" or even be combative.



***If blood glucose is less than (<) 60 mg/dl AND the patient is conscious with an intact gag reflex:***
**Administer 1 Tube Oral Glucose (24 grams)**
**Use caution and avoid creating a choking hazard**
**If necessary, the patient may self-administer Oral Glucose**

Can we do anything in the field for hyperglycemia? NO – not even the ALS unit has insulin, and that is what this patient needs. So we must transport to the hospital

**BASE PHYSICIAN ORDERS**

**RELEASE-AT-SCENE:**

Competent adults with normal vital signs, blood sugar, and mental status 10 minutes after ALS intervention, may be released if a cause of their condition and its solution has been identified

Refer to Refusal of EMS Service Policy 570.35.

# ALCOHOL, DRUGS AND POISONS

ASSESSMENT WITHOUT JUDGEMENT

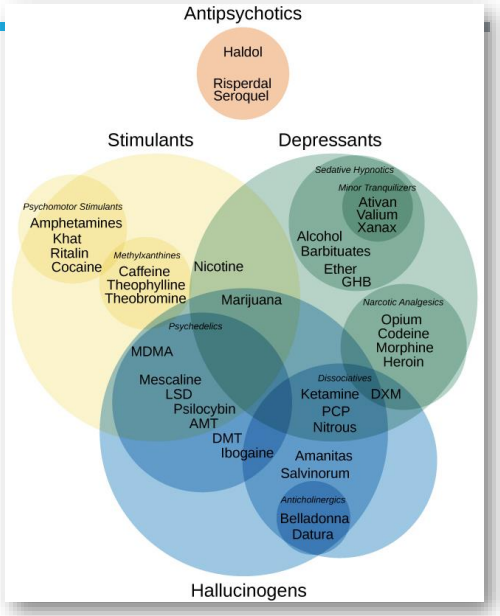
## ETHANOL AND ALOC

- **INTOXICATION BEHAVIOR BEGINS BEFORE LEGAL LIMIT**
- **ALCOHOL EFFECTS LAG CONSUMPTION**
- **ETHANOL HAS EMETIC PROPERTIES**
- **DRUGS AND ALCOHOL ARE A LETHAL MIX**
- **DRUNK OR DIABETIC, KNOW THE DIFFERENCE.**

While intoxication when driving legally occurs at 0.08 g of ethanol per 100 mL of blood, that's merely the definition. An individual may feel euphoric and engage in risky behavior much sooner than that.
Alcohol takes about 45 minutes to hit its peak limit. In other words, the intoxicated individual weaving in front of you may become even more altered over time, even in the absence of more alcohol consumption.
Alcohol can trigger the vomiting effect without warning. Laterally positioning the patient will go a long way in keeping the patient's airway patent.
Alcohol and drugs often go together. Remain vigilant for the use of stimulants that may mask the effect of alcohol or depressants that can amplify intoxication.
Finally, there are several conditions that can mimic alcohol intoxication, such as diabetic ketoacidosis or an evolving brain injury.

## YOUR BRAIN ON DRUGS

- Drugs are classified as:
  - Antipsychotics
  - Stimulants
  - Depressants
  - Hallucinogens
- Even prescribed medication can cause ALOC when misused or combined with substances such as alcohol.




First, mixing alcohol with any drug results in that drug remaining in a person's system longer than it normally would. This is because alcohol is metabolized first by the liver. The liver assigns priority to metabolizing alcohol despite any other substances being taken at the same time. As a general rule, the liver can metabolize about one ounce of pure alcohol per hour. This means that until the levels of alcohol in the system have been metabolized, other substances remain relatively unchanged.

**Marijuana is the most common illicit drug in the U.S. A few states have decriminalized small amounts of the drug**. Some permit medical uses. Marijuana is usually smoked. Effects include altered mood, impaired coordination, and impaired judgment. More severe effects sometimes occur. There is no antidote; treatment is supportive. The drug is sometimes addictive.

## DRUGS: UNDERSTANDING AND USING TOXIDROMES

- Toxidrome: the syndrome-like symptoms of a class or group of similar poisonous agents:

**Table 1** Major Toxidromes

| Toxidrome | Drug Examples | Signs and Symptoms |
|---|---|---|
| Stimulant | Amphetamine, methamphetamine, cocaine, diet aids, nasal decongestants, bath salts | Restlessness, agitation, incessant talking; insomnia, anorexia; dilated pupils, tachycardia; tachypnea, hypertension or hypotension; paranoia, seizures, cardiac arrest |
| Narcotic (opiate and opioid) | Heroin, opium, morphine, hydromorphone (Dilaudid), fentanyl, oxycodone-aspirin combination (Percodan), zolpidem tartrate (Ambien), secobarbital | Constricted (pinpoint) pupils, marked respiratory depression; needle tracks (IV abusers); drowsiness, stupor, coma |
| Sympathomimetic | Pseudoephedrine, phenylephrine, phenylpropanolamine, amphetamine, and methamphetamine | Hypertension, tachycardia, dilated pupils (mydriasis), agitation and seizures, hyperthermia |
| Sedative/Hypnotics | Phenobarbital, diazepam (Valium), thiopental, midazolam (Versed), lorazepam | Drowsiness, disinhibition, ataxia, slurred speech, mental confusion, respiratory depression, progressive central nervous system depression, hypotension |
| Cholinergic | Acephate (Orthene), diazinon (Basudin, Knox Out, Spectracide), and malathion (Celthion, Cythion), parathion, sarin, tabun, VX | Increased salivation, lacrimation, gastrointestinal distress, diarrhea, respiratory depression, apnea, seizures, coma |
| Anticholinergic | Atropine, scopolamine, antihistamines, antipsychotics | Dry, flushed skin, hyperthermia, dilated pupils, blurred vision, tachycardia; mild hallucinations, dramatic delirium |

Toxic syndrome or toxidrome is a constellation of toxic effects comprising a set of clinical fingerprints for a group of toxic chemicals.
Toxic syndrome or toxidrome recognition is important because it provides a tool for rapid detection of the suspected cause and can focus the differential diagnosis to consideration of only a few chemicals with similar toxic effects.

## STIMULANTS

- Users may become addicted within days:
  - Success of overcoming addiction is low
  - May be taken orally, smoked, or injected
  - Stimulants include:
    - Cocaine
    - Amphetamine, methamphetamine
    - Prescription stimulants like ADHD medications; Adderall and Ritalin.

Stimulants are a class of drugs that elevate mood, increase feelings of well-being, and increase energy and alertness. Stimulants can cause the heart to beat faster and will also cause blood pressure and breathing to elevate. Repeated use of stimulants can result in paranoia and hostility.

Examples include: cocaine, methamphetamine, amphetamine, MDMA (Ecstasy), nicotine, and caffeine.

## MARIJUANA AND CANNABIS COMPOUNDS

- Cannabis is a unique drug, marijuana doesn't cleanly fit into a particular category of drugs; Marijuana can **depress**, **excite** and **impair** the central nervous system - This makes it difficult to classify
- Clinical uses:
  - Treatment of glaucoma
  - Relief of nausea and chronic pain, and appetite loss from chemotherapy.

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## SEDATIVES AND HYPNOTICS

- Hypnotics are drugs that are used to help people fall asleep
- Some common side effects of some hypnotics include:
  - Hallucinations / Behavioral changes
  - Dizziness
  - Drowsiness
  - Withdrawal symptoms (for example, anxiety, or insomnia)
  - Confusion / Suicidal thinking

- Drinking alcohol while using a sleep medication or sedative may lead to severe drowsiness
- Opiate overdose can cause depressed breathing leading to hypoxia.

Barbiturates and benzodiazepines are the two major categories of sedative-hypnotic. Some well-known barbiturates are secobarbital (Seconal) and pentobarbital (Nembutal), diazepam (Valium), chlordiazepoxide (Librium), chlorazepate (Tranxene), lorazepam (Ativan), and alprazolam (Xanax). A few sedative-hypnotics do not fit in either category. They include methaqualone (Quaalude), ethchlorvynol (Placidyl), chloralhydrate (Noctec), and mebrobamate (Miltown). Additionally, alcohol belongs to the sedative-hypnotic group.

## POISONOUS PLANTS

**Table 9 Poisons in Some Common Plants, continued**

| Plant | Poisonous Part | Poison | Signs and Symptoms of Poisoning |
|---|---|---|---|
| Hyacinth | Bulb | Multiple | Severe gastroenteritis |
| Jack-in-the-pulpit | All parts | Calcium oxalate | Severe gastroenteritis |
| Jimson weed | All parts | Atropine | Dry mouth; hot, red skin; headache; hallucinations; tachycardia; hypertension; delirium; seizures |
| Laurel | All parts | Andromedotoxin | Salivation, lacrimation, rhinorrhea, vomiting, seizures, bradycardia, hypotension, paralysis |
| Lily of the valley | Leaf, flowers | Glycosides | Cardiac dysrhythmias, nausea |
| Mistletoe | All parts | Tyramine | Bradycardia, gastroenteritis, hypertension, dyspnea, delirium, sweating, shock |
| Morning glory | Seeds | LSD | Hallucinations |
| Narcissus | Bulb | Multiple | Gastroenteritis |
| Oleander | Entire plant | Oleanin | Cramps, bradycardia, dilated pupils, bloody diarrhea, coma, apnea (one leaf is lethal) |
| Philodendron | Entire plant | Calcium oxalate | Edema of tongue, throat |
| Poinsettia | Leaves, stem, sap | Multiple | Contact dermatitis, gastroenteritis |
| Potato | Green tubers, new sprouts | Solanine | Severe gastroenteritis, headache, apnea, shock |
| Rhododendron | Entire plant | Andromedotoxin | Salivation |
| Rhubarb | Leaves only | Oxalic acid | Cramps, nausea, vomiting, anuria |
| Wisteria | Pods | Glycoside | Severe gastroenteritis, shock |

OK – here is the Jimson weed with it's load of atropine, and the green, sprouted potatoes

But did you know that the Morning Glory seeds contain LSD?

Or that ONE LEAF of the Oleander (which is everywhere) **is LETHAL ! ! ! !**


# TRAUMATIC BRAIN INJURY

ASSESSMENT WITHOUT DIAGNOSIS

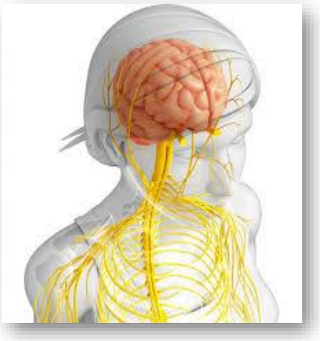
## THE NERVOUS SYSTEM

- Many illnesses and injuries can affect the brain
- When you have an "altered level of consciousness" - ALOC - in your patient – *your patient is critical*
- Trauma to the spinal cord can alter the sensations in the hands, feet and face;
  - When you have diminished /altered sensations, you must suspect spinal injury
  - That's why we check CSM over and over..

This is the "D" part of our assessment

## TYPES OF TRAUMATIC BRAIN INJURY

- Open head injury:
  - Lacerations, avulsions, penetrations, fractures
- Closed head injury:
  - Coup / Contrecoup injury
- Brain Tissue Injury:
  - Concussion
  - Contusion
  - Hematomas
- Increasing ICP (intra-cranial pressure).



Let's talk about each of these…

## OPEN HEAD INJURY

- Such as;
- Head lacerations
- Or penetrating injury; GSW.

You can see pretty massive damage here

## CLOSED HEAD INJURY: CONCUSSION

- **Concussion (Brain Shake):**
- **A concussion may or may not involve a positive loss of consciousness**
- **The patient relatively quickly returns to a totally normal mental function**
- **Concussions cause a *temporary* disruption of brain function (5 minutes to one hour)**
- ***BUT they Can be cumulative*….**

The signs and symptoms of a concussion can be subtle and may not show up immediately. Symptoms can last for days, weeks or even longer.
Common symptoms after a concussive traumatic brain injury are headache, loss of memory (amnesia) and confusion. The amnesia usually involves forgetting the event that caused the concussion.

Signs and symptoms of a concussion may include:
Headache or a feeling of pressure in the head
Temporary loss of consciousness less than a couple of minutes
Confusion or feeling as if in a fog
Amnesia surrounding the traumatic event
Dizziness or "seeing stars"
Ringing in the ears
Nausea
Vomiting
Slurred speech
Delayed response to questions
Appearing dazed
Fatigue

You may have some symptoms of concussions immediately. Others may be delayed for hours or days after injury, such as:
Concentration and memory complaints
Irritability and other personality changes
Sensitivity to light and noise
Sleep disturbances
Psychological adjustment problems and depression
Disorders of taste and smell

111 of them played in the N.F.L. — and 110 of those were found to have chronic traumatic encephalopathy, or C.T.E., the degenerative disease believed to be caused by repeated blows to the head.
C.T.E. causes myriad symptoms, including memory loss, confusion, depression and dementia. The problems can arise years after the blows to the head have stopped.

## Closed Head Injury: Coup/Contrecoup

- The contusion (tissue damage/bleeding) often occurs at a site distant from the point of impact (coup/contrecoup).


You can also see tissue swelling, blood (white) inside the cranium and a deviation of the midline of the brain

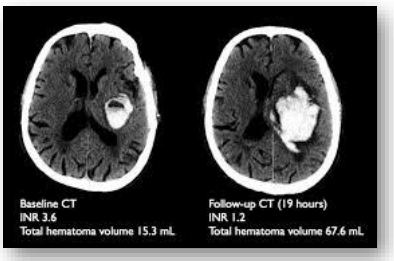
## CLOSED HEAD INJURY: CONTUSION

- **Contusion (*Brain Bruise*):**
- **A contusion involves bleeding and bruising of the brain**
- **The injured tissues swell, increasing intracranial pressure**
- **The patient may have neurological symptoms such as persistent vomiting, headache, blurred vision, extremity weakness, etc.**
- **Bleeding can be intracranial, epidural or subdural.**

More serious is an actual release of blood – a bruise
Traumatic brain injuries can impact patients in some different ways. The more severe the condition is, the more symptoms they will have. Those with a contusion can suffer from some intense side effects that worsen the longer they avoid seeing a doctor. A loss of consciousness is one of the more serious side effects. This can last from a few minutes to an hour or longer. Some patients may find that they lose consciousness more frequently after suffering a brain injury.
Patients may also experience immobilizing headaches, tiredness, insomnia, loss of memory, difficulty concentrating and trouble speaking. Left untreated, a brain contusion can also lead to personality changes. The family and friends of those with a contusion may notice variations in both attitude and behaviors.

## INTRACRANIAL HEMATOMA

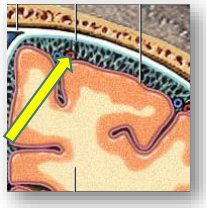
- **Characterized by bleeding directly into the brain tissue**
- **Cerebral edema occurs because blood irritates the nervous tissue**
- **The clinical presentation is <u>equivalent to a stroke and occurs quickly</u>**
  - **<u>Check history – is there head trauma involved?</u>**
- **The signs and symptoms *progressively worsen* over time.**

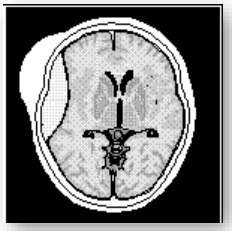



Worse than simple bruising, an intracranial hematoma is bleeding inside the brain itself. This CT scan shows why the symptoms worsen;  from 15 mls to 68 mls

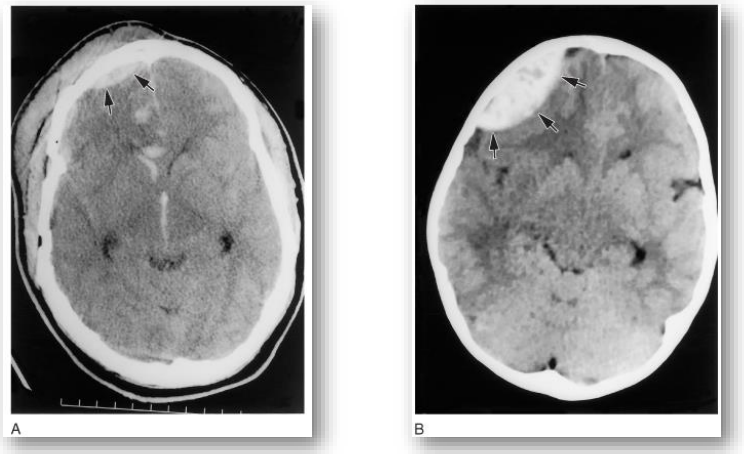
## EPIDURAL HEMATOMA

- Fast, *arterial* bleed:
- After an initial period of unconsciousness the patient may regain consciousness (lucid interval)
- However, as the hematoma enlarges the patient's level of consciousness declines
  - This is characterized by the so-called "talk-and-die" patient
- Generally the lucid interval doesn't last for more than 1-2 hours.





## EPIDURAL HEMATOMA



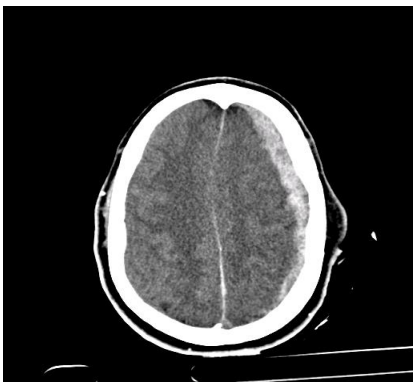

Epidural hematomas in CT scans on the patient's right side. The smaller lesion in A is obviously of traumatic origin; this patient has soft tissue damage, a fractured skull, blood in the substance of the brain.

Epidural hematomas are accumulations of blood between inner part of skull and outer part of dura (outer layer of meninges). Ask class about soft tissue swelling in Image A. These present as lens shaped masses

## SUBDURAL HEMATOMA

- **Slow, *venous* bleed:**
- **Symptoms can include: persistent headaches, vision changes, nausea, vomiting, abnormal behavior, weakness, decreasing mentation, and unresponsiveness**
- **These s & s may be acute or they may not be apparent for up to *two weeks post incident***
  - **The patient may look fine immediately after the event**
- **Only 30% or more of subdural hematomas are symptomatic within 24 hours of the incident *(70% can be asymptomatic!).***

## SUBDURAL HEMATOMA

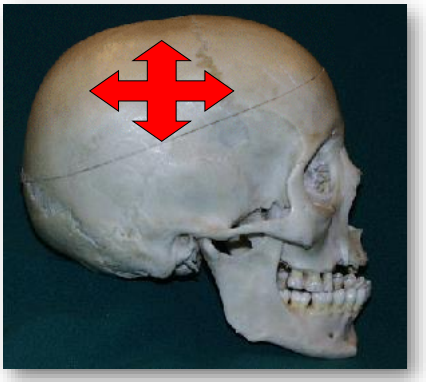


An example of a subdural hematoma (arrows) in CT scan on the patient's left side. This lesion is long and thin and extends for considerable distance over the surface of the hemisphere: note the shift in the midline.

Subdural hematomas are blood accumulations between inner part of dura and the arachnoid. Mention the layers of the dura, but emphasize the spatial relationships. More of a spread-out mass, but still look what is happening to the brain midline! This is from an increasing intracranial pressure (ICP)

## INCREASING INTRACRANIAL PRESSURE; WHY IS THIS SERIOUS?

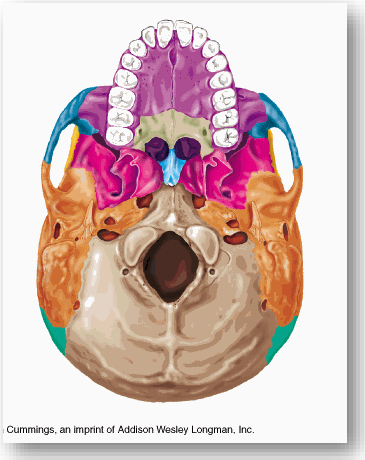
- The intracranial vault is a fixed volume : Bone does not expand!

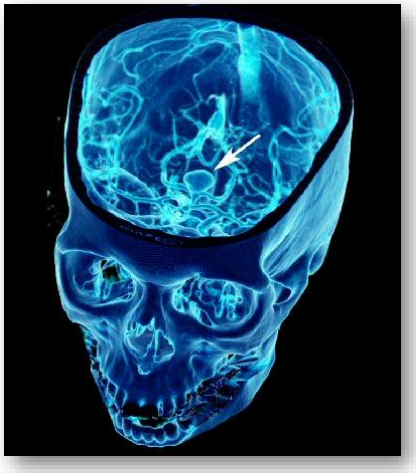


Because the bone volume does not expand it increases pressure on the brain tissue itself – and brain tissue is the consistency of pudding.

# ICP

- **There is only one way out of the intracranial vault : the opening at the base of the skull known as the *foramen magnum.***

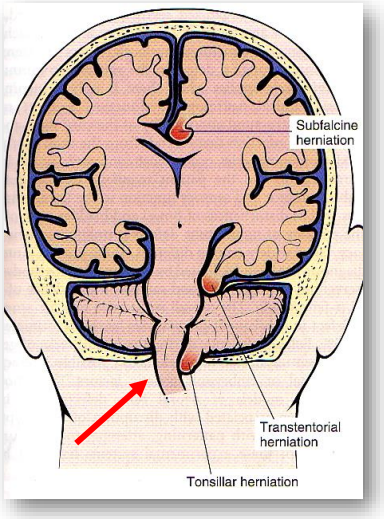


Unfortunately for us – the brainstem and spinal cord happen to be occupying the foramen.

# ICP

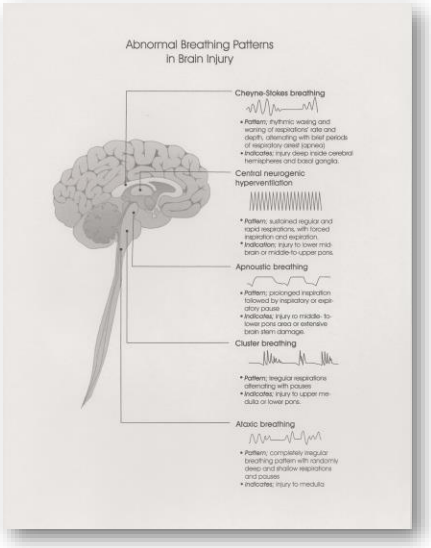
- **When the brain tissue is squeezed through the foramen magnum (called herniation), the brainstem is compressed, the patient stops breathing, and the patient dies**
- ***This can take 3-4 days after the injury****!*




Discuss herniation –
The brainstem controls our breathing > medical emergency, death is impending  Emphasize that there are many types of herniation, but brainstem herniation is the most acutely life threatening.

## BREATHING

- Abnormal respiratory patterns are common in patients with severe head injuries.




An abnormal breathing pattern is a red flag to us! Combined with a history of TBI our OS Meter should be pegged at the OH S_____! With all these S&S – what is the main things we will see with these patients? They will be a DICC Head….

## TBI – S&S

- The “DICC” Head:
  - Disoriented
  - Irritable
  - Combative
  - Comatose.




A patient can go from one to the next very quickly

## OTHER SIGNS AND SYMPTOMS OF HEAD INJURIES

Raccoon Eyes

Battle's Sign

Basal skull fractures (BSF) are the most common cause of raccoon eyes.
A basal skull fracture involves breaks in the bones that make up the base of the skull, including the temporal bone, occipital bone, sphenoid bone, or ethmoid bone.
A Battle sign, or Battle's sign, is a bruise that indicates a fracture at the bottom of the skull. At first, it can look just like a typical bruise that could heal on its own. However, Battle's sign is a much more serious condition.

These signs may be the only sign of a skull fracture, as it may not show on an X-ray. They may not appear until up 2–3 days after the injury.[3] It is recommended that the patient not blow their nose, cough vigorously, or strain to prevent further tearing of the meninges.[4]

# BLS EMERGENCY ASSESSMENT

WHAT ARE WE LOOKING FOR?

## EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **How does the current condition compare to baseline mental status?**
- **THINK:**
- **Ask family/friends about baseline when possible to establish normal behavior.**

## EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Is there difficulty breathing?**
- **THINK**
- **Altered mental status with difficulty in breathing may indicate lack of oxygen to the brain.**

# EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Is there a headache?**
- **Is there vomiting/ diarrhea?**
- **THINK:**
- **Headache with ALOC can indicate infection, tumor or bleeding**
- **Vomiting without diarrhea can be a sign of increased pressure in the brain**
- **Any source of dehydration can cause ALOC from poor perfusion**
- **Vomiting and diarrhea can cause hypoglycemia / electrolyte imbalance.**

## EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Has there been any dizziness or fainting?**
- **THINK:**
- **This could be a sign of poor perfusion to the brain.**

# EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **When did the symptoms start?**
- **How long do they last?**
- **Have they changed over time?**
- **THINK:**
- **Rapid onset think infection, inflammation, bleeding or drugs/toxins**
- **Gradual onset think less acute causes such as tumor or slow CVA bleeding in the brain**
- **Intermittent onset think seizures or psychiatric disease.**

# EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Any recent fevers? (especially pediatric patients)**
- **THINK:**
- **Serious infections in children and elderly can cause ALOC**
- **Prolonged outdoor (heat) exposure (heatstroke)**
- **Poisons/Medications/Drugs**
- **High fevers can cause ALOC.**

## EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **• ASK:**
- **• Any weakness, clumsiness or difficulty walking?**
- **• THINK:**
- **• Consider stroke or tumor**
- **• ASK:**
- **• Any neck pain or stiffness?**
- **• THINK:**
- **• Consider inflammation or infection in cerebral spinal fluid.**

# EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Any recent history of trauma or falls?**
- **THINK**
- **Bleeding in or around the brain (TBI) can cause ALOC even days/weeks after injury**
- **Chronic alcohol drinkers and the elderly (More prone to brain bleeding)**
- **May not remember falls**
- **Always consider unwitnessed trauma in a patient found altered with no known cause.**

## EMS GOALS: SAMPLE HISTORY

- **S: Signs and Symptoms**
- **ASK:**
- **Does anyone else from the same family or location have symptoms?**
- **THINK:**
- **IDLH poisoning**
- **Carbon monoxide is usually seen in cold climates with indoor heating, or from generator use.**

## EMS GOALS: SAMPLE HISTORY

- **A: Allergies**
- **ASK:**
- **Allergies to medications or other substances?**
- **Recent exposures to known allergens?**
- **THINK:**
- **Severe allergic reactions can present with AMS due to**
- **Low blood oxygen levels**
- **Poor blood circulation due to shock.**

# EMS GOALS: SAMPLE HISTORY

- **M: Medications**
- **ASK:**
- **Currently taking any medications?**
- **Collect medication list**
- **Any new medications or changed doses?**
- **THINK:**
- **Medication interactions**
- **Medication side effects**
- **Pain medications (opioids such as morphine, oxycodone, heroin)**
- **Sleeping medications**
- **Seizure medications.**

## EMS GOALS: SAMPLE HISTORY

- **P: Past Medical History**
- **ASK:**
- **History of diabetes?**
- **THINK:**
- **Low/High blood sugar**
- **Diabetic Ketoacidosis (DKA)**
- **Increased urine output**
- **Increased thirst**
- **Fast or deep breathing.**

# EMS GOALS: SAMPLE HISTORY

- **<u>P: Past Medical History</u>**
- **ASK:**
- **History of heart disease?**
- **History of stroke?**
- **History of high blood pressure?**
- **THINK:**
- **Heart attacks can decrease blood flow and oxygen to the brain**
- **Heart disease increases risk of stroke**
- **ALOC with a stroke history may indicate a new stroke or brain bleeding**
- **Old stroke symptoms may return with severe illness**
- **High blood pressure increases the risk for brain bleeding (CVA).**

# EMS GOALS: SAMPLE HISTORY

- **P: Past Medical History**
- **• ASK:**
- **• History of seizure?**
- **• Do they take regular seizure medications?**
- **• Any medication changes or missed doses?**
- **• If they had a witnessed convulsion ask about fall or head trauma**
- **• THINK:**
- **• Recovering from convulsion (postictal period)**
- **• Usually takes half hour to several hours at the most**
- **• A long time with ALOC, consider other causes.**

## EMS GOALS: SAMPLE HISTORY

- **L: Last Oral Intake**
- **ASK:**
- **When did the patient last eat or drink?**
- **THINK:**
- **Low blood sugar levels and dehydration can cause ALOC even in non-diabetics.**

## EMS GOALS: SAMPLE HISTORY

- **E: Events Surrounding Illness**
- **ASK:**
- **Was there any recent trauma?**
- **Any recent travel?**
- **THINK:**
- **Trauma can cause poor perfusion and ALOC**
- **Specific infections can lead to altered mental status.**

# EMS GOALS: SAMPLE HISTORY

- **<u>E: Events Surrounding INCIDENT</u>**
- **ASK:**
- **Recent exposures: sick person, recent bites, chemical exposures, exposure to hot or cold**
- **Drugs or alcohol?**
- **THINK:**
- **Sick contacts may suggest infection**
- **Chemical exposure (pesticides) may suggest poisoning**
- **Bites may suggest envenomation**
- **Exposure to extreme temperatures suggests hyper/hypothermia**
- **Drug ingestions can cause agitation or lethargy**
- **Alcohol intoxication and withdrawal can cause ALOC.**

# BLS TREATMENT

WHAT CAN WE DO ABOUT IT?

## EMS TREATMENT ON-SCENE

- SCENE SAFETY !
- ABCDE –
- TRY TO GET A FULL SAMPLE HISTORY
- GATHER MEDICATIONS.

## A/B: VENTILATORY SUPPORT

- Determine need for ventilatory support:
  - Hypoventilation (< 8 bpm)
  - Apnea (no respirations)
  - Shallow respirations
  - Dropping $SpO_2$ levels (below 95%)
  - Hypercapnia;
    - Excessive levels of carbon dioxide ($CO_2$) from hypoventilation.

85

**Adult 10 breaths per minute – 1 every 6 seconds**
**Child 20 breaths per minute – 1 every 3 seconds**
**Infant <1 y/o 25 breaths per minute – 1 every 2.5 seconds**

## A/B: HAZARDS OF HYPERVENTILATION

- Hyperventilation causes excessive exhalation of carbon dioxide ($CO_2$) creating secondary injuries:
  - Stimulates vasoconstriction which decreases blood flow
  - Brain especially sensitive to decreased blood flow
  - Decreased levels of oxygen and glucose.



Secondary injuries are those occurring after the primary insult. Can be the result of care provided or care withhold and a consequence of the patient's response to their condition/injuries.

## C: EXCESSIVE BLEEDING

- Control any bleeding you can see
- Beware of internal / intracranial bleeding that you cannot see:
  - Monitor closely for shock,
  - Watch $O_2$ levels – do not allow to drop below 90%.

87

Secondary injuries are those occurring after the primary insult. Can be the result of care provided or care withhold and a consequence of the patient's response to their condition/injuries.

## D: ALOC

- SCENE SAFETY IS IMPORTANT IN ANY CASE OF ALOC!
- Try to determine if the ALOC is caused by the action of a substance or drug
- Remember, even mild head trauma with anti-coagulants/anti-platelets can be a reason for major concern.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Secondary injuries are those occurring after the primary insult. Can be the result of care provided or care withhold and a consequence of the patient's response to their condition/injuries.

## E: HYPOTHERMIA / HYPERTHERMIA

- If your patient seems too cold or too hot for the environment, chase down the reason
- Is it simple fever?
- Or is it caused by a drug or other substance?
- In any trauma situation – always watch for hypothermia (even in warm weather).

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Drug induced hyperthermia:

| | |
|---|---|
| Antidepressants | Monoamine oxidase inhibitors, tricyclic antidepressants, selective serotonin reuptake inhibitors, serotonin-noradrenaline reuptake inhibitors, bupropion |
| Opioids | Tramadol, pethidine, fentanyl, pentazocine, buprenorphine oxycodone, hydrocodone |
| CNS stimulants | MDMA, amphetamines, sibutramine, methylphenidate, methamphetamine, cocaine |
| Psychedelics | 5-Methoxy-diisopropyltryptamine, lysergide |
| Herbs | St John's Wort, Syrian rue, Panax ginseng, nutmeg, yohimbine |
| Others | Tryptophan, L-Dopa, valproate, buspirone, lithium, linezolid, chlorpheniramine, risperidone, olanzapine, antiemetics (ondansetron, granisetron, metoclopramide), ritonavir, sumatriptan |

Ready for putting your new knowledge to work? Let's have some case studies!

# CASE SCENARIOS

WHAT CAN **YOU** DO ABOUT IT?

## CASE SCENARIO #1

- You are called to a unresponsive pediatric patient
- On-scene you find a 4 year old child who is pale, cool, sweaty and unresponsive
- Parents state that they found an empty bottle of Listerine mouthwash, that was full this morning
- Vital Signs: BP – 76/P, Pulse – 48, Respirations – 6, shallow
- Blood glucose is 32 mg/dl.

**When a child is 3 to 5 years old, their average vital signs are:**
heart rate: 80 to 120 beats per minute.
respiratory rate: 20 to 28 breaths per minutes.
blood pressure: systolic 89 to 112, diastolic 46 to 72.
Blood glucose 70 to 140 mg/dl

## CASE SCENARIO #1

- What is your general impression?
- What is going on here?
- Ethanol-containing mouthwash comprise most of the mouthwashes currently on the market
- The product with the highest ethanol concentration, Listerine (Warner-Lambert), **contains 26.9% ethanol by volume (53.8 proof),** more than five times the ethanol concentration of beer and more than twice that of table wines.

92

Some mouthwash contains high levels of alcohol - alcohol can produce profound hypoglycemia (<40 mg/dl) in a child or infant. Manufacturers are not required to use child proof containers or specify the alcohol content. Listerine is about 54 proof with 26.9% alcohol. The alcohol content of Scope weighs in at 18.9%, and Cepacol at 14%. When compared to beer (3% to 7% alcohol), wine (12%), and even some liquors and distilled spirits, these products are concentrated sources of ethanol.

## CASE SCENARIO #1

- Acute ethanol toxicity in pediatrics causes profound hypoglycemia
- Is this a critical patient?
- Can we do anything on-scene?
- Would you call the Poison Control Center?

93

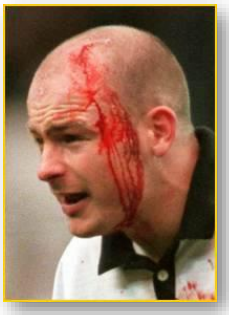
Critical? YES!
What can we do? ABCDE !
Call Poison Control? YES!!! 1-822-222-1222

## CASE SCENARIO #2

- You are dispatched to an MVA- car vs. tree
- The car involved has a “spider web” pattern of cracks on the right side of the windshield
- Your patient, a 23 year old male, was the unrestrained passenger.

## CASE SCENARIO #2

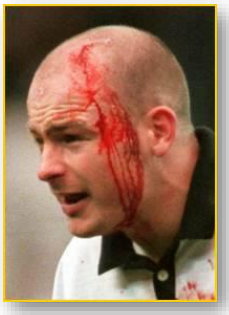
- He presents with head lacerations, is now AXO x 3, denies neck or spine pain, or any neurological deficit
- The driver states that your patient was unresponsive for about 5 minutes
- Your patient is irritable, and refuses your care states he will not go with the ambulance to the hospital.



## CASE SCENARIO #2

- Pulse 96, respiration 14, BP 134/88, pupils PERRL
- He has no medical history, medications or hospitalizations
- He is becoming increasingly irritable with your questions, especially when you ask about alcohol intake

- What do you suspect?
- What can you do about it?.



This is a tough one. He might be beyond disoriented and entering irritable. Next would be combative, so the scene may not be safe for very long. Do we wait for comatose?

## CASE SCENARIO #3

- You are dispatched to the scene for “man down”
- The initial assessment was performed by LE who were first on-scene and did not detect any serious injury
- Patient's mentation was altered and he was not able to speak
- The patient had also vomited and a presumptive diagnosis of alcohol intoxication was made by the LE
- #1 – do you take the LE officer’s word for an assessment here?
- Upon assessment you find an OOH DNR identifier on the patient’s wrist
- #2 - Would you continue care/treatment of this patient?

#1 – NO, they are not trained to the level of EMS (sorry)

#2 - YES  This condition is not the result of their underlying terminal condition  Contact on-line medical control if there are questions regarding the amount/type of treatment to be provided

## CASE SCENARIO #3

- The patient is approximately 65 and now unresponsive
- You get the following vitals:
- Blood Pressure 210/48
- Pulse 32
- Respirations irregular with periods of apnea

- Does this look like alcohol?
- What could it be?
- What can we do on scene?

Not alcohol – increasing ICP causing Cushing Triad.
The Cushing response refers to the changes the body experiences to compensate for rising intracranial pressure. Cushing's triad of signs includes hypertension, bradycardia and apnea.
What can we do? ABC's

## THANK YOU

PLEASE STAY SAFE OUT THERE!

Please take the exam for CEU cridit