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ED Report Outline

I. Etiology/pathophysiology

- Acetaminophen
  - Acetaminophen is a very common overdose
  - People think it is a very safe drug to take but can be very bad if taken in large doses
  - Readily available
  - Absorbed in the gastrointestinal tract, metabolized in the liver where it is conjugated to nontoxic metabolites and excreted in the urine
  - Onset is 30 minutes to 2 hours
  - Overdose levels peak at 4 hours
  - The liver is where glucuronidation and sulfuration, the two main metabolic processes, take place. When there is an overdose, these pathways become saturated, which causes cytochrome P450 to begin turning more acetaminophen into NAPQI. Toxic NAPQI is safely converted by glutathione to mercaptate and cysteine molecules, which are harmless and subsequently eliminated by the kidneys. When glutathione levels fall below 30% of normal due to an overdose, NAPQI levels rise and then bind to hepatic macromolecules, leading to hepatic necrosis which is irreversible.
  - Overdose usually occurs after more than 15 grams are ingested in a single dose. Hepatic injury than starts roughly 24-48 hours after the ingestion of acetaminophen and cause elevations in ALT and AST as well as symptoms such as jaundice, confusion, hepatic failure, and death
  - Signs and symptoms of overdose:
    - Abdominal pain, loss of appetite, coma, diarrhea, irritability, jaundice, nausea, vomiting, sweating
    - Symptoms may not occur until 12 hours or later after acetaminophen was taken
  - Complications:
    - Steven Johnson syndrome
    - Toxic epidermal necrolysis
    - acute generalized exanthematous pustulosis (AGEP)
    - liver failure
- Aspirin
  - Widely available and commonly taken OTC medication
  - Used for analgesic, antipyretic, and anti-thrombotic properties
  - Aspirin can be found in other classes of medication such as narcotics, antihistamines, and anticholinergic medications
  - Many metabolic diseases are brought on by salicylate intoxication. Hyperventilation and respiratory alkalosis are due to the direct stimulation of the cerebral medulla. It separates oxidative phosphorylation in the

mitochondria as it is broken down. Lactate levels rise because of the increased anaerobic metabolism which then results in metabolic acidosis. As a result of an effort to counteract the metabolic acidosis, hyperventilation gets worse, and the patient becomes too fatigued to compensate by hyperventilating and metabolic acidosis takes over causing end-organ damage and hemodynamic instability.

- In acute overdose, symptoms occur in 3-8 hours (40-80 mg)
- In moderate overdose, symptoms occur in 6-18 hours (80-100 mg)
- In severe overdose, symptoms occur in 12-24 hours (greater than 100 mg)
- Signs and symptoms of overdose
  - Airway and lungs
    - Tachypnea or bradypnea
    - Wheezing
  - Eyes, ears, nose, and throat
    - Ringing in the ear
    - Blurred vision
  - Nervous system
    - Agitation, confusion, incoherence
    - Collapse, coma, seizures
    - Drowsiness, headache
    - Unsteadiness
  - GI tract
    - Diarrhea
    - Heart burn
    - Nausea/vomiting
    - Stomach pain
  - Symptoms of chronic overdose
    - Fatigue
    - Slight fever
    - Confusion
    - Tachypnea and tachycardia
- Complications:
  - Respiratory arrest
  - Dyspnea
  - Hypotension
  - Coma

- Cocaine
  - Cocaine was removed from the leaves of the *Erythroxylon coca* plant in the 1800's and used in nausea pills, toothache drops, Coca-Cola and energy tonics
  - Since 1961, the recreational use of cocaine was considered a universal crime
  - Cocaine is listed as a DEA schedule II-controlled substance due to its medical use as well as potential for abuse

    - Cocaine inhibits the reuptake of catecholamines in the nerve endings leading to an increase in catecholamine levels which can cause arrhythmias, and the anesthetic properties of cocaine impair impulse conduction, which leads to re-entry ventricular arrythmias.
    - Long-term cocaine use can change the histology of the heart, resulting in fibrosis, myocarditis, and necrosis of the contraction bands as well as increased oxygen demand, heart rate and CO
    - Cocaine use can also cause ischemic stroke, seizures, and EPS symptoms such as dystonia, akathisia, and bradykinesia, and hyperthermia which is frequently accompanied by muscular atrophy, renal and hepatic damage, encephalopathy, disseminated intravascular coagulation (DIC), and metabolic acidosis.
    - Cocaine can be snorted, swallowed, injected, or smoked
    - Blocks dopamine, norepinephrine, and serotonin reuptake transporters, allowing the neurotransmitters to build up in the brain resulting in prolonged sympathetic effects
    - Cocaine acts on the alpha and beta 1 adrenoceptors resulting in increased heart rate, systemic pressure, and contractility
    - metabolites can cause vasoconstriction hours after the use
    - Cocaine also blocks sodium channels and interferes with the action potential propagation leading to conduction issues and dysrhythmias
    - Signs and symptoms of overdose
        - Seizures
        - Loss of awareness
        - Loss of urine control
        - High body temperature, severe sweating
        - High blood pressure, tachycardia
        - Bluish color of skin
        - Difficulty breathing
    - Complications:
        - Thrombophlebitis
        - HIV
        - Pulmonary emboli
        - Aneurysms
- Methamphetamine
    - Highly addictive psychostimulant drug that is a derivative of amphetamine
    - Produces euphoria and stimulant effects
    - Inexpensive and widely available which has led to increases in overdoses
    - Schedule II stimulant
    - Stimulates the release of dopamine, norepinephrine, and serotonin and blocks the reuptake of dopamine leading to euphoric effects as well as sympathetic effects

    - For oral intake, peak concentration time is within 2-4 hours, and for snorting, injecting, or smoking, concentration occurs within minutes
    - Signs and symptoms of overdose
        - Chest pain
        - Rapid increase in heart rate, blood pressure and body temperature
        - Confusion and agitation
    - Complications:
        - Hypertension
        - Intracranial hemorrhage
        - Seizures
        - Coma
- Rohypnol
    - Some forms are undetectable in drinks, but newer forms cause liquid to change colors
    - Commonly known as a “date rape” drug
    - Rohypnol affects the neurotransmitter GABA
    - Normally, GABA slows the communication between neurons, when someone ingests Rohypnol, the effects of GABA are enhanced which decreases communication between neurons even more which leads to the drowsiness and confusion effects of the drug
    - Signs and symptoms of overdose
        - Extreme sedation
        - Loss of consciousness
        - Slow or shallow breathing
        - Slowed heart rate
    - Complications:
        - Severe sedation
        - Unconsciousness
        - Suppression of respirations
        - Death
- Ecstasy
    - Also referred to as MDMA or methylenedioxymethamphetamine
    - Comes in a tablet or capsule form
    - Acts on the neurotransmitter’s serotonin, dopamine, and norepinephrine and prevents the reuptake which leads to the negative side effects days after the use
    - Can also have a reversal effect where it releases more serotonin into the synapses
    - Excess serotonin found in the synapse is what leads to the euphoric effects of the drug such as sensual enhancement, euphoria, emotional closeness to others
    - Inhibits monoamine oxidase activity which leads to increased serotonin levels

- Increase the blood levels of arginine vasopressin, which is the antidiuretic hormone, which leads to fluid retention
- Signs and symptoms of overdose
  - Hypertension
  - Dizziness
  - Agitation
  - Loss of consciousness
  - Seizures
- Complications:
  - Seizures, delirium
  - Dysrhythmias, MI
  - Liver failure
  - Rhabdomyolysis and renal failure
  - SIADH

II. On-Scene Treatment

- Airway, breathing, and circulation emergencies are the primary concern for EMS to treat
- Collect accurate information regarding type of drug ingested, how much, whether it was accidental or intentional, any previous drug usage, current medications, H + P, medical history
- Start IV access to administer fluids and medications if needed
- Gather a set of vitals including HR, BP, O2, temperature, and respirations
- Position the patient on their side if vomiting or to prevent aspiration
- If there is no pulse, immediately start CPR, continuously checking for pulse. Once an AED is available, follow the prompts, giving one shock then resuming compressions, before giving a second shock
- Provide supplemental oxygen if O2 saturation is below 95%
- If the patient has decreased LOC or altered mental status/too fatigued to support breathing on their own, EMS can place an OPA and provide respiratory support with a bag valve mask @ 16 breaths per minutes
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III. ED Treatment

- Acetaminophen
  - Toxicity levels are based on serum levels of the drug regardless of if the patient is symptomatic
  - Treatment depends on when the acetaminophen was ingested
  - Gastric decontamination can be performed if the ingestion was within one hour as well as activated charcoal if the patient is alert.
  - Gastric decontamination involves the use of an NG/OG tube placed in the stomach to aspirate the contents out of the body

    - Activated charcoal allows drugs and toxins to bind to it to help rid the body of harmful substances
    - If given within 8 hours, NAC (N-acetyl-cysteine) is the anecdote for acetaminophen and it prevents liver toxicity and is the primary treatment for acetaminophen overdose
        - prevents binding of NAPQI to hepatic molecules
        - acts as a substitute for glutathione
        - reduces NAPQI back to acetaminophen
    - NAC can be administered intravenously as well as orally
        - Oral form requires 18 doses given 4 hours apart totaling 72 hours which would extend their time in the ED and could possibly admit them into the hospital
    - If deterioration continues, then referral to a transplant surgeon should occur to discuss liver transplant
    - Hemodialysis can be performed as well if renal failure is present
- Aspirin
    - Aspirin overdose causes deficient fluid volume due to hyperventilation, fever, and increased metabolic activity. Fluid management includes D5 as well as 3 amps of sodium bicarbonate. Dextrose helps treat hypoglycemia and sodium bicarbonate will help treat metabolic acidosis
    - The goal of fluid management is to reach a urine output of 2-3 ml/kg/hr.
    - Potassium may be administered if hypokalemia is present
    - If someone is in severe overdose, mechanical ventilation will be required to help maintain breathing as they will be too fatigued and unable to control respirations on their own
    - Following intubation, hemodialysis should also be arranged
    - Activated charcoal has been shown to help decrease salicylate levels in the body along with gastric lavage if there is an acute overdose on enteric-coated tablets and it is within one hour
        - If there is any concern for aspiration, then both activated charcoal and gastric lavage are contraindicated
    - If a patient is experiencing seizures, benzodiazepines can be administered as well as glucose if hypoglycemia is still present
    - If minor ingestion and symptoms are improving along with serum levels trending down, then the patient will usually be sent home on symptomatic treatment
    - If serum levels, are rising, and the patient is continuing to decompensate, admission to the ICU will be required to continue fluid resuscitation and hemodynamic monitoring
- Cocaine
    - Benzodiazepines are first-line treatment for cardiovascular toxicity and agitation but there is a risk of sedation and respiratory depression

    - Calcium channel blockers such as diltiazem and verapamil help to reduce hypertension
    - Nitroglycerin and nitroprusside can help lower blood pressure but there is a risk for reflex tachycardia
    - Labetalol has been used to treat cocaine-induced hypertension and tachycardia
    - Benadryl is used to enhance sedation and prophylactically against dystonia and akathisia
    - Antipsychotics such as haloperidol may be helpful in treating agitated patients
    - Hyperthermia is treated with cooling measures such as water misting and convection cooling from a fan
- Methamphetamine
    - Benzodiazepines are first line treatment but usually require multiple doses to reach the desired effect
    - Antipsychotics such as haloperidol are useful to treat the agitation
    - Benadryl is used to enhance sedation and prophylactically against dystonia and akathisia
    - If a patient is tachycardic and hypertensive, labetalol is the drug of choice
    - If a patient is tachycardic without being hypertensive, metoprolol is the drug of choice
    - For severe hypertension without tachycardia, nitroprusside is the drug of choice
    - IV fluids are used to help with urinary elimination and prevent renal failure
    - Currently no FDA-approved treatments for stimulant use disorder, however, recent research revealed that treating individuals with moderate to severe methamphetamine use disorder with injectable naltrexone and oral bupropion was safe and effective.
- Ecstasy
    - History and physical is the gold standard in diagnosing ecstasy use
    - False positive and false negative urine drug screen results are very common and therefore not accurate in determining treatment
    - The gold standard test for determining if ecstasy was used is gas chromatography–mass spectrometry analysis but it can take days to get results and is very costly, so it is not commonly used.
    - May present obtunded due to hyponatremia which requires intubation
    - If present with severe toxicity within one hour, may receive activated charcoal PO or via an NG tube
    - Agitation can be controlled with benzodiazepines
    - To treat hyperthermia, ice packs to the groin and axillary area can be helpful along with evaporative cooling
    - If present with seizures, administer benzodiazepines
    - If hyponatremia is present, treated with hypertonic saline

- Rohypnol
    - If ingested within the last hour, activated charcoal or an emetic medication to induce vomiting may be used to rid the drug from the body
    - Flumazenil (Romazicon) has been used as a benzodiazepine antidote and has been effective in overdoses
        - Administered intravenously
        - If it is used in physically dependent Rohypnol users, it can lead to withdrawal symptoms and seizures
    - Administer antiseizure medications to help control seizures

IV. Role of ED nurse

- Acetaminophen
    - Maintain airway!
    - Start an IV
    - Obtain set of vital signs
    - Complete focused assessment
    - Obtain labs to determine serum levels of the drug
        - Blood draw must be done within 4-24 hours after ingestion
        - A level of 150 mcg/mL after four hours would be considered toxic
    - Other labs that might be drawn include LFT's, PT/INR, CBC, BMP
    - Obtain urine drug screen
    - Perform EKG
    - Obtain history and physical, if possible, to determine how long ago ingestion occurred which is important because the amount of time that has elapsed determines symptoms that may be present
        - First stage: 30 mins to 1 hr. = patient can be asymptomatic or experiencing emesis
        - Second stage: 18 to 72 hours = hypotension, emesis, right upper quadrant abdominal pain
        - Third stage: 72 to 96 hours = liver dysfunction and renal failure, metabolic acidosis, encephalopathies, death is imminent at this time
    - Possible foley insertion
    - Administer prescribed medications
- Aspirin
    - Maintain airway!
    - Start an IV
    - Obtain set of vital signs
    - Complete focused assessment
    - Obtain history, If possible, to determine time of ingestion, amount ingested and formulation, if any other substances were taken, and if the overdose was intentional or accidental

  - Obtain serum salicylate level as well as acetaminophen level due to confusion of what substances were ingested
  - Additional labs that might be ordered include CBC, BMP, lactate, ABG's, LFT's and coagulation studies
  - Perform an EKG to observe for any dysrhythmias
  - Prepare patient for possible CT scan if neurological deficits are present
  - Possible foley insertion
  - Administer prescribed medications
- Cocaine
  - Maintain airway!
  - Start an IV
  - Obtain set of vital signs
  - Complete focused assessment
  - Obtain accurate history if possible
    - Patients might not want to disclose their cocaine use
    - Thorough history of drug abuse and previous admissions are very important
  - Obtain labs such as CBC, BMP, troponins, creatinine kinase, urinalysis, urine drug screen, lumbar puncture
    - Creatinine kinase can help detect rhabdomyolysis
    - Urinalysis can detect myoglobinuria
    - Urine drug screen can help detect other illicit substances
    - Troponin can rule out myocardial infarction
    - Meningitis can be ruled out with lumbar puncture if it is suspected
  - Obtain EKG to observe for dysrhythmias
  - Possible imaging such as chest x-ray and abdominal x-ray to observe for possible stuffing or body packers
  - CT of head is possible if neurological deficits are present and to rule out intracranial hemorrhage
  - Possible foley insertion
  - Administer prescribed medications
- Ecstasy
  - Maintain airway!
  - Start IV
  - Obtain set of vital signs
  - Complete focused assessment
  - Obtain history if possible
    - Most ingestions of ecstasy occur with other illicit substances
    - Subjective report of exclusive ecstasy ingestion is not accurate as there are many compositions of the drug

    - Obtain labs such as CBC, BMP, BUN/creatinine, Creatinine kinase, LFT's, urine screening, myoglobin levels to evaluate rhabdomyolysis and renal injury
        - Aspirin, acetaminophen levels are checked as well to rule out toxicity of these substances
    - Obtain finger stick to check glucose levels
    - Obtain EKG to observe for dysrhythmias
    - Possible CT of the head and lumbar puncture to rule out causes of fever and altered mental status
    - Insertion of NG tube
    - Perform insertion of foley catheter to closely monitor urine output
    - Administer prescribed medications
- Rohypnol
    - Maintain airway!
    - Start IV
    - Obtain set of vital signs
    - Complete focused assessment
    - Obtain history, if possible, to obtain more information including if ingestion was accidental or intentional
    - Obtain labs such as CBC, BMP, ABG's, urinalysis
    - Obtain EKG to monitor for dysrhythmias
    - Test for other substances as well as Rohypnol is commonly ingested with other drugs
    - Administer prescribed medications
- Methamphetamines
    - Maintain airway!
    - Start IV
    - Obtain set of vital signs
    - Complete focused assessment
    - Obtain history if possible
        - Users are rarely forthcoming about their drug use
    - Obtain labs such as CBC, BMP, troponin, BNP, creatinine kinase, urinalysis,
    - Obtain EKG to observe for dysrhythmias
    - Possible CT scan for altered mental status to rule out brain hemorrhage
    - Administer prescribed treatment

V. Discharge/Prevention Instructions

- Acetaminophen
    - To protect children from overdose, keep medications out of reach and with child-proof caps
    - Take suicidal threats seriously and get help if you are experiencing suicidal ideation

    - Never take more than the recommended dose
    - Tell your doctor if have had a previous adverse reaction to the medication
    - Tell your doctor about all your prescribed medications including over the counter medications
    - Never mix medications if both contain acetaminophen unless instructed by your doctor
    - Don't take any drugs that aren't yours or are unfamiliar
- Aspirin
    - To protect children from overdose, keep medications out of reach and with child-proof caps
    - Take suicidal threats seriously and get help if you are experiencing suicidal ideation
    - Never take more than the recommended dose
    - Tell a doctor if you have had an adverse reaction previously
    - Tell your doctor about all your prescribed medications even over the counter medications
    - Don't take medications that aren't yours or are unfamiliar as they can be dangerous
- Cocaine
    - Never take drugs that aren't prescribed for you as they can be dangerous
    - When cocaine is combined with other illicit, and prescription drugs the mortality rate is high
    - Seek counseling or treatment if it is a chronic problem or you are struggling with addiction
- Methamphetamines
    - Don't take unknown drugs from someone as it can be dangerous
    - Seek counseling or treatment if it is a chronic problem or you are struggling with addiction
    - Take only as prescribed for ADHD
- Ecstasy
    - Don't take unknown drugs from someone as it can be dangerous
    - Avoid candy that isn't packaged as it can be a hidden form of ecstasy
- Rohypnol
    - Commonly referred to as the "date rape" drug, be cautious of your surroundings when you are out, especially in bars as someone can easily slip Rohypnol into your drink when you aren't paying attention – never leave your drink unattended
    - Don't take unknown drugs from someone as it can be dangerous
    - Take only as prescribed for insomnia

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