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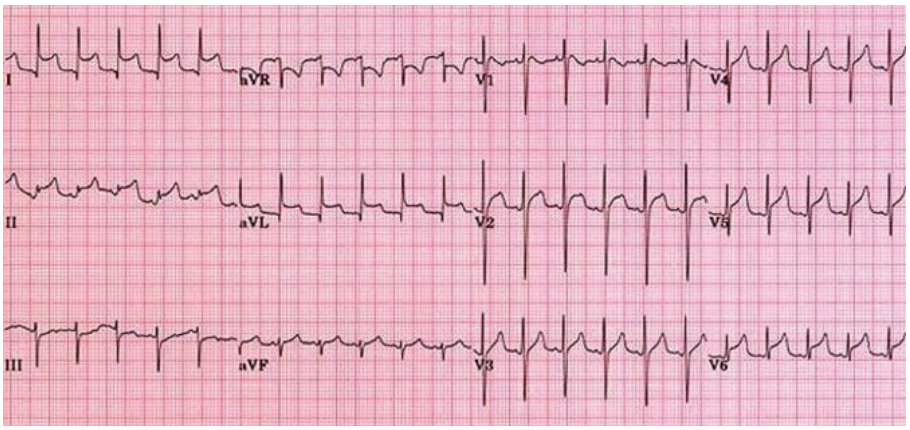
ENC(C) Questions

Cardiac (Rhythm Interpretation)

1. A 35-year-old female patient presents to the emergency department (ED) with a four-day history of "sharp pain" in her chest. Upon further assessment, you learn that the chest pain seems to be worse on deep inhalation, but not related to exertion. It is aggravated in supine position, but alleviated when leaning forward. You obtain a 12-lead electrocardiogram (ECG), which reveals the following:

Figure 1



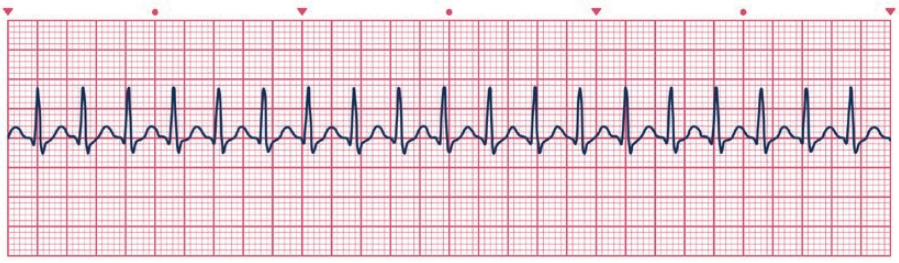
Note: Media App from the University of North Carolina (UNC; n.d.) https://apps.media.unc.edu/crashcart/Resources/HeartRhythms.html

Given the patient's history and ECG findings, she is **most** likely experiencing

A. an anterior myocardial infarction
B. pericarditis
C. a lateral myocardial infarction
D. endocarditis

2. A 40-year-old male patient arrives in the ED via ambulance. He is pale, diaphoretic, and "not feeling so good." His vital signs are: BP 88/60 mmHg, HR and rhythm as you see below (Lead II), RR 26 breaths/minute, SpO_2 93% on 4 L O_2 via nasal prongs.

Figure 2



Note: Media App from the University of North Carolina (UNC; n.d.) https://apps.media.unc.edu/crashcart/Resources/HeartRhythms.html

The **most** appropriate **initial** intervention would be

A. defibrillation at 200 Joules (J)
B. Valsalva manoeuvrez
C. cardioversion at 100 J
D. adenosine 6 mg intravenous (IV) push

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Obstetrics

3. A woman who is 28 weeks pregnant has sustained blunt abdominal trauma when hit repeatedly in the abdomen by her partner.

   Which of the following statements are correct regarding abdominal trauma in pregnancy?
   A. a hematocrit of 0.34 indicates significant blood loss
   B. a fetal heart rate of < 110/min or > 160/min is often an early indirect sign of maternal distress
   C. if amniotic fluid is present in the vaginal secretions, the pH will be 4.6 to 6.0
   D. increasing fundal height indicates a possible placenta previa

4. You are assisting with a precipitous delivery in the ED. On assessment you discover the umbilical cord protruding from the vagina.

   Which of the following interventions will you anticipate? Choose all that apply, there is more than one correct answer.
   A. apply gentle traction on the umbilical cord to straighten out the cord and normalize circulation
   B. instruct the mother to push to accelerate delivery and relieve pressure on the cord
   C. elevate the mother's hips to reduce pressure on the cord
   D. prepare to administer a tocolytic to inhibit labour until the cord can be corrected

Toxicology

5. A 0-year-old male arrives at the ED with impaired motor coordination, ataxia, slowed reaction time, slurred speech, and visual changes including blurred vision, emesis, and signs of dehydration. His friends state that he was getting more intoxicated. They are unsure of what he drank. The emergency nurse suspects
   A. ethanol poisoning
   B. methanol poisoning
   C. ethylene glycol poisoning
   D. isopropyl alcohol poisoning

6. A 78-year-old patient has been diagnosed with a right fractured hip. For pain management a regional nerve block is performed. The patient becomes acutely confused with a seizure and is hypotensive and bradycardic following the nerve block. ACLS measures are initiated including atropine, pacing, and a vasopressor infusion. The toxicologist is consulted. The emergency nurse anticipates the following intervention is
   A. intralipid therapy intravenously
   B. glucagon 1mg intravenous (IV)
   C. calcium gluconate 1 gram IV
   D. epinephrine 1mg IV

7. A 3-year-old child presents to triage with their parents. The parents report the child found an open bag of a chemical the parents use for pest control in the garage and was sprinkling "fairy dust" around the grass. Parents report the child started to act strangely, is coughing up a lot of saliva, and has profound diarrhea. The highest priority for the emergency nurse is
   A. continue to triage, take vital signs, and complete registration
   B. immediately take the child to the resuscitation room
   C. page the medical toxicologist
   D. don personal protective equipment (PPE)

Answers with rationales

1. Correct answer is B

Rationale: Pericarditis is a disorder of the heart wall, specifically the pericardium. It is most often idiopathic or caused by viral infection, leading to inflammation of the pericardium, which manifests as diffuse ST-segment elevation without Q waves on an ECG. Symptoms, such as sharp chest pain, typically develop over several days and are aggravated by respiratory movements (i.e., inhalation) as intrathoracic pressure increases, irritating the cardiac wall. Exertion may worsen chest discomfort, but it is not a precipitating factor, such as in acute coronary syndrome. Gravity aggravates the cardiac wall when lying flat; however, leaning forward expands the thoracic cavity and lessens frictional irritation (Brashers, 2019, p. 1088). In myocardial infarction (MI), chest discomfort is unaffected by body position or ventilation; however, exertion may precipitate chest discomfort, such as during an exercise stress test. ECG findings in anterior and lateral ST-segment elevation MI would present with ST elevation in leads V1–V4 and V5-V6-aVL-aVF, respectively (Foley & Sweet, 2020, pp. 239–242). Endocarditis involves inflammation of the innermost lining of the heart, the endocardium, of which the cardiac valves are composed. Infectious causes (e.g., group A beta-hemolytic Streptococci) are the most common culprit, leading to sequelae such as rheumatic heart disease and cardiac hypertrophy (Brashers, 2019, pp. 1091–1095). Thus, ECG findings related to endocarditis are typically due to valvular disease or atrial/ventricular hypertrophy, presenting with increased R wave voltage in lateral leads and ST depression/T wave inversion in leads V5–V6 (Burns & Buttner, 2021).

2. Correct answer is C

Rationale: In this scenario, the patient's rhythm is supraventricular tachycardia (SVT) with a rate of 210–240 bpm and evidence of hemodynamic instability (i.e., hypotension, pallor, diaphoresis, complaint of "not feeling so good"). The key here is determining whether the tachycardia is causing the serious signs or symptoms; if so, cardioversion should not be withheld. Therefore, cardioversion at 100 J (or dosage recommended by manufacturer) is the recommended intervention (American Heart Association [AHA], 2020, pp. 81–86). Adenosine may be considered if preparing for cardioversion, time permitting, but it would be inappropriate to delay cardioversion in this case. Defibrillation is 1st-line treatment for lethal rhythms (i.e., ventricular fibrillation, pulseless ventricular tachycardia [VTach]) and polymorphic VTach (i.e., Torsades de pointes) only. Valsalva manoeuvres slow down the heart rate by stimulating the vagus nerve (parasympathetic nervous system), such as by asking a patient to "bear down" or blow through the end of a syringe. They are first-line treatments for stable patients in regular SVT or paroxysmal SVT (AHA, 2020, pp. 81–82).

3. Correct answer is B

Rationale: For the pregnant trauma patient, a fetal heart rate of < 110/min or > 160/min is often an early indirect sign of maternal distress (Jain et al, 2015; Repasky, 2020). Vaginal bleeding and increasing fundal height indicate a possible abruptio placenta rather than placenta previa (Repasky, 2020). Dilutional anemia in pregnancy can cause inaccurate assessment of bleeding so the hematocrit level is slightly low but is more likely a normal physiologic response to pregnancy (Repasky, 2020; Sakamoto, et al., 2019). Amniotic fluid typically has a pH of 7.1–7.3, while normal vaginal secretions have a pH of 4.5–6.0 (Olarinoye et al, 2021).

4. Correct answer is C

Rationale: A prolapsed umbilical cord is a true obstetric emergency. Cord compression can cause fetal distress and even death (Bush et al., 2022). The most appropriate answer is to position the mother to relieve pressure on the cord and instruct her not to push to avoid further compression (Jordan, 2020). The physician may attempt to relieve pressure on the cord by lifting the presenting fetal part until a c-section can be performed. Other appropriate actions might include assessing for fetal distress and covering the cord with moist sterile gauze to keep it from drying out (Jordan, 2020). Pulling on the cord can cause damage. Unless the cervix is fully dilated, it is more likely that an immediate c-section will be performed rather than risk fetal distress with a prolonged vaginal delivery (Bush et al., 2022). A tocolytic would not be indicated.

5. Correct answer is B

Rationale: Methanol poisoning can be difficult to distinguish from ethanol ingestion, ethylene glycol ingestion, or isopropyl alcohol ingestion, or if they are co-ingested together or other co-ingestions. Early signs and symptoms of methanol poisoning are similar to ethanol intoxication — unsteady gait, slurred speech, central nervous system sedation. Methanol metabolites can specifically damage the retina and lead to visual disturbances including swelling of the optic disc leading to permanent blindness if not treated. The toxic metabolites also affect the central nervous system and may lead to hypoxia and acidosis. Ethylene glycol poisoning metabolites target the kidney leading to renal failure and acidosis. It may not be possible to get an accurate history to determine the toxin ingested. Lab work may include toxic alcohols to determine the type of alcohol ingested. Treatment is based on the clinical stability of the patient and if methanol poisoning is confirmed, fomepizole is the antidote. If fomepizole is not available, ethanol can be used. Hemodialysis may be used for severe poisoning. There is little role for gastrointestinal (GI) decontamination in this situation.

6. Correct answer is A

Rationale: Glucagon 1 mg is provided to patients IM if they are hypoglycemic and have an altered LOC, cannot swallow a source of glucose, and an IV cannot be established. Glucagon IV is an option for an overdose of calcium channel blockade or beta blockade, but the dose needed is higher and to be used only when routine ACLS measures for symptomatic bradycardia are not meeting the end goals of resuscitation. Calcium gluconate IV would be administered for hypocalcemia, calcium channel blocker overdose, and in hyperkalemia. Epinephrine 1 mg IV is the cardiac arrest dose and not the dose for route direct IV when a patient has a pulse.

Intravascular administration of local anesthetics such as lidocaine or bupivacaine inadvertently can cause cardiovascular collapse and seizures. Injecting the local anesthetic at the site of injury can cause local absorption into the vasculature. Frequent assessments including vital signs, GCS, and sensory and motor function following a regional nerve block are required to assess for local anesthetic toxicity.

Think about what local anesthetics do when injecting the skin around a laceration prior to wound approximation — it numbs the area for comfort during the procedure. If the local anesthetic is given into the intravascular space, the symptoms will be systemic. The initial signs of local anesthetic toxicity include dizziness, drowsiness, and slurred speech, circumoral numbness followed by seizures, coma, severe hypotension, and possibly death.

Support the patient's vital signs, cardiovascular, and respiratory with ACLS measures. If there is a lack of response, consult a medical toxicologist at the local poison control centre. The medical toxicologist will provide suggestions on next steps — possibly intralipid therapy.

Intralipid therapy may reverse the local anesthetic toxicity by redistribution of the local anesthetic away from the site of injection to decrease absorption or by enhancing metabolism within the cardiac cells. The dosing recommendation is usually an IV direct dose of intralipid followed by an infusion over about 30–60 minutes.

Any procedure involving injection of local anesthetics can predispose patients to local anesthetic toxicity. Most poison control centres will have a resource available for health practitioners. Consult with your local medical toxicologist when managing these patients.

7. Correct answer is D

Rationale: The highest priority is for the emergency nurse to don PPE to avoid exposure of a potential cholinergic exposure. The emergency nurse is at high risk of exposure as are the parents. Do not continue to triage or touch the child as residue from the chemical agent may be still present on the child's skin and clothing and possibly the parents. The parents and possibly the triage nurse may have been exposed to the same chemical as the child and may develop the same symptoms. Safety of the emergency team and anyone else in the triage area is a high priority. Paging the medical toxicologist is an option; but, at present, decontamination procedures are needed.

This is an example of a chemical, biological, radiological, nuclear (CBRNE) exposure. Follow local protocols for decontamination and emergent medical needs of the victims. Each ED must have an action plan on where/who/how/what occurs when patients arrive, even if they are unannounced.

Toxidromes are a group of symptoms that can occur after a toxic exposure that fall into certain categories. The child's symptoms are suggestive of a cholinergic exposure, such as a pesticide in the garage. A simple mnemonic can help identify this toxidrome — SLUDGE

S = Salivation
L = Lacrimation
U = Urination
D = Defecation
G = Gastrointestinal symptoms — abdominal cramps, diarrhea
E = Emesis

The treatment begins with decontamination and institution of basic and advanced life support. The antidote for cholinergic poisoning is atropine. The atropine dose for children is 0.05 mg/kg IV and for adults it is 2 to 5 mg IV. Further dosing may be needed until pulmonary signs and symptoms are resolving. Consult local poison control for further guidance.

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