**Case Vignette for October StuNews**

*Reviewed by Clinical Pharmacy Challenge Exam Panel*

**History of Present Illness:** A 34-year-old pregnant woman (33 weeks’ gestation) presents to the emergency department with abdominal pain and nausea. The patient states that she took about 8 g of acetaminophen because she wanted to end her life. Six hours after ingestion, she decided to seek medical assistance.

**Medical History:** Depression, anxiety disorder

**Social History:** No alcohol use; previous 1 pack/day smoker; no intravenous drug use

**Current Medications:** Prenatal vitamin, ranitidine, calcium carbonate as needed

**Allergies**: Penicillin—anaphylaxis

**Vital Signs:** Temperature 37°C; heart rate 90 beats/minute; respiratory rate 16 breaths/minute; blood pressure 130/90 mm Hg; Oxygen saturation 98% on room air; height 65 inches (165.1 cm); weight 81 kg

**Laboratory Values:** Acetaminophen 150 mcg/mL (*SI* 990 micromoles/L); WBC (white blood cell [count]) 27.8 x 103 cells/mm3 (SI 27.8 x 109/L; hemoglobin 12.1 g/dL (*SI* 121 g/L); platelet count 150,000/mm3 (*SI* 150 x 109/L); hematocrit 43.4% (*SI* 0.434); sodium 135 mEq/L (*SI* 135 mmol/L); potassium 3.8 mEq/L (*SI* 3.8 mmol/L), chloride 98 mEq/L (*SI* 98 mmol/L); bicarbonate 23 mEq/L (*SI* 23 mmol/L); glucose 119 mg/dL (*SI* 6.6 mmol/L); calcium 9.5 mg/dL (*SI* 2.4 mmol/L); serum creatinine (SCr) 1.2 mg/dL (*SI* 106.1 micromoles/L); phosphorus 2.3 mg/dL (*SI* 0.74 mmol/L); magnesium 1.9 mEq/L (*SI* 0.78 mmol/L); aPTT (activated partial prothrombin time) 38.3 seconds; international normalized ratio (INR) 1.3; AST (aspartate aminotransferase) 77 IU/L; ALT (alanine aminotransaminase) 64 IU/L

**Procedure Data:** Blood culture: no growth to date; urine culture: greater than 100,000 organisms/mL of gram-negative rods (final pending)

**Other Data:** She is alert, quiet, and shaking her head yes/no to questions, with poor eye contact. Her skin is pink with good perfusion. Her oral mucosa is moist. Heart is regular with a normal rhythm and rate. Lungs are clear with good aeration. Her abdomen is soft, with normoactive bowel sounds, minimal epigastric tenderness, no rebound, and no guarding. She is alert and oriented, and she walks around the room without difficulty.

**Question 1**

The patient arrives at the emergency department 6 hours after ingestion. She is experiencing nausea and vomiting. At this point, which stage of acetaminophen toxicity is the patient in?

1. Stage I
2. Stage II
3. Stage III
4. Stage IV

Answer: 1. Stage I

Rationale: The correct answer is option 1. There are four stages of acetaminophen overdose. Stage I is during the first 24 hours, and the patient may have symptoms of anorexia, nausea, and vomiting. Sometimes, the patient may have pallor and diaphoresis. Option 2 is incorrect. Stage II is 24–48 hours after ingestion, and the patient may show improvement in clinical symptoms. The liver enzymes may begin to elevate. Option 3 is incorrect. Stage III is 72–96 hours after ingestion and is called the hepatic stage. The patient may have vomiting, jaundice, abdominal pain, bleeding, confusion, or lethargy and may even be in a coma. The patient may have coagulation defects such as disseminated intravascular coagulopathy and may progress to death. Option 4 is incorrect. Stage IV is 4 days to 2 weeks after ingestion, which is called the recovery phase.

Citations:

1. O’Malley GF, O’Malley R. Acetaminophen poisoning. In: Merck Manual Online. Available at www.merckmanuals.com/professional/injuries\_poisoning/poisoning/acetaminophen\_poisoning.html. Accessed February 1, 2014.

2. Chun LJ, Tong MJ, Busuttil RW, et al. Acetaminophen hepatotoxicity and acute liver failure. J Clin Gastroenterol 2009;43:342.

**Question 2**

Given the patient’s current clinical status and other conditions, which antidote is most appropriate to administer?

1. Gastric lavage
2. Oral N-acetylcysteine (NAC)
3. Intravenous sodium bicarbonate
4. Intravenous N-acetylcysteine (NAC)

Answer: 4. Intravenous N-acetylcysteine (NAC)

Rationale: The correct answer is option 4. Administration of intravenous is recommended in pregnant women because of the advantage of increased delivery to the fetus. Option 1, gastric lavage, is indicated only in patients who present within 1 hour of ingestion or if extended-release preparations have been ingested. Option 2, oral NAC, is effective; however, because the patient is pregnant, the preferred route of administration is intravenously to ensure delivery to the fetus. Additionally, the patient is exhibiting nausea and vomiting which may further decrease absorption of the oral agent. Option 3, sodium bicarbonate, is not effective in the management of acetaminophen toxicity unless the patient develops acidosis.

Citation: Hendrickson RG. Acetaminophen. In: Nelson LS, Lewin NA, Howland M, et al., eds. Goldfrank’s Toxicologic Emergencies. New York: McGraw-Hill, 2011:chap 34. 9e. Available at http://accesspharmacy.mhmedical.com.lp.hscl.ufl.edu/content.aspx?bookid=454&Sectionid=40199408. Accessed February 1, 2014.

**Question 3**

On the second day of hospitalization, the patient becomes febrile, and the nurse notes that the patient has developed pyuria. The physician decides to initiate antibiotic therapy. What antibiotic regimen should be initiated?

1. Amoxicillin
2. Doxycycline
3. Nitrofurantoin
4. Trimethoprim/sulfamethoxazole

Answer: 3. Nitrofurantoin

Rationale: The correct answer is option 3. Nitrofurantoin in all trimesters of pregnancy appears to be safe and is effective against gram-negative rods in the urine. Option 1, amoxicillin, is incorrect. This would be the drug of choice because while no β-lactam antibiotic is known to be teratogenic and is effective against gram-negative rods in the urine; however, the patient has an allergy to penicillin with an anaphylactic reaction. Option 2, doxycycline, is incorrect. Doxycycline is a known teratogen because of to the likelihood that it will cause teeth discoloration in fetuses as they develop in infancy; therefore, it should be avoided. Option 4, trimethoprim/sulfamethoxazole, is incorrect. This agent should be avoided in the third trimester because of the potential for kernicterus.

Citation: Schnarr J. Smaill F. Asymptomatic bacteruria and symptomatic urinary tract infections in pregnancy. Eur J Clin Invest 2008;38(suppl 2):50-7.

**Question 4**

The patient begins to experience altered mental status. The attending physician wants to evaluate the patient’s prognosis using King’s College Criteria to determine whether the patient will need a liver transplant. Which laboratory parameters are used to determine the prognosis using King’s College Criteria?

1. Platelet count, liver function tests, serum creatinine (SCr)
2. Arterial pH, INR, SCr
3. Arterial pH, liver function tests, SCr
4. Platelet count, arterial pH, liver function tests

Answer: 2. Arterial pH, INR, SCr

Rationale: The correct answer is option 2. The most commonly used indicator of the need for immediate transplantation is the King’s College Criteria, which was developed and validated in patients with acetaminophen-induced fulminant hepatic failure. The criteria include a serum pH below 7.30 after fluid resuscitation or the combination of creatinine above 3.3 mg/dL, INR greater than 5, and grade 3 or 4 encephalopathy. Options 1–3 are incorrect; using liver function tests and platelet count has not been shown to determine the need for immediate liver transplantation due to acetaminophen-induced fulminant hepatic failure.

Citation: Hendrickson RG. Acetaminophen. In: Nelson LS, Lewin NA, Howland M, et al., eds. Goldfrank’s Toxicologic Emergencies. New York: McGraw-Hill, 2011:chap 34. 9e. Available at http://accesspharmacy.mhmedical.com.lp.hscl.ufl.edu/content.aspx?bookid=454&Sectionid=40199408. Accessed February 1, 2014.

**Question 5**

On the third day of hospitalization, the patient becomes unresponsive and is no longer able to protect her airway; intubation is necessary. What intravenous **induction** agent should be administered for facilitating intubation?

1. Etomidate
2. Succinylcholine
3. Midazolam
4. Rocuronium

Answer: 1. Etomidate

Rationale: The correct answer is option 1. Etomidate, FDA (U.S. Food and Drug Administration) category C, is the recommended induction agent for use in pregnant patients requiring intubation. Option 2, succinylcholine, is incorrect because it is a paralytic agent and should not be used solely for induction. Option 3, midazolam, is not preferred because it is a pregnancy category D agent and is contraindicated in pregnancy. Option 4, rocuronium, is a paralytic, not an induction, agent.

Citations: Downing JW, Buley RJ, Bork-Utne JG, et al. Etomidate for induction of anesthesia at caesarean section: comparison with thiopentone. Br J Anaesth 1979;51:135-40.

Lutes ML, Slawter A. Focus On Emergency Airway Management in the Pregnant Patient. American College of Emergency Physicians (ACEP) News July 2007. Available at <http://www.acep.org/Clinical---Practice-Management/Focus-On--Emergency-Airway-Management-in-the-Pregnant-Patient/>. Accessed August 13, 2014.