Mr. Jimenez is a 56 year old woman who has been having financial difficulties since her divorce five year ago. She was recently involved in a motor vehicle accident (MVA) where she drove over a curb and hit a telephone pole. She did not sustain any significant injuries in the MVA. Today, Mr. Jimenez’s daughter Maria returned home at 9:00 P.M. to find Ms. Jimenez sitting on the floor with a decreased level of consciousness. Maria was able to shake her mother awake. With slurred speech, Ms. Jimenez told her daughter that she drank three large glasses of antifreeze (ethylene glycol) at around 7:00 P.M. Maria called 911 and emergency medical services transported Ms. Jimenez to the local emergency department.

Case Study

Upon arrival to the emergency department, Ms. Jimenez is afebrile with a rectal temperature of 97 F (36.1 C). Her other vital signs are blood pressure 135/85, pulse 68, and respiratory rate 24. Her initial arterial blood gases (ABGs) on a 15 litters per minute non-rebreather revealed a pH of 7.19, partial pressure of carbon dioxide (PaCO2) of 13 mmHg, partial pressure of oxygen (PaO2) of 359 mmHg, bicarbonate (HCO3) of 5 mEq/L, and oxygen (O2) saturation of 100%. Ms. Jimenez is sedated in the emergency department using etomidate. She is intubated and put on mechanical ventilator. A foley catheter is inserted. She receives succinylcholine chloride, Lorazepam, and porpofol. Her oxygen saturation is 92% on an FIO2 (fraction of inspired oxygen) of 70%. The health care provider’s physical examination reveals no abnormal findings. The neurological exam is deferred because Ms. Jimenez is intubated and sedated. An electrocardiogram shows that Ms. Jimenez is in a normal sinus rhythm. A chest X-ray (CXR) shows no infiltrate and proper endotracheal tube placement.

A urinalysis shows a specific gravity of 1.010, a small amount of occult blood, 3 to 5 white blood cells per high-power field (HPF), a few bacteria per HPF, and a moderate amount of uric acid crystals and urine calcium oxalate crystals. A urine culture and colony count was negative (no growth). Her blood alcohol level is less than 10 mg/dL. Her ethylene glycol level is 36 mg/dL. Her complete blood count (CBC) is within normal limits except for a mean cell volume (MCV) of 79.2 um3. Troponin level is 0 ng/mL, creatine kinase cardiac isoenzymes (CK-MB) is within normal limits. Serum osmolality is 392 mOsm/Kg. Her electrolytes are WNL except for serum bicarbonate of 7 mEq/L. She has an anion gap of 29 mEq/L, blood urea nitrogen (BUN) of 25 mg/dL, and creatinine of 1.4 mg/dL. Her liver function tests are WNL.

Ms. Jimenez is admitted to the intensive care unit (ICU) and prescribed intravenous (IV) fluids of normal saline with 2 ampules of bicarbonate at 125 cc per hour. The medications prescribed for her include 4-methylpyrazole IV every 12 hours, intramuscular (IM) pyridoxine 5 mg, thiamine 100 mg IM, and levalbuterol treatments. Lab work prescribed includes CBC, electrolytes, ethylene glycol levels, basic metabolic panel (BMP), creatinine level, acetone level, and urinalysis.
In the ICU at the bedside, a Quinton dialysis catheter is surgically inserted in the right internal jugular vein for emergency dialysis and placement of Quinton catheter is confirmed by CXR.

Questions:
1. What is ethylene glycol? What products contain ethylene glycol?
2. Discuss the potential effects of ingesting ethylene glycol (antifreeze).
3. What is a “half-life”? Explain the half-life of ethylene glycol and how ethylene glycol is cleared from the body.
4. Discuss the rationale for why Ms. Jimenez is receiving 4-methylpyrazole. What is a drawback of this medication?
5. If 4-methylpyrazole is not available, what is the next most effective treatment for ethylene glycol poisoning? Discuss how this treatment is administered and what should be monitored during administration.
6. If Maria had come home earlier and Ms. Jimenez was found within an hour of drinking the antifreeze, what four interventions could have been considered to decrease the progression of the toxic effects of the ethylene glycol?
7. Briefly describe the indication for each of the following medications Ms. Jimenez received during her initial medial treatment: pyridoxine hydrochloride, thiamine, succinylcholine chloride, levalbuterol, Lorazepam porpofol and etomidate.
8. Why were intravenous (IV) fluids of normal saline with 2 ampules of bicarbonate at 125 cc per hour prescribed as part of the medical management of Ms. Jimenez?
9. Complete an analysis of Ms. Jimenez’s initial arterial blood gas (ABG) result while on 15 liters of oxygen via non-rebreather. Are her ABG’s consistent with those expected for a person with an ethylene glycol overdose?
10. Why was Ms. Jimenez intubated and placed on a mechanical ventilator?
11. Ms. Jimenez is on a mechanical ventilator set on assist-control of 14, respiratory rate of 28, tidal volume 650, oxygen 40%, and a PEEP of 5. What does each ventilator setting indicate?
12. The respiratory rate on a mechanical ventilator is usually set between 10 and 14 breaths per minute. Why is the rate for Ms. Jimenez set at 28 breaths per minute?
13. Which of Ms. Jimenez’s laboratory results below are most significant in the determination of a diagnosis of ethylene glycol poisoning?
14. Why did Ms. Jimenez’s prescribed laboratory tests include an assessment of her liver function?
15. What is a Quinton catheter and why was one inserted?
16. Prioritize three nursing diagnoses that are appropriate to include in Ms. Jimenez’s plan of care.
It is forty-eight hours after her arrival in the emergency department. Ms. Jimenez has undergone 12 hours of emergency dialysis, has been extubated, and is medically stable for transfer to the medical-surgical floor. A safety sitter remains in Ms. Jimenez’s room at all times. Ms. Jimenez is alert and oriented but has a flat affect. She is not remorseful for her actions and states; “I had hoped I would be successful this time.” A psychiatrist sees Ms. Jimenez for a consultation. The psychiatric assessment reveals that she has been planning the poisoning for a few weeks. She states, “I was hoping I would die quickly and it would look like an accident.” Ms. Jimenez states that she has made attempt in the past to overdose on medication. She did not seek care at the hospital when these suicide attempts were not successful. She has been depressed since divorcing her husband five years ago. Since her divorce, she has not paid taxes and there have been mounting financial bills with the Internal Revenue Service. As a result, her wages are being garnished (money is withheld from her paycheck and sent to a creditor). She reports, “On the outside I appear bright and upbeat but on the inside I am so lonely and sad and jut don’t want to go on anymore.” She wonders how she will pay for her medical care no. “I had not planned on the poison not working and needing dialysis. I bet dialysis is expensive?

17. Explain acute renal failure (ARF).
18. Discuss the characteristics and causes of the three types of ARF.
19. Considering the conditions that cause ARF, which type of ARF is Ms. Jimenez experiencing?
20. What characteristics and laboratory data define the four phases of acute renal failure, and what is the approximate duration of each phase?
21. It has been four days since admission. According to the definitions proved in the response to questions number 21, which phase of acute renal failure is Mrs. Jimenez experiencing?
22. While the nurse is assessing the Quinton catheter insertion site, Ms. Jimenez asks what dialysis is and how long she will need to do it. Her initial dialysis treatment was twelve hours long and she is wondering if she will always have to be “hooked up” to the machine that long each time. How should the nurse respond?
23. On admission, Ms. Jimenez’s creatinine was 1.4 mg/dL, and her BUN was 25 mg/dL. Ms. Jimenez has repeat creatinine and BUN labs drawn two days after admission. The results are a creatinine of 4.7 mg/dL and a BUN or 24 mg/dL. A say later her creatinine is 8.5 mg/dL with a BUN is 57 mg/dL. Are these results getting better or worse since admission? Discuss why.
24. Identify five priority nursing diagnoses that are appropriate to include in Ms. Jimenez’s plan of care.
25. Why has a safety sitter been included as part of Ms. Jimenez’s plan of care?
26. What are two collaborative services to consider when planning Ms. Jimenez’s discharge?
27. Discuss how Ms. Jimenez’s recent MVA may relate to her current admission.