

## Case Study 1: Patient N.B.

### Diabetic Ketoacidosis

#### Patient Profile

N.B., a 34-year-old Native American man, was admitted to the emergency department after he was found unconscious by his wife in their home.

#### Subjective Data (Provided by Wife)

- Was diagnosed with type 1 diabetes mellitus 12 mo. ago
- Was taking 50 U/day of insulin: 5 U of lispro insulin with breakfast, 5 U with lunch, and 10 U with dinner Plus 30 U of glargine insulin at bedtime
- States a history of gastroenteritis for 1 wk with vomiting and anorexia
- Stopped taking insulin 2 days ago when he was unable to eat

#### Objective Data

##### Physical Examination

- Breathing deep and rapid
- Fruity acetone smell on breath
- Skin flushed and dry

##### Diagnostic Studies

- Blood glucose level 730 mg/dL (40.5 mmol/L)
- Blood pH 7.26

#### Discussion Questions

1. Briefly explain the pathophysiology of the development of diabetic ketoacidosis (DKA) in this patient.  
When the patient became sick, began vomiting, and stopped eating he assumed he should stop taking his insulin. What the patient did not consider is that the illness would cause a stress response in his body that would lead to increased blood glucose levels. With the lack of insulin, he had no way to get the glucose, which is the unit of energy, into his cells. Without access to glucose for fuel, his body resorted to burning fat in order to obtain energy, this is what led to ketone body production. These ketones make very acidic waste, which is what leads DKA.
2. What clinical manifestations of DKA does this patient exhibit?  
The patient exhibited Kussmaul breathing; deep and rapid breaths, with a fruity acetone odor. The patient also presented with increased blood glucose level and a pH of 7.26. Acidosis occurs when the pH is below 7.35, which was the case in this patient. Additionally, the patient's skin was flushed and dry, which is a classic sign of hyperglycemia.
3. What factors precipitated this patient's DKA?  
The main factor in this patient's DKA was that he stopped taking his insulin. This allowed his blood glucose level to rise well above normal. When the blood glucose enters an elevated range of this extent, the body has no way of controlling itself and thus starts off the chain reaction that becomes DKA. Aside from not taking insulin, the patient was sick with gastroenteritis. When the body is put under the stress of fighting off infection, blood glucose is known to elevate, so the patient is not only taking less insulin than he should be, but is also requiring more insulin than he would be on an average day.
4. Priority Decision: What is the priority nursing intervention for N.B.?  
The priority in this case would be to administer fluids and begin the process of lowering the patient's blood glucose. In cases where the blood glucose elevates to such an extent, it is necessary to lower the sugars slowly, like landing a plane. If the sugar level is lowered too quickly it will also lower the patient's level of potassium, which will lead to impaired function of the heart, since the heart needs potassium to pump blood to the rest of the body.

5. What distinguishes this case history from one of hyperosmolar hyperglycemic syndrome (HHS) or Hypoglycemia?

Firstly, the patient is a type 1 diabetic and DKA typically occurs in that population whereas HHS usually presents in type 2 diabetics. Another distinction is that acidosis was present; no acidosis occurs in HHS. The fruity acetone breath is another clear distinguisher, as ketones are not present in HHS.

6. Priority Decision: What is the priority teaching that should be done with this patient and his family?

It is important to teach the patient and family that once we get to this point, we need to lower blood glucose slowly in order to preserve potassium. Once this is managed and the patient and his family are ready to tolerate further education, we must teach them that insulin should not be skipped on sick days. Even if the regular diet is not consumed, insulin is still necessary, especially because illness will raise blood glucose.

7. What role should N.B.'s wife have in the management of his diabetes?

While the patient needs to be the main participant in his own care, it is important for the wife to remind him of what is appropriate to eat as a diabetic, and perhaps to change the habits of the household in order to make this transition simpler. In addition, the wife should try her best to learn sick day rules and understand how to administer insulin, and in case of hypoglycemia how to mitigate symptoms (hard candy, juice, limit protein and aim for carbs.) She should also be educated on signs and symptoms of both hyper and hypoglycemia, so that she can notice when her husband is in need of intervention.

8. Priority Decision: Based on the assessment data presented, what are the priority nursing diagnoses? Are there any collaborative problems?

Priority nursing diagnoses for this case include deficient knowledge and deficient fluid volume.

Collaborative interventions for this will likely include hydrating the client with isotonic IV solutions as prescribed.

9. Evidence-Based Practice: N.B.'s wife asks you if she should have given her husband insulin when he got sick? How would you respond?

“Yes, is important for N.B. to take his insulin, even when he is sick. Being sick puts extra stress on the body, which makes the body release more sugar into the blood, so even if he is not eating or is throwing up, he will still need that insulin. If you ever have questions you can always refer to the notes I will include in his discharge paperwork, or you can call his endocrinologist.”