**CLINICAL VIGNETTE**

# A Case of Severe Hypoglycemia in the Setting of Pneumonia and Concurrent Sulfonylurea Administration

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***Case Presentation***

A 96-year-old male nursing home resident with Alzheimer's dementia and type 2 diabetes presented to the emergency department with altered mental status. The patient was in his usual state of health until he awoke confused and unable to answer any questions. At baseline, he was alert and conversant, and oriented to person but not place or year. At the nursing home he had a blood glucose of 49 milligrams per deciliter (mg/dL), was given a push of 25 g of 50 percent dextrose in water (1 ampule of D50W), and brought to the emergency room. Of note, the patient had been taking metformin 1000 mg BID and glimepiride 3 mg daily for many years. No medications were recently changed, and insulin was not part of his medical management of diabetes. He had been noted to have decreased PO intake for several weeks.

On presentation, the patient's vital signs included temperature 36.8° C, blood pressure was 117/54 mmHg, heart rate was 92/min, respiratory rate 21 breaths/min, and 97% O2 saturation on room air. He was alert but was nonverbal and unable to answer questions. Initial point of care blood glucose was 70 mg/dL but dropped to 19 mg/dL on repeat check one hour later. The patient was subsequently given 1 ampule of D50W with improvement in blood glucose to 106 mg/dL and brief improvement in mental status. Additionally, he was started on continuous intravenous (IV) 5% dextrose (D5W) in normal saline at 75 cc/hr. Despite these interventions, he became hypoglycemic again within one hour with a subsequent blood sugar of 53 mg/dL and worsening confusion. Fluids were consequently switched to 10% dextrose (D10W) in normal saline.

Initial labs were notable for WBC 12.2 k/uL and his chest x-ray demonstrated bibasilar consolidations. Given the elevated heart rate, and leukocytosis, the patient was thought to have sepsis with multifocal pneumonia as the source. Nasopharyngeal COVID-19 was negative. He was started on vancomycin and piperacillin/tazobactam for healthcare-associated pneumonia.

For the first twenty-four hours, despite receiving D10W intravenously, the patient's blood glucose rapidly dropped to the 20-50 range every one to two hours, requiring multiple additional pushes of ampules of D50. In total, he required fourteen ampules of D50W over this twenty-four-hour time period. The patient's home metformin and glimepiride were held. Due to the severity of the patient's hypoglycemia and concern for sulfonylurea as a contributing etiology of his symptoms, he received three doses of 75 mcg octreotide subcutaneously spaced eight hours apart. Twenty-four hours after admission, the patient's blood glucoses remained consistently above 120 mg/dL and his mental status improved back to his baseline. He was subsequently weaned off of the dextrose-containing IV fluids. His vancomycin and piperacillin/tazobactam were transitioned to levofloxacin for a seven-day treatment course. His metformin and glimepiride were discontinued, and he was discharged on sitagliptin.

During one hypoglycemic episode with a blood glucose of 19 mg/dL, diagnostic evaluation was undertaken with results showing c-peptide was elevated at 7.3 ng/mL, proinsulin was elevated at 8.8 pmol/L, insulin level was 18 uU/mL, and beta-hydroxybutyrate was <1.0 mg/dL. AM cortisol was 19 mcg/dL. Hemoglobin a1c was 7.1%. His high c-peptide, proinsulin and insulin with suppressed ketones showed that he had increased endogenous insulin release. Given the rapid resolution of hypoglycemia, it was unlikely that the patient had an insulinoma and likely had hypoglycemia in part due to sulfonylurea administration. In addition to sulfonylurea usage, additional contributors to his hypoglycemia included low glycogen stores from poor oral intake and sepsis from aspiration pneumonia.

***Discussion***

This case demonstrates the vulnerability of nursing home populations to hypoglycemia. Diabetic patients residing in nursing homes are at high risk for hypoglycemia.[1] In a study of 77 diabetic patients at a skilled nursing facility, rates of severe hypoglycemia were 7.8% per patient per year.[2] Amongst patient taking sulfonylureas specifically, risk factors for development of hypoglycemia include an age greater than 70 years old, polypharmacy, renal insufficiency, and dementia.[3] Nursing home patients frequently have one or more of these risk factors.

In addition to these risk factors, nursing home patients are also at high risk for developing infections such as pneumonia and sepsis.[4] Hypoglycemia is a known manifestation of sepsis, with sepsis characterized by intense cytokine release, which can cause hypoglycemia by depleting glycogen stores, impairing gluconeogenesis, and increasing peripheral glucose utilization.[5] Given the known increase in metabolic demand associated with systemic infection, it is therefore not surprising that nursing home populations are susceptible to hypoglycemia. This is

further exacerbated, by decreased oral intake associated with infection. In this patient, despite having depleted glycogen stores, the sulfonylurea dosage was not modified or withheld during this period of time, eventually culminating in his episode of profound hypoglycemia. It is therefore important for nursing staff to report decreased oral intake to clinicians, and for clinicians to adjust parameters for oral hypoglycemics to match the patient's oral intake.

Amongst nursing home patients who are admitted for hypoglycemia, a thorough medication reconciliation must be performed. Furthermore, if sulfonylureas are part of the patient's daily regimen, this should raise the index of suspicion for sulfonylurea as a potential etiology, as this can affect the plan for therapy. Typically, when hypoglycemia is recognized, intravenous dextrose is administered to increase blood glucose levels acutely. However, symptomatic hypoglycemia from sulfonylurea overdose must also be treated with octreotide, a somatostatin analog that inhibits insulin release. A retrospective review of nine adult patients treated for hypoglycemia from sulfonylureas showed that 2.9 ampules of D50W were needed for each patient before octreotide treatment but only 0.2 ampules were needed after octreotide was given,[6] thus highlighting the need for early administration when sulfonylurea is the suspected etiology.

***Conclusion***

Diabetic patients residing in nursing homes are at risk of hypoglycemia due to a multitude of factors, including intrinsic patient characteristics, administration of oral hypoglycemics (especially sulfonylureas), and a heightened risk of developing pneumonia with subsequent sepsis. Additionally, these patients may exhibit decreased oral intake which requires nursing home physicians to diligently monitor their patients' intake and appropriately modify their diabetic medication regimens. Hypoglycemia in this setting requires the administration of IV formulations of glucose, and timely administration of octreotide if sulfonylureas are suspected to be a contributing cause.

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