

Case Study: Inpatient Hyperglycemia: Typical Versus Ideal Outpatient Follow-Up Care

Lois L. Exelbert, RN, MS, CDE, BC-ADM

PRESENTATION

M.G., a 54-year-old Hispanic woman, entered the Emergency Department with acute cholecystitis. Her chemistry profile revealed a random glucose of 325 mg/dl. She is 5 feet, 2 inches tall and weighs 186 lb. M.G. has had annual exams but was never told her blood glucose levels were high. Her parents both died from complications of type 2 diabetes. The Emergency Department staff initiated the hospital's routine diabetes orders. This included blood glucose measurements before meals and at bedtime, along with a supplemental scale of aspart insulin starting at 150 mg/dl. She was admitted for antibiotic therapy, but the surgeon preferred to perform her cholecystectomy as an outpatient procedure. The diabetes education team was consulted 3 days after the admission. Chart review revealed that M.G.'s blood glucose levels were still consistently > 150 mg/dl and that she received the sliding-scale insulin coverage but no routine basal or bolus doses. Insulin was not prescribed at discharge, and treatment was deferred to her primary care physician. Her hemoglobin A_{1c} (A1C) was 8.2%.

M.G. was taught blood glucose monitoring and normal levels, the basic pathophysiology of diabetes, and how to schedule an outpatient appointment. She was reminded of the importance of good blood glucose control before surgery.

M.G. returned 10 days later for an outpatient cholecystectomy. Her blood glucose was 190 mg/dl preoperatively and 236 mg/dl postoperatively. She was

sent home with instructions to see her surgeon in 2 days.

M.G. returned to the Emergency Department 6 days later with fever and pain at the surgical site. Her blood glucose was 402 mg/dl. She was admitted to the hospital, and an endocrinologist was formally consulted. This time, when placed on the hospital's standing diabetes orders, she was given a basal dose of glargine insulin at bedtime and premeal aspart plus the supplemental scale. The diabetes education team was called in again to initiate teaching for a new diagnosis and insulin administration. They reminded her about returning for complete education. She stayed 4 days and was given an 1,800-calorie diet. Her family brought in food from home so that she would "get well sooner," yet this was undetected by the nursing staff. Her discharge dose for insulin was based on her inpatient needs, and M.G. was sent home with glargine at bedtime and premeal aspart.

M.G. made appointments with her surgeon, her primary care physician, and the endocrinologist. Feeling better, she resumed normal activity and began following the suggested meal plan. As a result, she experienced hypoglycemia at least twice a day and reported it to her primary care physician. He discontinued her insulin completely and prescribed metformin, 500 mg twice daily. M.G. had to wait 3 weeks to see the endocrinologist, and by then, her blood glucose levels were ranging between 160 and 280 mg/dl. She explained why she stopped the insulin. M.G. was reminded to return to the center for full education

and told to test her blood glucose fasting and postprandially, and her metformin was increased to 1,000 mg twice daily. She was told that she may still need to resume insulin.

M.G. completed 10 hours of diabetes education and eventually lost 45 lb. One year later, her diabetes was still controlled on oral agents, and her A1C was 6.8%.

QUESTIONS

1. What did the initial A1C of 8.2% indicate?
2. Was this patient receiving adequate insulin during her first hospital stay?
3. Ideally, when should the diabetes education team have been consulted?
4. How well controlled should blood glucose be before surgery?
5. Could a follow-up call from the diabetes education team have improved this patient's care?

COMMENTARY

During annual physician visits, M.G. should have been told about her high risk for type 2 diabetes. Was pre-diabetes or type 2 already present before her first admission? Type 2 diabetes can be preceded by impaired glucose tolerance and elevated insulin levels for as long as 8–10 years. M.G. would have benefited earlier from weight loss and increased regular activity.

Evidence shows that higher-than-normal blood glucose levels result in poorer outcomes regardless of whether the patient has known diabetes. In M.G.'s case, the initial A1C of 8.2% confirms that her diabetes likely existed before her first hospital admission.

While in the hospital during that stay, the supplemental scale of insulin was not adequate. Evidence indicates that “sliding scales” or “supplemental scales” alone are insufficient. Basal and bolus doses should have been initiated during the first hospitalization, and M.G. should have been told that she had diabetes.

Because M.G. required surgery, her blood glucose should have been controlled preoperatively to lessen the risk of postoperative infection and improve the metabolic milieu. This follow-up did not occur. With hospitalists now seeing 75% of inpatients, the reporting of and follow-up on inpatient care can be less than desired.

M.G.’s primary care physician downplayed the acute episode of hyperglycemia and was unaware of the A1C of 8.2%. Had the education team placed a follow-up call, they might have reminded the patient about this. M.G.’s blood glucose levels stayed high, which interfered with her recuperative ability and may have been a contributor to her infection.

M.G.’s care finally turned the corner when she was readmitted, and an endocrinologist was consulted. However, the standard of care of bolus, basal, and supplemental insulin should be widely used by all physicians treating diabetes in the hospital, not just endocrine specialists. The common error during this hospital stay was that M.G. ate foods brought in by her family, but no one

detected it. Therefore, her discharge dose of insulin was too high. Other factors, such as increasing insulin sensitivity following infection, may have contributed to her hypoglycemia though.

Although diabetes education in the hospital is often interpreted as the only education necessary, survival skills are usually the only skills taught. Therefore, outpatient follow-up is imperative. Most patients will only realize the importance of this if their physicians remind them about it. Only after seeing the endocrinologist and having that physician specify the importance of diabetes education did M.G. return for education. The encouragement may have helped M.G. to lose 45 lb and exercise safely.

Clinical Pearls

- Although increased stress hormones and decreased physical activity in the hospital can account for hyperglycemia, this does not happen to everyone. It must be treated and then evaluated later.
- Although A1C is not a typical test performed in the hospital, it may provide important evidence for diagnosis for someone with no history or known diabetes.
- The American Association of Clinical Endocrinologists and the American Diabetes Association released a position statement in February 2006 regarding inpatient glycemic control. It included recommendations to:

- Identify elevated blood glucose levels in all hospitalized patients.
- Establish a multidisciplinary team approach to management.
- Implement structured protocols for aggressive control.
- Create educational programs for all appropriate hospital personnel.
- Plan a smooth transition from hospital to outpatient care with appropriate management.

SUGGESTED READINGS

American Diabetes Association: Standards of medical care in diabetes—2007. *Diabetes Care* 30 (Suppl. 1):S4–S41, 2007

Knecht LAD, Gauthier SM, Castro JC, Schmidt RE, Whitaker MD, Zimmerman RS, Mishark KJ, Cook CB: Diabetes care in the hospital: is there clinical inertia? *J Hosp Med* 1:151–160, 2006

Cook CB, Castro JC, Schmidt R, Gauthier SM, Whitaker M, Roust LR, Argueta R, Hull BP, Zimmerman RS: Diabetes care in hospitalized noncritically ill patients: more evidence for clinical inertia and negative therapeutic momentum. *J Hosp Med* 2:203–211, 2007

Clement S, Braithwaite SS, Magee MF, Ahmann A, Smith EP, Schafer RG, Hirsch IB: Management of diabetes and hyperglycemia in hospitals. *Diabetes Care* 27:553–591, 2004

Garber AJ, Moghissi ES, Bransome ED Jr, Bunocore D, Clark N, Cobin R, Eckel R, Fleming B, Fonseca V, Haas L, Inzucchi S, Kelemen M, Korytkowsky M, Maynard G, Newton C, Peeples M: American College of Endocrinology position statement on inpatient diabetes and metabolic control. *Endocr Pract* 10:77–82, 2004

Lois L. Exelbert, RN, MS, CDE, BC-ADM, is the director of the Diabetes Care Center at Baptist Hospital of Miami in Florida.