

Journal of  
Hospital Medicine<sup>®</sup>

# Choosing Wisely<sup>®</sup>: Things We Do for No Reason<sup>™</sup>

## Sliding-Scale Insulin as Monotherapy for Glycemic Control in Hospitalized Patients

Based on Ambrus DB, O'Connor MJ. Sliding-Scale Insulin as Monotherapy for Glycemic Control in Hospitalized Patients. *J. Hosp. Med.* 2019 February;14(2):114-116.



## Clinical Scenario

- **60-year-old man presented to the emergency department with one week of myalgias and fever up to 103.5°F (39.7°C). He had no localizing symptoms, and physical examination was unrevealing, except for a small scab from a tick bite sustained two weeks prior to symptom onset.**
- **Past Medical History: obesity and type II diabetes, managed with metformin 1,000 mg BID**
- **On arrival, his blood sugar level was 275 mg/dL.**
- **The admitting resident decides to hold the patient's metformin, but wonders whether to replace it with insulin per a sliding scale or a basal/bolus regimen**



## Background

- The basic premise of sliding-scale insulin (SSI) is to correct hyperglycemia through the frequent administration of short-acting insulin dosed according to a patient's blood glucose level with the help of a prespecified rubric.
- When blood glucose levels are low, patients receive little or no insulin, and when blood glucose levels are high, higher doses are given.
- This approach to inpatient blood glucose management was first popularized by Joslin in 1934<sup>1</sup>



# Why You Might Think This is Necessary

- **Use of SSI is common**
  - 2007 survey of 44 hospitals showed that 43% of all noncritically ill patients with hyperglycemia were treated with SSI alone.<sup>2</sup>
  - A single-center study showed that 30% of clinicians continued to use SSI as monotherapy even after the implementation of order sets designed to limit this practice.<sup>3</sup>
- **Guidelines suggest that certain patients should be screened periodically for hyperglycemia (blood glucose persistently >180 mg/dL) and that hyperglycemia should be treated.<sup>4</sup>**
  - By pairing finger-stick glucose monitoring with SSI, the diagnosis and treatment—although not the prevention—of hyperglycemia can be accomplished simultaneously.
- **Avoiding hypoglycemia**
  - SSI as monotherapy is sometimes viewed as a cautious approach as insulin is administered only if the blood sugar level is high.
- **Convenience**
  - Hospitals may have ready-made order sets for SSI that are easier to prescribe than patient-specific regimens
  - In one single-center survey, physicians and staff were found to favor convenience over perceived efficacy when asked about their attitudes toward inpatient glycemic control.<sup>5</sup>



# Why This Is Unnecessary and Potentially Harmful

- **SSI does not prevent hyperglycemia<sup>6</sup>**
  - Adding SSI to oral antihyperglycemic medications resulted in no difference in rates of hyperglycemia.<sup>7</sup>
  - 84% of administered SSI doses failed to correct hyperglycemia.<sup>8</sup>
- **Adding basal insulin is more effective and does not increase the risk of hypoglycemia**
  - Randomized trial of SSI vs basal-bolus insulin in diabetic long-term care residents (already on SSI at baseline) found that the basal-bolus group experienced lower average blood glucose levels without an increase in adverse glycemc events.<sup>9</sup>
  - RABBIT 2 multicenter trial (2007) - randomized hospitalized, insulin-naïve diabetics to weight-based regimen of basal-prandial insulin or SSI only.<sup>10</sup>
    - Rates of hypoglycemia and length of stay did not differ between the groups
    - 66% of patients receiving basal-prandial insulin achieved glycemc control target vs 38% of patients on SSI only
    - SSI group required more total insulin.
  - RABBIT 2 – surgery (2011) – randomized diabetic patients admitted for elective surgery to SSI or weight-based, basal-bolus strategy<sup>11</sup>
    - Basal-bolus strategy was similarly effective, without causing severe hypoglycemia, even for patients who could not maintain consistent oral alimentation.
    - On post-hoc analysis, basal-bolus insulin was associated with fewer surgical complications and produced a cost savings of \$751 per day.<sup>12</sup>
- **SSI alone may be harmful**
  - For type 2 diabetics and nondiabetics, hyperglycemia is a marker for adverse outcomes among hospitalized patients<sup>13</sup>
    - SSI monotherapy is associated with a three-fold higher risk of hyperglycemia compared with the use of a sliding scale plus other forms of insulin.<sup>14</sup>
  - SSI is associated with a significantly increased length of stay compared with proactive insulin dosing.<sup>15</sup>



## When you might consider using SSI as monotherapy

- The use of SSI as monotherapy as a short-term approach has not been well studied.
- “Dose finding” – withhold basal insulin for the first 24 hours in insulin-naïve patients at risk for adverse glycemic events and use the amount of SSI received in this time to inform subsequent insulin dosing
  - Consider if the medication reconciliation or other key components of the history are in doubt, or if there are risk factors for hypoglycemia such as a history of bariatric surgery.
  - This method has not been validated in the literature.
- If a patient without type 1 diabetes is felt to be at high risk for a severe hypoglycemic event, it may be prudent to withhold long-acting insulin. However, in that situation, adding SSI to finger-stick monitoring is unlikely to be beneficial.



# What You Should Do Instead

- **Current guidelines recommend against the prolonged use of SSI as monotherapy and support the use of basal plus correctional insulin with the addition of nutritional insulin for patients with consistent oral intake<sup>16,17</sup>**
- **How to determine a basal/bolus insulin regimen<sup>4</sup>**
  - Calculate a weight-based total daily dose of insulin
    - RABBIT 2 protocol for known type 2 diabetics used total daily dose of 0.4 units/kg for patients presenting with blood sugar levels  $\leq 200$  mg/dL and 0.5 units/kg for those with higher initial glucose levels
  - Give half of the total daily dose as basal insulin
  - Give the remainder with meals along with correctional insulin as needed to account for premeal hyperglycemia.
- **Caution with insulin dosing may be required in patients aged >70 years, in those with impaired renal function, and in situations in which steroid doses are fluctuating.**
- **The Society of Hospital Medicine has formulated an online insulin order implementation guideline, eQUIPS, that can be a helpful resource<sup>18</sup>**



## Recommendations

- **Instead of using SSI monotherapy for hospitalized patients who require insulin, add basal and prandial insulin, using a weight-based approach for insulin-naive patients.**
- **Engage with leadership at your center to learn how inpatient hyperglycemia protocols and blood sugar management teams can help provide evidence-based and individualized treatment plans for your patients.**
- **If no infrastructure exists at your center, the Society of Hospital Medicine offers training and guidance through its eQUIPS inpatient hyperglycemia management program.**





## Conclusions

- **Using SSI as monotherapy for hyperglycemia is a common practice, but it is ineffective and possibly dangerous**
- **Continued efforts must be made to address the gap between guidelines and suboptimal practice patterns locally and nationally.**

## Case Scenario

- **The patient should be started on a combination of basal and prandial insulin as determined by his weight and current renal function as opposed to monotherapy with SSI.**



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## Citation

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