

## **Is there a Role for Diabetes Stewardship in Orthopaedics? Observations from a Hand and Upper Extremity Surgery Clinic**

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### **INTRODUCTION:**

Corticosteroid injection (CSI) is a valuable tool in the armamentarium of clinicians for the conservative treatment of a variety of musculoskeletal disorders. Though generally safe, CSI does have notable side effects. In particular, transient hyperglycemia following CSI has been well-reported. The hand, shoulder, and spine literature have described blood glucose increases of over 100mg/dL, with effects typically lasting one to two days following injection. Patients with preexisting insulin-dependent diabetes were at particular risk for these fluctuations. In rare cases, severe hyperglycemia resulting in hyperglycemic hyperosmolar syndrome (HHS) or diabetic ketoacidosis (DKA) has been reported. Despite this risk, point-of-care blood glucose (POC BG) testing prior to CSI administration has not been described. The prevalence of medication nonadherence in adults with diabetes in the United States is high. Paired with the danger of precipitating dangerous metabolic diabetes-related medical emergencies, a better understanding of the incidence of hyperglycemia prior to administration of an otherwise elective CSI is necessary.

Over the past four years, our hand and upper extremity surgery clinic has begun screening all patients with a previous diagnosis of diabetes mellitus (DM) with a POC BG test prior to CSI. Patients with a POC BG greater than 150mg/dL were refused a CSI at that visit and referred to their primary care provider (PCP), endocrinologist, clinical pharmacist, or emergency room for further glucose management prior to returning for CSI. Using this data, we sought to understand the incidence of patients who presented to our hand and upper extremity surgery clinic with uncontrolled diabetes as well as the rate of follow up and medication adjustment with their medical provider. We hypothesized that the incidence of patients with known diabetes requiring hospitalization or emergency room evaluation for acute diabetic emergencies to be rare, however the incidence of patients with uncontrolled diabetes on POC BG to be far more common. We also hypothesize that the medical provider follow-up rate for glucose management to be higher than typically reported for routine monitoring.

### **METHODS:**

All patients who received a POC BG test in our urban, tertiary referral hand and upper extremity surgery clinic between 2018 - 2022 were queried. Patient age, body mass index, reason for seeking CSI, POC BG result, hemoglobin A1C immediately preceding the orthopaedic hand clinic encounter and latest available in the electronic medical record, anti-hyperglycemic regimen at time of appointment, and the timing and intervention provided at any post-encounter follow up with the patient's PCP, endocrinologist, clinical pharmacist, or emergency department were recorded. Descriptive statistics are expressed as means and SDs. Continuous outcome measures are assessed using t tests. Categorical outcomes will be compared using chi-square and exact tests of goodness of fit. P values less than 0.05 will be considered statistically significant.

### **RESULTS:**

A total of 207 patients met inclusion criteria. Eighty-one (39.1%) patients had a POC BG greater than 150mg/dL (mean  $236.4 \pm 76.7$ , range 161-578 mg/dL) and were refused a CSI. Fifty-nine (72.8%) of these patients successfully followed up with their medical provider, on average  $33.2 \pm 38.0$  days after their orthopaedic appointment. Twenty-four (40.7%) patients required a diabetes medication adjustment (either addition of new anti-hyperglycemic medication or dose increase) at that visit. Two patients were referred to the ED from the clinic for POC BG of 578 and 401mg/dL. Neither were found to be in active DKA or HHS. However, one required a course of insulin, potassium, and intravenous fluids in the ED, while the other was referred for close follow up with their PCP. Patients who successfully followed up with their medical provider for glucose management after that initial visit to the orthopaedic hand office had an average decrease in hemoglobin A1C of  $0.40 \pm 1.37\%$ , while those who did not follow up saw an increase of  $0.35 \pm 1.35\%$  ( $p=0.037$ ). The latest hemoglobin A1C values were recorded  $18.0 \pm 14.6$  and  $19.3 \pm 15.9$  months, respectively, following the preorthopaedic hand appointment value ( $p=0.63$ ).

### **DISCUSSION AND CONCLUSION:**

The incidence of poorly controlled blood glucose in our community was found to be high (39.1%). However, the rate of patient follow up with their medical provider seeking better glucose control was high (72.8%) and surprisingly consistent within a month of the visit to our hand and upper extremity surgery clinic. The observational data gathered in this study illustrate potential short- and long-term benefits of diabetic screening in the orthopaedic surgery clinic prior to CSI. Acutely, patients nearing diabetic crisis were able to be identified and directed for acute emergency care. Perhaps even more importantly, patients who followed up saw sustained improvements in diabetes control, even beyond 18 months from that initial screening. In the medical literature, there is a consistent observation that medication adherence is associated with perceived need. We believe pain, and our ability to alleviate it through a simple in-office procedure like

CSI, to be a valuable motivator. These observations suggest that orthopaedic surgeons stand at an important crossroads - one where a short delay in patient satisfaction may result in more lasting changes in a patient's overall health.