Intraoperative Point-of-Care Blood Glucose Values Show Poor Agreement with Central Lab Blood Values

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INTRODUCTION

- Accuracy of point-of-care (POC) glucose devices compared to central lab values in critically ill patients has come into question, particularly during intensive insulin therapy (IIT)[1,2]
- POC devices perform particularly poorly in the hypoglycemic range
- Typically tested under ideal conditions in the lab; intraoperative, real-life data are lacking[3]

OBJECTIVES

- To assess the accuracy of the Accu-Chek POC glucometer in the intraoperative setting relative to near-simultaneous central lab values in diabetic patients
- To determine the potential risk of relying on POC measurements during intensive insulin therapy

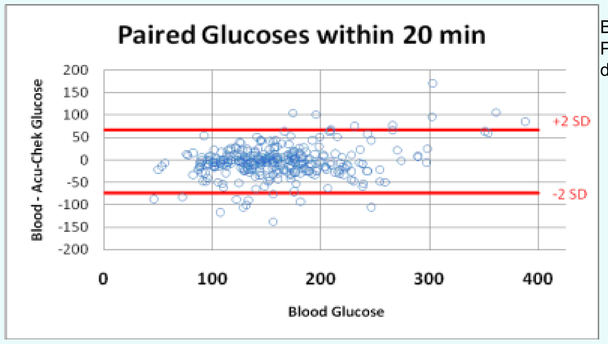
METHODS

- All surgical cases performed between 11/2005 and 1/2010 were queried
- Retrospective, IRB-approved study
- Data collected in diabetic patients (Types I and II) and those receiving intraoperative insulin
  - Accu-Chek® blood glucose (BG) values and time performed
  - Central lab values and times logged in to the lab
  - Demographic data, medications, diagnoses
- POC and central lab values within 15 and 20 min paired for comparison
  - Accounts for time to get specimen to lab
- Differences (lab BG – Accu-Chek BG) analyzed
  - Method of Bland and Altman[4]
  - Clark error grid analysis (EGA)[5]
- Differences between measurements were fit to common probability distribution curves using Systat 12.0, method of maximum likelihood

RESULTS

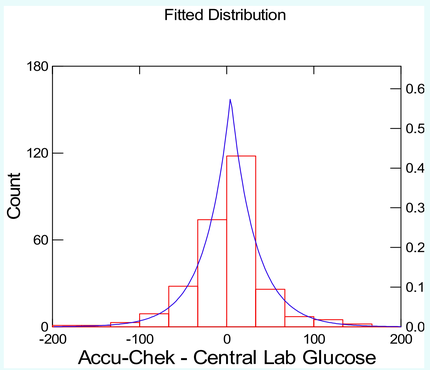
- 80,379 records examined
- Patients classified as diabetic by having taken diabetic meds pre-op, having DM dx, or receiving intra-op insulin
- 10,996 cases in diabetics
  - 6,727 cases had ≥1 Accu-Chek or central lab value taken
  - 307 paired POC and central lab measurements

Bland-Altman Plot



Bias = -4.0 mg/dL
Precision (mean absolute difference) = 24.1 mg/dL

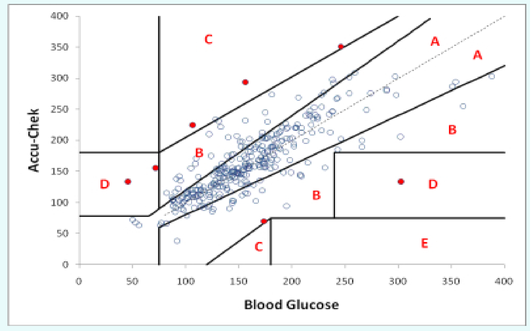
Laplace/Double Exponential Fit



Location = 4.5
Shape = 28.5
P = 0.287

- Paired values are within 15 minutes
- If target = 110 mg/dL using POC device, lab BG would have 10% ≤ 60 mg/dL, 5% < 40 mg/dL
- If target = 80 mg/dl using POC device, lab BG would have 29% ≤ 60 mg/dL, 14% < 40 mg/dL

Clark (EGA) Plot of Near-Simultaneous Accu-Chek and Central Lab BG



Zone	Description
A	≤20% from ref BG
B	>20% from ref BG but not resulting in inappropriate tx
C	Overtreatment
D	Potential miss of dangerous hyper/hypoglycemia
E	Confusion of hypo- and hyperglycemia

- 4 patients in Area C
- 3 patients in Area D

DISCUSSION

- Accuracy of POC device was poor
- Potential risk of unrecognized hypoglycemia if POC measurements used alone during intensive insulin therapy, since symptoms masked during anesthesia
- Study limitations
  - Delay in the central lab to perform test not recorded
  - Relatively few paired values with Accu-Chek ≤ 60 mg/dL
  - Inaccuracy in recording POC data and times in the AIMS
- <u>Recommendations</u>
  - Relying solely on POC devices *during IIT* is strongly discouraged
  - Frequent lab values should be obtained if an IIT protocol is followed, especially in light of increased risk during perioperative IIT[6]

References

1. Crit Care Med 2008;36:3062-6
2. J Diabetes Sci Technol 2008;2:932-8
3. Anesth Analg 2010;110:1056-65
4. Lancet 1986;1:307-10
5. Diabetes Care 1987;10:622-8
6. Ann Intern Med 2007;146:233-243