Creatinine levels in patients with renal disease: Discordance between POC meter and automated enzymatic methods.

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Objective: Point of Care (POC) creatinine and eGFR measurements are commonly used to confirm renal function before administering MRI contrast agents. Monthly correlation analyses at Johns Hopkins Hospital have revealed a subgroup of patients whose results do not correlate between the EZ CHEM Creatinine Meter and an enzymatic central laboratory method. This study aimed to determine the frequency of such discrepancies and explore possible causes by further investigating the patient population in question.

Methods: The EZ CHEM Creatinine Meter (Nova Biomedical, Waltham, MA) is a POC instrument that measures creatinine in whole blood based on the current generated when creatinine in the specimen mixes with reagent on the test strip. Fifty heparinized whole blood samples from hospital inpatients were tested with four different EZ CHEM Creatinine Meters. Results were compared to an endpoint creatininas enzymatic method (Roche Hitachi Modular) using plasma from each specimen. Patient age, gender, race, hematocrit, blood pH, pO2, currently prescribed medications and diagnosis were all documented and compared between groups.

Results: Using the automated (enzymatic) method, creatinine values from the fifty patient specimens ranged from 0.20 to 12.90 mg/dL (median 1.30; adult male reference range 0.6 – 1.3 mg/dL). Fourteen samples (from 10 individuals) had creatinine results that differed between the two methods by > 0.5 mg/dL (28% of all samples). The mean EZ CHEM creatinine value in this group of patients was 4.62 mg/dL, compared to 5.32 mg/dL obtained using the automated method. Of the discrepant creatinine values, 71% of results reported by the POC instruments were lower than the automated method values, representing a mean bias of -0.69 mg/dL. To investigate the discordant results, a group of control patients (n=10) were selected from the original group of samples. Controls were age, gender and race-matched to the patients with discordant results. The mean creatinine value for the control group was 1.41 mg/dL reported by EZ CHEM meters and 1.26 mg/dL using the automated method (mean bias 0.14 mg/dL). No differences in hematocrit or currently prescribed drugs were noted between the two groups. Comparisons of blood pH and pO2 could not be made, as most patients in the discrepant group did not have blood gas values available. However, 9 of 10 patients whose results did not correlate between the POC instrument and the automated method had some form of renal insufficiency. Diagnoses of these patients included end stage renal disease, chronic kidney disease and acute renal failure. In comparison, 3 of 10 patients in the control group had varying degrees of renal insufficiency.

Conclusions: Overall, the EZ CHEM Creatinine Meter reported creatinine results that were statistically significantly lower than those obtained using the automated enzymatic method. Result discrepancies were observed in patients with elevated creatinine values (above 2.0 mg/dL). Patients with creatinine values in this range commonly have renal insufficiency, which may play a role in the lack of agreement between these two instruments. Assessing renal function in these patients with a POC instrument such as the EZ CHEM Creatinine Meter may produce falsely low values.