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Audit of sweat chloride testing reveals analytical errors

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Abstract

Objectives: Sweat chloride testing (SCT) is the mainstay for the diagnosis of cystic fibrosis (CF) and biomarker in the evaluation of CFTR-modifying drugs. To be a reliable and valid tool, analytical variance (CVA) must be minimized. However, external quality assessments have revealed significant deviations in routine clinical practice. Our goal was to identify and quantify technical errors through proficiency testing and simulations.

Methods: Chloride concentrations of three blinded samples (each as triplicates) were measured in 9 CF centers using a chloridometer in a routine setting. Technical errors were simulated and quantified in a series of measurements. We compared imprecision and bias before and after a counseling session by evaluating coefficients of variation (CV), adherence to tolerance limits, and inter-rater variability coefficients.

Results: Pipetting errors resulting in changes in sample volume were identified as the main source of error with deviations up to 41%. After the counseling session, the overall CVA decreased from 7.6 to 5.2%, the pass rate increased from 67 to 92%, and the inter-rater variability diminished. Significant deviations continued to be observed in individual centers.

Conclusions: Prevention of technical errors in SCT decreases imprecision and bias. Quality assurance programs must be established in all CF centers, including staff training, standard operating procedures, and proficiency testing.

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