



# Validation of Reportable Range of Hematology Instrumentation

## WHO REQUIRES IT AND WHAT THEY REQUIRE

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Regulatory agencies require that a laboratory validate an instrument before reporting patient results. The validation of the patient reportable range is one of those requirements.

## LABORATORIES ARE REQUIRED TO ESTABLISH AND VERIFY THE PERFORMANCE SPECIFICATIONS OF NEW INSTRUMENTATION

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*Laboratories must have documentation that they have verified the performance of a new analyzer.*

The Clinical Laboratory Improvement Amendment (CLIA) regulations state that the laboratory must demonstrate that it can obtain performance specifications comparable to those established by the manufacturer when it introduces a new hematology analyzer.

Laboratories not only need to perform these validations, they must document them and have them available for inspection during a laboratory survey.

This document serves to clarify the process used to validate the reportable range of a new hematology instrument. All other validations, including the determination of the accuracy or precision of a new analyzer and discussion on how to validate the laboratory's reference values, are outside the scope of this document.

## REGULATORY BODIES REQUIRE THE ESTABLISHMENT OF PERFORMANCE SPECIFICATIONS

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*Laboratories must establish the reportable range of new instrumentation.*

The Clinical and Laboratory Standards Institute (CLSI), the College of American Pathologists (CAP), and CLIA all require the establishment of an instrument's reportable range. Specific to "reportable range," a somewhat ambiguous term, CLSI provides clarification in document H26-A2, *Validation, Verification, and Quality Assurance of Automated Hematology Analyzers; Approved Standard-Second Edition*. CLSI refers to the concept of reportable range as the Analytical Measuring Interval (AMI) while CAP uses the term Analytical Measurement Range (AMR). Both AMI and AMR refer to "the range of analyte values that a method can directly measure on the specimen without any dilution, concentration, or other pretreatment not part of the usual assay process," and correspond to the CLIA reportable range.

### CLIA REGULATIONS STATE THE FOLLOWING:

#### **Sec. 493.1253 Standard: Establishment and verification of performance specifications**

(b)(1) Verification of performance specifications. Each laboratory that introduces an unmodified, FDA-cleared or approved test system must do the following before reporting patient test results:

(i) Demonstrate that it can obtain performance specifications comparable to those established by the manufacturer for the following performance characteristics:

- (A) Accuracy
- (B) Precision
- (C) Reportable range of test results for the test system

The CLIA interpretive guidelines explain how to achieve the goal:

### **Interpretive Guidelines §493.1253(b)(1)(i)(C)**

Reportable Range - The laboratory is responsible for verifying the reportable range of patient test results for each test system. Verification of reportable range may be accomplished by:

- Assaying low and high calibration materials or control materials; or
- Evaluating known samples of abnormal high and abnormal low values.

Hematology whole blood high range calibration materials are not generally available.

Therefore, laboratories may use patient specimens with verified elevated cell counts to verify the upper limit of the reportable range.

The last statement, "Hematology whole blood high range calibration materials are not generally available" is outdated. Streck offers two products for the assessment of the instrument reportable range; the products are CVA (Calibration Verification Assessment) and Retic-Chex® Linearity (RCL). These products provide instrument-specific ranges for multiple hematology instruments on the market.

### **CAP LABORATORY GENERAL CHECKLIST STATES THE FOLLOWING:**

#### **GEN.42085**

**Is the reportable range verified/established for each analytic procedure before implementation?**

NOTE: The reportable range includes all results that may be reliably reported, and embraces two types of ranges:

1. The ANALYTICAL MEASUREMENT RANGE (AMR) is the range of analyte values that a method can directly measure on the specimen without any dilution, concentration, or other pretreatment not part of the usual assay process.
2. The CLINICALLY REPORTABLE RANGE (CRR) is the range of analyte values that a method can measure, allowing for specimen dilution, concentration, or other pretreatment used to extend the direct analytical measurement range.

### **JOINT COMMISSION ON ACCREDITATION OF HEALTHCARE ORGANIZATIONS**

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) not only requires verification of the reportable range when an instrument is put into initial service, but it also requires calibration verification every six months. Streck asked for guidance for the following situation:

Does JCAHO require linearity testing on hematology instruments every six months (the same as the standard for chemistry analyzers)? If so, how many levels would be required and are all of these parameters included: WBC, RBC, Hb, Platelet, and Reticulocyte Count?

The response provided by the JCAHO Standards Interpretation Group stated:

“Calibration verification requires a minimum of three levels that span the patient reportable range. It is required semiannually for all non-waived test systems that have a calibration process. Previously, it had only been required for high complexity testing.”

## HOW YOUR LAB CAN FULFILL THESE REQUIREMENTS

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*Streck offers two products to assist labs in determining the reportable range of a new instrument.*

CVA (Calibration Verification Assessment) is a multi-level product designed to verify the reportable range for white blood cell count (WBC), red blood cell count (RBC), hemoglobin (Hb), and platelet (PLT) count. Retic-Chex® Linearity verifies the reportable range of the reticulocyte portion of the red blood cell population. By running these kits, the lab can simultaneously verify both the analytical measurement interval/range and calibration verification for RBC, Hb, PLT and WBC.

Laboratories run these products and submit their data to Streck's *STATS*® department. Laboratories then receive a comprehensive, easy-to-read report documenting the calibration verification and/or reportable range validation. Instrument performance is also evaluated against a peer group.

## FREQUENTLY ASKED QUESTIONS

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*The reportable range cannot exceed the manufacturer's limits.*

Many customers ask how they should decide where to set their reportable range. If the values obtained are within the assay range for the specific instrument, the laboratory may report patient results between the lower and upper levels that have been verified.

For example:

The manufacturer states that the limits of the WBC on their instrument are 0-120 x 10<sup>9</sup>/L.

The mean of the lowest level the lab recovered is 0.5.

The mean of the highest level obtained is 130.

What is the established lower and upper limit for WBC?

The lower limit of the range is 0.5, because that is the lowest level that could be verified by the laboratory. The lab could not use the manufacturer's lower limit of zero because they have not proven the instrument values below 0.5 are valid.

Although the lab has shown the instrument is linear to 130, the instrument manufacturer does not make that claim; therefore the upper limit of the range is 120. The verified reportable range of the instrument is 0.5-120 for WBC. The established ranges may not exceed the instrument manufacturer's performance claims.

One of the most commonly asked questions upon completing the assessment is, “What is my reportable range?” The lowest and highest means attained for each parameter that fulfill the following guidelines are the system’s proven upper and lower limits:

- Within the manufacturer ranges
- Within the CVA or RCL published ranges (if instrument-specific ranges are provided)
- Visual inspection of the graph is linear

Another recurrent question is “Can I claim linearity range to zero?” CLSI H26-A2 explains that the AMI cannot extend lower than the background count or limit of blank (LoB). If the background counts are nonzero values, establishing a reportable range to zero would “lack scientific sense.”

## SUMMARY

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*Establishing reportable range is easily accomplished with CVA and Retic-Chex Linearity.*

Regulatory agencies require that a laboratory validate an instrument before it is put into use for patient testing. To assist with one of these requirements, the validation of the patient reportable range, Streck offers CVA and Retic-Chex Linearity. The laboratory can submit their data to Streck and receive a comprehensive report documenting the calibration verification and/or reportable range validation.