User Verification of Linearity Implementation Guide

EP06-Ed2-IG

Introduction

This implementation guide describes the minimum procedures necessary for a medical laboratory to verify a developer's linearity interval claim. For additional information on verifying linearity, see CLSI document EP06.[1]

NOTE: This verification of linearity process can be used only when the measurement procedure produces quantitative numerical results.

IMPORTANT NOTE: The study outlined in this implementation guide and described in Chapter 4 of CLSI document EP06[1] is not intended for use by a test developer to establish or validate the linearity interval for a new commercial test or laboratory-developed test. Instead, test developers should consult Chapters 2 and 3 of CLSI document EP06[1] for guidance on establishing and validating a linearity interval. Laboratories and commercial manufacturers are collectively referred to as "developers" in this implementation guide.

What Is Linearity?

A measurement procedure is linear throughout a given interval when the results, on average, are proportional to the true values of the samples. In the graph below, both test 1 (orange line) and test 2 (blue line) are linear and proportional but give very different values. Each line can be depicted in the following equations:

- Test 1: $Y = X$

- Test 2: $Y = 2X$
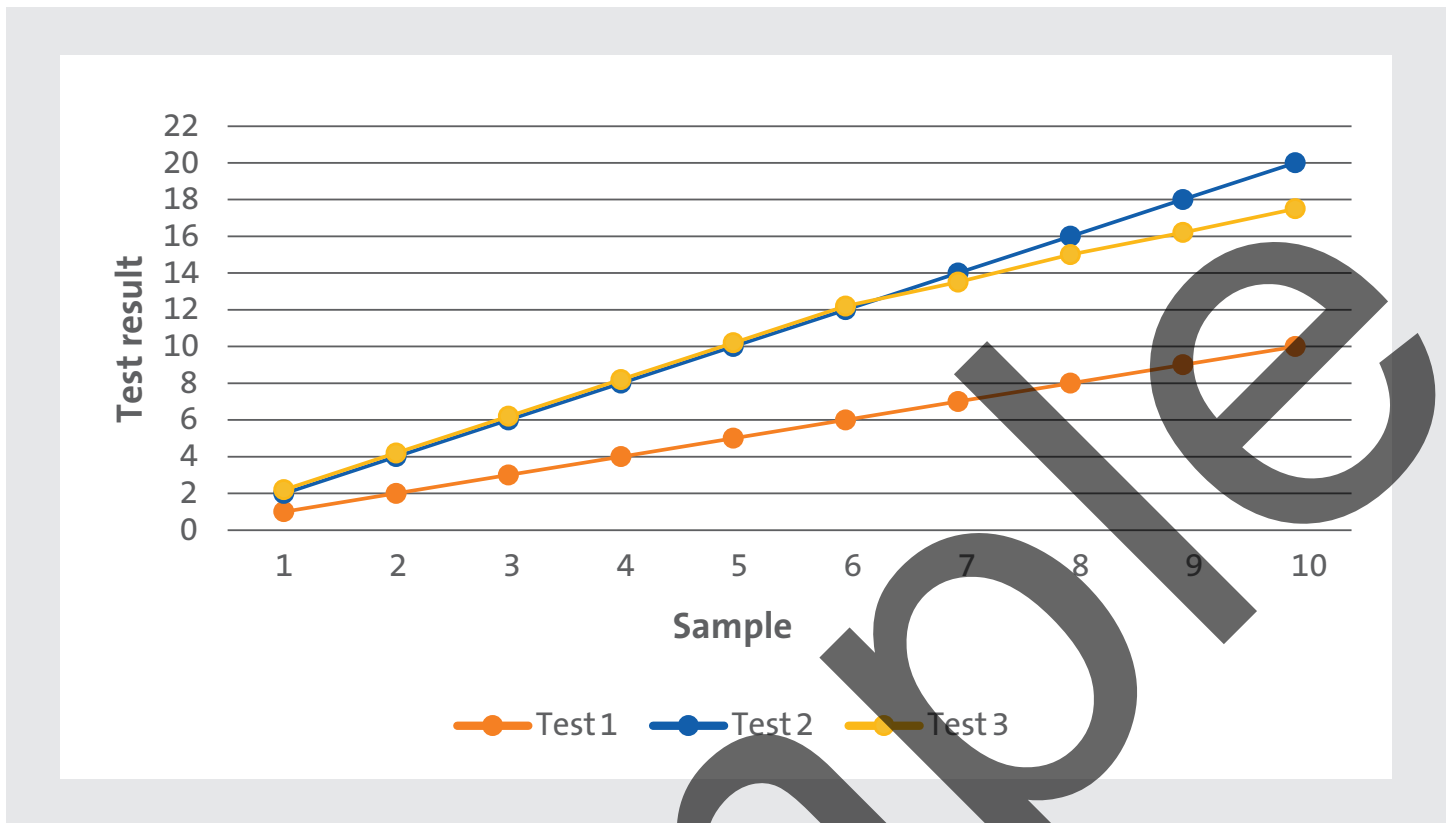
This concept of proportionality is important for patient decision-making. That is, when a patient sample is measured, a change in a test result over time (eg, a 40-mg/dL change in glucose results over a two-hour period) must reflect the change in the patient's condition.

What Is the Linearity Interval?

The linearity interval is the range of values (low to high) that falls on a straight line. In the graph above, test 3 (yellow line) is linear only up to a value of 12. Then, the values begin to fall below the straight line. In this case, test 3 is linear from 1 to 12; therefore, its linearity interval is said to be 1 to 12. The lowest value shown to be linear is called the lower limit of the linearity interval (LLLI), and the highest value shown to be linear is called the upper limit of the linearity interval (ULLI). A measurement procedure is said to be linear when the procedure is linear throughout its stated analytical measuring interval (AMI).

Verification of the Linearity Interval

The linearity interval verification process is outlined in the figure below.