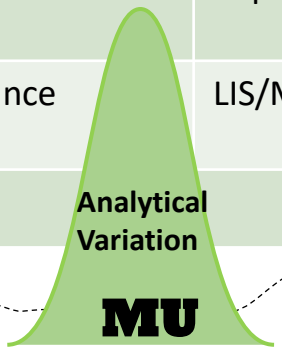
Job Aid 3: Diagnostic Uncertainty [1507v2]

The medical utility of laboratory tests is limited by variation arising from any source, including biological variation as well as analytical variation (measurement error).

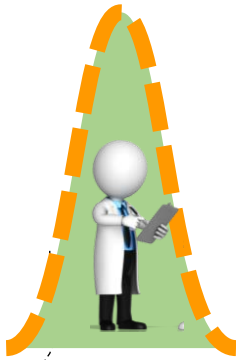
POW Sources of Uncertainty
Quality planning and continuous quality improvement processes should be in place to detect and minimize these sources throughout POW.

Pre-examination	Examination	Post-examination
Sample collection	Reagent storage/ preparation	Interpretation of results
Sample storage/ transportation	Instrument performance	Report format
Patient state (e.g. fasting)	Operator performance	LIS/Middleware transmission
	Calibration	

Biological Variation CV_I



If uncertainty is measured it is no longer uncertainty, but the confidence interval within which the result falls.



Diagnostic Uncertainty

μ = uncertainty, U = expanded uncertainty = k *μ using a k = 2 for approximately 95% confidence and k=3 for approximately 99% confidence

X ± 2 μ includes a true value of X with approximately 95% confidence; between the values (X-2μ, X+2μ) = (X-U, X+U)

At a level near X, MU is ±U; (95% CI = X-U to X+U) The number of significant digits given for a MU should be the same as that used for reported results.

X ± 3μ includes the true value with approximately 99% level of confidence.

Reference change values (RCVs) - Determines whether the difference between two results is negligible due to uncertainty or significant due to a genuine change in the condition of the patient.

$RCV_{in\ \%} > 2.77 * (\%CV_{Analytical})$ at a 95% Confidence Level

$RCV_{in\ units} > 2.77 * (sd_{Analytical}) = 2.77 ([\%CV_{Analytical} * \text{test result}]/100\%) = 2.77 ([\mu\% * \text{test result}]/100\%)$

If biological variation (CV_I)is known, then $RCV_{in\ \%} > 2.77 * \sqrt{(\%CV^2_{Analytical} + \%CV^2_I)}$ at a 95% Confidence Level

$\%CV_{Analytical} = \%\mu$ $sd_{Analytical} = \mu_{in\ units}$ $sd_{Analytical} = (\%CV_{Analytical} * \text{mean})/ 100\%$

- If the method has a quantitation step, such as an absorbance value for determining a cutoff, measurement of uncertainty must be calculated.
- When calculating combined uncertainties for parameters that are calculated using addition and subtraction e.g. Anion gap, the SD or μ value can be used.
- Similarly when calculating combined uncertainties for parameters that are calculated using division and multiplication e.g. creatinine clearance, the sd or μ must first be converted to %CV.