

GUIDE

Fulfillment of Laboratory Results Comparability Requirements

Introduction

Purpose

This document from the Diagnostic Accreditation Program (DAP) provides guidance for organizations on fulfilling the Laboratory Medicine Accreditation Standards.

The DAP accreditation process assesses the comparability of results at a regional or organizational level and at the individual facility level. Standards addressing comparability of laboratory results within a single facility in BC have been in place for many years. Incorporation of ISO 15189 requirements into the DAP laboratory medicine standards requires health authorities and organizations to ensure comparability of laboratory results across all sites within their jurisdiction. All laboratories must demonstrate comparability of results across their region or organization and within their individual facilities.

If you have questions about items in the standards, please email them to dap@cpsbc.ca.

Objectives

The objectives of this document are to

- familiarize assessors with the concept of laboratory results comparability,
- introduce the approaches laboratories can use to ensure results comparability, and
- describe the assessment of comparability of laboratory results.

Comparability

What is comparability of laboratory results?

The comparability of results provides assurance that the examination of a measurand is consistent within a laboratory system, even if different methods and instruments are used. There is no consensus procedure for demonstrating the comparability of laboratory results across different methodology and instrumentation. Laboratories must establish their own procedures to ensure the comparability of results in their individual system. This includes the frequency of comparability testing (at minimum every six months), the criteria for acceptability, consideration of the number of samples used for comparability validation, consideration of the range of clinical values, and the response for non-comparability of

results. The procedures to ensure comparability of results must also specify the samples to be used. Samples used for verification of comparability can be individual patient samples, pooled patient samples, laboratory prepared material, proficiency testing material and QC material.

Summary reports prepared by proficiency testing vendors cannot be used for comparability testing. Proficiency testing data may be used if the laboratory has developed a mechanism to demonstrate comparability.

Manufacturer's QC material can be used to demonstrate comparability of identical instrumentation and methodology. In instances where systems differ in instrumentation and/or methodology, QC material can be used to demonstrate comparability if:

- the numeric relationship between the means for QC results from the different measuring systems is known
- the result for primary clinical samples has been verified to be comparable
- the performance of the measuring systems remains unchanged
- the above remain comparable following lot changes

It may be more practical to perform comparability monitoring using primary clinical samples than to conduct the validation required for QC results.

Why must laboratories demonstrate comparability of results?

Patients are often diagnosed and treated in multiple health care settings within a regional laboratory system. Within that laboratory system, there may be many instruments performing the same test using different methodology. Larger laboratories may have multiple instruments within one location, such as a primary analyzer, a backup analyzer, and point-of-care testing equipment. Even in small laboratories, the same examination will be performed in the laboratory using conventional instruments and near point-of-care testing equipment. These results may be reviewed by multiple clinicians at multiple patient care locations within a single laboratory system.

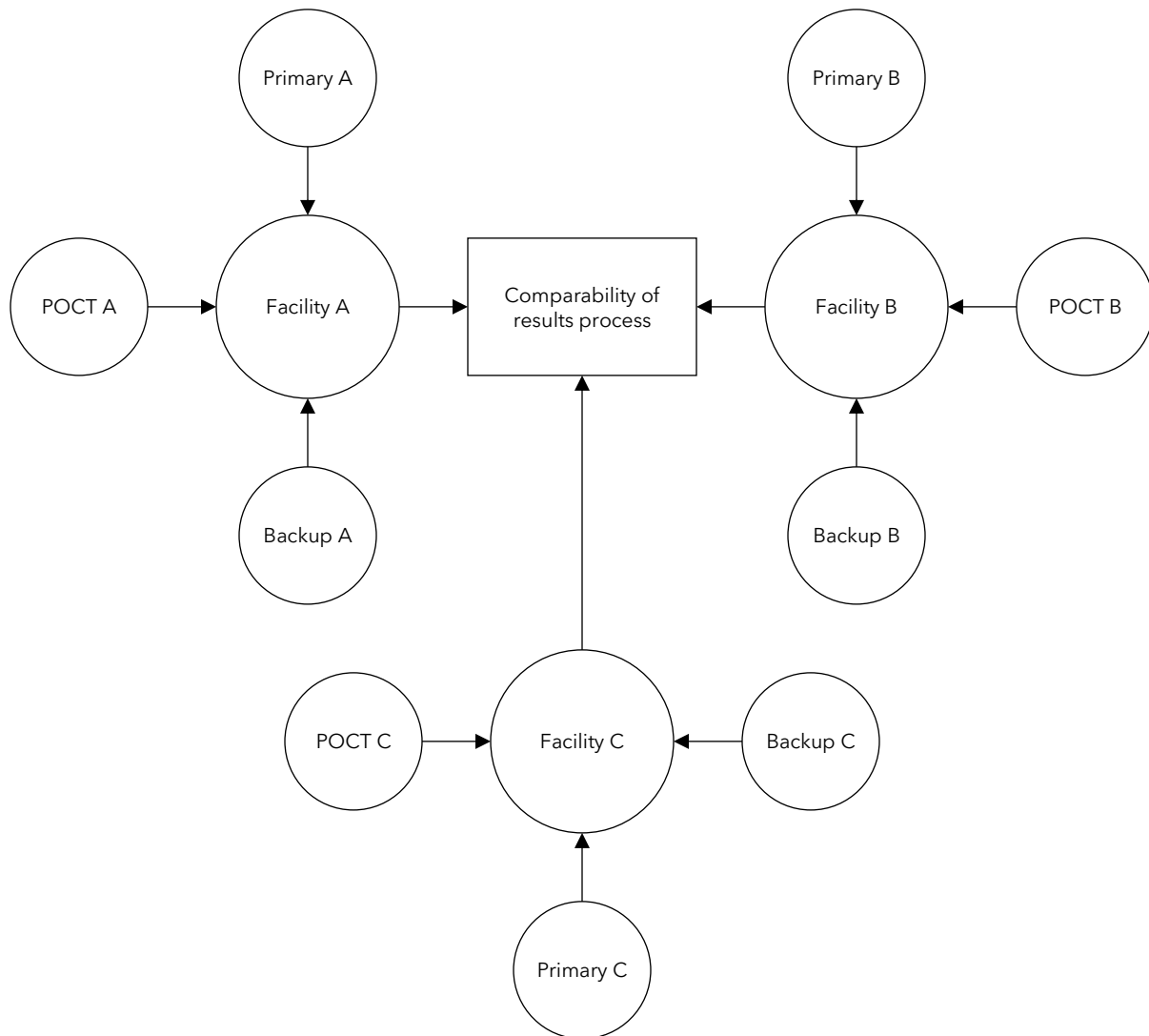
The diagnostic value of multiple laboratory results in multiple sites is optimized when there is agreement of those results. Conversely, multiple laboratory results from laboratories where comparability has not been achieved can result in confusion and distrust, and potentially compromise patient care. Clinicians should not have to consider when, where or how the examination was performed when interpreting results.

Non-comparability of laboratory results may occur because of the following:

- different methodologies
- differences in calibration or imprecision between procedures
- value assignment errors and variation of commutability between calibrator lots
- age/stage difference and time-dependent degradation of calibrators used simultaneously in different locations
- differences in commutability of calibrators with different procedures
- reagent degradation after calibration
- instrument drift/failure

- use of different reagent lots
- variation in shipping or storage conditions
- differences in instrument parameters (e.g. dilution rates, incubation times)

Comparability model



Laboratories may use a variety of processes to demonstrate comparability. In the above model, the organization consists of three sites, each having a primary analyzer, a backup analyzer and point-of-care testing. The laboratory must demonstrate comparability of results across the organization, and this will be assessed at both the regional assessment and at the individual facility assessments.

Regional assessment of comparability

At the regional assessment, laboratories must demonstrate comparability from site to site. This is most easily done by comparing Primary A to Primary B to Primary C.

Facility assessment of comparability

At the facility assessment, laboratories must demonstrate comparability within an individual site. This is usually done by comparing the primary analyzer to the backup analyzer to the point-of-care testing (e.g. Primary A to Backup A to POCT A).

Overall assessment of comparability

If the laboratory demonstrates site-to-site comparability and comparability within each site, then there should be comparability between all examinations at all sites within the laboratory system (e.g. Primary A = Backup B = POCT C).

Examinations subject to comparability in DAP assessments

Anatomic pathology	Chemistry	Cytogenetics
None at this time <i>For future consideration:</i> <ul style="list-style-type: none"> • Immunohistochemistry 	All measurands except: <ul style="list-style-type: none"> • body fluids • trace metals • urinalysis • less frequent special chemistry testing • results based on calculations from measured parameters when comparability already assessed 	None at this time

Cytology	Hematology	Microbiology
None at this time	<ul style="list-style-type: none"> • CBC, differentials and any reportable results thereof • Reticulocytes • Coagulation testing including INR, PTT, D-dimer, fibrinogen, thrombin 	<ul style="list-style-type: none"> • Primary vs backup methodology and instruments • Molecular testing • Serology <p>Automated vs. Manual methods:</p> <ul style="list-style-type: none"> • Antimicrobial susceptibility testing • Bacteria/yeast identification

Molecular Diagnostics	Point of Care Testing	Transfusion Medicine
None at this time	<p>All measurands except:</p> <ul style="list-style-type: none"> • Urinalysis • Fetal scalp lactate • Qualitative examinations • Rotational thromboelastometry (ROTEM) 	<ul style="list-style-type: none"> • ABO/Rh typing • Antibody screening and identification • Crossmatch methods • Direct antiglobulin testing <p><i>For future consideration:</i></p> <ul style="list-style-type: none"> • <i>Reaction grading</i> • <i>Phenotyping</i>

Assessment of comparability

There are seven criteria in the standards (version 1.7) used to evaluate the laboratory's verification of the comparability of patient results within the region or organization. They are as follows:

QUA3.1.1 M There is a defined means of comparing procedures, equipment and methods used and establishing the comparability of results for patient samples throughout the clinically appropriate intervals. This is applicable to the same or different procedures, equipment, different sites, or all of these.

Guidance: In the particular case of measurement results that are metrologically traceable to the same reference, the results are described as having metrological comparability providing that calibrators are commutable.

Evidence: Specific procedures addressing comparability of results. The procedures should address regional and facility comparability.

Where: Regional assessment

Comment: A laboratory system must ensure comparability of results throughout its operation. This includes site to site comparability within a region or organization as well as comparability within a facility.

QUA3.1.2 M Comparability encompasses the entire range of clinically relevant values.

Guidance: Freshly obtained patient samples are the preferred comparability material as commercial materials have had their matrices modified in ways that may significantly affect commutability with native clinical samples.

Evidence: Specific records of the samples and results used to demonstrate comparability for each measurand.

Where: Regional and facility assessments

Comment: Laboratories must establish the types and numbers of samples used at which clinically significant points through the reportable range of the measurand.

Ideally, all values throughout the reportable range would be checked during comparability testing, but that is often not possible. The laboratory must establish the number and value of points checked during comparability testing. The range of values tested will be specific to individual examinations with a range equivalent to the analytical measurement range or reference interval and include all clinical decision points.

The preferred samples for comparability verification are individual patient samples, pooled patient samples, laboratory prepared (spiked) material, proficiency testing material and QC material.

QUA3.1.3 **M** Acceptability criteria are defined for comparability of procedures, equipment and methods.

Evidence: Specific records of the samples and results used to demonstrate comparability for each measurand.

Where: Facility assessments

Comment: Laboratories must establish the tolerance limits for comparability between sites and between instruments.

Laboratories must determine the limits of acceptable variability for results produced by different methods and analyzers for the same measurand. Acceptability criteria may need to be defined for each measurand. Evaluation of comparability may be based on published professional recommendations, based on goals set by external bodies or based on laboratory generated data.

QUA3.1.4 **M** The laboratory documents, records and as appropriate, expeditiously acts upon results from the comparison performed. Problems or deficiencies identified are acted upon and records of actions retained.

Evidence: Specific records of the results of comparability for each measurand as well as any resulting activity.

Where: Facility assessments

Comment: Laboratories should have documentation that demonstrates they have verified the comparability of results and have recorded any activity in response to any issues of comparability.

QUA3.1.5 **M** The laboratory notifies users of any differences in comparability of results and discusses any implications for clinical practice when examination systems provide different reference intervals for the same measurand (e.g. glucose) and when examination methods are changed.

Evidence: Specific records of user notification of differences in results of comparability.

Where: Regional assessments

Comment: Laboratories should have a process to notify users of any differences in comparability of results.

QUA3.1.6 M Instruments and methods are checked against each other at least twice a year for comparability of results.

Guidance: Frequent monitoring generally involves comparing fewer samples more often while less frequent intervals require a larger number of samples due to the lower frequency of comparability. Periodic monitoring (e.g. quarterly, semi-annually) is performed when frequent monitoring is deemed unnecessary because the examination systems involved are stable and the risk of errors in clinical interpretation due to non-comparable results is low

Evidence: Specific records demonstrating the frequency of the comparability of results assessment.

Where: Facility assessments

Comment: Laboratories should determine the risk for non-comparability of results. The higher the risk, the more frequent comparability of results should be checked. The minimum timeframe for assessing comparability is every six months.

There is no absolute answer to the question, "How often should verification of the comparability of results be performed?" Although the standards state that comparability verification should be performed at least twice a year, the laboratory should determine the risk for non-comparable results along with cost considerations and operational viability. Initially a laboratory should perform comparability verification more frequently until confidence in comparability is established. Once the actual comparability performance has been established the laboratory can evaluate the risk and reduce comparability testing appropriately. Laboratories should also consider those situations where special cause comparability verification is performed in addition to routinely scheduled comparability verification in instances of major maintenance, software update, clinician inquiry regarding results accuracy or resolution of other problems.

QUA3.1.7 M The laboratory has defined situations where special cause comparability verification is performed in addition to routinely scheduled comparability verification.

Guidance: Special cause testing is performed in response to an alert from a monitoring procedure or a triggering event such as: failure of a frequent or periodic monitor; proficiency testing/external quality assessment failure; shift in a statistical monitoring parameter; quality control result; reagent or calibrator lot change.

Evidence: Specific records of the results of comparability for each measurand as well as any resulting activity.

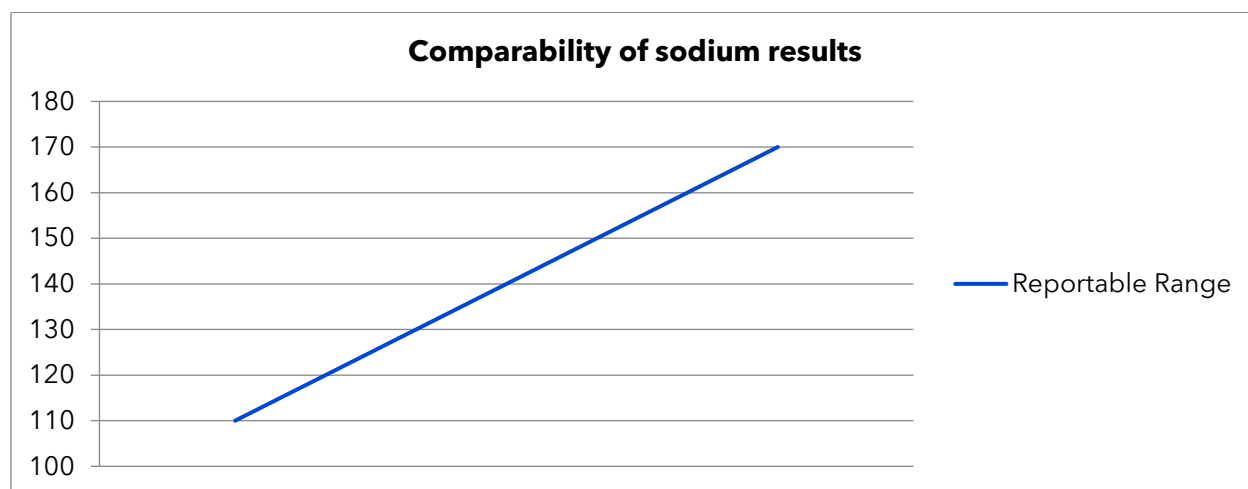
Where: Regional assessments

Comment: Laboratories should have documentation that demonstrates they have verified the comparability of results and have recorded any activity in response to any issues of comparability.

Example

Comparability of Examination Results at a Facility

Consider the comparability of sodium results within a single laboratory site. To establish comparability of sodium results the region has determined the reportable range of the measurand (110-170 mmol/L).



The laboratory has determined the number of samples; in this case, three patient samples with results that span the reportable range as much as possible. Although the reportable range may be from 110-170 mmol/L, the laboratory is only able to find samples that span a smaller range.

The results for the patient samples are as follows:

Instrument/Equipment	Sample 1	Sample 2	Sample 3
Primary laboratory analyzer	120	138	152
Backup analyzer	125	141	150
Point-of-care equipment	123	145	154

QUA3.1.1, QUA3.1.5 and QUA3.1.7 are assessed at the regional level and not used at the facility level.

QUA3.1.2 **M** Comparability encompasses the entire range of clinically relevant values.

Interpretation: Laboratories must use samples across the entire range of clinically relevant values and not be comprised of a single point assessment.

QUA3.1.3 **M** Acceptability criteria are defined for comparability of procedures, equipment and methods.

Interpretation: Laboratories must establish the tolerance limits for comparability between sites and between instruments. See below.

The laboratory has also determined that results from the backup analyzer and point-of-care instrumentation must be within 5% of the primary laboratory analyzer to be considered comparable.

Instrument/Equipment	Sample 1	Sample 2	Sample 3	Result
Conventional laboratory analyzer	120	138	152	
5% tolerance limit	114-126	131-145	146-160	
Backup analyzer	125	141	150	Pass
Point-of-care equipment	123	145	154	Pass

In this case, comparability has been demonstrated so there is no need for the laboratory to perform any tasks associated with QUA3.1.4 for this measurand.

QUA3.1.6 M Instruments and methods are checked against each other at least twice a year for comparability of results.

Guidance: Frequent monitoring generally involves comparing fewer samples more often while less frequent intervals require a larger number of samples due to the lower frequency of comparability. Periodic monitoring (e.g. quarterly, semi-annually) is performed when frequent monitoring is deemed unnecessary because the examination systems involved are stable and the risk of errors in clinical interpretation due to non-comparable results is low.

The laboratory has records of comparability testing for each assessed measurand.

In this example, checking comparability has been performed across a suitable range with adequate samples. The backup analyzer and point-of-care testing is within the established tolerance limit compared to the primary laboratory analyzer with an acceptable frequency. Comparability of results has been demonstrated for this measurand at this site.

Terms and definitions

comparability	Agreement between patient results obtained for a measurand using different measurement procedures within a health care system.	CLSI
	Note: Results are considered to be comparable if the differences do not exceed a critical value established based on defined acceptance criteria.	
corrective action	Action taken to eliminate the cause(s) of nonconformities.	ISO
	Note: Corrective action is usually taken in response to nonconformity or an identified problem noted in audits or during the accreditation process.	
examination	A set of operations having the object of determining the value or characteristics of a property.	ISO
	Synonyms: analysis, assessment, investigation, measurement, study, test	
measurand	Quantity intended to be measured.	ISO
	Synonym: analyte	

procedure	A documented, specified way to carry out an activity of a process. Note: For the purposes of accreditation, procedures must always be documented, implemented and maintained.	ISO
process	A set of interrelated or interacting activities which transform inputs into outputs.	ISO
primary analyzer	The identified method in a facility to which others will be compared for a particular examination.	CLSI
sample	A discrete portion of a body fluid, breath, hair or tissue taken for examination of one or more quantities or properties assumed to apply for the whole. One or more parts taken from a primary sample. Synonyms: specimen, primary sample, aliquot	ISO
user (of laboratory services)	Physicians and others who order diagnostic examinations and/or receive diagnostic information and reports from laboratories. Synonyms: authorized requestor, ordering physician, clinical personnel	DAP

References

1. College of American Pathologists. All common checklist: CAP accreditation program. Northfield, IL: College of American Pathologists; 2019.
2. Clinical and Laboratory Standards Institute. Verification of comparability of patient results within one health care system; approved guideline (interim revision). Wayne, PA: Clinical and Laboratory Standards Institute; 2012. 84 p. CLSI document EP31-A-IR.
3. International Organization for Standardization. Medical laboratories - requirements for quality and competence. 4th ed. International Organization for Standardization; 2022. ISO 15189:2022