TRAINING UPDATE

Lab Location:	GEC, SGMC & WAH	**Date Distributed:**	8/19/2019
Department:	Technical Specialists, Mgmt & QA	**Due Date:**	9/15/2019
		Implementation:	**9/15/2019**

DESCRIPTION OF PROCEDURE REVISION

Name of procedure:

Carryover Studies SGMC.QA1025 v1
Carryover Studies template AG.F464.1

Description of change(s):

This is a 'new' SOP that replaces our previous NQA corporate version. It is very similar to the old SOP but has been converted to our local SOP format and info that did not pertain to our labs was deleted

Note: The form is NOT attached.
It is an excel worksheet that perform the necessary calculations & is nearly identical to the QD versions. It will be placed on the G drive and emailed.

This SOP & Form will be implemented on September 15, 2019

Document your compliance with this training update by taking the quiz in the MTS system.

Non-Technical SOP

Title	**Carryover Studies**	
Prepared by	Leslie Barrett	Date: 8/12/2019
Owner	Cynthia Bowman Gholston, Robert SanLuis	Date: 8/12/2019

Laboratory Approval		
Print Name and Title	**Signature**	**Date**
Refer to the electronic signature page for approval and approval dates.		
Local Issue Date:	Local Effective Date:	

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1. PURPOSE

This document describes the policy and process for performing carryover studies in the laboratories. Carryover studies are required under a variety of conditions for quantitative and semi-quantitative analytical methods.

2. SCOPE

- This policy and process applies to:
  - Departments that perform quantitative dispensing as part of the testing process using automatic pipetting systems.
  - Stand-alone pipette systems
  - Sample pipettes integrated into analytic instruments
- This document does not apply to automatic pipetting systems that use disposable pipet tips.

3. RESPONSIBILITY

Responsible Party	Task
Laboratory Director	• Approve the initial document and revisions. • Approval of carryover studies performed prior to patient testing as part of the initial method validation
Laboratory Director or Designee	• The recurring review of this document.
Technical Supervisor	• Ensuring compliance with this procedure in his/her department. • Determining which analytes qualify for a carryover study. • Ensuring carryover studies are performed at the required frequency. • Documenting all steps of the process. • Approval of carryover studies performed after major maintenance or repair • Ensuring all staff is appropriately trained.
Designated Department Personnel	• Comply with procedure • Halting patient testing after major maintenance or repair of the pipette assembly until a carryover study has been performed.

4. DEFINITIONS

Term	Definition
Allowable Total Error (TEa)	The amount of error that meets the laboratory's stated quality goals or quality requirement for that analyte that can be tolerated without compromising the clinical usefulness of the analytical result, or incurring unsuccessful performance in proficiency testing surveys.
Carryover	The increase in a quantitative test result due to remnants of a previously run sample. Carryover may occur when samples of low assay value are run after samples of high assay value using a method that includes an automatic pipetting system.
Analyte Measurement Range (AMR)	The range of analyte values that a method can directly measure without dilution or concentration.
Limit of Quantitation (LoQ)	The lowest concentration at which analytical performance meets the laboratory's stated quality goals or requirements for that analyte.

5. POLICY

- Carryover Studies must be performed as follows:
  - Part of initial method validation
  - After major maintenance or repair of the pipetting assembly

- Each laboratory must determine which quantitative methods and analytes require carryover evaluation.
  - Analytes that use these pipetting systems must be evaluated if there is a wide range of analyte concentration, such that a small amount of carryover could have significant clinical implications.
  - An analyte with a wide clinical range that requires carryover studies is defined as having a Reportable Range greater than or equal to 2 logs or a one hundred fold difference between the lower limit of the AMR and the upper limit of the Reportable Range, which extends to an analyte concentration corresponding to the maximum dilution Section 1 of procedure block

6. PROCESS

6.1 Identify any method performed in the laboratory that uses a specimen sampling system with a non-disposable sample probe or set of probes to sample patient specimens.

6.2 Evaluate the Reportable Range specifications for each analyte performed by these methods. A carryover study is required when:

- The span of the Reportable Range is ≥ 2 logs
  OR
- The ratio of the lower limit of AMR to the highest value after the maximum dilution (i.e. the high Reportable Range) is more than 100 fold.

Example 1: If the low AMR is 50 and the highest concentration after the maximum dilution is 1,500, the ratio is 1,500/50 = 30. A carryover study is **NOT** required.

Example 2: If the low AMR is 50 and the highest concentration after the maximum dilution is 6,000, the ratio is 6,000/50 = 120. A carryover study **IS** required.

NOTE: Initial laboratory method validations also require carryover studies for these analytes.

6.3 Select one of these analytes to represent each automatic pipetting system.

- It is not necessary to include every qualifying analyte in the study.
- The selection should be based upon any analyte that may be more likely to show carryover, if applicable

6.4 Obtain the current TEa for the analyte to be evaluated. Refer to the Quest Diagnostics Medical Quality/Quality Control intranet site.

6.5 Specimen Selection

A. Obtain a patient specimen of very high concentration (near the highest value that can occur in the human body)
B. Obtain a specimen at a very low concentration, but above LoQ (it must be measureable). Pooled serum is acceptable but MUST be WELL-MIXED.

6.6 Specimen volume required:

A. Sufficient volume to perform at least 6 assays of the high sample (H)
B. Sufficient volume to perform at least 15 assays of the low sample (L)

6.7 Perform the carryover test at least 3 separate times in the following sequence:
L1, L2, H1, H2, L3, L4, L5.

NOTE: The same day and run is acceptable.

6.8 Enter the data in the Carryover Studies Template.

6.9 The Carryover Study Template performs the following calculations:

- For each run:
  - The average expected baseline value for the low sample will be the average of L1 and L5
  - The average of the expected value for the high sample will be the average of H1 and H2
  - The difference in the first sample after the high samples relative to the expected baseline (L3 – average of L1 & L5)
  - The difference in the second sample after the high samples relative to the expected baseline (L4 – average of L1 & L5)
  - The difference in the sample just before the high samples relative to the expected baseline to check for pre-carryover. (L5 – average of L1 & L5)
- Average across runs:
  - The average carryover of the first low sample (L3) after the high samples
  - The average carryover of the second low sample (L4) after the high samples
  - The average pre-carryover of the low sample (L2) just before the high samples

6.10 Review the calculation results generated from the template. Compare the average differences to allowable difference TEa/4.

If…	**Then**
Carryover is not observed	• No action needs to be taken. • Patient testing can be initiated/resumed
Carryover is observed and is not expected,	• Do not perform patient testing. • Perform troubleshooting procedures and/or contact the manufacturer to ensure that all systems are in order.
Carryover is observed and is expected according to known limitations,	• Patient testing can be resumed using previously established retesting protocols for samples that follow high concentration samples.

6.11 Document the results of the carryover performance evaluation in the comment field on the template.

6.12 Obtain appropriate approval signatures and file the carryover study in the designated binder/place.

7. PROCEDURE NOTES

N/A

8. RELATED DOCUMENTS

- Quest Diagnostics Allowable Total Error Table
- Calibration and AMR Verification, QA procedure
- Validation Requirements for Quantitative and Semi-Quantitative Methods, QA procedure
- Carryover Studies Template (AG.F464)

9. REFERENCES

1. Code of Federal Regulations CLIA Public Health 42 CFR Part 493
2. College of American Pathologists Laboratory Accreditation Checklists
3. Quest Diagnostics *Policy for Carryover Studies* QDNQA723

10. DOCUMENT HISTORY

Version	Date	Reason for Revision	Revised By	Approved By
		Supersedes SGAHQDNQA723v2.1		

11. APPENDICES

Appendix A: Analyzer Specifications

Appendix A Analyzer Specifications

A. Dimension chemistry analyzers (EXL/Xpand)
   1. Major maintenance is defined as change R1 sample arm assembly, change syringe or if recommended by field service representative.
   2. Analytes to be tested: BHCG, CREAT

B. VISTA chemistry analyzers
   1. Major maintenance is defined as replacement of sample or reagent arm assembly, change syringe or recommended by field service representative.
   2. Analytes to be tested: Vista 500 (BHCG, CREAT, LDI, PTN)
      Vista 1500 (Server 1: BHCG, CREAT, LDI, PTN)
      Vista 1500 (Server 2 and 3: CREAT, LDI)

   3. **Vista 1500 Server Configuration Modification and Programming:**
      a. Navigate to **Advanced>Configurations>Reagent Flex Configuration**. Select **Modify Reagent Flex Configuration** from the Action menu. (Vista 1500 only)
         1) Select the server location(s) for the method(s) to study, then confirm or configure the selected methods into these servers for the duration of this study.
         2) Highlight the Flex reagent cartridge to move, select local server, select the new server, and save changes.
         3) Document the pre-study server locations for any methods moved specifically for this study and change back at the study conclusion.
      b. Navigate to **Advanced>Internal Use>System Configuration (Internal Use)>Modify System Configuration>Method Processing Order**. Configure the system to run tests by changing the Method Processing Order to "As Entered." Document the pre-study processing order before changing and change back at the conclusion of this study.
      c. Any method moved to new server locations must be calibrated and QC within control limits before proceeding.

   Notes:
   - BHCG, CREA, and LD are analytes in a sample carryover kit sold by the College of American Pathologists (CAP).
   - Patient samples will be used for PTN testing. Samples with high abnormal values will be frozen and / or samples will be requested from the reference lab.

C. Centaur (Not indicated – disposable pipette tips)

D. Coagulation analyzers (Stago)
   1. Performed with bi-annual PM by service technician. Performed by technical staff if a problem is suspected.
   2. Analyte to be tested: PTT

E. Hematology analyzers (Sysmex, Pochi)
   1. Major maintenance is defined as a change or replacement of pipettor assembly.
   2. Analytes to be tested: WBC, RBC, HGB, HCT, PLT

F. Urinalysis analyzers (AUWi PRO System) – verified by QC testing sequence, refer to AUWi SOP for details