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IQCP for GENEXPERT

Facility: EXAMPLE
Test System: Cepheid GeneXpert
Test System Primary SOPs include: MICROBIOLOGY QUALITY CONTROL MANUAL – BOOK 1 MOLECULAR QUALITY CONTROL MANUAL – BOOK 8
Historical Quality Review: Regulatory guidelines required testing of external QC with each new lot, every 30 days or with each new shipment. Internal controls are run with each specimen. Each test includes a Sample Processing Control (SPC), a Sample Adequacy Control (SAC) and a Probe Check Control (PCC). • **Sample Processing Control (SPC)—**Ensures the sample was correctly processed. The SPC passes if it meets the validated acceptance criteria. • **Sample Adequacy Control (SAC)—**Ensures that the sample contains human cells or human DNA. The SAC signal is only to be considered in an analyte negative sample. A negative SAC indicates that no human cells are present in the sample due to insufficient mixing of the sample or because of an inadequately taken sample. • **Probe Check Control (PCC)—**Before the PCR reaction starts, the GeneXpert instrument measures the fluorescence signal from the probes to monitor bead rehydration, reaction-tube filling, probe integrity and dye stability. PCC passes if it meets the validated acceptance criteria. The laboratory has been following the **CLSI standards for years without any significant QC problems**. It is rare to encounter an out-of-range result with QC. Processes to mitigate patient reporting errors and delayed reports are addressed in this IQCP.

Information Used to Conduct Risk Assessment

Regulatory and Accreditation Requirements:
Checklist from Accrediting Agency: • CAP IQCP checklist questions in the ALL COMMON and MICROBIOLOGY checklist • CMS requirements
Method verification: • Instrument received and test system verification completed in 2010. • Subsequent verifications performed for additional tests added to the menu: MRSA – 2010 C. difficile – 2010 VRE – 2012 Flu – 2014

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Chlamydia and Gonorrhea – 2014 • Documentation filed in Microbiology lab.
Training of personnel: • Completion of training documented in employee personnel files.
Competency Assessment: • Employees are annually accessed for current competency. Documentation filed in employee personnel files.
Proficiency Testing: • All personnel test and review results. Proficiency testing records filed in CAP SURVEY binders.
Quality Control: • CLIA '88 and CAP requirements for testing of QC.

Test System Information:
Manufacturer: Cepheid GeneXpert • Package insert contains system performance data and describes testing principle and procedure, QC recommendations, and limitations. Package insert is located supervisor's office and are included with each kit shipment. • Manufacturer alerts and bulletins are located in the Microbiology Lab. • Operator's manual including troubleshooting guide is located the Microbiology Lab.
Summary of in-house data from routine testing of QC strains: • QC testing was performed according to Molecular Microbiology Quality Control located in BOOK 8. Review of QC records for all 5 assays for the past 12 months (12/1/14 – 11/30/15) demonstrated: • 163 results including 30 from MRSA, 26 from VRE and C. difficile, 39 from Flu and 42 from Chlamydia and Gonorrhea • No external qc failures. • No internal qc failures
Summary of in-house data from routine instrument performance checks: • Instrument checks were done according to SOP • Review of instrument QC records for the past 12 months and 1 report following scheduled maintenance performed by Cepheid service engineer revealed 2 instrument performance problems that resulted in 2 modules that failed the calibration check. These modules were not in use until replaced on 12-16-15. No patient results were impacted.

Risk Assessment and Determination of Risk Level

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Frequency of occurrence:	**Severity of harm to patient:**
Unlikely (once every 2-3 years)	Negligible (temporary discomfort)
Occasional (once per year)	Minor (temporary injury; not requiring medical intervention)
Probable (once per month)	Serious (impairment requiring medical intervention)
Frequent (once a week)	Critical (life threatening consequences)

Risk Level:
Risk level for any Risk Factor that is "Not Acceptable" must be addressed in the IQCP.
Risk level for any Risk Factor that is "Acceptable" may be included in the IQCP at the discretion of the Laboratory Director.

Risk Acceptability Matrix

Probability of Harm	Negligible	Minor	Serious	Critical
Frequent	Not Acceptable	Not Acceptable	Not Acceptable	Not Acceptable
Probable	Acceptable	Not Acceptable	Not Acceptable	Not Acceptable
Occasional	Acceptable	Acceptable	Acceptable	Not Acceptable
Unlikely	Acceptable	Acceptable	Acceptable	Acceptable

Risk Acceptability Assignment

Risk Factor (Possible Sources of Error)	**Frequency of occurrence**	**Severity of harm to patient**	**Risk Level**
Preanalytical			
Specimen (Primary):			
Patient identification	probable	minor	Not Acceptable
Collection/container/volume	frequent	negligible	Not Acceptable
Integrity	frequent	negligible	Not Acceptable
Transport	frequent	negligible	Not Acceptable
Storage	probable	negligible	Acceptable
Risk Factor (Possible Sources of Error)	**Frequency of occurrence**	**Severity of harm to patient**	**Risk Level**

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Analytical			
Testing Personnel:			
Training	probable	serious	Not Acceptable
Competency	probable	serious	Not Acceptable
Experience	probable	serious	Not Acceptable
Proficiency Testing	unlikely	negligible	Acceptable
Staffing	occasional	minor	Acceptable
Reagents:			
Shipping/receiving/storage	occasional	minor	Acceptable
Expiration dates	unlikely	minor	Acceptable
Preparation/use	probable	minor	Not Acceptable
QC strain storage/prep	occasional	negligible	Acceptable
Environment:			
Temperature/airflow/humidity/ ventilation	unlikely	negligible	Acceptable
PCR free	occasional	minor	Acceptable
Test System:			
Mechanical/electronic stability of instrument/equipment/jam	occasional	negligible	Acceptable
Function checks	frequent	serious	Not Acceptable
Transmission of results to LIS	unlikely	serious	Acceptable
Postanalytical			
Test Results:			
Transmission of results to Electronic Health Record	occasional	serious	Acceptable
Review reported results	frequent	serious	Not Acceptable
Clinician feedback	probable	serious	Not Acceptable

Assessment

Possible Sources of Error	How can identified sources of error be reduced?

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Risk Factor	Possible Error	
Preanalytical		
1: Specimen - Biological	• Improper specimen procurement/ handling/processing	• Adhere to procedures in SOP Phlebotmy.3 that addresses patient identification and specimen collection, labeling, transport, storage and remedial actions to control improperly handled specimens or delayed specimens. • Annually review representative specimen processing errors with all staff involved with patient specimens. During initial training and competency assessment, emphasize: • Proper specimen handling/processing is the most critical part of any test
Patient/specimen identification		See above (Specimen)
Collection/container/ volume		See above (Specimen)
Integrity		See above (Specimen)
Transport		See above (Specimen)
Storage		See above (Specimen)
Analytical		
2: Testing Personnel	• Incompletely trained	During initial training and competency assessment, emphasize: • Key aspects of each test. • Supervisor annually review any changes in recommendations described by accrediting agencies or standards organizations
Training		See above (Testing Personnel)
Competency		See above (Testing Personnel)
Experience		• Supervisor review reports generated by new employees prior to release for the first two months of their employment
Proficiency Testing		• All staff read (and sign off) on PT sample critiques
Staffing	Adequate staff to support the turn-around-times for all shifts.	• Supervisor to annually review appropriate staffing needs and schedule staff accordingly
3: Reagents		During initial training and competency assessment, emphasize standard rules to always:

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		• Take responsibility for reagents/supplies (all staff) • Maintain reagents at proper storage conditions • Check expiration dates • Perform required QC
Receiving/storage	• Incorrect ordering • Depleted reagent supply • Reagent integrity compromised	• Designated staff member(s) assigned to inventory (order/receipt) reagents to ensure inventory properly maintained and testing materials are handled appropriately on receipt
Expiration dates		See above (Reagents)
QC	• QC out of control	During initial training and competency assessment, emphasize: • All specimen-specific QC parameters are controlled within the cartridge; if there is a failure, the assay will not deliver a patient result. • Potential sources of QC failures • QC troubleshooting • QC frequency
4: Environment	• Results not reported (ancillary equipment failure, e.g., bay malfunction)	• Instrument installed at a location following manufacturer's suggestions. During initial training and competency assessment, emphasize standard rules for: • Take responsibility for any possible instrument/ environmental problem (out of the ordinary observation)(all staff) • Equipment maintenance •
Temperature/airflow/humidity		See above (Environment)
Utilities		See above (Environment)
Space		N/A (sufficient space available)
PCR free		Benches are bleached prior to performing testing; procedures for reducing cross-contamination are used. Also, the test cartridges for the Xpert are self-contained –amplicons cannot escape unless the cartridge integrity is damaged. Proper

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		discarding and decontamination protocols are followed for disposal of all cartridges.
5: Test System		During initial training and competency assessment, emphasize standard rules for: • Take responsibility for any possible instrument/test system problem (out of the ordinary observation)
Mechanical/electronic/jam	Results not reported (e.g., instrument malfunction and/or aborted test)	• Perform preventive maintenance according to recommended schedule During initial training and competency assessment, emphasize: • How to avoid and resolve jams
Function checks		• See above
Transmission of results to LIS	• Incorrect transmission of results • Delay in transmission of results	• Daily supervisor (or supervisor designee) review of reported results • Annual check of test system- LIS computer interface • QA monitor for time to reporting results
Postanalytical		
6: Test Results		• Supervisor maintains summary of incorrect results released and meets with laboratory director monthly to review this summary • QA monitor for turn-around-times to reporting results During initial training and competency assessment, emphasize: • Need for timely results to guide therapy
Results reported within 5 days	• Results delayed beyond that expected	See above (Test Results)
Transmission of results to Electronic Health Record	• Incorrect transmission of results • Delay in transmission of results	See above (Test Results)
Review reported results	• Erroneous results reported • Report comments missing	See above (Test Results and Test System) Note: results are checked at multiple steps by tech and then by supervisor
Clinician feedback	• Complaints/suggestions regarding delayed results and potential erroneous results	See above (Test Results) • Incorporate suggestions into QA plan, as appropriate.

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Final QCP for CEPHEID GeneXpert
Based on our risk assessment and Quality Assessment, the QCP consists of following the instructions that are provided in explicit detail in Molecular Quality Control Procedure Manual located in BOOK 8 and are summarized here.
Testing of appropriate QC on each new lot/shipment of panels before or concurrently with placing these materials into use for testing patient's isolates.
Testing of appropriate QC on each panel type monthly.
Testing of appropriate QC on each panel type after major system maintenance or software upgrade before or concurrently with placing the equipment back into service.
Recording and evaluating QC results according to QC acceptability criteria as defined in the SOP. Any out-of-range result is immediately investigated and corrective action performed prior to releasing any patient results.

Quality Assessment: Ongoing Monitoring for QCP Effectiveness (Performed by supervisor and/or section head)		
Reasons for QC failures, PT failures, and patient isolate reporting errors will be examined and addressed as needed in a new/updated risk assessment: 1) Has a new risk factor been identified? 2) Does this change the frequency of risk? 3) Does the risk factor change the potential severity of harm to patient?		
Daily review of patient results for reporting errors and clinician complaints. Take corrective action and revise QCP as needed.		
Monthly review of QC results by supervisor or section head. Take corrective action and revise QCP when unexpected QC failures indicate adjustment to the QC plan defined herein is needed.		
Monthly review of length of time from specimen collection to result reporting to determine incidence of reports delayed. Take corrective action and revise QCP when number of delayed reports exceeds acceptable limit as established by the laboratory director.		
Regular review of Proficiency Testing results. Take corrective action and revise QCP if necessary when PT results are not acceptable.		
Monthly review of all equipment maintenance/monitoring logs according to standard laboratory protocols. Take corrective action and revise QCP as needed.		
Regular training and competency assessment according to standard laboratory protocols. Modify training and revise QCP as needed.		
Continual participation in this institution's quality program that addresses specimen handling and erroneous specimen labeling. Take corrective action and revise QCP as needed.		
This QCP has been reviewed and is approved by the laboratory director (as named on the CLIA license).	**Signature**	**Date**

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