Validation of Microbiology Tests

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An Ongoing Process

• “...monitoring a test, procedure, or method to ensure that it continuously performs as expected; simply put “Does the test still work?””

• “...confirms that the test continues to perform satisfactorily according to the laboratory’s requirements or the manufacturer’s claims...”

Source: Cumitech 31A. 2009. ASM Press
Complete Testing Process

- Preanalytic
- Analytic
- Post-analytic
CLIA Subparts—Validation

• Subpart K. Quality systems for nonwaived testing
  – Subspecialty specific
  – General laboratory systems
  – Preanalytic systems
  – Analytic systems
  – Post analytic systems

CLIA Subpart K—Quality Systems, General Laboratory

- Confidentiality of patient information
- Specimen identification and integrity
  - “...from time of collection or receipt of specimen through completion of testing and reporting of results”
- Complaint investigations
  - “...document complaints and problems reported... conduct investigations... when appropriate”
- Communications
  - “...identify and document breakdown in communication between laboratory and authorized individual who orders or receives test results...”
CLIA Subpart K—Quality Systems, General Laboratory

• Personnel competency assessment
• Evaluation of proficiency testing performance
  – Perform at least twice annually; review results
• General laboratory systems assessment
  – “…establish and follow written policies and procedures…to monitor, assess, and, when indicated, correct problems…”
  – Review effectiveness of corrective actions
CLIA Regulations—Preanalytic

• Test request
  – Contents
    • Name and address or other identifiers of authorized person requesting the test
    • Patient name or unique identifier
    • Patient sex and age or DOB
    • Test(s) to be performed
    • Source, if appropriate
    • Date and time (if appropriate) of collection
    • Additional relevant information
  – Laboratory must ensure information entered into LIS is transcribed accurately
CLIA Regulations—Preanalytic

- Specimen submission, handling, and referral
  - Written procedures must include:
    - Patient preparation
    - Specimen collection
    - Specimen labeling
    - Specimen transport, storage and preservation
    - Specimen processing
    - Specimen acceptability and rejection
    - Specimen referral
  - The laboratory must document the date and time it receives a specimen
CLIA Regulations—Analytic

- Procedure manual
  - Required elements: preanalytic, analytic, post-analytic
- Test systems, equipment, instruments, reagents, materials, and supplies
- Establishment and verification of performance specifications
- Maintenance and function checks
- Control procedures
  - Detect immediate errors
  - Monitor test accuracy and precision over time
  - Number and frequency
  - Criteria for acceptability
CLIA Regulations—Analytic

- Calibration and calibration verification procedures
- Comparison of test results
  - Same test using different methodologies or instruments, or at multiple testing sites
  - Investigate test results that appear inconsistent with clinical data, other test results
- Corrective action
  - Test system, controls, calibrators fail to meet performance specifications
  - Specimens or reagents stored improperly
- Test records
CLIA Regulations—Post Analytic

• Test report
  – “…adequate manual or electronic systems in place to ensure test results...are accurately and reliably sent...to final report destination, in a timely manner”
  – Information included in report
  – Corrected reports
    • Maintain copies of original and corrected reports
Validation—CAP Checklists

• “…requirements of the accreditation organization…(CAP) are equal to, or more stringent than, the CLIA condition-level requirements…”

CAP Standard (Core Principle) III: Quality Management

- **Performance improvement**
  - Preanalytic, analytic, post-analytic
  - Identify and address problems
  - Participate in institutional QM plans
  - Ongoing quality improvement

- **Quality control**
  - Prevent, detect, address errors in analytic testing

- **Instrument maintenance**

- **Proficiency testing**
  - Or alternative assessments for tests which CAP doesn’t require PT
CAP Standard (Core Principle) III: Quality Management

- Clinical validity (of tests)
- Validation (verification) of test systems
- Human resource management
  - Number, qualifications, training
- Information management
- Communication
  - To clinicians, pts, admin, government entities
CAP “Extras” (or Details)

- Measure of physicians’ or patients’ satisfaction
- Interim self-inspection
- Validation (verification) study summary statement signed by lab director (or so qualified)
- Timely reporting of critical results
- Methodologic/clinical standard of care
  - Sputum adequacy by gram stain
  - Enrichment cultures
  - Blood cultures examined 2X daily first 2 days
  - Fluorochrome staining for AFB
  - % parasitemia
  - Cell lines and incubation time for virus isolation
  - Statistics for molecular tests
Validation Simplified—Cumitech 31A

- Personnel training—when?
  - New employee
  - New assay procedure
  - Changes to procedure
  - Errors/competency assessment unacceptable

- Personnel competency assessment—types
  - Direct observation of assay procedures
  - Monitoring reporting of test results
  - Review of QC logs, PT results, PM records
  - Direct observation of instrument maintenance
  - Testing unknown samples
  - Problem solving skills/written tests
Validation Simplified—Cumitech 31A

- Proficiency testing
  - When no external PT program available...
    - Split samples with another laboratory
    - Split samples internally with another method
    - QC samples from another laboratory
    - Seeded samples

- Comparison of multiple instruments—how?
  - Previous patient specimens
  - Archived PT samples
  - Splitting or alternating QC among instruments
Summary

• Validation is an ongoing process
• Confirms that test systems perform according to manufacturers’ or laboratory’s specifications
• Includes complete testing process
  – Preanalytic, analytic, post-analytic
• A quality system consisting of a number of components