

## **QUALITY MANAGEMENT** PLAN, IMPLEMENT, TRACK, IMPROVE

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#### LEARNING OBJECTIVES

This lecture will enable the participant to:

- 1. List the elements of a quality management plan
- 2. Describe key stake holders of the planning, implementation, maintenance, and improvement stages of total quality management plans
- 3. Explain ways to monitor elements of the plan, key performance indicators, and improvement initiatives



#### WHY THIS TOPIC IS IMPORTANT TO ME?

- Two experiences soon out of fellowship:
   1. Lead an effort to start a new department in a large lab network
  - How do I fit this new effort into an existing quality framework?
  - 2. Get a quickly growing lab CAP accredited
    - How do I build the quality framework and make it continuously work?



#### OUTLINE

- I. History of Quality Management PDSA model
- II. Quality Management Fundamentals
- III. Responsibilities of Lab Directors and Pathologists
- IV. Elements of a Quality Management Plan
- V. Making the Quality Management Plan Operational
- VI. Tools, Metrics, and Outcomes
- VII. Risk Assessment Across the Process
- VIII. Resources



#### HISTORY OF QUALITY MANAGEMENT





**W. Edwards Deming** (1900-1993)



Walter A. Shewhart (1891-1967)



Joseph M. Juran (1904-2008)



#### Process model for ISO 15189 QMS

ACT





4.1 Organization & Management

Responsibility

- 4.4 Service agreements
- 4.15 Management review
- 4.2 Quality Management System

4.3 Document control

4.13 Control of records

#### **Evaluation & Improvement**

4.8 Resolution of complaints
4.9 Identification & control nonconformities
4.10 Corrective action
4.12 Continual improvement
4.14 Evaluation and internal audit

5.6 Ensuring quality of results (in part)

#### **Resource Management**

5.1 Personnel

5.2 Accommodations, environmental conditions

DO

- 5.3 Equipment, reagents, consumables
- 5.9 Laboratory information management 4.6 External service and supplies

#### Examination Processes

4.5 Examination by referral laboratories 4.7 Advisory services

- 5.4 Pre-examination processes
- 5.2 Examination processes
- 5.2 Examination processes
- 5.6 Ensuring quality of examinations
- 5.7 Post examination processes
  - 5.8 Reporting of results

STUD



Basic Quality Management Systems, Westgard, JO et al. 2014



HEALTH UNIVERSITY OF UTAH pixabay.com/users/272447-272447 https://www.moabadventurecenter.com/desolation-canyon-rafting/map

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#### KEY QUALITY MANAGEMENT ELEMENTS

- Statement affirming commitment to quality and patient safety
- Risk assessment
- Monitoring and control activities

   Identify indicators and metrics
- Response to identified problems
- Information and communication
- Continuous improvement



CAP Presentation by Paul Bachner, MD, FCAP

#### KEY QUALITY MANAGEMENT COMPONENTS

- Written Quality Plan (CAP & CLIA)
   High emphasis by CAP (critical deficiency)
- Annual review & approval by director
   2.2% of CAP labs had not performed!
- Specify information/reporting method
- Accuracy of results (analytic)
- Integrity of pre & post-analytic processes in all sections



CAP Presentation by Paul Bachner, MD, FCAP

#### QUALITY MANAGEMENT PLAN FORMATS

- Format may be Laboratory designed
- CLSI (NCCLS) guidelines (GP-22 or GP-26)
- ISO 9000 series
- ISO 15189 accreditation and standards
- JC model for improvement of organizational performance
- AABB quality program
- Safety plan integrated or separate



CAP Presentation by Paul Bachner, MD, FCAP

#### WHAT WILL INSPECTORS BE LOOKING FOR?

- Written QM plan
- Lab director involvement
- Monitoring of process and improvement
- Communication within organization
- Incorporation of PT data & corrective action
- Attention to employee and "client" concerns
- Use of incident reports to improve process and practice
- All shifts and all sections



#### "Stereoscopic View"





CLIA:

It is the responsibility of the lab director to "...ensure that the laboratory **develops and uses a quality system** approach to laboratory testing that provides accurate and reliable patient test results."



CLIA Brochure - Laboratory Director Responsibilities CMS.gov

CAP Accreditation:

"Director must assume responsibility for **implementation** of the quality management plan. The director and professional laboratory personnel must **participate** as members of the various quality management committees of the institution."



www.CAP.org

CAP Accreditation:

"Ensure that the laboratory participates in the **monitoring** and evaluation of the quality and appropriateness of services rendered within the context of the quality assurance program appropriate for the institution, regardless of testing site(s).



www.CAP.org

# ELEMENTS OF A QUALITY MANAGEMENT PLAN (QMP) -RESOURCES



#### Wager, Horowitz & Slegal's

#### LABORATORY ADMINISTRATION FOR PATHOLOGISTS

Second Edition

Dastern A Roger Mahari E Colori Donald L Kanher Gane E Segal

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How to Apply Including Inte	r for a CLIA Certificate, ernational Laboratories	The Centers for M U.S. through the C entities. The Divisi	edicare & Medica Clinical Laboratory on of Clinical Lab rds and Quality //	Id Services (CMS) I Improvement Ame oratory Improvement CCSO) has the roor	regulates all laboratory t ndments (CLIA). In total nt & Quality, within the C consibility for implement	esting (except research) perforr , CLIA covers approximately 26 Quality, Safety & Oversight Grou	ned on huma 0,000 laborati ip, under the (
State Agency Branch Conta	& CLIA Operations acts	The objective of the	e CLIA program i	s to ensure quality I	aboratory testing. Althou	igh all clinical laboratories must	be properly o
Accreditation States	<u>1 Organizations/Exempt</u>	to receive Medicar For the following in	e or Medicaid pay	yments, CLIA has n o the downloads/lin	o direct Medicare or Me ks listed below:	dicaid program responsibilities.	
Categorizatio	on of Tests	- Eroquonthy	Asked Questions	(EAOs) CLIA Guid	anco During the COVID	19 Emorgonou	
Certification	Boards for Laboratory	Frequently	asked Questions	(FAQs), CEIA Guid (FAQs), Abbott i-ST	AT:	To Emergency,	
Directors of H	High Complexity Testing	<ul> <li>For addition</li> </ul>	nal information ab	out a particular labo	pratory, contact the appr	opriate State Agency (PDF) or F	Regional Offic
CLIA Brochu	res	contact (PE	<u>)F);</u>				
CLIA Regulat	tions and Federal Register	<ul> <li>Information authority is</li> </ul>	about what is CN found in the dow	IS' authority regard	ing Laboratory Develop e file called "LDT and Cl	ed Tests (LDTs) and how does it LIA FAQs";	t differ from Fl
CLIA Related	Hearing Decisions and	CMS Blog	FDA & CMS For	m Task Force on LE	OT Quality Requirements	s;	
Compliance 1	Topics	Information	on research testi	ng and CLIA is four	nd in the file called "Res	earch Testing and CLIA";	Testine de
CLIA Statistic	cal Tables/Graphs	OlG reports	about direct acce s relating to CLIA:	ss testing (DAT) ar	iu trie GLIA regulations i	s included in the Direct Access	resung down
CME Courses	s for Laboratory Directors	Guidance f	or Coordination of	f CLIA Activities Am	ong CMS Central Office	. CMS Regional Offices. State A	aencies (inclu
of Moderate (	Complexity Laboratories	State with L	icensure Require	ements), Accreditati	on Organizations and St	ates with CMS Approved State	Laboratory Pr
Cytology Pro	ficiency Testing	is containe	d in the Partners i	n Laboratory Overs	ight download;		
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				-			



#### June 201

#### QMSo1-A4

Quality Management System: A Model for Laboratory Services; Approved Guideline—Fourth Edition



#### QUALITY MANAGEMENT PLAN

Why is the QM Plan important?

- CAP and CLIA accreditation requirement
- Will improve patient care and safety
- Will help you to improve lab services (money, time)
- Ensures continuing surveillance and management
- Always ready for inspection
- What are the key compliance issues?
  - Plan format
  - Components (entire analytic cycle, all sections)
  - Metrics, benchmarks, and indicators
  - Corrective action and follow-up to problems
  - A focus on how the plan contributes to patient safety



#### TEMPLATE FOR QM PLAN - 12 QUALITY SYSTEM ESSENTIALS

- 1. Organization
- 2. Personnel Resources
- 3. Equipment
- 4. Supplier, Customer Issues, and Referral Laboratories
- 5. Process and Performance Control (QC, PT)
- 6. Documents and Records
- 7. Occurrence Management
- 8. Assessments and Audits
- 9. Process & Performance Improvement
- 10. Facilities and Safety
- 11. Information Management
- 12. Customer Service and Satisfaction



#### 1. Organization

- Geographical scope and locations
   one or multiple labs, mobile, POC, etc
- Organization
  - Organization charts
    - medical and administrative leaders
    - managers, supervisors
    - updated as needed and reviewed annually



#### 2. Personnel Resources

- List the CLIA personnel and definitions
  - Cross-reference chart of local versus CLIA personnel titles
- Employee orientation, training, annual competency assessment, CE, safety training
- Summary of educational resources
- Location and process of documenting employee assessments and competencies



## 3. Equipment

- <u>Briefly</u> describe that equipment policies exist for:
  - Selection
  - Acquisition
  - Installation
  - Validation
  - Maintenance
  - Malfunction response
  - Disposal



# 4. Supplier, Customer Issues, and Referral Laboratories

## **Supplies**

- Who is responsible for supporting lab operations?
  - Uninterrupted flow of supplies and services?
  - Quantity, quality, right time, price
  - Procedure for supply recall



# 4. Supplier, Customer Issues, and Referral Laboratories

## Customer Issues (Surveys)

- Clinicians and nurses
  - TAT, critical values, phlebotomy response, test menus, consultation, courtesy
- Employee satisfaction
  - Communication, work environment and facilities, pay & promotion, "morale"
- Patients
  - phlebotomy, wait times, courtesy, complaints

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# 4. Supplier, Customer Issues, and Referral Laboratories

#### **Referral Laboratories**

- Selection is the responsibility of director

   consult with facility and medical staff
- Annual review/audit
  - Results
  - Service and support
  - Contracts
    - Compliance with federal requirements



## 5. Process and Performance Control (QC, PT)

## Quality Control (QC)

- Analysis of materials of known composition or reactivity in conjunction with patient samples
- Measure of precision and confirms instrument calibration
  - QC frequency (min. vendor or CAP)
  - Process for QC drift, shifts, outliers
  - QC record retention policy (hard copy and digital)



## 5. Process and Performance Control (QC, PT)

## Proficiency Testing (PT)

- Periodic testing of blinded samples
  - sent to the lab by an approved agency
  - If not available, alternate performance assessment (APA) must be defined and followed semi-annually
- No inter-lab sharing/communication
- Integration into routine workflow
- Process to address failures and near misses



## 5. Process and Performance Control (QC, PT)

### Test validation

- Formal validation of
  - Laboratory-developed test (LDT)
  - Laboratory-modified test (LMT)
- Minimum requirements:
  - Test performance (accuracy, precision, linearity, carryover, sensitivity, etc.)
  - Intended use and applicable specimens
  - Clinical validity
  - External verification (PT)



### 6. Documents and Records

- Management policy for documents

   Policies, procedures, QC records, PT records, etc
   Appropriateness (up to date)
- May use master lists and SOPs for document management
- Who is responsible for management, review, signatures
- Document retention and discard
- Helpful to list as a table



#### HANG IN THERE



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#### 7. Occurrence Management

• Systemic analysis of events that affect lab services, quality, and patient safety

- Serious, common, recurring, or systemic problems

- Capture and analyze nonconforming events
  - Random review
  - Detection by laboratory or technologist
  - External detection (clinicians, nurses, patients, clients)
- Corrective actions
- Root cause analysis for serious or frequent events
- Discussion at quality meetings/committees
   Laboratory Administration for Pathologists, CAP, 2011



#### KEEP IN MIND

- CAP Patient Safety Goals
  - Improve patient & sample identification
  - Improve verification and communication of lifethreatening information (critical values, tests)
  - Improve identification, communication and correction of errors
  - Improve integration & coordination of the laboratory patient safety role within the healthcare organization
  - <u>Utilize data within system to improve care</u>



#### 8. Assessments and Audits

- List expected external assessments
  - CAP, CMS, FDA, AABB, CDC, state agencies, Joint Commission
- Describe internal
  - CAP interim, personnel competency assessments, quality indicators, periodic audit of QM plan, safety audits
- Can refer to individual SOPs to keep this section simple



- 9. Process and Performance Improvement
- Define the authority, responsibility, and delegation
  - Lab director and quality management team
- Define basis for review (including establishment of a quality committee), and organizing an improvement project (e.g., FOCUS-PDCA)
- Involve all lab sections, pre-analytic, analytic, and post-analytic processes



## 9. Process and Performance Improvement (cont.)

- List hospital/clinic or other committees
  - Infection control
  - Transfusion
  - Safety
  - Quality Committee(s)

Interdisciplinary involvement critical to improvement and to demonstrate lab integration with institutional QM programs



## 9. (continued) How to do it

- FOCUS
  - Find a process to improve
  - Organize a team
  - Clarify current knowledge
  - Understand variation
  - Select process to improve
- PDCA/PDSA
  - Plan the improvement action
  - Do/test the action
  - Check to determine the effects of the action
  - Act to implement or change approach



## 9. (continued) Sample QM Indicators

- Diabetes monitoring (system)
- Hyperlipidemia screening (system)
- Test order accuracy (preanalytic)
- Patient identification (preanalytic)
- Blood culture contamination (preanalytic)
- Adequacy of specimen information (system/preanalytic)



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## 9. (continued) Sample QM Indicators

- Accuracy of point-of-care testing (analytic)
- Cervical cytology/biopsy correlation (analytic)
- Critical value reporting (postanalytic)
- Turnaround time (postanalytic)
- Clinician satisfaction (system & postanalytic)
- Clinician follow-up (system & postanalytic)

Laboratory Administration for Pathologists, CAP, 2011 CAP Presentation by Paul Bachner, MD, FCAP The Institute for Quality in Laboratory Management; CAP TODAY, June 2005



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#### 12 QUALITY SYSTEM ESSENTIALS – SAMPLE QM INDICATORS

#### Laboratory Medicine Quality Indicators by Stage of the Total Testing Process

Stage	IOM Domains <sup>*</sup>	
Test ordering		
Test order appropriateness <sup>†</sup>	Effectiveness, efficiency, timeliness	
Patient identification/specimen collection		
Inpatient wristband identification error	Safety	
Patient satisfaction with phlebotomy	Patient-centeredness	
Specimen identification, preparation, and transport		
Specimen inadequacy/rejection	Effectiveness, efficiency, safety, timeliness	
Blood culture contamination	Efficiency, safety	
Specimen container information error	Efficiency, safety	
Analysis		
Proficiency testing performance	Safety	
Gynecologic cytology-biopsy discrepancy	Effectiveness, efficiency, safety	
Result reporting		
Inpatient laboratory result availability	Patient-centeredness, timeliness	
Corrected laboratory reports	Efficiency, safety	
Critical values reporting	Safety, timeliness	
Turnaround time	Timeliness	
Clinician satisfaction with laboratory services	Effectiveness, timeliness	
Result interpretation and ensuing action		
Follow-up of abnormal cervical cytology results	Effectiveness, timeliness	

\* Descriptions of the Institute of Medicine (IOM) health care domains are as follows: effectiveness, providing care processes and achieving outcomes supported by scientific evidence; efficiency, avoiding waste, including waste of equipment, supplies, ideas, and energy; equity, providing care that does not vary in quality because of personal characteristics such as sex, ethnicity, geographic location, and socioeconomic status; patient-centeredness, meeting patient needs and preferences and providing education and support; safety, preventing or reducing actual or potential bodily harm; and timeliness, obtaining needed care while reducing delays.



Shahangian, S. Snyder SR. AJCP, 2009, 131(3), 418–431

#### 10. Facilities and Safety

- Describe participation in facilities and safety
- Refer to the safety manual (usually large)
- Annual safety audit of lab sections
- Lab safety committee manages safety and facilities initiatives



### 11. Information Management

- Authority to approve users and access
- States that policies and procedures exist for data security and transfer integrity
- List security measures (passwords, security levels, access)
- Document audit of data transfer
- HIPPAA compliance is described
- Frequency of system checks
- Annual report of system integrity



## 12. Customer Service and Satisfaction

- State frequency of surveys
- Physicians and nurses
  - TAT, critical values, phlebotomy, test menus, consultation, courtesy
- Employee satisfaction
  - Communication, work environment, pay & promotion, "morale"
- Patients
  - phlebotomy, wait times, courtesy, complaints





#### MAKING THE QUALITY MANAGEMENT PLAN OPERATIONAL



Photo by Tom Fisk from Pexels

#### FUNDAMENTALS OF QUALITY MANAGEMENT IMPLEMENTATION

- Implement as designed in the QM plan
- Explicit delegation of responsibility
- <u>Specify frequency of activities</u>
- Create quality committee(s)
- Evidence and documentation
  - Committee minutes
  - QI reports
  - Documents responding to complaints, problems, adverse events



#### MAKING THE QUALITY MANAGEMENT PLAN OPERATIONAL





#### MAKING THE QUALITY MANAGEMENT PLAN OPERATIONAL





#### TOOLS, METRICS, OUTCOMES



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### TOOLS, METRICS, OUTCOMES

- Statistical control charts
- Process and workflow design charts
- Root cause analysis
  - Process mapping, 5 whys, fishbone diagram
- Lean six sigma
- External quality activities
- Quality dashboards
- Spreadsheets
- Risk analysis
- Non-conformance reports



#### SHORT TERM/REAL-TIME MONITORING

 Assay-specific statistical control charts





Device-specific temperature charts



BioRad Unity. www.QCNET.com Rees Scientific. www.reesscientific.com

#### SHORT TERM/REAL-TIME MONITORING – MOVING AVERAGES/MEDIANS





#### SHORT TERM/REAL-TIME MONITORING – MOVING AVERAGES/MEDIANS







Example of monitoring medians at Intermountain Healthcare using Data Innovations software

#### EXAMPLE MONTHLY QC REVIEW – PEER BASED

Instrument(s) e	valuated	· C1 AND 11																	
Month i	n Review:	: Mar-19		Lab	Peer	Set	Lab	Peer	Lab	Lab	Peer	Lab	Set	Lab	Peer	Lab	Peer	Lab	
	TEST	METHOD	LOT#	Count	Count	Mean	Mean	Mean	z-score	CV	CV	CVR	S.D	SD	SD	SDI	Set SD	SD MoM	Comments
	ACETDA	11	40951	64	626	9.5	9.6	9.6	-0.19	6%	5%	1.2	1	0.6	0.49	-0.02	1.0	1.0	
	ACETDA	11	40952	64	603	37	37.1	37.3	-0.21	2%	2%	1.1	1	0.7	0.62	-0.22	1.0	1.0	
	ACETDA	11	40953	64	640	107	106.8	107.5	0.14	1%	2%	0.8	3	1.3	1.65	-0.44	3.0	1.0	
	ALB	C1	47951	67	1309	2.6	2.6	2.6	-0.58	2%	2%	1.3	0.1	0.1	0.04	0.41	0.1	1.0	
	ALB	11	47951	33	1309	2.6	2.6	2.6	-0.42	1%	2%	0.9	0.1	0.0	0.04	0.06	0.1	1.0	
	ALB	C1	47953	65	1303	4.6	4.6	4.6	0.42	1%	1%	1.2	0.1	0.1	0.05	0.36	0.1	1.0	
	ALB	11	47953	33	1303	4.6	4.6	4.6	0.23	1%	1%	1.1	0.1	0.1	0.05	0.61	0.1	1.0	
	ALB	C1	56611	10	37	2.6	2.6	2.7	0.82	2%	20%	0.1	0.1	0.0	0.54	-0.27	0.1	1.0	
	ALB	11	56611	11	37	2.6	2.5	2.7	1.63	2%	20%	0.1	0.1	0.0	0.54	-0.33	0.1	1.0	
	ALB	C1	56613	10	29	4.6	4.6	4.6	0.47	1%	1%	1.2	0.1	0.1	0.05	-0.01	0.1	1.0	
	ALB	11	56613	11	29	4.6	4.6	4.6	0.44	1%	1%	1.2	0.1	0.1	0.05	0.04	0.1	1.0	
	ALC	C1	54261	33	263	40	41.0	60.1	-0.74	3%	96%	0.0	2	1.3	57.9	-0.33	2.0	1.0	
	ALC	11	54263	32	162	247	246.1	251.8	0.14	3%	2%	1.0	8	6.2	6.18	-0.92	7.0	1.1	
	ALKP	C1	47951	65	1320	31.5	32.5	29.7	-0.63	5%	6%	0.8	2.5	1.6	1.77	1.61	2.5	1.0	
	ALKP	IC	47951	37	1320	32	31.5	29.7	0.36	5%	6%	0.8	2.5	1.4	1.77	1.02	2.5	1.0	
	ALKP	C1	47953	64	1316	325	324.3	318.5	0.12	2%	2%	1.0	9	5.8	5.92	0.99	8.0	1.1	
	ALKP	11	47953	37	1316	328	325.7	318.5	0.43	2%	2%	0.9	9	5.3	5.92	1.23	8.0	1.1	
	ALKP	C1	56611	10	37	32	31.4	55.5	0.17	12%	136%	0.1	2.5	3.6	75.4	-0.32	2.5	1.0	
	ALKP		56611	11	37	32	31.3	55.5	0.20	12%	136%	0.1	2.5	3.7	/5.4	-0.32	2.5	1.0	
	ALKP	C1	56613	10	29	304	304.0	307.0	0.00	2%	2%	1.3	9	6.8	5.32	-0.57	9.0	1.0	
	ALKP	11	56613	11	29	304	309.2	307.0	-1.08	2%	2%	0.9	9	4.8	5.32	0.40	9.0	1.0	



#### EXAMPLE MONTHLY QC REVIEW – PEER BASED

Other sources of peer-based QC
monitoring

#### Unity

#### Laboratory Performance Overview

Immunoassay Plus • Lot 12345 • Exp 01-Jan-2016

Immunoturbidimetric ug/mL Vanconwcin Peer Method Level Peer Method Peer Method Level eve Siemens Dimension EXL SDI -0.39 -0.85 -0.28 -0.83 2.22 2 2 1.5 2 2 CVR 0.4 0.5 0.3 03 0.1 13145 13448 13448 40344 39435 40344 # Points 1 1 1 402 1206 398 1195 # Labs 402 1206 çvr CVR 2 CVR 0 0 0 Peer Peer Peer .  $\Box$ □Method Method □Method -1 -1  $\square$ -1 SDI -2 **SDI** -2 SDI -2

BioRad Unity. www.QCNET.com



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#### January 2014 • Lab 12345

Associated Regional Laboratoryy 123 Main Street Anytown, NY 12345-6789 Attention: Lab Supervisor

#### EXAMPLE – WEEKLY NONCONFORMANCE REPORT

#### Mass Spectrometry 2

#### Results from 4/10/2020 to 4/16/2020

#### Total Occurrences: Total Patients: Total PSID:

	QAR Completed: 4/15/2020				
QAR ID					
Patient Count					
Problem Statement					
Immediate Action					
Case					
Accession		Mnemonic			
Accession		Mnemonic			
Client ID					
Category	Subcategory	Rating	Outcome	Reportable	PSID
Post-Analytical	Reporting Results	Minor Nonconformance	Corrected Report	Yes	No
Investigation			· · · · · · · · · · · · · · · · · · ·		
Investigation					
Root Cause					
Notes					
	QAR Completed: 4/16/2020				



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**ARUP** Laboratories

#### PROCESS-BASED RISK ASSESSMENT





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#### PROCESS-BASED RISK ASSESSMENT



Preanalytic				Stage 1 Result Reporting
Stage	Item Description	Risk	Mitigation Plan	Tracking/Log
А				
В				
С				
Analytic				
А				
В				
С				
Postanalytical				
А				
В				
С				



#### RESOURCES

Description of CLIA

<u>https://www.cms.gov/Regulations-and-</u> <u>Guidance/Legislation/CLIA/index?redirect=/clia/</u>

<u>CLIA Laboratory Requirements</u>

https://www.govinfo.gov/content/pkg/CFR-2003-title42-vol3/xml/CFR-2003-title42-vol3-part493.xml

- Quality Management in Clinical Laboratories: Promoting Patient Safety Through Risk Reduction And Continuous Improvement, P. Valenstein, CAP, 2005
- CAP Laboratory Accreditation Manual: <u>http://www.cap.org/apps/docs/laboratory\_accreditation/standards/lap\_manual\_0707.pdf</u>
- CLSI Guidelines: GP2-A5, QMS20-R, QMS01-A4



#### RESOURCES



#### Wager, Horowitz & Siegel's

#### LABORATORY ADMINISTRATION FOR PATHOLOGISTS

Second Edition

Andrew Colored Michael & Color Document & Color Second & Color Sec

Strater & Astronom

#### Wagar, Horowitz & Siegal's Laboratory Administration for Pathologists

Elizabeth A. Wagar, MD, Michael B. Cohen, MD, Donald S. Karcher, MD, and Gene P. Siegal, MD, PhD



#### SUMMARY

Do your people know what they are doing?

Does your process produce quality results?

Thank you!



