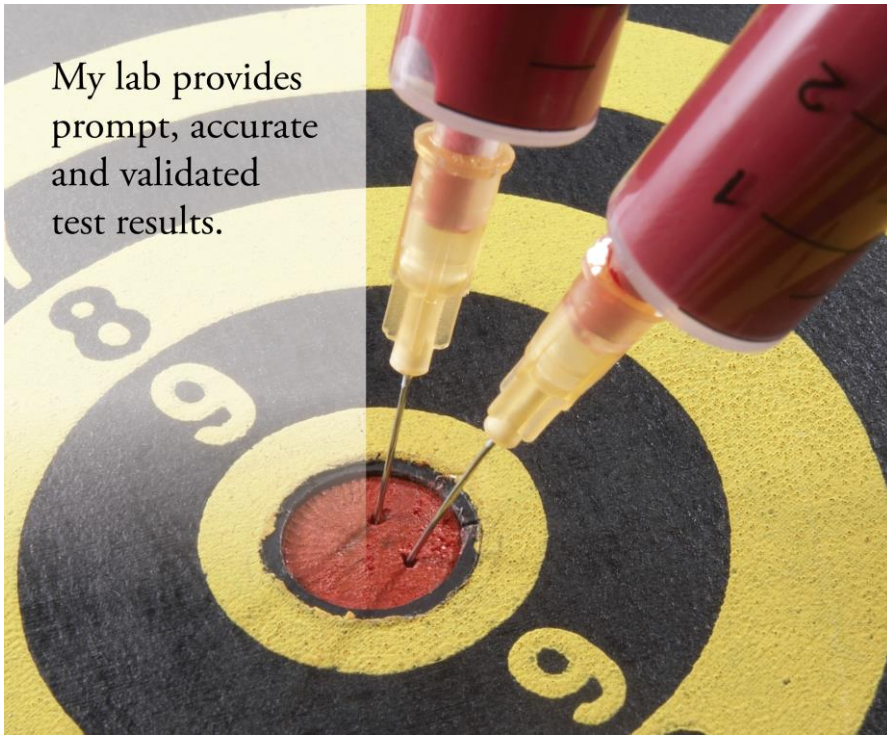
MODULE 8

Laboratory Testing

2015 Version



SLMTA Trainer's Guide

Overview

MODULE 8. LABORATORY TESTING

Performance Outcome

With satisfactory participation in the training and successful implementation of laboratory improvement projects, a participant's laboratory should achieve the following outcome:

- All laboratory tests are performed promptly and accurately
- Test results are validated and recorded before release

Checklist Items Supported by this Module

This module supports the requirements for the following items from the SLIPTA Checklist:

1.2, 1.5, 6.1, 7.10, 8.1, 8.2, 8.3, 8.4, 8.7, 8.8, 8.9, 8.12, 9.1, 9.2, 9.3, 9.4, 9.8, 10.3

Learning Objectives (Management Tasks)

By the end of this module, participants should be able to perform the following management tasks:

1. Monitor testing to ensure SOP's are followed and tests are performed and reported properly and promptly
2. Cross-check test reports against test request to ensure completion of all tests
3. Review test records and findings promptly to ensure accuracy and timely release of test results
4. Validate assigned tests and specific abnormal results

What's in this Module?

ACTIVITY TITLE	PURPOSE	DURATION
Validation of Test Results	The total testing process can be divided into three phases, the pre-analytical phase, the analytical phase, and the post analytical phase. A problem or error in any of the three phases can invalidate the results of the entire testing process. In this activity, participants identify the potential sources of errors or problems and create a checklist to verify patient results before their release.	1 hour
Is the Test Report Ready to be Released?	Test result reports should be complete, accurate, legible, and clinically valid. In this activity, participants cross-check a test report to identify errors and omissions that must be resolved before the report is released.	45 min
	TOTAL ACTIVITY TIME:	**1hr 45 min**

Overview

TABLE OF CONTENTS

ACTIVITY Validation of Test Results

Module 8

PURPOSE:

The total testing process can be divided into three phases, the pre-analytical phase, the analytical phase, and the post analytical phase. A problem or error in any of the three phases can invalidate the results of the entire testing process. In this activity, participants identify the potential sources of errors or problems and create a checklist to verify patient results before their release.

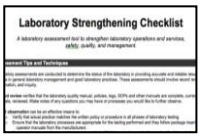
RESOURCES FOR FACILITATOR:

- ❑ PowerPoint slides: 8.5 to 8.7
- ❑ Tool: Validation Items
- ❑ Tape, flipchart and markers

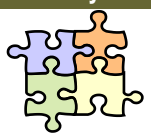
RESOURCES FOR PARTICIPANT:

None

This activity supports the following laboratory management tasks and SLIPTA checklist items

Management Tasks 	6.4 Validate new equipment, reagents, and supplies 7.3 Enforce good specimen handling and processing practices 8.4 Validate assigned tests and specific abnormal results
Checklist Items 	1.2 Laboratory Quality Manual Is there a current laboratory quality manual, composed of the quality management system's policies and has the manual content been communicated to, understood and implemented by all staff? 1.5 Laboratory Policies and Standard Operating Procedures Are policies and/or standard operating procedures (SOPs) for laboratory functions, technical and managerial procedures current, available and approved by authorized personnel? (Purchasing and Inventory Control; Pre-examination Processes; Validation and Verification of examination procedures / Equipment; Quality Control and Quality Assurance) 6.1 Internal Audits Are internal audits conducted at intervals as defined in the quality manual and do these audits address areas important to patient care? 7.10 Product Expiration Are all reagents/test kits in use (and in stock) currently within the manufacturer-assigned expiration or within stability? 8.1 Information for patients and users Are guidelines for patient identification, specimen collection (including client safety), labelling, and transport readily available to persons responsible for primary sample collection? 8.2 Does the laboratory adequately collect information needed for examination performance? 8.3 Are adequate sample receiving procedures in place? 8.4 Pre-examination Handling, Preparation and Storage Where testing does not occur immediately upon arrival in the laboratory, are specimens stored appropriately prior to testing? 8.7 Documentation of Examination Procedures Are examination procedures documented in a language commonly understood by all staff and available in appropriate locations? 8.8 Reagents Acceptance Testing Is each new reagent preparation, new lot number, new shipment of reagents or consumables verified before use and documented? 8.9 Quality Control Is internal quality control performed, documented, and verified for all tests/procedures before releasing patient results? 8.12 Are environmental conditions checked and reviewed accurately? 9.1 Test Result Reporting System Are test results legible, technically verified by an authorized person, and confirmed against patient identity? 9.2 Testing Personnel Are testing personnel identified on the result report or other records (manual or electronic)?

	9.3 Report Content 9.8 Test Result Are test results validated, interpreted and released by appropriately-authorized personnel? 10.3 Is corrective action performed and documented for non-conforming work?

This activity is related to the following activities:	
	Cross-Cutting: Process Mapping Module 8: Is the Test Report Ready to Be Released?

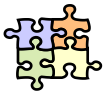
ACTIVITY AT-A-GLANCE				
Step		**Time**	**Resources**	**Key Points**
1	Review the 3 phases of the total testing process	10 min	Slides 8.5 to 8.6	
2	Introduce the activity	5 min	Slide 8.7	
3	Conduct the activity	20 min		
4	Review the validation checklists from both teams	15 min		
5	Debrief the activity	5 min	Tool	
6	Conclude the Activity	5 min		
	TOTAL TIME:	**60 min**		

PROCESS

Preparation

- Procure 6 sheets of flipchart paper and 6 markers.
- Label at the top of 2 sheets with the heading, "Pre-analytical." Repeat this labeling for "Analytical" and "Post Analytical" so that you create 2 sets of 3 sheets each with one of the phases labeled at the top.

Step 1. Review the 3 phases of the total testing process 10 min



- Project Slides 8.5 to 8.6 to introduce the activity and the total testing process. Review the 3 phases so that each participant understands what activities occur within each phase. If the 'Process Table' (from the *Process Mapping* activity) is still visible in the classroom, point out the 3 phases and their associated steps.
- Emphasize that a problem or error in any of the three phases can invalidate the results of the whole testing process. Stress that wrong laboratory results will negatively impact the quality of the patient's care and treatment.
- Explain the importance of identifying all the potential sources of errors or problems that can invalidate the patient's results. By recognizing these potential pitfalls, a validation checklist can be created.
- Provide an example of a potential error and a checklist item for each phase. See the table for suggested examples.

Phase	Pitfall (Error or Problem)	Validation Item
Pre-analytical	Specimen not labeled	Correct specimen labeling
Analytical	Alert value not recognized	Confirm all critical results by repeat testing
Post Analytical	Alert value not recognized	All critical results are called, read back, and documented

Step 2. Introduce the activity 5 min

- Project Slide 8.7 to provide an overview of the activity.
- Divide the class into 2 teams. Select a team captain for each group.
- Hand one set of 3 flipchart sheets (Pre-analytical, Analytical, Post Analytical) previously prepared and 3 markers to each team captain.
- Explain that each team will create a validation checklist for each of the 3 phases. Indicate that participants may want to jot down pitfalls and transform them into a validation checklist item before writing them onto the appropriate flipchart page. The team captains can divide their teams as they see fit and designate a lead person for each phase. Indicate that each team has 20 minutes to create a validation checklist.
- Explain the scoring to the participants. At the end of 20 minutes, each phase developed by each team will be taped side-by-side.
  - Points will only be awarded for each item not included by the other team.
  - If the same item is noted by both teams, no points will be awarded.

  - The team with the highest number of points wins.
  - Using the table above and providing a concrete example, explain how points would be awarded or not awarded. For example, if both teams include "Correct specimen labeling," then no points are awarded to either team. If only one team includes "All critical results are called," then that team receives one point.
- Explain that participants may use the *Framework Tasks* and the *SLIPTA Checklist* to brainstorm for ideas.

Step 3. Conduct the activity — 20 min

- Allow participants 20 minutes to create their validation checklist.
- Provide impartial assistance and coaching where necessary.

Step 4. Review the validation checklists from both teams — 15 min

- Tape each phase side-by-side and circle all common items noted by both teams for each phase. To speed the review, have the team captains review the other phases.
- Review each phase with the class by discussing each common element from one team's list and each uncommon element from both team's list. Facilitate a discussion regarding what policies and procedures must be available to the staff to effectively use this checklist. For example if the following item is listed, "All critical results are called," then a critical list must be developed (all glucoses < 2.8 mmol/L or >22.2mmol/L), a laboratory policy for criticals, and a procedure for critical notification.
- Tally the score at the end of each phase. Announce the winning team.

Step 5. Debrief the activity — 5 min

- Offer any suggestion of checklist items overlooked by both teams. Refer to Tool: Validation Items for an expected list of items.
- Emphasize that for this validation checklist to be utilized, the necessary policies and procedures must be developed and communicated to the staff.
- Explain the difference between QA (quality assessment) and QC (quality control). Connect the term 'QA' with this activity.
- Explain how the cross-checking step fits into and compliments the verification checklist.

Step 6. Conclude the Activity — 5 min

- Highlight or reiterate the key messages below.
- Make certain participants achieved the objectives of the activity.

KEY MESSAGES

- The assurance of quality laboratory results relies on a commitment to assess all aspects of the total testing process.
- A problem or error in any of the three phases can invalidate the results of the entire testing process.
- For a QA program to be effective, the necessary policies and procedures must be developed and available to staff members.

ACTIVITY OBJECTIVES MET?

Can they:

- Recognize that a problem or error in any of the three phases can invalidate the results of the whole testing process?
- Identify potential pitfalls at each phase of the total testing process?
- Create a checklist to verify areas before patient results are released?

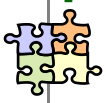
Connections and Applications

- The 3 phases can be simply stated as follows:
  - Pre-analytical – before testing
  - Analytical – testing which includes QC
  - Post Analytical – after testing

Pre-Analytical	Analytical	Post-Analytical
Test ordering Sample collection Sample transport and storage Sample receipt and processing	Testing and examinations (manual and automated) Result review and follow-up Interpretation	Result reporting, distribution, and archiving Sample storage and retrieval

- The aim of quality assessment (QA) is to create and follow policies and procedures so that the most accurate and reliable laboratory results are provided and to minimize errors throughout all phases of the total testing process.
- Quality Control (QC) is a component of QA. A QC system monitors and detects changes in the analytical performance of the test system. QC is used to validate the analytical phase of patient testing.
- QA activities must go beyond the boundaries of the laboratory to monitor all aspects of laboratory performance.
- The quality manual contains the laboratory's overall quality policy, the quality objectives, and the policies, processes, and procedures for each quality system essentials (QSE's). Overall, the laboratory requires two types of manuals, one containing all the technical procedures necessary for the three phases of testing, and a quality manual. The quality manual contains all non-technical procedures that are integral for managing a quality laboratory. Examples of non-technical areas include: training staff and assessing competency, defining document and record retention schedules, investigating occurrences, and defining safety practices, laboratory restrictions, and the use of personal protective equipment (PPE).

➤➤ Connections and Applications



- Cross-checking is the final step before the release of the results from the laboratory. It provides an additional review of the report by a second staff member. Link this to the activity, *Is the Test Ready to Be Re Released?*.

Tool: Validation Items

Expected List of Items for Validation of Test Results

Pre-analytical

- Patient identification
- Correct specimen labeling
- Proper patient preparation
- Proper sample presentation
- Requisition/order matches specimen
- Requisition has accurate contact (ordering party information)
- Specimen in acceptable condition
- Specimen transported appropriately
- Log book entry matches specimen
- Any abbreviations are confirmed
- Person collecting the samples is identified
- Date and time of collection is indicated

Analytical

- Results make sense clinically
- Results are within the linearity of the analyzer's range
- If diluted, final results are calculated correctly with the correct dilution factor
- There were no flags on the analyzer's results that need investigation
- QC associated with the result run was acceptable
- Reagents and test kits used are within expiry date
- Panic (critical) values are confirmed
- Confirmatory testing or established testing algorithms are completed
- Previous patient results are available to assist with interpretation of current sample's result

Post Analytical

- Each test ordered has an appropriate result including test and result match
- Proper concentration units for result has been used
- Decimal place is correct if result has decimals
- Person performing the test is identified
- Result release is dated and timed
- All results and documentation are legible
- Immediate notification and documentation of a Panic (critical) Value. Submission of results and verification of the recipient's accurate receipt of results using a read-back-of-results mechanism.
- Report interpretative information, which assists clinician with interpretation of test result (information is not misleading, inadequate or contradictory)

ACTIVITY Is the Test Report Ready To Be Released? Module 8

PURPOSE:

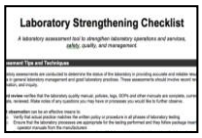
Test result reports should be complete, accurate, legible, and clinically valid. In this activity, participants cross-check a test report to identify errors and omissions that must be resolved before the report is released.

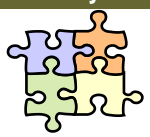
RESOURCES FOR FACILITATOR:

- ❑ PowerPoint slides: 8.9 to 8.12
- ❑ Tool: Laboratory Report Answers
- ❑ Tape, flipchart and markers

RESOURCES FOR PARTICIPANT:

- ❑ Handout: Errors Noted (801)
- ❑ Worksheet 1: Laboratory Report (802)
- ❑ Worksheet 2: Report for Review (803)
- ❑ Job Aid: Cross-checking Guidelines (804)

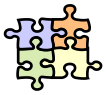
This activity supports the following laboratory management tasks and SLIPTA checklist items	
Management Tasks 	8.1 Monitor testing to ensure SOPs are followed and tests are performed and reported properly and promptly 8.2 Cross-check test reports against test request to ensure completion of all tests 8.3 Review test records and findings promptly to ensure accuracy and timely release of test results 8.4 Validate assigned tests and specific abnormal results 9.1 Aggregate and report all test findings for each patient
Checklist Items 	1.5 Laboratory Policies and Standard Operating Procedures Are policies and/or standard operating procedures (SOPs) for laboratory functions, technical and managerial procedures current, available and approved by authorized personnel? (Identification and Control of Nonconformities; Authorization; Reporting and Release of Results) 9.1 Test Result Reporting System Are test results legible, technically verified by an authorized person, and confirmed against patient identity? 9.2 Testing Personnel Are testing personnel identified on the result report or other records (manual or electronic)? 9.3 Report Content 9.4 Analytic System/Method Tracing When more than one instrument is in use for the same test, are test results traceable to the equipment used for testing? 9.8 Test Result Are test results validated, interpreted and released by appropriately-authorized personnel? 10.3 Is corrective action performed and documented for non-conforming work?

This activity is related to the following activities:	
	Module 1: Whisper Down the Alley Module 1: What are the Benefits of a Standardized Process? Module 1: Competency Assessment Module 6: Using Standard Operating Procedures Module 10: Why Was The Outdated Version Used?

ACTIVITY AT-A-GLANCE				
Step		**Time**	**Resources**	**Key Points**
1	Introduce the activity	5 min	Slides 8.9 to 8.10 Worksheet 1	
2	Conduct the activity	10 min	Worksheet 1	
3	Review the test report	10 min	Slides 8.10 to 8.11 Job Aid Worksheet 1 Handout Tool	
4	Discuss how to document the cross-check review	10 min	Slide 8.12 Worksheet 2	
5	Discuss the importance of cross-checking	5 min		
6	Conclude the activity	5 min		
	TOTAL TIME:	**45 min**		

PROCESS

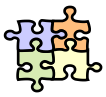
Preparation



- Verify the printing quality is sufficient for Worksheet 1: Laboratory Report and Worksheet 2: Report for Review in the participant's manual. If printing quality is insufficient or English is not used in the report, then procure blank in-country result reports. Add entries (both errors and omissions) to create Worksheet 1. Create an acceptable report to use for Worksheet 2. If the approved report document is missing important information (i.e. reference ranges or units), consider facilitating a discussion regarding essential report components and the necessary steps to revise an approved document. Link this to the activity, *Why Was The Outdated Version Used?*.

Step 1. Introduce the activity 5 min

- Project Slide 8.9 to introduce the activity.
- Explain the importance for creating a cross-checking workstation.
  - Emphasize that the product produced by the laboratory is accurate and reliable results. In order to ensure high quality results, the final step before the release of results from the laboratory should be a cross-check.



  - Remind participants about the activity, *What are the Benefits of a Standardized Process?*
  - Explain that standardization makes errors more difficult to commit and more visible when committed.
  - Explain that through this activity the last benefit, "absorb errors that are committed," will be emphasized. It is through cross-checking that errors which slip past standardization are detected and addressed before the results are released (i.e. the errors are absorbed within the laboratory).
- Project Slide 8.10 and refer participants to Worksheet 1: Laboratory Report.
  - Explain to the participants that they will cross-check a test report. Participants will work individually to identify all omissions or errors committed by the laboratory staff members by circling them on their worksheet.
  - Emphasize that they are to review this record and not focus on the document (approved report format for this laboratory).
  - Instruct participants to complete the 'Patient Information' section located in the lower right hand corner of Worksheet 1 with either their own information or that of someone close to them (e.g., their mother, son, etc.). Emphasize the connection between results reported and patient care (i.e. patient care is based on laboratory results).

Step 2. Conduct the activity 10 min

- Inform the participants they have 10 minutes to cross-check the report.
- Remind participants to focus on the laboratory staff's errors or omissions on Worksheet 1: Laboratory Report.

Step 3. Review the test report 10 min

- Distribute or reference Job Aid: Cross-checking Guidelines.
- Project Slide 8.10 to refer to during the classroom discussion
- Ask each participant to provide a response for an error or omission identified on the worksheet. See Tool: Laboratory Report Answers. Discuss and connect each response with Job Aid. Ensure the discussion includes ways to resolve or prevent the error or omission.
- Project Slide 8.11 and refer participants to Handout: Errors Noted. Ensure every error or omission was discussed. Refer to Tool for a list of errors and omissions.

Step 4. Discuss how to document the cross-check review 10 min

- Project Slide 8.12 and refer participants to Worksheet 2: Report for Review.
- Indicate that this approved document does not have an area for the technologist or supervisor who performed the cross check to initial or date the record.
  - Ask participants to suggest ways to document that the cross-check review was performed (i.e. initials/date noted in upper right hand corner of the report or the cross-checker initials and enters the 'Report Date/Time'). Discuss how this procedural step can be addressed/standardized in the SOP and communicated to staff.
  - Select one suggestion and instruct participants to perform the documentation of their review on Worksheet 2. Indicate the report is ready to be released to the customer.

Step 5. Discuss the importance of cross-checking 5 min

- Discuss the advantages of cross-checking reports before results are released.
- Discuss ways their laboratory can begin to implement cross-checking in their test workflow process and to organize a cross-checking workstation.

Step 6. Conclude the activity 5 min

- Highlight or reiterate the key messages below.
- Make certain participants achieved the objectives of this activity.

KEY MESSAGES

- A cross-check provides a quality step to review accuracy and reliability of results prior to release.
- Each test request should have a corresponding result that is accurate and clinically meaningful.
- Laboratory errors and omissions are best handled prior to their release from the laboratory. However the most efficient way to handle errors is to prevent their initial occurrence.

Can they:

- Cross-check a laboratory report identifying errors and omissions?
- Provide next steps to resolve or prevent the errors or omissions?

ACTIVITY OBJECTIVES MET?

Connections and Applications

- Mistakes are best handled by first preventing them and second by addressing them immediately. The most effective principles to achieve this are standardization and confirmation. Standardization means the work is performed the same way each time. Confirmation means detecting and addressing the error which slips past standardization before the error is released to the customer.
- Behind every result reported is a patient. A cross-check, the final inspection of the report prior to its release, improves the quality of the laboratory and patient care.
- Cross-checking provides additional benefits beyond the validation of results at the individual workstation.
  - With the review of a consolidated report on the patient, additional clues may be noticed that need further investigation. For example, if the chemistry workstation indicated the sample was moderately hemolozyed, the hematology sample may require further investigation and review of the RBC and hematocrit results.
  - With the review of a batch of results from a workstation, patterns may be noticed. For example, if numerous calcium results are consistently reported for all patient types greater than the established reference range, the validity of the results should be questioned. In hematology, if the MCHC is consistently increased, further review of the instrument should be investigated.
- Standard operating procedures (SOPs) must specify how to report a result for a test. To standardize what constitutes a reportable format, the SOP should state acceptable responses, significant figures (where applicable), units of measure, and any other pertinent information. Link this concept to the following activities: *Whisper Down the Alley, What are the Benefits of a Standardized Process?*, and *Using Standard Operating Procedures*.
- All reports should have the initials of personnel who performed the tests with the corresponding result. Acceptable responses may include: test not indicated (NI), quantity not sufficient (QNS), or hemolyzed – unable to report. Policies and procedures must be established for the use of standardized abbreviations and the handling of unsatisfactory samples. If a test can not be performed because the specimen is unsatisfactory or QNS, it must be recorded on the report. If this information is not recorded, it will appear as if the request was overlooked.
- Ensure staff members are familiar with the SOPs in order to standardize the reported results. Policies and procedures should be established to address critical results, ammended results, abbreviations, and unsatisfactory specimen

➤➤ Connections and Applications

reports. Consider the review of a SOP or policy during a staff meeting that involves a common issue encountered at the cross-check workstation.

- Ensure training and competency assessment includes how to correctly complete the test report for all phases of the laboratory. Link this concept to the *Competency Assessment* activity.
- Utilize the instrument software to assist technologist with result reports.
  - Instrument set-up parameters for result reports should be the same as the SOPs specified format. For example, if a test is reported in whole numbers, then program the instrument's set-up parameter to only report whole numbers on the print-out. Carefully set the instrument's parameters so that any additional interpretive steps required by the technologist are removed. Become familiar with the manufacturer's operation manual to see if the set-up parameters are specific to non quality control (QC) results only or if they also involve the QC format.
  - Instrument set-up parameters for result reports should be in alignment with the report format. For example, the test print-out order on the report for a panel can be set in the same order as the instrument's set-up parameters. Select the same order as it appears on the report or logbook so result inversions do not occur when results are transcribed.
- Post the Job Aid: Cross-checking Guidelines at the workstation to assist staff members to cross-check reports.
- When questionable requests appear on the requisition, always clarify the requests with the provider or nursing unit who ordered the test. For example, a urine pregnancy request on a male indicates a transcription error (test never ordered, incorrect patient information supplied, or wrong patient identity entered on the request). It may also reflect the incorrect test choice if the request was for the beta-HCG tumor marker.
- The information recorded on the report should be sufficient to recreate the entire test sequence for each phase of the test process.
- Critical means 'life-threatening' and must be quickly acted upon. Policies and procedures must be established that define what constitutes a critical result and how to handle and document a critical result on the report and in the log book. All critical results should be verified by either a repeat of the test or verified by other means, for example, a peripheral smear review. If a test is repeated on the same sample, it should be noted it was verified on the same sample. If the specimen was recollected, it should be noted that verification was performed on a recollected, second sample.
- An excellent gauge to determine legibility is to note if the result must be looked at twice to determine its value, then it is not legible.
- The results should be aligned by using the decimal point, which makes the report easier to scan and interpret for the provider.

Tool: Laboratory Report Answers

Errors and Omissions on the Laboratory Report (Worksheet)

Hematology Section	▪ CBC alignment – decimal alignment makes it easier to scan and interpret results. ▪ RBC result – illegible ▪ HCT result – illegible. If the result is 22% and not 33%, H & H does not match ▪ RDW – incorrect decimal placement; should be 16.0% ▪ PLT (platelet) ○ Random erroneous mark on requisition could make result appear as 122 ○ No documentation that the critical value was confirmed or notified to customer ▪ Differential ○ Count - exceeds 100 cells ○ Initials of tech who performed the test are absent ○ Macrocytosis - indicated with a MCV of 68.9 fl
Chemistry Section	▪ Initials of tech who performed the test are absent ▪ Normal BUN with an elevated creatinine – shows an inconsistent relationship between results and indicates a test or instrument issue. ▪ Bilirubin results -written on wrong line (one row above) ▪ D-Bili (direct bilirubin) - value does not have a leading zero ▪ ALT - reported to the tenths but reference value is reported to the whole number ▪ Calcium and Phos (phosphorus) - overlooked
Additional In-House Testing	▪ Urine pregnancy - tech who performed the analysis forgot to indicate result ▪ If the patient is a male (supplied by participant), then the request is incorrect.
Urinalysis	▪ Glucose – result is illegible ▪ Specific Gravity (SG) – numbers inverted, should be 1.025. urinalysis strips measure SG in increments of 0.005 ▪ pH- there is no decimal point ▪ Nitrite – inconsistent report format. For format to remain consistent, the word 'positive' should be used ▪ Microscopic ○ Performing tech initials absent ○ WBC and Bacteria microscopic results do not correlate with macroscopic results, possible patient mix-up
Turn-around Time (TAT)	Too long for requested tests, report date and receive date differ by 2 days

Worksheet 1: Laboratory Report

Cape Regional Laboratory

Report Date/Time: 5-10-2008 1500

Lab #: 32
Drawn by: SL
Collected Date/Time: 3-10-2008 0815

Hematology

[X] CBC — Tech initials: SL

Results		Adult Normal Values		
		M 3.3 - 10.0	F 3.4 – 9.8	
15.3	WBC			x10³/ul
3.94	RBC	4.35 - 5.9	3.69 – 5.13	x10⁶/ul
11.0	HGB	13.7 - 16.7	11.7 – 14.5	g/dl
32.0	HCT	40.5 - 49.7	34.1 – 44.3	%
68.9	MCV	79.7 – 92.0	81.5 – 96.7	fl
22.6	MCH	26.1 – 33.3	26.5 – 33.5	pg
31.0	MCHC	32.2 – 35.0	31.9 – 35.3	g/dl
1.60	RDW	11.6 – 14.4		%
122	PLT	140 - 440		x10³/ul

[X] Differential — Tech initials:

		Adult Normal Values
85	Neutrophils	45 – 66%
10	Bands (Neutrophilic)	1 – 12%
7	Lymphocytes	20 – 40%
	Atypical Lymphocytes	0 – 2%
	Monocytes	4 – 10%
	Eosinophils	1 – 6%
	Basophils	0 – 2%
	Other	

RBC Morphology [ ] Normal Morphology

	Anisocytosis
	Microcytosis
+2	Macrocytosis
+1	Hypochromia
	Poikliocytosis

Morphology Terms
1 = Slight
2 = Moderate
3 = Marked

Chemistry

[ ] Basic [ ]Comprehensive [ ] LFT [ ] Lipid — Tech initials

	Result	Normal (M / F)		Result	Normal (M / F)
[ ] GLUC		3.9 – 5.8 mmol/l -fasting	[X] ALT	30.1	< 41 / < 31 U/L
[X] UREA	4.9	2.5 – 6.4 mmol/L	[ ] AST		< 37 / < 31 U/L
[ ] Na		136 - 145 mmol/L	[ ] ALP		53 – 128 / 42 – 98 U/L
[ ] K		3.5 – 5.3 mmol/L	[ ] CK		38 – 171 / 26 – 145 U/L
[ ] Cl		98 - 110 mmol/L	[ ] LDH		230 – 460 U/L
[X] CREAT	418	62–115 / 53 -97 umol/L	[ ] AMY		27 – 102 U/L
[ ] URIC ACID		208– 430 / 155 - 360 umol/l	[X] CALCIUM		2.15 – 2.50 mmol/L
[ ] T- PROT		64 – 83 g/L	[X] PHOS		0.87–1.45 mmol/L
[ ] ALBUMIN	6.0	35 – 52 g/L	[ ] CHOL		3.6 – 5.7 mmol/L
[X] T-BILI	.5	5.1 – 20.5 umol/L	[ ] TRIG		< 2.26 mmol/L
[X] D-BILI		0.0 – 3.4 umol/l	[ ] HDL-C		0.78 – 1.94 / 0.85–2.38 mmol/L
[ ] GGT		< 55 / < 38 U/L	[ ] calc LDL-C		< 1.71 – 5.44 / 1.48–5.80 mmol/L
[ ] Glucose Result by Glucometer		4.1 – 5.9 mmol/l -fasting			

Additional In-House Testing

Tech initials: AM			Normal Values
[X] Urine Pregnancy	POS	NEG	N/A
[ ] CRP	POS	NEG	NEG
[ ] Malaria Rapid	POS	NEG	NEG
[ ] RPR	WEAK REACTIVE / REACTIVE	NON REACTIVE	NON REACTIVE
[ ] KOH	Source:		
[ ] Saline Prep			
[ ] Gram Stain			

CCMS Urinalysis

[X] Tech initials: AM

		Normal Values
yellow	Color	N/A
hazy	Appearance	N/A
16	Urobilinogen	<16 umol/L
~~neg~~	Glucose	Negative (mmol/L)
neg	Bilirubin	Negative (ummol/L)
neg	Ketones	Negative (mmol/L)
1.052	Specific Gravity	1.005 – 1.030
moderate	Blood	Negative
6.5	pH	5.0 – 8.0
1.0	Protein	Negative (g/L)
(+)	Nitrite	Negative
moderate	Leukocytes	Negative

[X] Microscopic — Tech initials:

	WBC/HPF	Crystals:
10-20	RBC/HPF	
	EPI-renal/HPF	Casts/LPF:
5-10	EPI-squamous /HPF	
	Bacteria	Trichomonas / Yeast / Parasite:
	Mucus	

Quality Assurance

Date Requested: 3/10/08
Ordering Doctor: Smith

[X] Routine [ ] Stat [ ] Waiting [X] Fasting [ ] Non-Fasting

QA Review:

Date: ____/____/____ Comments: _____

Doctor Signature: _____

Patient Information

Name (surname, first): _____

D.O.B.: ____/____/____ Age: _____ [ ] Male [ ] Female

Patient No.: _____

Diagnosis:

Job Aid: Cross-Checking Guidelines

Cross-Checking Guidelines
Items to be verified prior to release of test results

Completeness

- Each test has a corresponding result
- Patient information
- Clinical information
- Provider information
- Specimen information
- Collection information
- Initials of staff member who performed each test indicated
- Date and time of report
- Result information identical with log book

Critical (Panic Values)

- Result verified and verification documented
- Documentation of result notification
  - On result report
  - In log book

Testing Priority

- STAT request's communicated and documented
- Delays communicated and documented

Specimen Rejection

- Reason for specimen rejection documented
- Clinician and / or patient notified and this notification is documented

Result Information

- Legible
- Proper placement of decimals
- Uniform result alignment with regards to decimal placement
- Format of results corresponds with SOP
- Proper units and significant places
- Abbreviations used from approved list
- Within instrument linearity
- No associated instrument codes with regard to accuracy
- Result corresponds with correct test
- Diluted results multiplied with correct dilution factor
- No consistent pattern or trend exhibited between patients for a specific analyte during cross-checking unless patient grouping under review is from the same diagnosis/population pool (i.e. Newborn hemoglobin and hematocrit)

Appropriateness

- Test relevant to patient's age and gender
- Result information makes clinical sense
  - Electrolytes
  - BUN/Creatinine
  - Macroscopic with microscopic
  - Instrument with smear
  - RBC Indices, RBC count, Hemoglobin and Hematocrit all show agreement

Handout: Errors Noted

Cape Regional Laboratory

Report Date/Time: 5-10-2008 1500

Lab #: 32
Drawn by: SL
Collected Date/Time: 3-10-2008 0815

Hematology

[X] CBC — Tech initials: SL

Results		Adult Normal Values		
15.3	WBC	M 3.3 - 10.0	F 3.4 – 9.8	x10³/ul
3.94	RBC	4.35 - 5.9	3.69 – 5.13	x10⁶/ul
11.0	HGB	13.7 - 16.7	11.7 – 14.5	g/dl
32.0	HCT	40.5 - 49.7	34.1 – 44.3	%
68.9	MCV	79.7 – 92.0	81.5 – 96.7	fl
22.6	MCH	26.1 – 33.3	26.5 – 33.5	pg
31.0	MCHC	32.2 – 35.0	31.9 – 35.3	g/dl
1.60	RDW	11.6 – 14.4		%
422	PLT	140 - 440		x10³/ul

[X] Differential — Tech initials: [ ]

		Adult Normal Values
85	Neutrophils	45 – 66%
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RBC Morphology [ ] Normal Morphology

	Anisocytosis	**Morphology Terms**
	Microcytosis	1 = Slight
+2	Macrocytosis	2 = Moderate
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	Poikliocytosis	

Chemistry

[ ] Basic [ ]Comprehensive [ ] LFT [ ] Lipid — Tech initials

	Result	Normal (M / F)		Result	Normal (M / F)
[ ] GLUC		3.9 – 5.8 mmol/l -fasting	[X] ALT	30.1	< 41 / < 31 U/L
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[X] D-BILI		0.0 – 3.4 umol/l	[ ] HDL-C		0.78 – 1.94 / 0.85–2.38 mmol/L
[ ] GGT		< 55 / < 38 U/L	[ ] calc LDL-C		< 1.71 – 5.44 / 1.48–5.80 mmol/L
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Additional In-House Testing

Tech initials: AM

				Normal Values
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[ ] Malaria Rapid	POS		NEG	NEG
[ ] RPR	WEAK REACTIVE	REACTIVE	NON REACTIVE	NON REACTIVE

[ ] KOH — Source:
[ ] Saline Prep
[ ] Gram Stain

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[X] Tech initials: AM

		Normal Values
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16	Urobilinogen	<16 umol/L
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moderate	Blood	Negative
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	WBC/HPF	Crystals:
10-20	RBC/HPF	
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5-10	EPI-squamous /HPF	
	Bacteria	Trichomonas / Yeast / Parasite:
	Mucus	

Quality Assurance

Date Requested: 3/10/08 — Ordering Doctor: Smith

[X] Routine [ ] Stat [ ] Waiting [X] Fasting [ ] Non-Fasting

QA Review:

Date: ___/___/___ Comments: _____

Doctor Signature: _____

Patient Information

Name (surname, first): _____

D.O.B.: ___/___/___ Age: _____ [ ] Male [ ] Female

Patient No.: _____

Diagnosis:

Worksheet 2: Report for Review

Cape Regional Laboratory

platelet count verified by peripheral smear critical plt called to Dr Smith at 1122 3-10-08 SL

Report Date/Time: 3-10-2008 1500

Lab #: 32
Drawn by: SL
Collected Date/Time: 3-10-2008 0815

Hematology

☒ CBC — Tech initials: SL

Results		Adult Normal Values		
		M	F	
15.3	WBC	3.3 - 10.0	3.4 – 9.8	x10³/ul
3.96	RBC	4.35 - 5.9	3.69 – 5.13	x10⁶/ul
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68.9	MCV	79.7 – 92.0	81.5 – 96.7	fl
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22	PLT (22)	140 - 440		x10³/ul

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RBC Morphology [ ] Normal Morphology

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	Macrocytosis	
+1	Hypochromia	
	Poikliocytosis	

Chemistry

[ ] Basic [ ]Comprehensive [ ] LFT [ ] Lipid — Tech initials GW

	Result	Normal (M / F)		Result	Normal (M / F)
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☒ UREA	14.9	2.5 – 6.4 mmol/L	[ ] AST		< 37 / < 31 U/L
[ ] Na		136 - 145 mmol/L	[ ] ALP		53 – 128 / 42 – 98 U/L
[ ] K		3.5 – 5.3 mmol/L	[ ] CK		38 – 171 / 26 – 145 U/L
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☒ CREAT	418	62–115 / 53 -97 umol/L	[ ] AMY		27 – 102 U/L
[ ] URIC ACID		208– 430 / 155 - 360 umol/l	☒ CALCIUM	2.30	2.15 – 2.50 mmol/L
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[ ] GGT		< 55 / < 38 U/L	[ ] calc LDL-C		< 1.71 – 5.44 / 1.48–5.80 mmol/L
[ ] Glucose Result by Glucometer		4.1 – 5.9 mmol/l -fasting			

Additional In-House Testing

Tech initials: AM

				Normal Values
☒ Urine Pregnancy	POS	NEG		N/A
[ ] CRP	POS	NEG		NEG
[ ] Malaria Rapid	POS	NEG		NEG
[ ] RPR	WEAK REACTIVE	REACTIVE	NON REACTIVE	NON REACTIVE

[ ] KOH — Source:
[ ] Saline Prep
[ ] Gram Stain

CCMS Urinalysis

☒ Tech initials: AM

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yellow	Color	N/A
hazy	Appearance	N/A
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negative	Glucose	Negative (mmol/L)
negative	Bilirubin	Negative (ummol/L)
negative	Ketones	Negative (mmol/L)
1.025	Specific Gravity	1.005 – 1.030
moderate	Blood	Negative
6.5	pH	5.0 – 8.0
1.0	Protein	Negative (g/L)
positive	Nitrite	Negative
moderate	Leukocytes	Negative

☒ Microscopic — Tech initials: AM

5-10	WBC/HPF	Crystals:
10-20	RBC/HPF	
	EPI-renal/HPF	Casts/LPF:
3-5	EPI-squamous /HPF	
moderate	Bacteria	Trichomonas / Yeast / Parasite:
	Mucus	

Quality Assurance

Date Requested: 3/10/08 Ordering Doctor : Smith

☒ Routine [ ] Stat [ ] Waiting ☒ Fasting [ ] Non-Fasting

QA Review:

Date: ___/___/___ Comments: _____

Doctor Signature: _____

Patient Information

Name (surname, first): _____

D.O.B.: ___/___/___ Age: _____ [ ] Male [ ] Female

Patient No.: _____

Diagnosis: