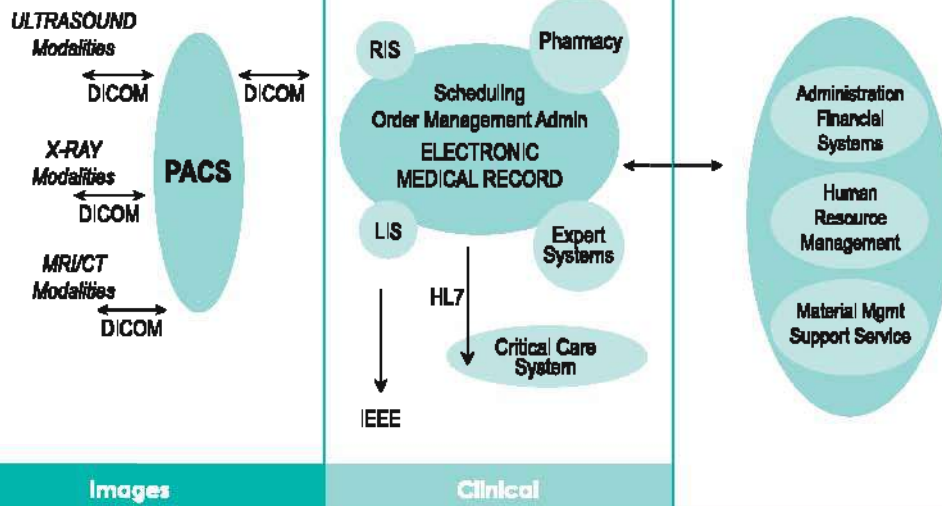


## THIS STRUCTURE



# LABORATORY INFORMATION SYSTEM

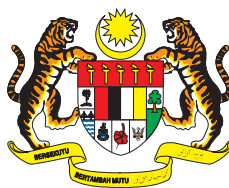
CLINICAL BASED

NON CLINICAL

## Functional Requirements Brief Hospital Information System



Health Informatics Standards  
Ministry of Health, Malaysia



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# FOREWORD

Tan Sri Datuk Dr. Haji Mohd. Ismail Merican  
Director General of Health Services, Malaysia

Malaysia being progressive in the adoption of Information communication “Technology in Health Care” has embarked in the creation of ICT enabled facilities. The Telemedicine blueprint “Leading Healthcare into Information Age” has laid the foundation for the planning and implementation of ICT initiatives in the country. Amongst the building blocks that has been recognised as vital for interoperability was the development and adoption of Health Informatics Standards.

The Ministry of Health has played a leading role in the development of Health Informatics Standards. In collaboration with stakeholders in the public and private sector, several standards have been developed for adoption in the country. Amongst them include the “Functional Requirements Brief” that has been prepared to provide functional requirements of the core business of the hospital as an entity. The business functional model including business functions, operational policies, high level work flows and system functionalities are well documented. This document would provide the health care personnel as to how the work processes and procedures are streamlined in a computerised working environment and for the system developers, it provides an in depth understanding of the user needs.

The documents that have been developed includes the

- Person Management System
- Pharmacy Information System
- Laboratory Information system
- Radiology Information System
- Blood Bank Information system
- Oral Health Information system
- Operation Theatre Management System

I wish this document be used as a generic standard in the development and customization of hospital information system being deployed in the hospitals in the country. I take the opportunity to congratulate the expert group that has put in countless number of man hours for the preparation of the document and all members of the consensus meeting for their participation and contribution.

**TAN SRI DATUK DR. HAJI MOHD. ISMAIL MERICAN**  
*DIRECTOR GENERAL OF HEALTH, MALAYSIA*



## VISION FOR HEALTH

Malaysia is to be a nation of healthy individuals, families and communities, through a health system that is equitable, affordable, efficient, technologically appropriate, environmentally-adaptable and consumer-friendly, with emphasis on quality, innovation, health promotion and respect of human dignity and which promotes individual responsibility and community participation towards an enhanced quality of life.



## MISSION OF THE MINISTRY OF HEALTH

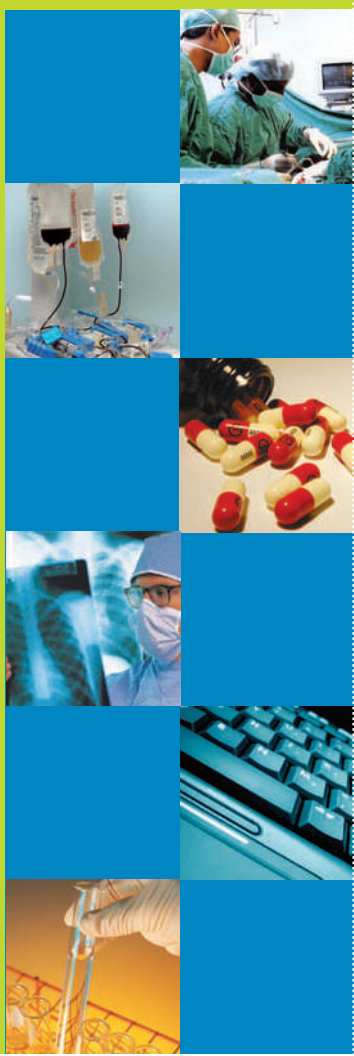
The mission of the Ministry of Health is to build partnership for health to facilitate and support the people to :

- Attain fully their potential in health.
- Motivate them to appreciate health as valuable asset.
- Take positive action to improve further and sustain their health status to enjoy a better quality of life.



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## 1. Introduction:-

The laboratory services department consists of separate functional units as follows:-

- 1.1. Chemical Pathology.
- 1.2. Microbiology.
- 1.3. Haematology.
- 1.4. Blood Transfusion.
- 1.5. Cytopathology.
- 1.6. Histopathology..

The department provides accurate and timely information for the diagnosis, monitoring and treatment of the clients. It receives specimen, which originates from outpatients clinic, wards, emergency departments, operation theatres, as well as from other external health facilities. Specimens for test not performed in the lab shall be subcontracted to an external laboratory.

## 2. Purpose.

The purpose of this document is to define the functional requirements of the proposed Laboratory Information System (LIS), which is one of the core applications under the clinical support services (CSS) functions of the Hospital Information System (HIS). The document will be used for communicating the LIS functions to both users as well as the application developers who will use it for defining the requirement specifications of the proposed LIS, which in turn will be used for detail software design.

## 3. Objective:-

- 3.1. The main objective of the LIS is to provide the systematic information flow that requires end-to-end transmission of the physician order.
- 3.2. The proposed LIS will provide a solution to a physician-orientated workflow.

## 4. Scope:-

- 4.1. Laboratory Information System (LIS) will encompass the following functionalities:-
  - 4.1.1. Receive orders and collect specimen.
  - 4.1.2. Process orders.
  - 4.1.3. Create testing work orders.
  - 4.1.4. Lab equipment interface.
  - 4.1.5. Actual testing.

- 4.1.6. Generate a transmitted results.
- 4.1.7. Generate Management Reports.

4.2. System interface is required under the CIS for the following functionalities:-

- 4.2.1. Lab orders.
- 4.2.2. Specimen taking.
- 4.2.3. Order tracking.
- 4.2.4. Retrieve Results.
- 4.2.5. Results charting.

4.3. The Grouping & Cross Matching Blood Storage (Recipient) functions of the Blood transfusion unit will be included under the LIS. The other functionalities as listed below will be provided under the Blood Bank Information System.

- 4.3.1. Procurement of blood - Donor Recruitment and Management.
- 4.3.2. Storage of Blood.
- 4.3.3. Supply of Blood.

System interface will be required with the Blood Bank Information System.

4.4. The forensic pathology function is provided under the Forensic Information System.

4.5. The functionalities for the laboratory management is provided under functional specifications which describe the work processes involved in the management data of patients required including reports.

## 5. Methodology:-

5.1. The Business Functions Model (BFM) for the Laboratory Information System was developed through a series of workshops with the experts whereas the generic functions of the laboratory was developed by a core group with members derived from all disciplines. The model for specific labs were developed by pathologists, scientific officers and medical lab technologists working in the respective labs.

5.2. The experts analyzed the business functions by mapping the relationship between functions, work processes and workflows, the operational policies and system functionality to support the workflows which were then developed.

5.3. Based on the mapping chart, the groups then developed the Business Functions Model (BFM) as follows:-

- 5.3.1. Business Functions:-
  - 5.3.1.1. Service product / scope.
  - 5.3.1.2. Range.

5.3.1.3. Type of services.  
5.3.1.4. Clients.

5.3.2. Operational policies.  
5.3.3. High level workflows.  
5.3.4. System functionality.  
5.3.5. Assumptions.  
5.3.6. Functional specifications:-

5.3.6.1. Work process.  
5.3.6.2. System function.  
5.3.6.3. Data input.  
5.3.6.4. Data output.

6. A consensus workshop held with the users approved the proposed BFM for Laboratory Information System, Blood Bank Information System and Forensic Medicine Information System.
7. A national consensus workshop held in 2006 among all stakeholders in health ICT further deliberated on the documents that has been finally modified.



## Generic Functions of Pathology Laboratories:-

1. Name of Lab – Pathology Laboratory Services.

2. Business Functions:-

2.1. Service Products/Scope:-

- 2.1.1. Histopathology.
- 2.1.2. Cytopathology.
- 2.1.3. Haematology.
- 2.1.4. Microbiology.
- 2.1.5. Chemical Pathology.
- 2.1.6. Immunohaematology.

2.2. Types of services:-

- 2.2.1. Urgent.
- 2.2.2. Routine.
- 2.2.3. Special Procedures/tests.
- 2.2.4. Referral and Consultation.
- 2.2.5. Subcontracting.

2.3. Range of services:-

2.3.1. Chemical Pathology:-

- 2.3.1.1. General Chemistry.
- 2.3.1.2. Endocrinology.
- 2.3.1.3. Tumour markers & Special Protein.
- 2.3.1.4. TDM & clinical toxicology.
- 2.3.1.5. Paediatric Screening  
(e.g. Congenital Hypothyroidism Screening).
- 2.3.1.6. Drug Abuse.
- 2.3.1.7. Molecular diagnostics.
- 2.3.1.8. Miscellaneous  
(e.g. Trace elements, Inborn Errors Of Metabolism).

2.3.2. Microbiology:-

- 2.3.2.1. Diagnostic Bacteriology (including Mycology, Mycobacteriology).
- 2.3.2.2. Diagnostic Immunology.
- 2.3.2.3. Diagnostic Virology.
- 2.3.2.4. Diagnostic Parasitology.
- 2.3.2.5. Molecular diagnostics.

- 2.3.2.6. Hospital/ Nosocomial Infection Control.
- 2.3.2.7. Community outbreaks.
- 2.3.2.8. Ancillary service (eg:- media preparation, autoclaving).

2.3.3. Haematology:-

- 2.3.3.1. Basic haematological tests.
- 2.3.3.2. Bone Marrow Aspirate/Trephine biopsy.
- 2.3.3.3. Cytochemistry.
- 2.3.3.4. Immunophenotyping/ Immunohistochemistry.
- 2.3.3.5. Cytogenetics.
- 2.3.3.6. Molecular diagnostics.
- 2.3.3.7. Haemostasis and thrombosis.
- 2.3.3.8. Miscellaneous:- Ham's test, Osmotic Fragility Test, etc.

2.3.4. Histopathology:-

- 2.3.4.1. Basic Surgical Pathology.
- 2.3.4.2. Frozen Section.
- 2.3.4.3. Histochemistry.
- 2.3.4.4. Immunohistochemistry.
- 2.3.4.5. Enzymehistochemistry.
- 2.3.4.6. Immunofluorescence.
- 2.3.4.7. Molecular diagnostics.
- 2.3.4.8. Electron microscopy.

2.3.5. Cytopathology:-

- 2.3.5.1. Exfoliative Cytology.
- 2.3.5.2. Fine Needle Aspiration Cytology.

2.3.6. Blood Transfusion Management:-

- 2.3.6.1. Blood Grouping.
- 2.3.6.2. Cross Matching.
- 2.3.6.3. Antibody Screening & Identification.
- 2.3.6.4. Transfusion Reaction Investigation.
- 2.3.6.5. Predeposit autologous transfusion.
- 2.3.6.6. Blood & Component Stock inventory.

2.4. Laboratory Management Functions:-

- 2.4.1. Quality Assurance Program (e.g. Internal Quality Control Program External Proficiency Testing Program, NIA indicator).
- 2.4.2. HMIS Report.
- 2.4.3. Registries.
- 2.4.4. Epidemiological Surveillance.

- 2.4.5. Cost Analysis.
- 2.4.6. Personnel Management.
- 2.4.7. Material Management.
- 2.4.8. Consultation services.
- 2.4.9. Training.
- 2.4.10. Research.
- 2.4.11. Audit.

2.5. Clients:-

2.5.1. Internal Clients:-

- 2.5.1.1. Within the department.
- 2.5.1.2. Within the Hospital – Clinical Department.
- 2.5.1.3. Within the enterprise (electronically linked facilities).

2.5.2. External clients (not electronically linked):-

- 2.5.2.1. Other MOH Hospitals / Health Clinics.
- 2.5.2.2. Private Hospitals / Clinics / Labs.
- 2.5.2.3. University Hospitals / Army Hospitals.
- 2.5.2.4. Ministry of Health.
- 2.5.2.5. Others.

### 3.1. Service Hours:-

- 3.1.1. All laboratories shall provide services during office hours.
- 3.1.2. Hematology, Microbiology, Chemical Pathology and Blood Transfusion Laboratories shall provide out of office hour services for certain listed tests only, exception to be determined by local policy.

### 3.2. Test Requests:-

- 3.2.1. All test requests from internal clients will be requested electronically by authorized personnel.
- 3.2.2. All special test requests shall be requested by relevant specialist / consultant.
- 3.2.3. All test requests shall be accompanied by relevant clinical information.
- 3.2.4. Urgent test requests must be justified either by the clinical history, diagnosis or other reasons for the urgency.
- 3.2.5. All test requests from critical care areas will be considered as priority.
- 3.2.6. Certain test requests shall require prior appointment / scheduling and provision shall be available for acceptance of appointment. Any cancellation or rescheduling of tests shall be immediately informed to the lab personnel.
- 3.2.7. Acceptance of request and specimen for tests requiring special preparation (e.g. stock and cell culture) shall be made only when it is ready.
- 3.2.8. All test requests from clients that are not on line shall be submitted through adequately filled and legibly written request form.
- 3.2.9. All external client test requests shall be registered into the system.
- 3.2.10. Medical Officers and Pathologists shall be given limited access to patients' Electronic Medical Records.
- 3.2.11. Test Request maybe modified upon consultation with the ordering source.
- 3.2.12. Repeated test request for same test on same patient may be cancelled upon consultation with ordering source.
- 3.2.13. For histopathology lab, booking for scheduled frozen section shall be discussed and agreed by pathologist with requesting specialist at least a day prior to schedule.
- 3.2.14. MLT may be allowed to enter order request on behalf of the doctor ordering from external institution. Such orders shall be verified by the doctors / scientific officers in the receiving laboratory.
- 3.2.15. A consensus guideline in accordance with best medical practice shall be developed to control and monitor lab orders.
- 3.2.16. The Hospital Director shall approve the list of tests. Additional new tests shall be formatted into the system after obtaining approval from change control authority.
- 3.2.17. Request for Grouping & Cross Matching shall be in accordance with maximum surgical blood ordering schedule.

### 3.3. Specimens and Containers:-

- 3.3.1. All specimens should be collected from the patients in the Wards /Clinics / Operating Theatres and other collection points and dispatched to the laboratory in appropriate containers as specified.
- 3.3.2. Specimen containers are indented by the Wards / Clinics directly from the Central Stores except for certain special containers which are supplied by the lab.
- 3.3.3. All specimen containers must be correctly labelled.
- 3.3.4. All blood / body fluid specimens must have the correct volume as specified on the specimen label and/or user manual.
- 3.3.5. All specimens must be transported in biohazard plastic bag to the lab. Each bag must only contain specimens from the same patient.
- 3.3.6. All specimens shall be sent through the common reception counter. Exceptions shall be made for certain tests and specimens based on local policy.

### 3.4. Receipt of Specimens:-

- 3.4.1. All specimens will be checked and verified against the test request, and receipt acknowledged in the system.
- 3.4.2. Specimens, which are received late, will be subjected to initial processing, then stored and analysed the next working day. Criteria for late receipt shall be determined by the local policy.

### 3.5. Rescheduling & Cancellation:-

- 3.5.1. Provisions shall be made to inform the lab personnel or clinician of any cancellation or rescheduling of cases and shall be updated in the system.

### 3.6. Sorting and Distribution of Specimens:-

- 3.6.1. Specimens will be sorted according to disciplines and distributed to the respective workbenches.
- 3.6.2. Allow reprints of labels in the laboratory.

### 3.7. Specimen Rejection:-

- 3.7.1. Specimens not acceptable for analysis will be rejected.
- 3.7.2. Rejection of specimens shall be notified and alerted immediately by phone and online for urgent specimens and online only for non-urgent specimens. Date, time, person informing and receiving rejection information shall be documented. For external clients, a report will be generated.
- 3.7.3. The handling of the rejected specimen will be determined by the reasons for rejection and discipline specific defined criteria.
- 3.7.4. Consensus shall be developed and continuously updated on non-acceptance criteria for discipline specific specimens.
- 3.7.5. Conformity and compliance to the specific rejection criteria shall be adhered to at all times.

3.8. Specimen Processing and Analysis:-

- 3.8.1. All specimens will be processed and analysed according to disciplines' specific work procedures.

3.9. Specimen Storage:-

- 3.9.1. The laboratory shall withhold rejected samples. Duration of withholding such samples shall be determined by local hospital policy.
- 3.9.2. All specimens and processed samples (e.g. slides, paraffin blocks), shall be stored for a duration as determined by national policy.

3.10. Subcontracting:-

- 3.10.1. A list of tests for subcontracting shall be approved by Hospital Director.
- 3.10.2. The laboratory shall subcontract work because of unforeseen reasons (workload, need for further expertise or temporary incapacity) or on a continuing basis (e.g. permanent subcontracting).
- 3.10.3. The work shall be placed with a competent subcontractor as determined by MOH criteria.
- 3.10.4. The lab shall maintain a register of all subcontractors.
- 3.10.5. The lab shall be responsible to the client for the subcontractor's work except in the case where the client or a regulatory authority specifies the subcontractor.
- 3.10.6. All tests subcontracted to another laboratory which is not electronically linked shall be accompanied by adequately filled request forms.(Appointment is required for specialized tests. Any cancellation or rescheduling of tests shall be informed immediately to lab personnel).
- 3.10.7. The specimen for subcontracting may be subjected to initial processing where appropriate.
- 3.10.8. Test request and result transmission shall be made on-line if there is linkage with the subcontracted labs.
- 3.10.9. Release of subcontracted test results shall be made by authorized lab personnel.
- 3.10.10. Hard copy results from subcontracted laboratory will be entered into LIS by authorized lab personnel and will be made available in CIS.

3.11. Point Of Care Testing (POCT):-

- 3.11.1. The introduction of POCT services shall involve the hospital administrator, the clinician and laboratory personnel.
- 3.11.2. Laboratory test performed at the bedside testing only involve testing using whole blood utilizing the appropriate technology that allows non-lab trained user to perform the test.
- 3.11.3. The lab should take an important role in making sure that the performance of test is of good quality by regularly monitoring performance of analyzer and the user by providing user training.
- 3.11.4. The care provider shall enter results of POCT into the patient's EMR.



### 3.12. Validation & Distribution / Review of Results:-

- 3.12.1. The ward staff shall check status of request order at least twice a day i.e. am/pm.
- 3.12.2. Hardcopy of results shall be made available on request.
- 3.12.3. All results shall be viewed by requesting doctor / ordering source after verification of results by the lab staff.
- 3.12.4. All relevant lab results shall be made available in Discharge Summary for patient management and follow-up purposes.
- 3.12.5. All charges shall be made after the verification of results.
- 3.12.6. All suspicious / confirmed infectious and malignant cases shall be notified to a designated person as determined by the Hospital.

### 3.13. Laboratory Management:-

- 3.13.1. The pathology department shall establish, implement and maintain a quality system appropriate to its activities.
- 3.13.2. The laboratories shall adhere to the policies and objectives as defined in the quality manual.
- 3.13.3. Laboratories specific guidelines and procedures shall be continuously developed and updated to ensure quality of service.
- 3.13.4. The laboratories shall establish and maintain procedures to control all documents that form part of its quality system (internally generated or from external sources) such as regulations, standards, other normative documents, tests and / or calibration methods, as well as drawings, software, specifications, instructions and manuals.
- 3.13.5. All documents issued to personnel in the laboratory as part of the quality system shall be reviewed and approved for use by authorized personnel prior to issue.
- 3.13.6. Access to LIS shall be determined by the category of personnel on need to know basis.
- 3.13.7. All laboratory records shall be held secure and in confidence.
- 3.13.8. Laboratories shall have procedures to protect and backup records stored electronically and to prevent unauthorized access to or amendment of these records.
- 3.13.9. Appropriate measures shall be taken to avoid loss or change of original data in technical records.
- 3.13.10. Contents of the reports shall adhere to the requirements of ISO/IEC 15189 standard or other current standards as recommended by MOH.
- 3.13.11. Laboratory Personnel management shall be able to link to human resources management information system.
- 3.13.12. Laboratory inventory and stock management shall be linked to material management information system.
- 3.13.13. Laboratory management report shall be produced as per ministry and the local enterprise / hospital requirements.
- 3.13.14. Data repository for research purposes shall be managed by the pathology department.

- 3.13.15. Blood Bank laboratory shall be linked to the Regional Blood Centers for the blood transfusion management.
  - 3.13.16. Disposable items shall be supplied by material management to wards and clinics.
  - 3.13.17. Lab Information system shall be interfaced with infection control information system.
  - 3.13.18. Lab equipment procured shall be HL7 compliant to facilitate interface with LIS and barcode label printer.
  - 3.13.19. For haematology lab, all bleeding disorders shall be recorded and record sent to central registry in National Blood Bank.
  - 3.13.20. Adequate blood supply shall be maintained in Blood Bank in accordance to recommendations from PDN and subject to local policy.
- 3.14. Research & Training:-
- 3.14.1. Hospital Research Committee shall approve access to lab database for research purpose.
  - 3.14.2. Training and continuous professional development shall be given to all laboratory staff.
- 3.15. System Downtime:-
- 3.15.1. The lab shall develop an offline procedure should LIS fails or is down for preventive maintenance.
  - 3.15.2. Hospital shall establish local policy for receiving samples during unplanned downtime of HIS.
  - 3.15.3. During downtime, lab number shall be issued manually in sequence with number generated last by system and shall be maintained when system is online.
- 3.16. Data archiving:-
- 3.16.1. All results shall be stored online for a defined time from the date of reporting subsequent to which it shall be archived.
  - 3.16.2. All data identified for clearance shall be according to standard procedure and the provision for audit trail.
- 3.17. Data Access:-
- 3.17.1. Various levels of access to LIS shall be determined on need to know basis by hospital policy.
  - 3.17.2. Clinicians are able to view status of report only.
  - 3.17.3. High-level confidentiality shall be maintained for results of specified test (e.g. HIV).

The high level workflow for the generic lab functions is applicable to all labs. The workflows under the specific labs indicate the work process for test performed in the individual labs.

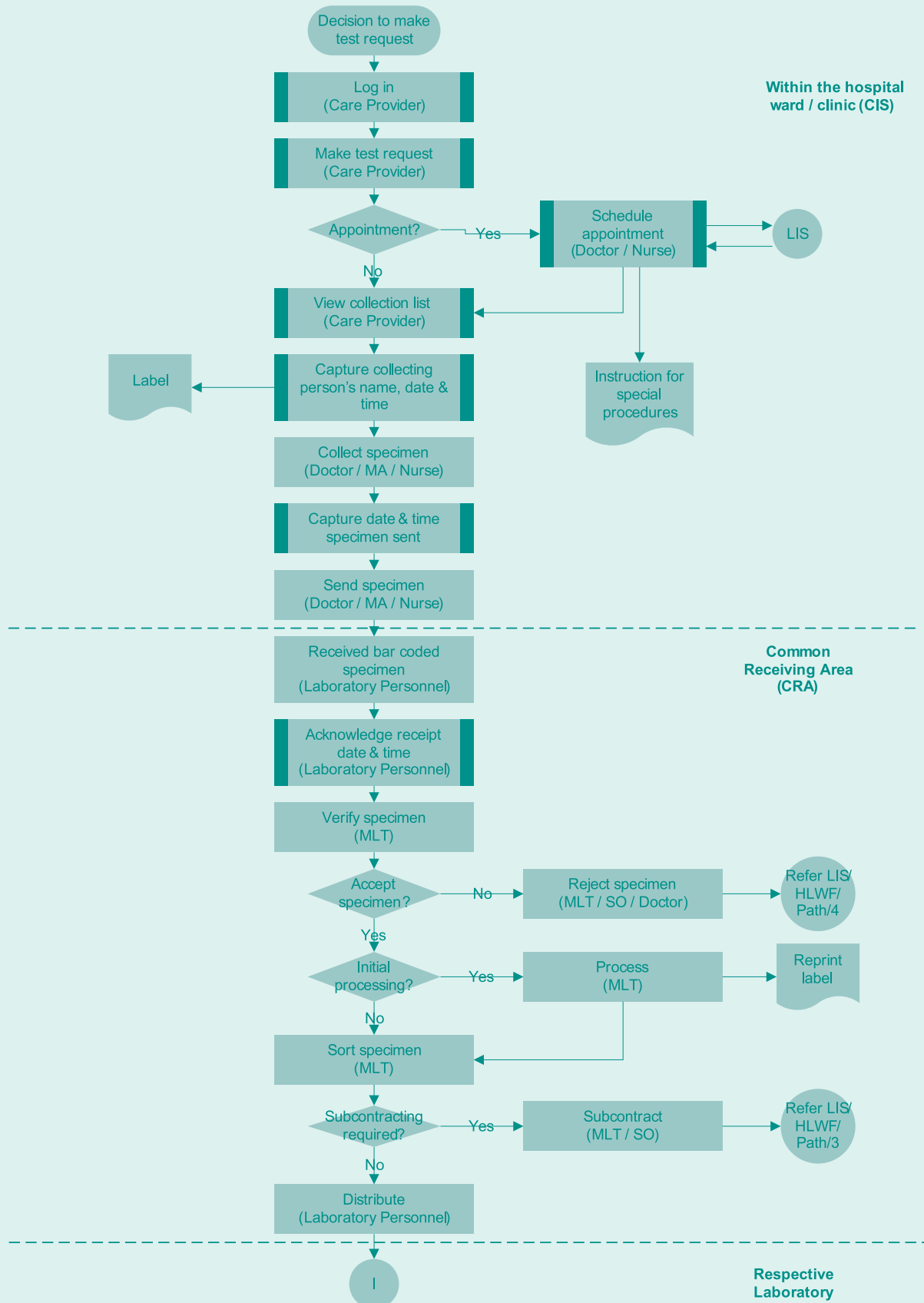
4.1. Workflows for Generic Function:-

- 4.1.1. Receiving and processing test request / specimen for in-house orders.
- 4.1.2. Receiving and processing test request / specimen for external health facilities.
- 4.1.3. Processing lab orders to subcontracted lab.
- 4.1.4. Monitoring Point of Care Testing (POCT) Services.
- 4.1.5. Rejection of Test Request.
- 4.1.6. Managing System Request during system down time.
- 4.1.7. Receiving and Processing Medico – Legal test Requests.

4.2. Workflows for specific lab function:-

- 4.2.1. Processing test order / performed in Chemical Pathology Lab.
- 4.2.2. Processing test order / performed in Microbiology Lab.
- 4.2.3. Processing test order / performed in Haematology Lab.
- 4.2.4. Processing test order / performed in Histopathology Lab.
- 4.2.5. Processing test order / performed in Cytopathology Lab.
- 4.2.6. Processing test order / performed in Blood Transfusion Lab.

# High Level Workflow Pathology Department - Receiving and Processing Test Request for In-House Orders LIS/HLWF/Path/1

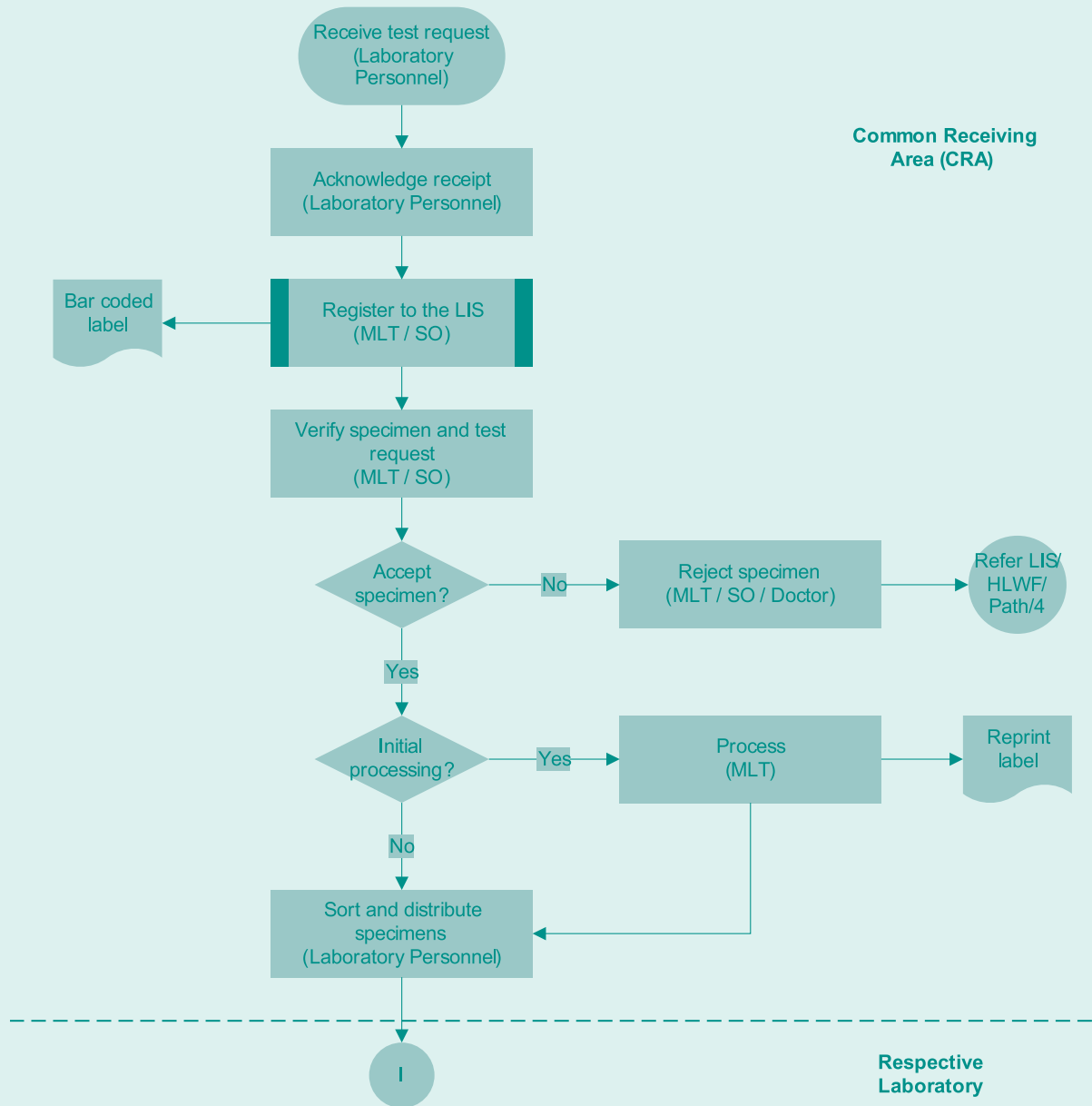


## High Level Work Procedure Pathology Department- Receiving and Processing Test Requests for in House Orders

### LIS/HLWP/Path/1

1. This high level work procedure is applicable for in house order where Laboratory Information System (LIS) is installed as part of Hospital Information System (HIS).
2. This workflow is not applicable for stand alone LIS, handling external requests and medico legal requests.
3. Upon deciding to make a test request, the care provider shall log in into the system.
4. Prior to specimen collection, clinicians shall check if such orderable requires an appointment. For test requiring appointment, Care provider shall liaise with the laboratory.
5. After the test request is confirmed by the clinician, this request shall be indicated in the collection list.
6. The system shall be able to capture the collection date, time, and person collecting the specimens. At the same time, barcode labels shall be printed out.
7. Before sending the specimen, the Doctor (Dr) or nurse or Medical Assistant (MA) has to acknowledge the sending of the specimen whereby the date and time will be captured in the system.
8. The specimens shall be sent via pneumatic system or by hand depending on the type of specimens (refer to Pathology Department Operational Policy).
9. Upon receiving the specimens in the Common Receiving Area (CRA) of the laboratory, the laboratory personnel shall acknowledge receipt of specimens and request whereby date and time shall be captured in the system.
10. The MLT shall verify the specimens (physical check).
11. If the specimen is not suitable for processing, the MLT or SO or Dr shall reject request and the reason for rejection shall be given to the care provider via the system.
12. The specimens shall be sorted after initial process.
13. If subcontract is required, refer to LIS/HLWP/Path/3.
14. The specimens shall be distributed to the respective laboratory units.

## High Level Workflow Pathology Department - Receiving and Processing Test Request for External Health Facilities and Other Institutions LIS/HLWF/Path/2



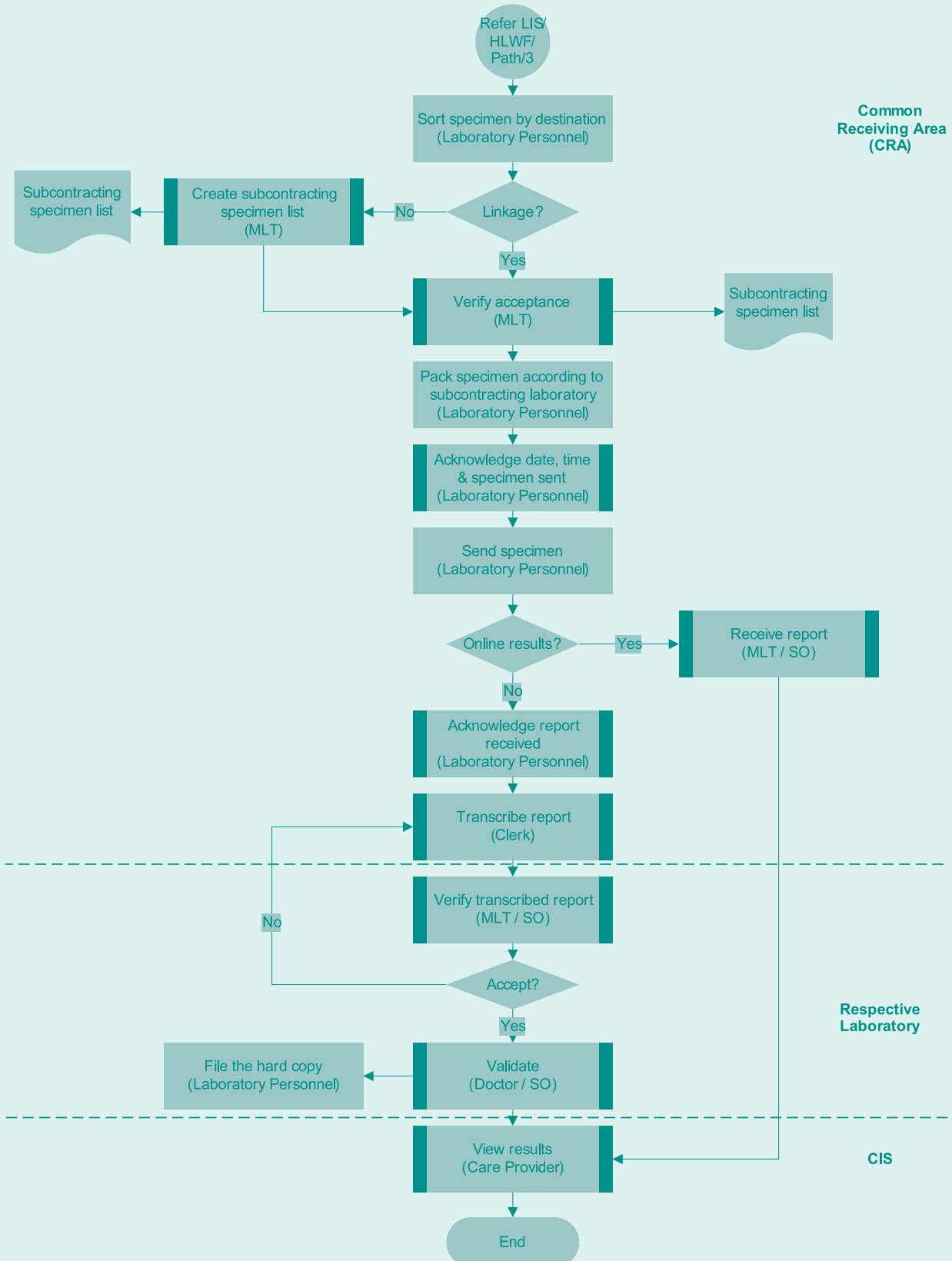


## High Level Work Procedure Pathology Department - Receiving And Processing Test Requests For External Health Facilities And Other Institutions

### LIS/HLWP/Path/2

1. This high level work procedure is applicable for test request laboratory from external clients.
2. This workflow is not applicable for specimens from in house order and medico legal specimens.
3. The laboratory personnel shall receive test requests accompanied with appropriate laboratory request forms and “Borang Senarai Permintaan Ujian Patologi”. For the external clients, this request form shall be made available from the hospital website.
4. The laboratory personnel shall acknowledge receipt of specimens in the “Borang Senarai Permintaan Ujian Patologi”.
5. The requests shall be registered into the system by the Medical Laboratory Technologist (MLT) or Scientific Officer (SO). A bar code label will be generated and stuck onto the container and the request form.
6. The MLT or SO then will verify the test requests and the specimens.
7. If the specimen is not suitable for processing, the MLT or SO or Dr shall reject the request. Reason of rejection shall be captured and the report shall be given.
8. The specimens shall be sorted and distributed to the respective laboratory unit after initial process if required. The labels will be reprinted if necessary.

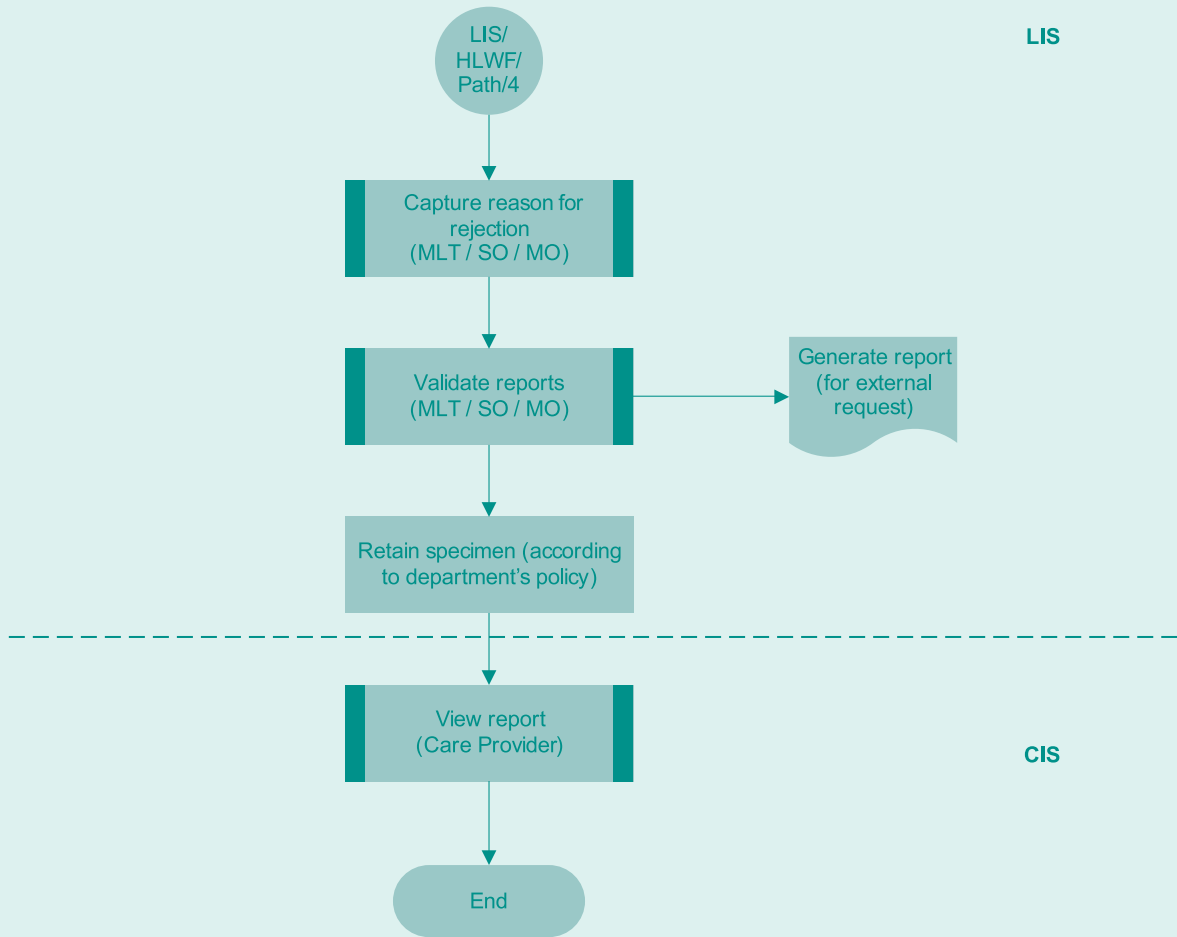
## High Level Workflow Pathology Department - Processing Test Requests for Subcontracted Labs LIS/HLWF/Path/3



### High Level Work Procedure Pathology Department- Processing Test Requests for Outsourcing LIS/HLWP/Path/3

1. This high level work procedure is applicable for handling subcontract tests requested by clinicians where Laboratory Information System (LIS) is installed as part of Hospital Information System (HIS).
2. This workflow is not applicable for stand alone LIS, handling external requests and medico legal requests.
3. The laboratory personnel will sort out specimens by destination.
4. If subcontractor laboratory is interlinked, the MLT shall verify the acceptance of the request and print the subcontracting specimen list.
5. For non interlinked subcontractor laboratory, the MLT shall create and print the list.
6. The laboratory personnel shall pack the specimens according to the recommended transportation procedure of the subcontractor laboratory.
7. An acknowledgement of sending the specimens will be made into the system.
8. The laboratory personnel shall be responsible to send the specimens to the subcontractor laboratory. Time of sending the specimens is according to the Pathology department policy.
9. All reports from non interlinked subcontractor laboratory will be directed to CRA.
10. The laboratory personnel will acknowledge receipt of the report and a clerk will transcribe the report.
11. The MLT or Scientific Officer will verify the transcribed report at the respective laboratory.
12. The accepted transcribed report will be validated by the Scientific Officer or Doctor and released to Clinician Information System (CIS). The hard copy will be kept at the Medical Record (refer to the department policy).
13. Only validated results can be viewed by the Care Provider in CIS.
14. For online results, the MLT or SO shall acknowledge receipt of the report which can be viewed by Care Provider.

High Level Workflow Pathology Department - Rejection of Test Request  
LIS/HLWF/Path/4

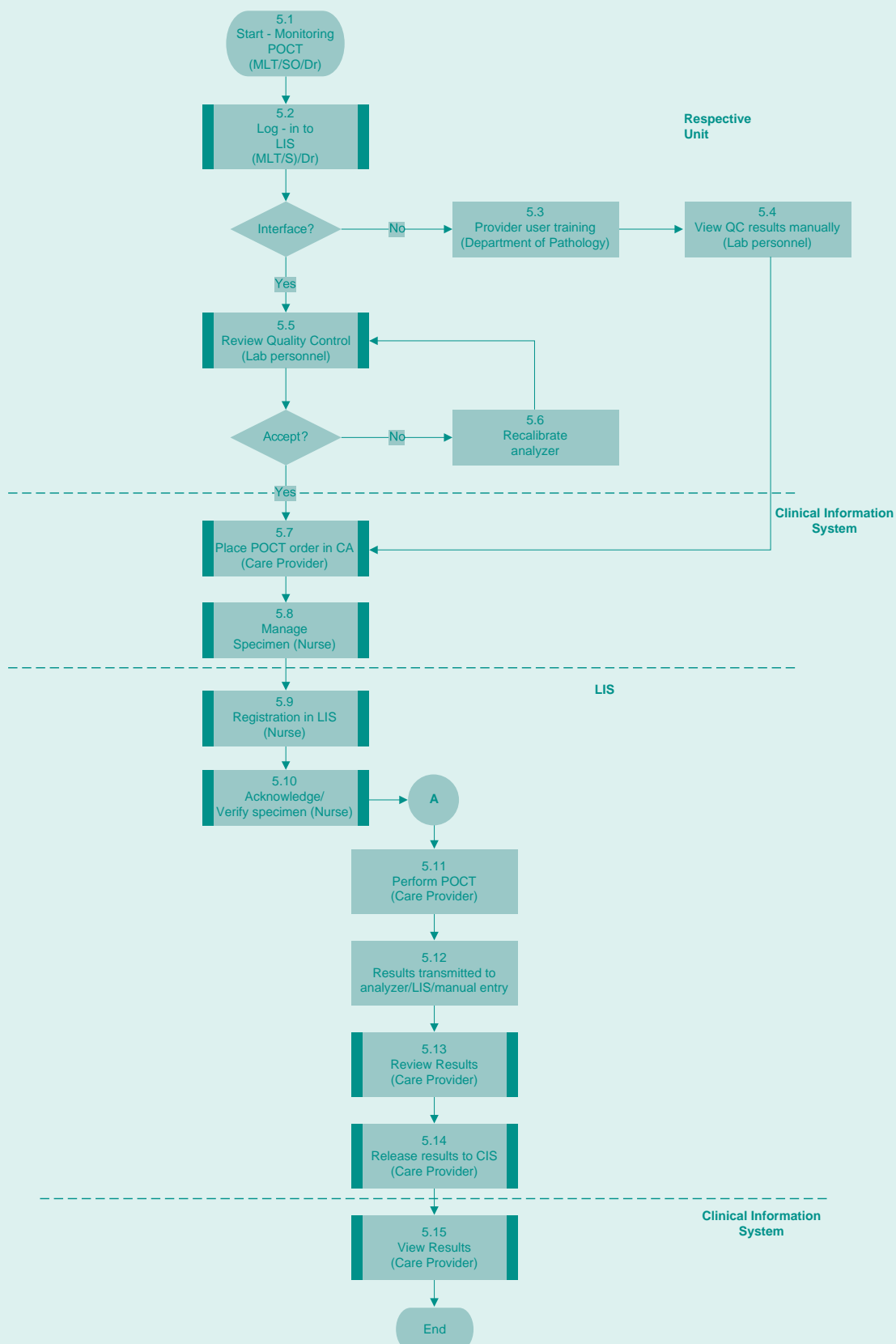


## High Level Work Procedure Pathology Department- Rejection of Test Requests LIS/HLWP/Path/4

1. This high level work procedure is applicable for in-house orders, external request and medico legal test request rejection where Laboratory Information System (LIS) is installed as part of Hospital Information System (HIS).
2. The reason for rejection shall be captured by MLT/SO/MO.
3. All reports of rejection shall be validated by MLT/SO/MO before being released to care provider.
4. The report can be viewed by the Clinician in CIS and for the external request; the MLT/SO/MO has to print out the report.

## High Level Workflow Pathology Department - Monitoring Point of Care Testing (POCT) Services

### LIS/HLWF/Path/6



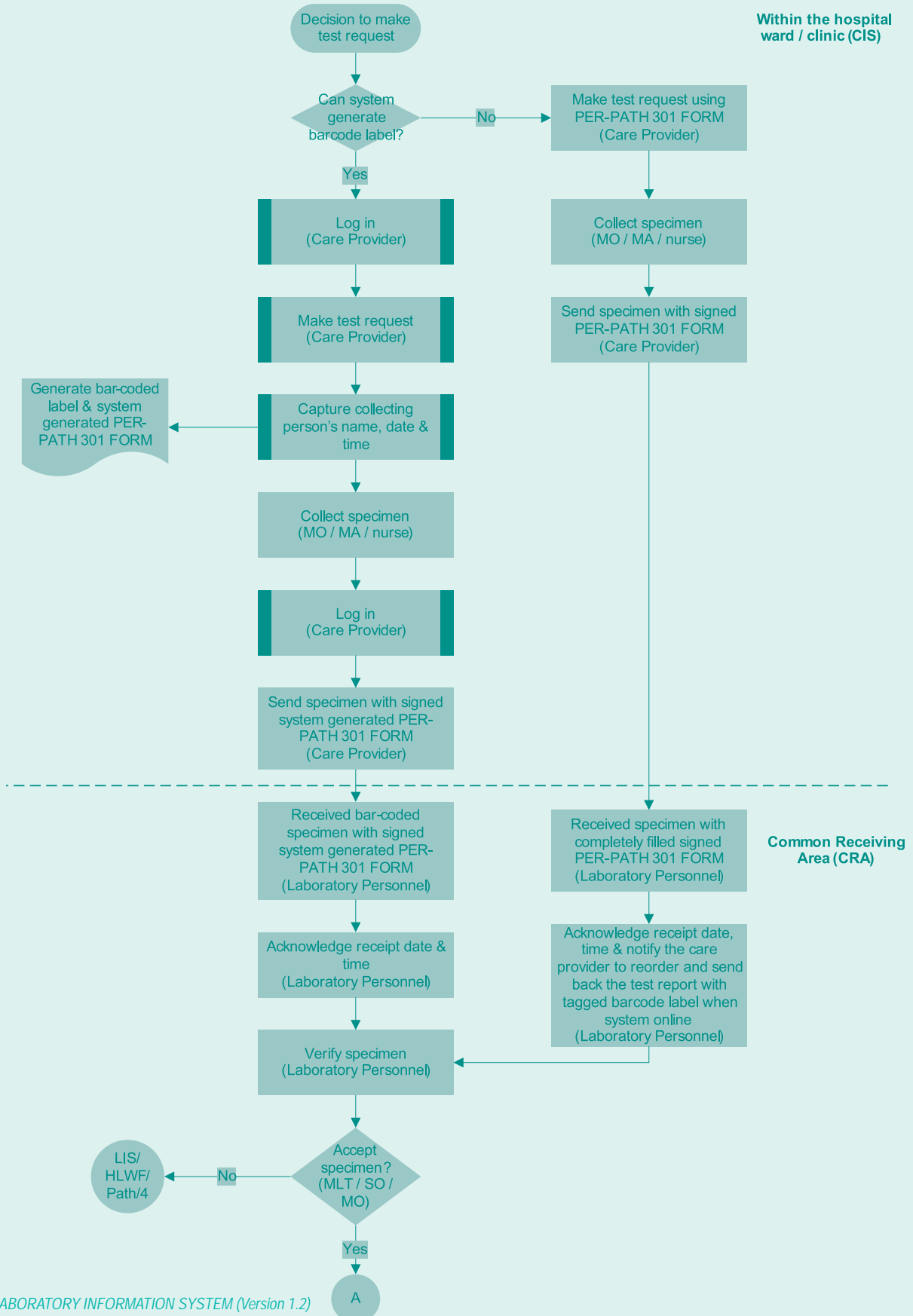


**High Level Work Procedure Pathology Department- Monitoring Point of Care Testing (POCT) Services**  
**LIS/HLWP/Path/6**

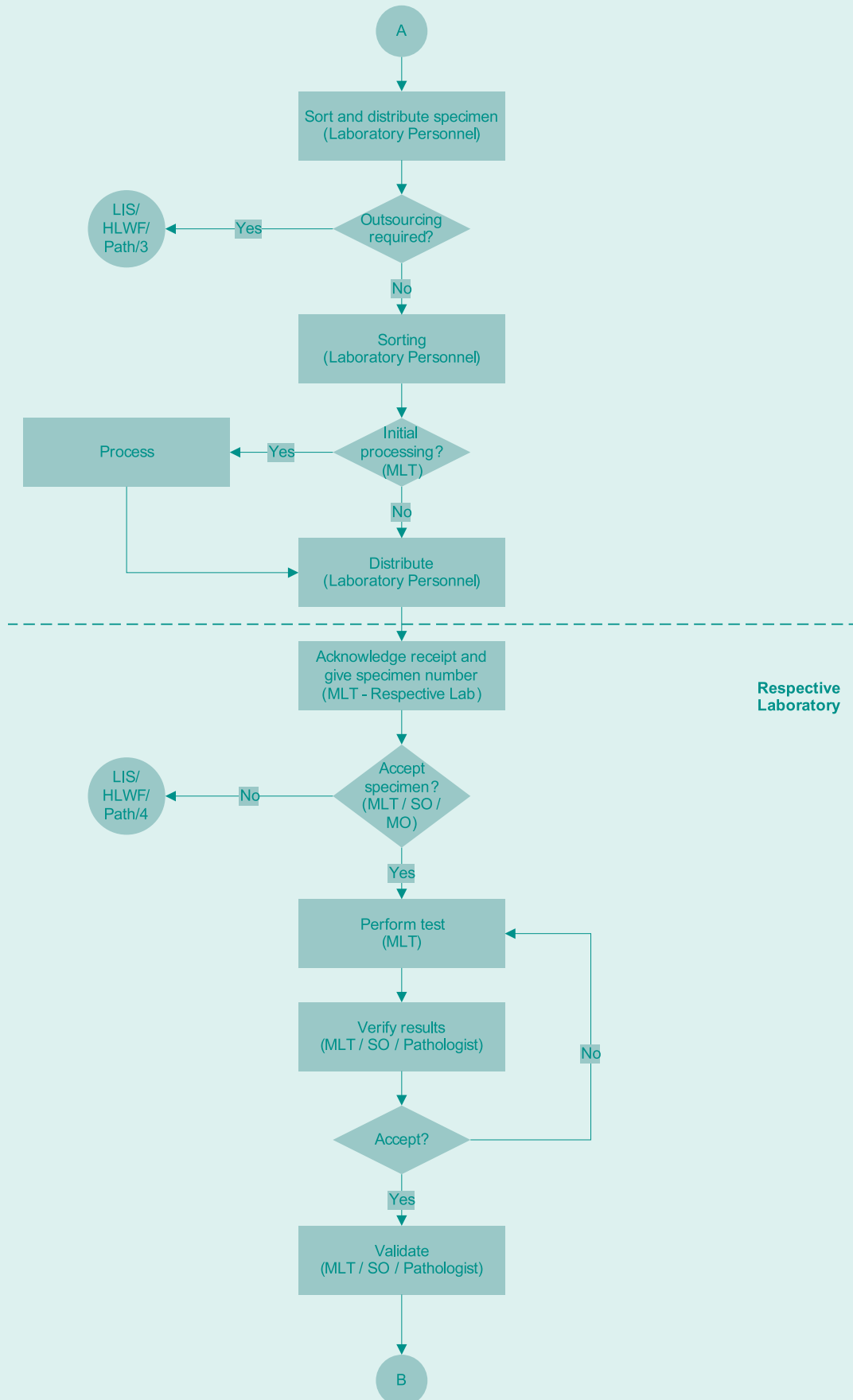
1. This high level work procedure is applicable for monitoring of interfaced Point of Care Testing (POCT) services to ensure good quality results and is not applicable for the non interfaced POCT equipments.
2. The laboratory personnel shall identify the analyser and location of POCT service.
3. Quality control and calibration shall be monitored regularly by reviewing through the system (refer Pathology Department policy- POCT)
4. If the analyser performance does not conform to the standard, the end user will be alerted via the system and analyser's operation shall be suspended.
5. The end user needs to take corrective measures before the analyser can resume the operation.
6. If the results are acceptable, the analyser can be operated.

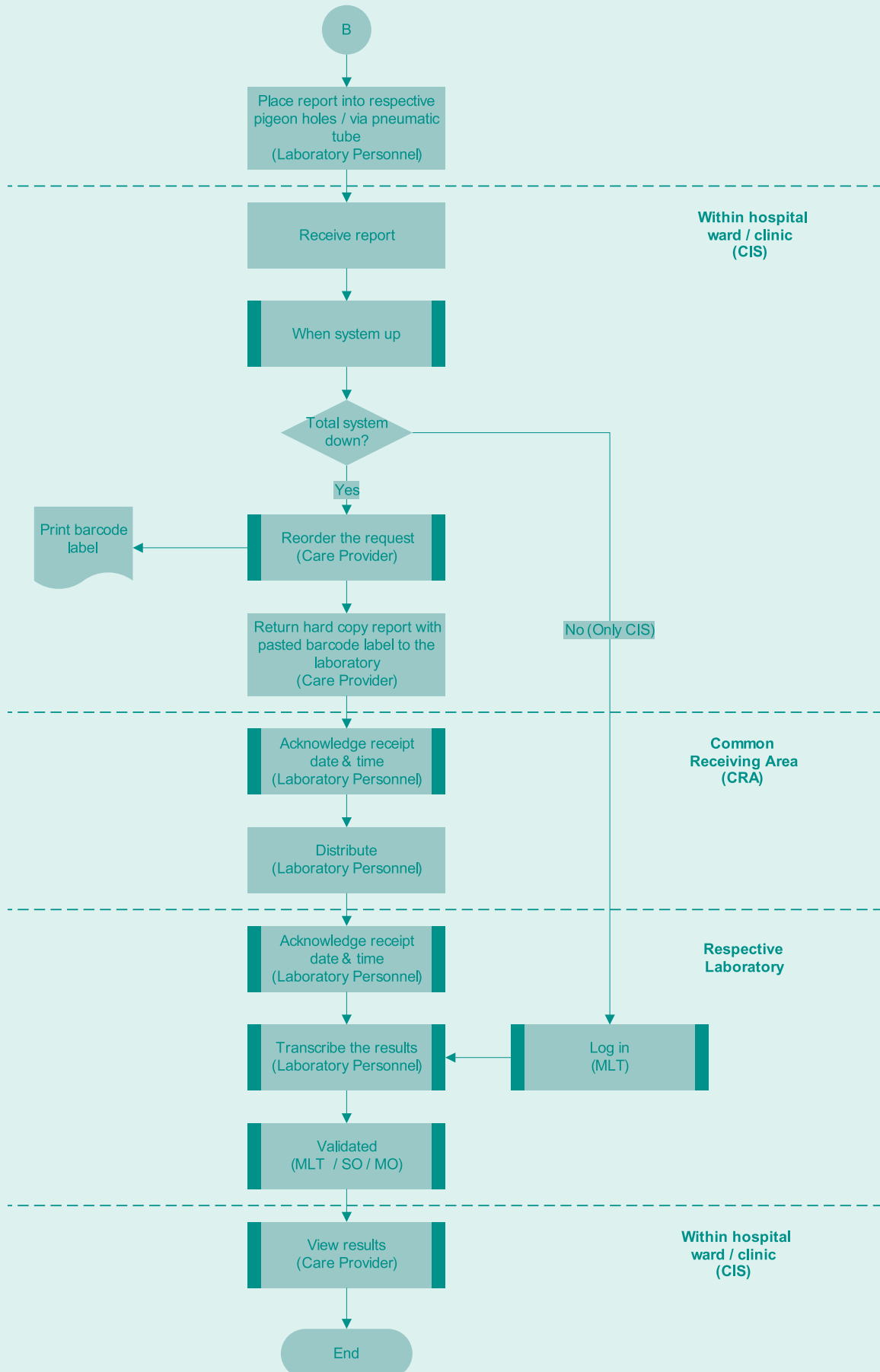
## High Level Workflow Pathology Department - Managing Test Request During System Downtime

### LIS/HLWF/Path/7



## LIS/HLWF/Path/7-A





## High Level Work Procedure Pathology Department- Managing Test Request during System Downtime

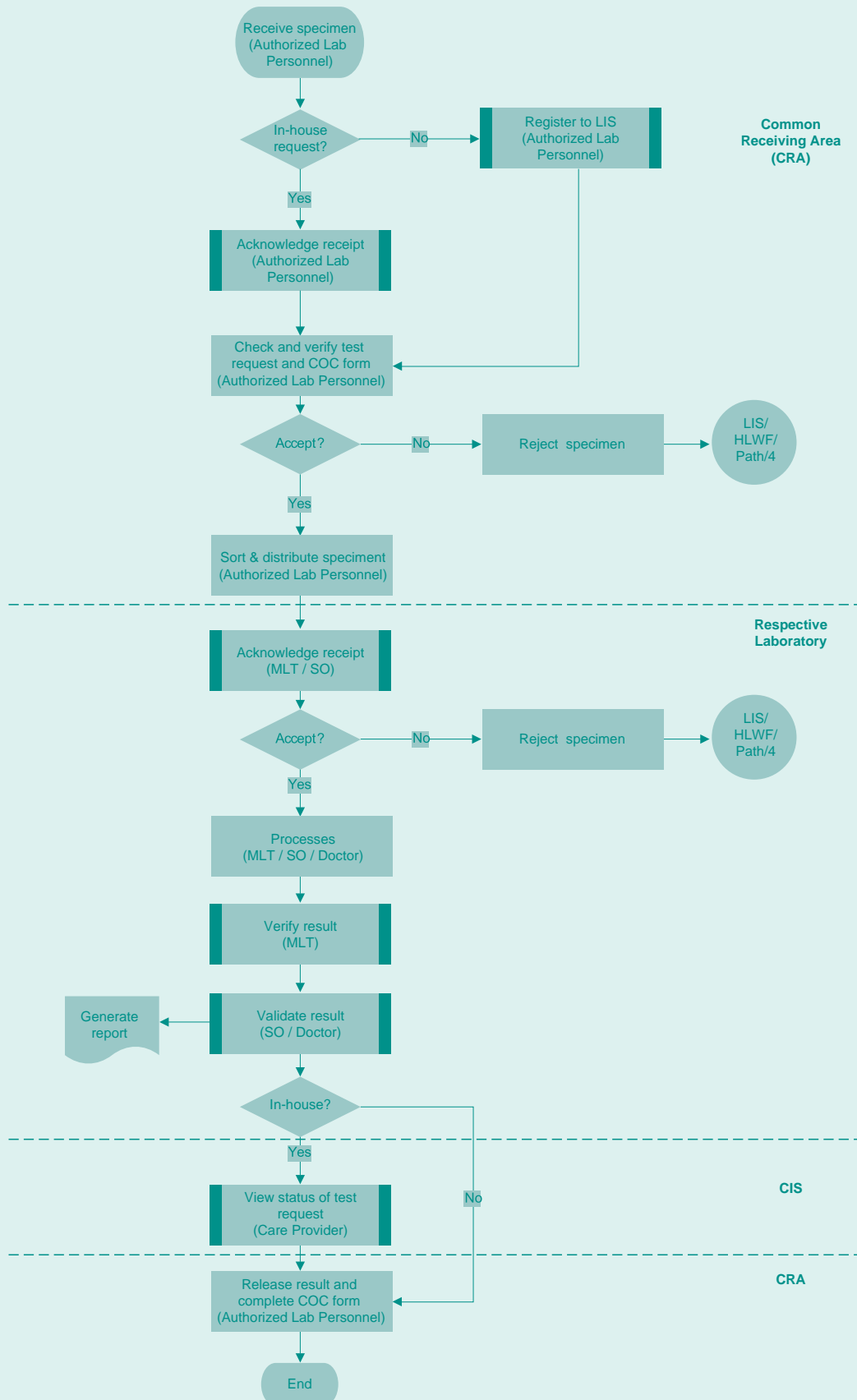
### LIS/HLWP/Path/7

1. This high level generic workflow is applicable during System down time.
2. System down time can be divided into two; partial system down time and total system down time. Partial system down time only involves Laboratory Information System (LIS) and total system downtime involves the Total Hospital Information System (THIS). (refer to operational policy Pathology Department).
3. When system partially down (LIS), request for laboratory test still can be done through the Clinician Information System (CIS) except the care provider has to fill up and sign the computer generated PER-PATH 301 request form.
4. During THIS down time, laboratory test request is done manually.
5. The specimens, accompanied with signed request forms shall be sent via pneumatic system or by hand depending on the type of specimens (refer to operational policy Pathology Department).
6. Upon receiving the specimens in the laboratory, the laboratory personnel shall manually acknowledge receipt of specimens and request forms.
7. For THIS system down time, the laboratory personnel at CRA has to stamp the request form with "Do reorder test request and return the hard copy report pasted with bar-coded label once system is up".
8. The laboratory personnel will verify the test request and the specimen.
9. If the specimen is not suitable for processing, the MLT/SO/MO shall reject the request. Reason for rejection shall be captured manually and the report shall be given.
10. The specimen shall be sorted and distributed to the respective laboratory unit after initial process whenever necessary.
11. In the respective laboratory unit, acknowledgement of receiving such samples will be done by the assigned MLT and the test will be performed accordingly.
12. If the specimen is not suitable for processing, the MLT/SO/MO shall reject the request and pre-printed hard copy report of rejection shall be given to the care provider.
13. Upon completion, the MLT /SO/ MO shall verify all the results. For any unsatisfactory performance, the tests shall be repeated.
14. All results shall be validated by MLT/SO/MO. The results shall be released together with the request form into the secured respective pigeon holes or via pneumatic tube.

15. Once LIS is restored, the MLT at the respective laboratory shall log into the system and will transcribe the test result which will be validated by MLT/SO/MO.
16. In the event of THIS system down, the care provider has to reorder the test request through the system and print out the barcode label once the THIS is restored. Care provider shall return the hard copy report with pasted bar coded label to the laboratory.
17. At the CRA, the laboratory personnel will acknowledge receipt of the test report and distribute to the respective laboratory.
18. The MLT at the respective laboratory will acknowledge receipt of the test report, transcribed/up loaded which will be validated by MLT/SO/MO.
19. The result can be viewed by the Clinician in CIS.



# High Level Workflow Pathology Department-Receiving and Processing Medico Legal Test Request LIS/HLWF/Path/8

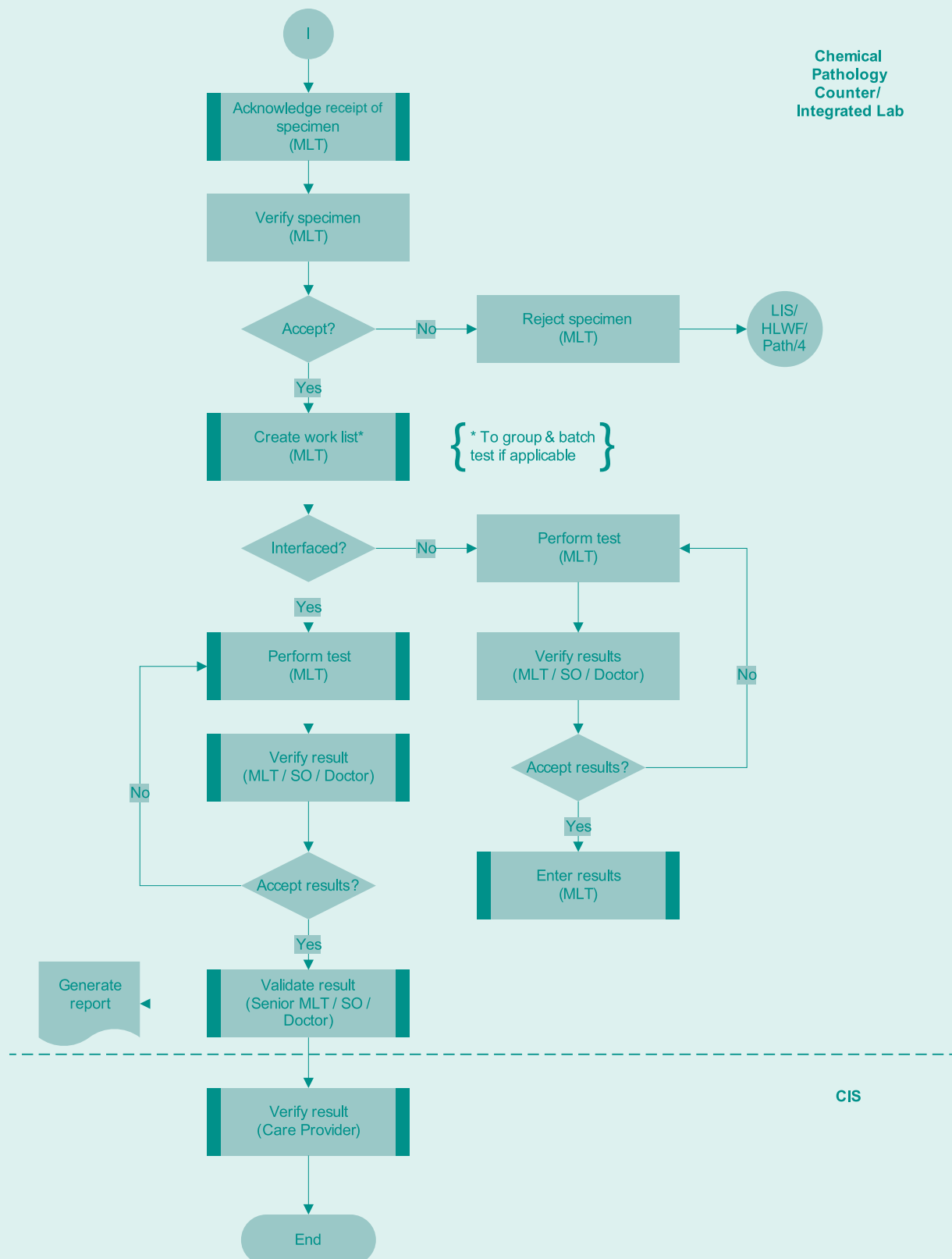


**High Level Work Procedure Pathology Department-Receiving and Processing Medico Legal Test Request**  
**LIS/HLWP/Path/8**

1. This high level work procedure is applicable for receiving Medico legal specimen in the Pathology Department. Identification of Medico legal specimens as per Patient Management System (PMS) defined criteria whereas for external Medico legal specimens will depend on type of test request/requesting institutions.
2. This high level work procedure is not applicable for handling test request for Jabatan Kimia.
3. Upon receiving the specimen in the Common Receiving Area (CRA), the authorized lab personnel shall acknowledge, check and verify the test request, the specimen and Chain Of Custody (COC) form. In the case of external test request, registration to Laboratory Information System (LIS) shall be done.
4. If the specimen is not suitable for processing, the Scientific Officer (SO) or Doctor (Dr) shall reject the request and the reason for rejection shall be given. (Refer LIS/HLWP/Path/4 and Appendix IV of Pathology Department Policy).
5. The specimen shall be sorted and distributed to the respective laboratory unit by the authorized lab personnel.
6. After acknowledging, checking and verifying the specimen, the MLT or SO or Dr shall proceed with the analysis.
7. Upon completion of the analysis, reports shall be verified by MLT and be validated by Dr or SO. All signed reports shall be submitted to the authorized laboratory personnel.
8. For in house requests, the care provider can view the request status and collect the reports from the authorized laboratory personnel in CRA.
9. For external requests, only authorized personnel from the institutions shall be allowed to collect the reports in CRA.
10. At time of collecting the reports, the COC form shall be completed.

# High Level Workflow Pathology Department - Receiving and Processing Test Requests in Chemical Pathology Laboratory

## LIS/HLWF/Path/9

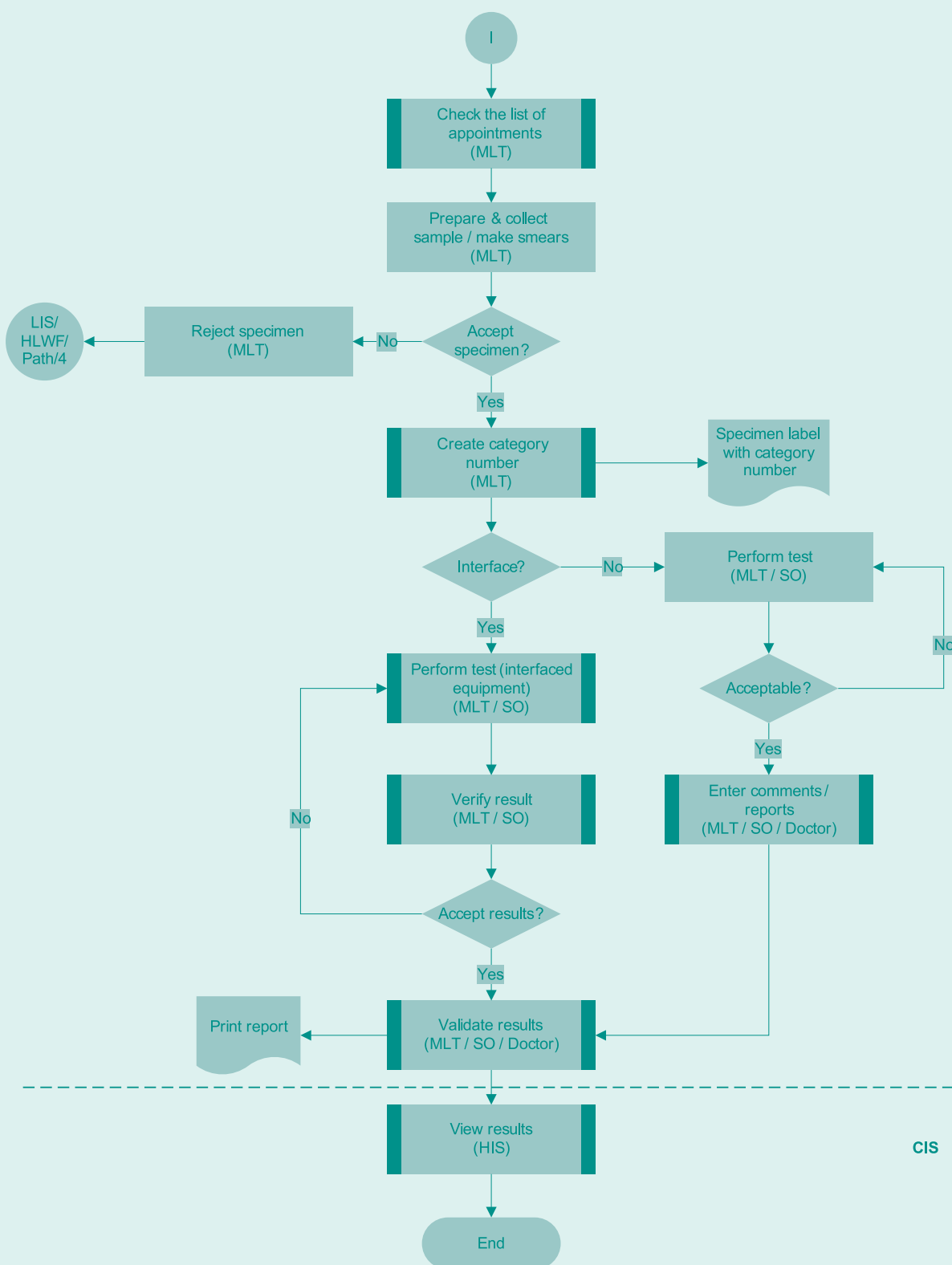


## High Level Work Procedure Pathology Department- Receiving and Processing Test Requests in Chemical Pathology Laboratory

### LIS/HLWP/Path/9

1. This work procedure is applicable for receiving and processing test request in Chemical Pathology Laboratory.
2. The MLT designated to the Chemical Pathology laboratory shall acknowledge receipt of all specimens arriving in the lab.
3. MLT shall check and verify all specimens prior to acceptance for analysis. For laboratories having the facility of Pre-Analytical Workstation, specimen inspection (check and verify) shall be done by automation.
4. Any specimen found not meeting the analysis requirements, shall be rejected with reference to the LIS/HLWP/Path/4.
5. Specimen will be processed immediately or subject to batch testing. A work list shall be generated for batch testing to enable specimen traceability.
6. Analysis of samples shall be proceeded either by automated system which is interfaced (in most of the cases) or by manual method.
7. All results will be verified by Medical Laboratory Technologist (MLT) or Scientific Officer (SO) or Doctor (Dr) via system.
8. For the non interfaced analyzers, MLT or SO or Dr will verify prior to results acceptance and result entry.
9. All results shall be validated by senior MLT or SO or Dr before being viewed by the clinicians.
10. For external cases, hard copies report shall be generated by the system together with the List of External Pathology Report, released to the secured pigeon holes at the CRA for collection.

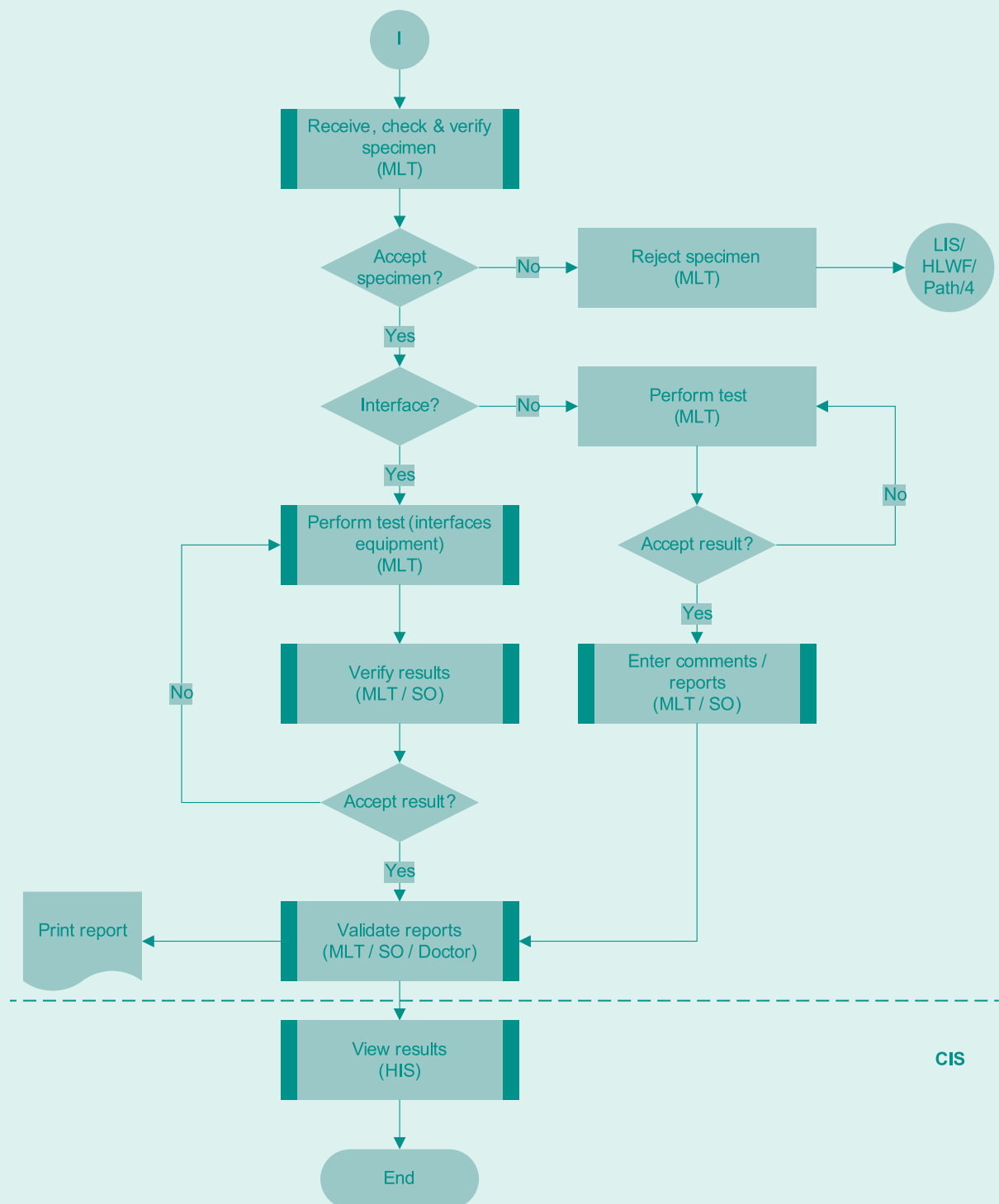
# High Level Workflow Pathology Department - Receiving and Processing Test Requests in Haematology Laboratory for Schedule Test LIS/HLWF/Path/10



**High Level Work Procedure Pathology Department – Receiving and Processing Test Requests in Haematology Laboratory for Scheduled Test**  
**LIS/HLWP/Path/10**

1. This work procedure is applicable for receiving and processing test request in Haematology Laboratory, based on orderables for scheduled test.
2. The MLT has to check the scheduled list and prepare the pre collection of samples. Upon successful completion of the procedure, specimen labels will be generated.
3. Upon arriving in the Haematology laboratory, the Medical Laboratory Technologist (MLT) shall verify the test request and specimen.
4. If the specimen is suitable for processing, the MLT shall assign the category number for the sample.
5. The MLT shall identify whether the test is done manually/ non interfaced or interfaced equipment.
6. For manual test, the MLT or Scientific Officer or Doctor shall enter comments/report.
7. Only validated results can be viewed by the care provider.
8. For external request, hard copies of report shall be generated and released to the secured pigeon holes at the CRA for collection.

# High Level Workflow Pathology Department - Receiving and Processing Test Requests in Haematology Laboratory for Non -Schedule Test LIS/HLWF/Path/11

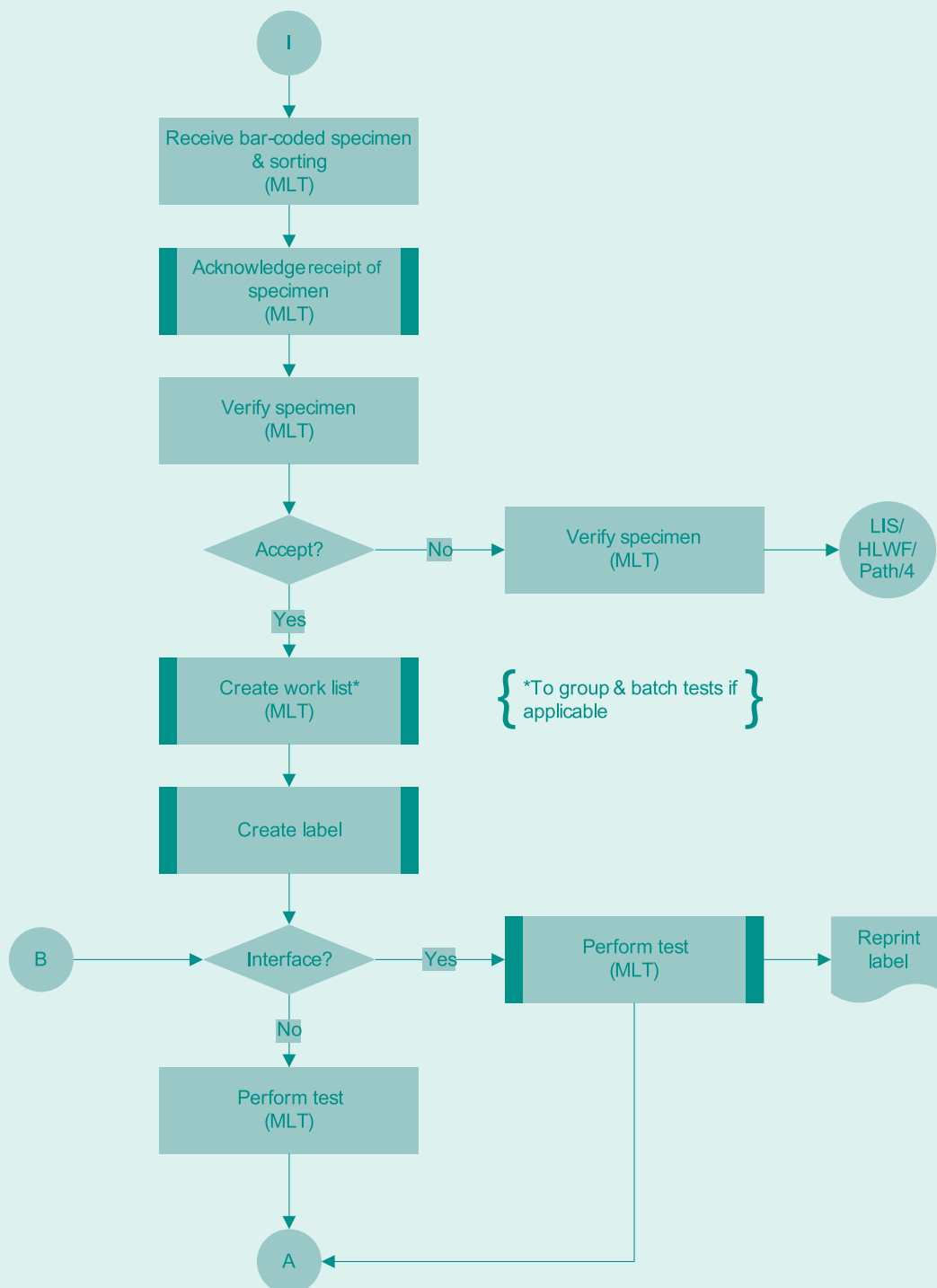


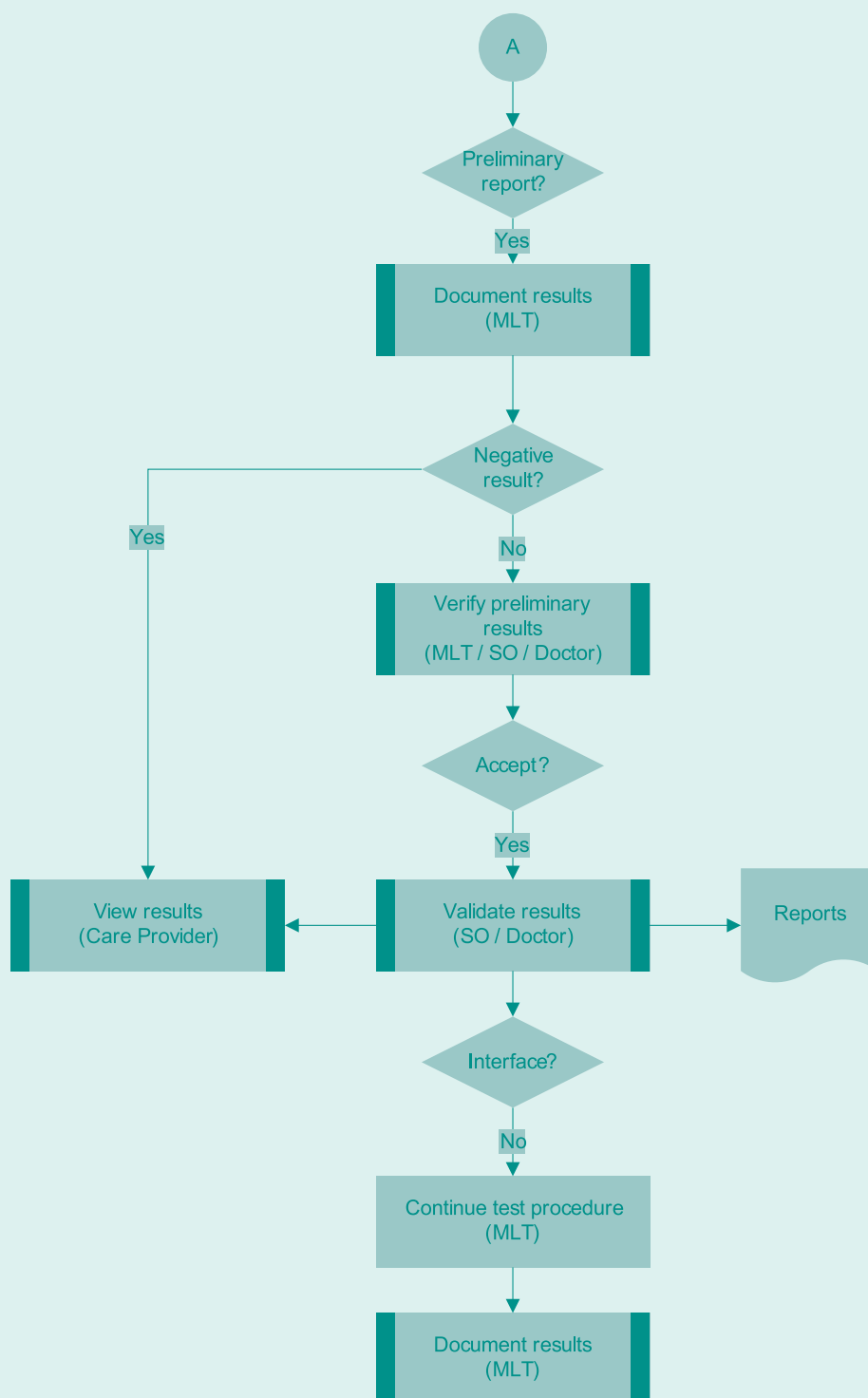
**High Level Work Procedure Pathology Department – Receiving and Processing Test Requests in Haematology Laboratory for Non Schedule Test**  
**LIS/HLWP/Path/11**

1. This work procedure is applicable for receiving and processing test request in Haematology Laboratory, based on the orderables for non scheduled test.
2. Upon arriving in the Haematology laboratory, the Medical Laboratory Technologist (MLT) shall check and verify the test request and specimen.
3. If the specimen is suitable for processing, the MLT shall identify whether the test is done manually/ non interfaced or interfaced equipment.
4. For manual test, the MLT or Scientific Officer (SO) or Doctor (Dr) shall enter comments/ report.
5. Only validated results can be viewed by the care provider.
6. For external request, hard copies of report shall be generated and released to the secured pigeon holes at the CRA for collection.



High Level Workflow Pathology Department - Receiving and Processing Test Request in Microbiology Laboratory  
LIS/HLWF/Path/12

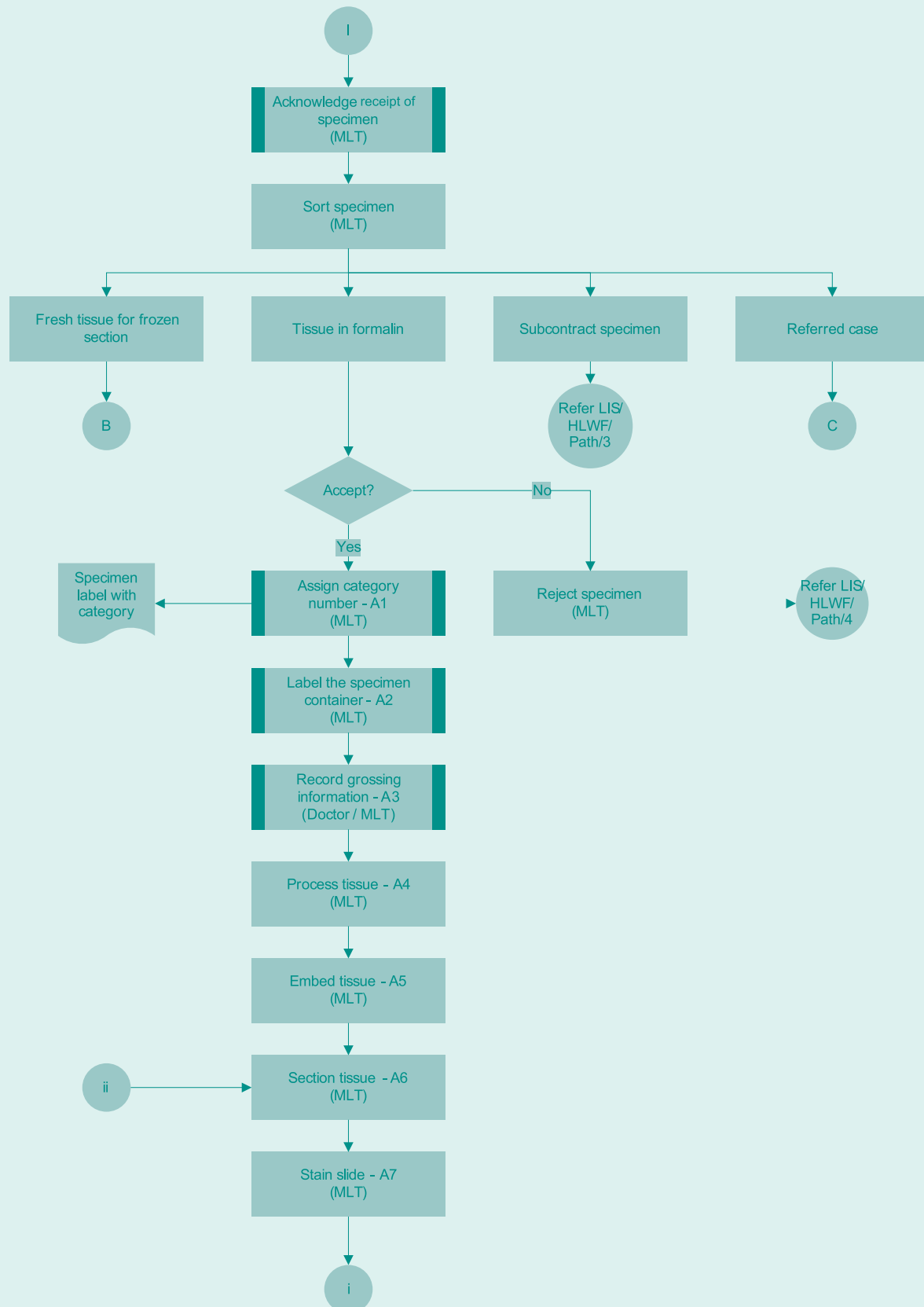


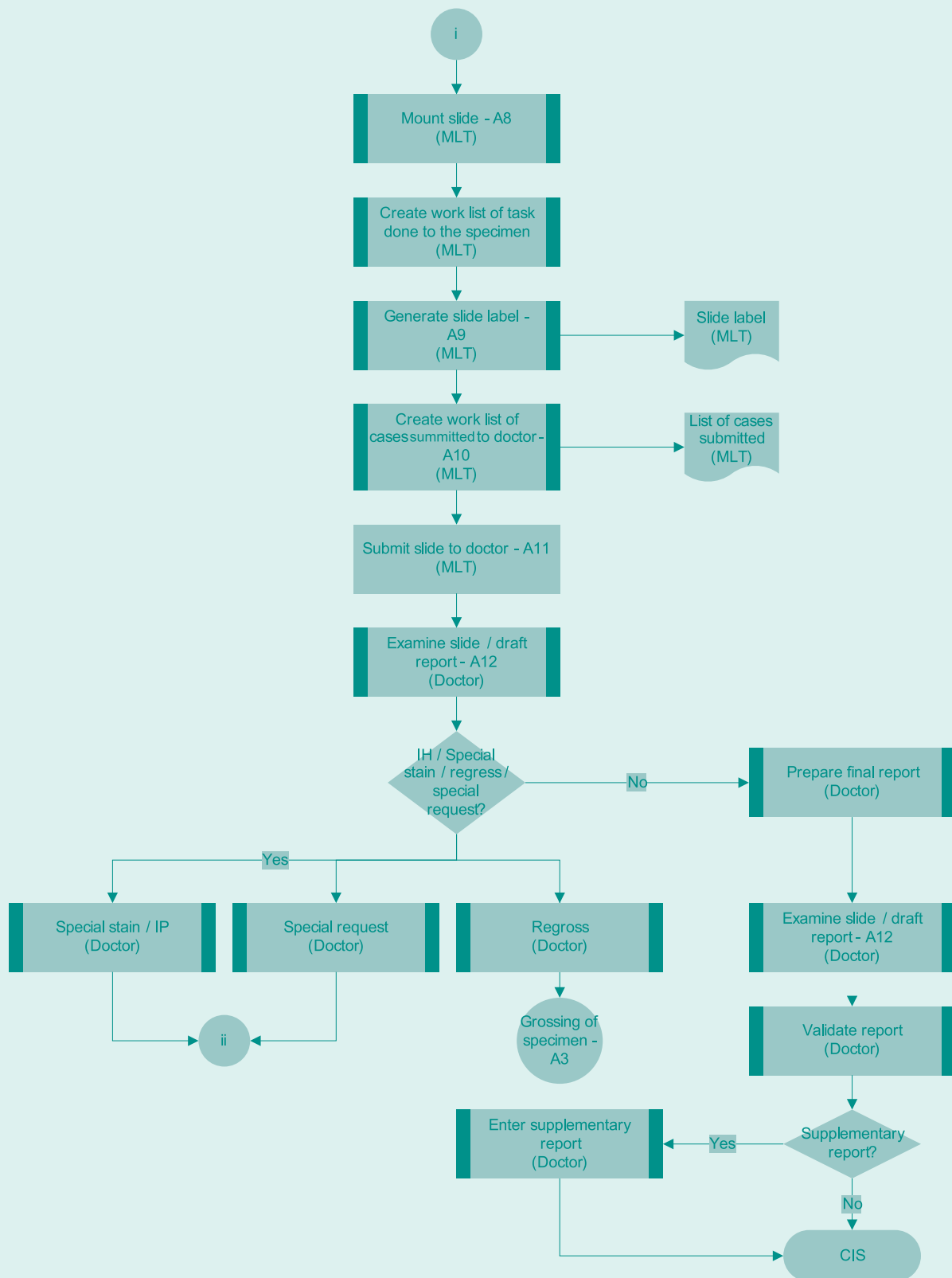


**High Level Work Procedure Pathology Department – Receiving and Processing Test Request in Microbiology Laboratory**  
**LIS/HLWP/Path/12**

1. This high level work procedure is applicable for processing internal and external specimens in Microbiology Laboratory.
2. The Medical Laboratory Technologist (MLT) will receive bar coded specimens from the Common Receiving Area (CRA) and will sort out to individual Microbiology section.
3. The MLT or Scientific Officer (SO) /Doctor (Dr) will acknowledge the receipt of the specimen at the individual Microbiology section.
4. The MLT or SO or Dr will check and verify the test request and the specimen.
5. If the specimen is not suitable for processing, the MLT or SO or Dr shall reject request and the reason for rejection shall be given (Refer LIS/HLWP/Path/4).
6. For the group and batch tests, system has provision to create Work list.
7. Analysis of the sample shall be proceeded either by automated system which is interfaced or by manual method.
8. All preliminary reports shall be documented. The positive preliminary report shall be verified and validated by SO or Dr before being viewed by the care provider. The analyzer will release automatically all negative preliminary results through the CIS.
9. This preliminary report supercedes any previous preliminary result.
10. The test shall be repeated for all unsatisfactory preliminary performance.
11. The MLT shall proceed with the test after satisfactory performance has been attained.
12. The result shall be documented. If any supplementary test is required, the MLT/SO/Dr will add on the related test for further investigation. Refer to LIS/HLWP/Path/3 for any test that needs to be out sourced.
13. Upon completion, the MLT /SO/Dr shall verify all the final results. Any unsatisfactory performance of the test shall be repeated.
14. All final results shall be validated by MLT/SO/Dr.
15. For external requests, the final results shall be released together with the List of External Pathology Report (system generated) into the secured respective pigeon holes. Where by for in house request, final results can be viewed through the Clinician Information System.

## High Level Workflow Pathology Department - Receive Test Request and Process Work Order in Histopathology Laboratory LIS/HLWF/Path/13

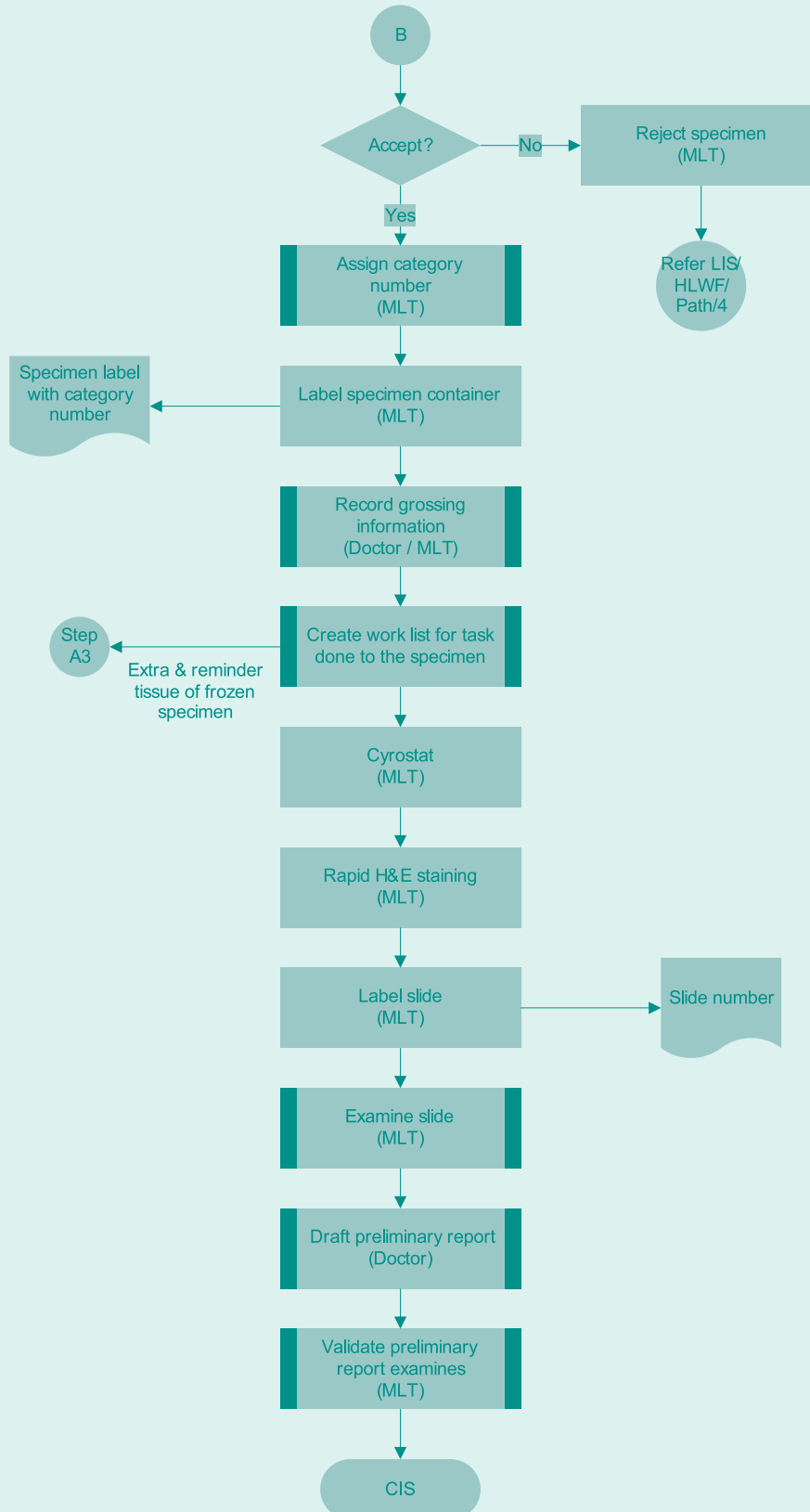




**High Level Work Procedure Pathology Department- Receive Test Request and Process Work Order in Histopathology Laboratory.**  
**LIS/HLWP/Path/13**

1. This work procedure is applicable for tests performed in Histopathology laboratory.
2. This medical laboratory technology (MLT) in Histopathology Laboratory shall acknowledge receipt of specimens and sort out the specimens based on type of orders.
3. If the specimen /request is not suitable for processing, the MLT/Dr shall reject the request and the reason for rejection shall be given (Refer LIS/HLWP/Path/3).
4. Once the request /specimen is accepted, unique category number shall be assigned to the specimen whereby specimen label which contains the category number and specimen number will be generated.
5. Dr/MLT will do the grossing procedure which depends on the specimens received. Details that need to be captured include description of the specimens and number of blocks taken.
6. Subsequent tasks (A4-A8) shall be created based on the category number by the MLT in charge.
7. A list of cases submitted to the doctor needs to be generated and sent together with the respective slides.
8. Dr shall examine the slides and draft report for all cases.
9. Additional sets of tasks can be ordered for the specimen.
10. Only validated reports can be viewed by the clinician through the system.
11. Supplementary reports can be produced as and when is necessary.

High Level Workflow Pathology Department - Receive Test Request and Process Work Order of Fresh Tissue for Frozen Section.  
LIS/HLWF/Path/14



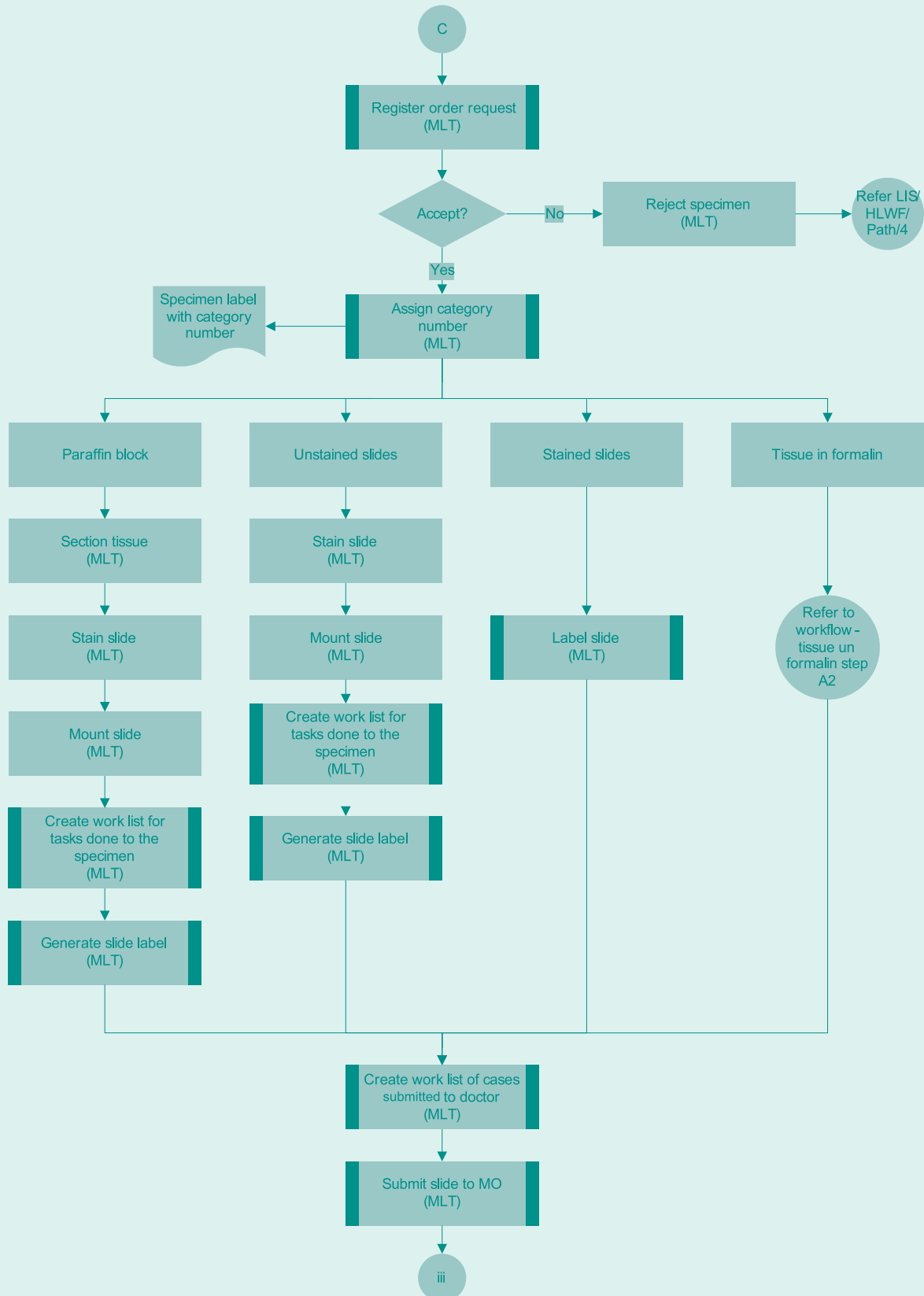
## High Level Work Procedure Pathology Department- Receive Test Request and Process Work Order of Fresh Tissue for Frozen Section.

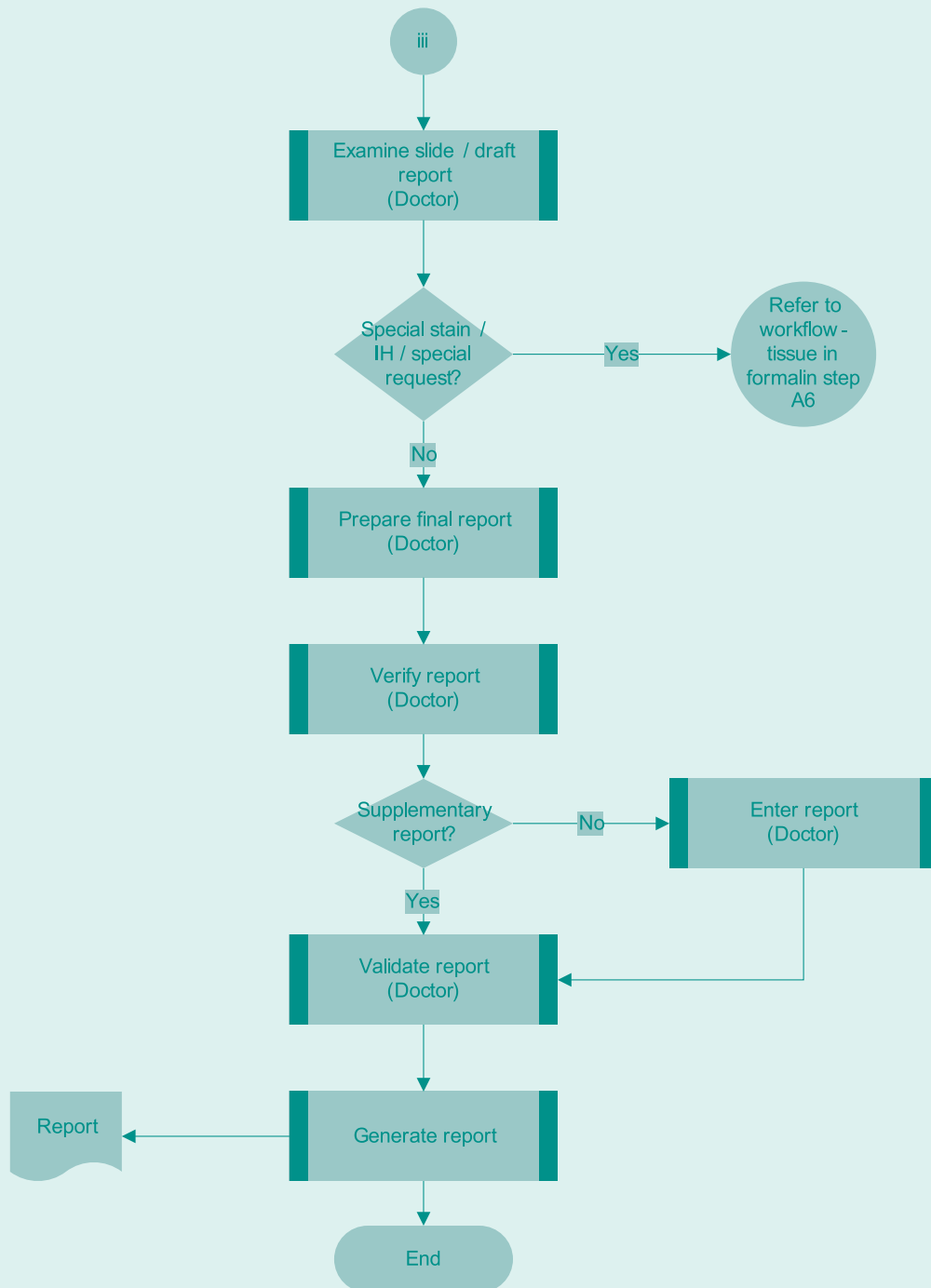
LIS/HLWP/Path/14

1. This work procedure is for test request and processing work order for frozen section.
2. Once the specimen is accepted, unique category number shall be assigned to the specimen, whereby specimen labels which contains the category number and specimen number will be generated.
3. Dr will do the grossing procedure based on the specimen received. Details that needs to be captured in the system include description of the specimen and number of blocks taken.
4. Subsequent tasks shall be created based on the category number by the MLT in charge.
5. Dr will examine the slides and draft the preliminary report.
6. Only verified preliminary report will be viewed by the clinician.
7. The remaining tissue will be put in 10% formalin and processed as tissue in formalin.
8. Final report can be viewed by the clinicians once it is validated by the Dr.



## High Level Workflow Pathology Department - Referred Case in Histopathology Laboratory and Cytology Laboratory LIS/HLWF/Path/15

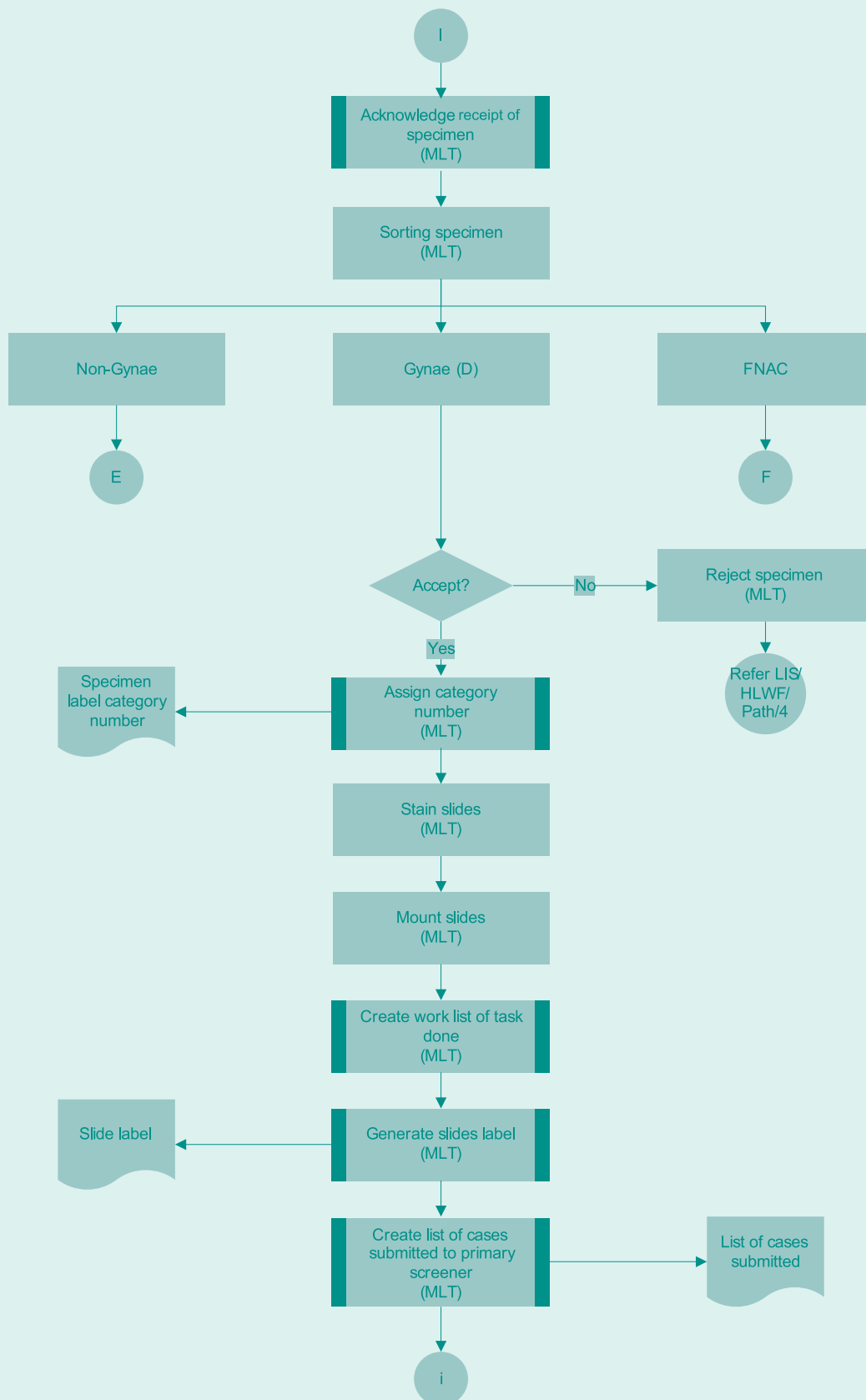


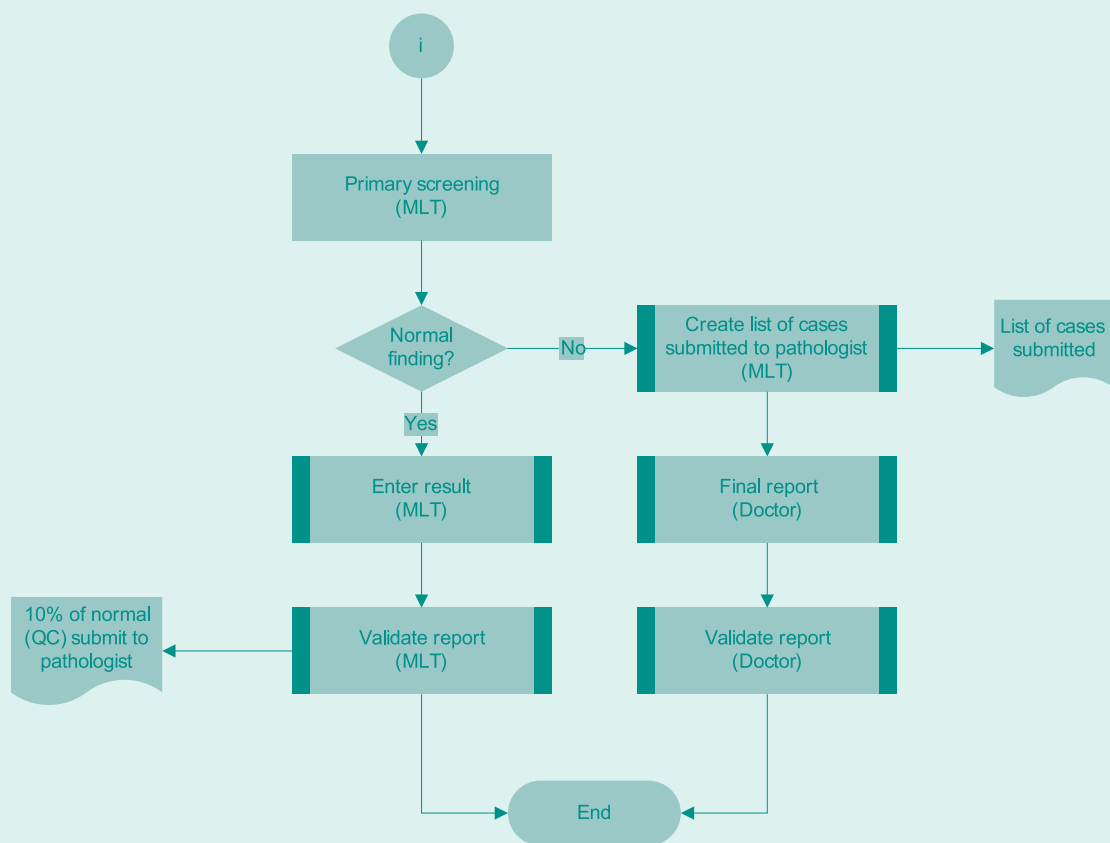


**High Level Work Procedure Pathology Department- Referred Case in Histopathology Laboratory and Cytology Laboratory**  
**LIS/HLWP/Path/15**

1. This work procedure is applicable for test request and processing work order for referred case (External request) in histopathology and cytology laboratory.
2. Once the specimen/request is accepted, a unique category number shall be assigned to the specimen.
3. The subsequent task depends on the type of "specimen" received (block, unstained slides, stained slide or tissue in formalin).
4. For block, the task starts from sectioning up to labelling of the slides, while for unstained slides, the tasks start from staining, mounting and labelling of the slides.
5. For tissue in formalin, the tasks are similar to in house request for histopathological examination.
6. The MLT will create a list of cases submitted to Dr and send the list together with the respective slides.
7. Dr will examine the slide and draft a report.
8. Another set of tasks can be ordered depending on the tissue/block availability and requirement.
9. Only validated reports can be generated from the system and needs to be signed by the MLT/Dr before being sent to CRA (Refer to LIS/HLWP/Path/2).

High Level Workflow Pathology Department - Receive Test Request and Processing  
Gynaecology Work Order  
LIS/HLWF/Path/16

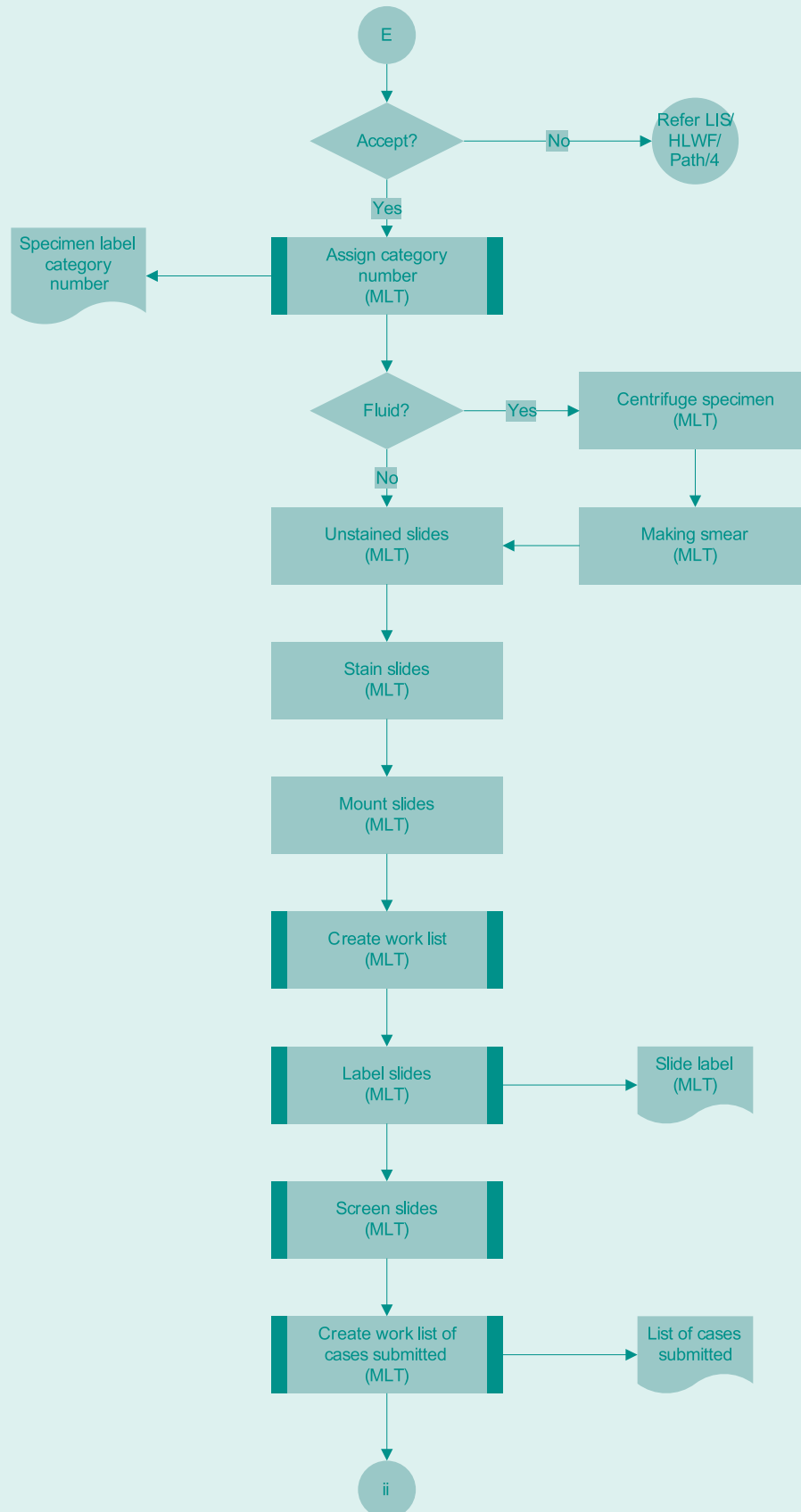


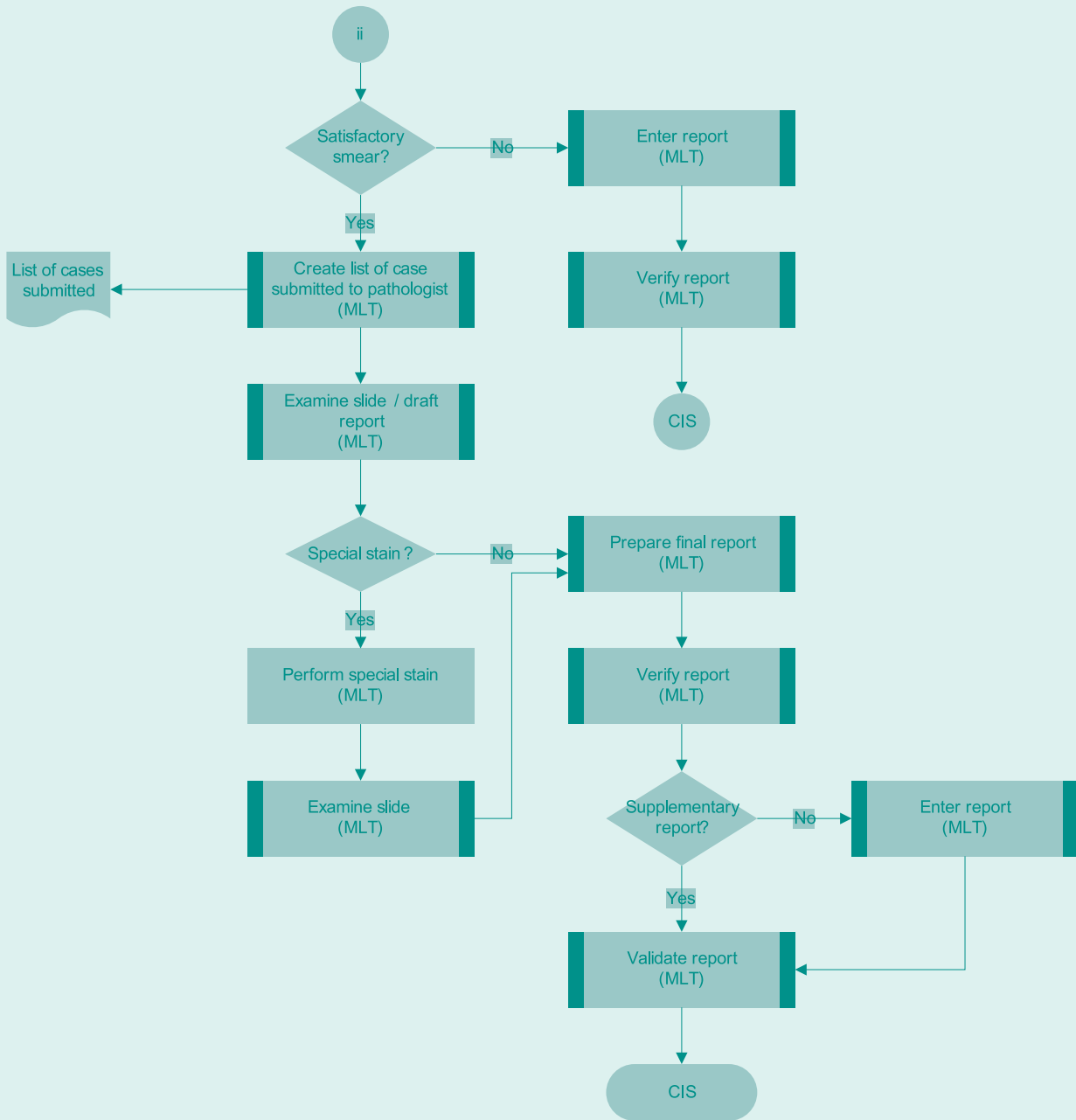


**High Level Work Procedure Pathology Department- Receive Test Request & Processing  
Gynaecology Work Order.  
LIS/HLWP/Path/16**

1. This work procedure is applicable for receiving test request and processing Gynaecology cytology samples.
2. Once the specimen is accepted, a unique category number shall be assigned to the specimen.
3. Subsequent list of tasks need to be created for set of specimens received.
4. A list of cases submitted to a primary screener needs to be generated and given together with the stained slides.
5. Primary screener will examine the stained slides and verify the normal and unsatisfactory reports.
6. A list of cases will be submitted to Doctor to be generated and given together with the stained respective stained slides.
7. Only validated reports will be viewed by the Clinician through the system.
8. A list of 1:10 of normal report needs to be generated and to be sent to the Dr/second screener for continuous quality programme.
9. Supplementary reports can be produced as and when necessary.

# High Level Workflow Pathology Department - Receive Test Request and Process of Non-Gynaecology Work Order LIS/HLWF/Path/17



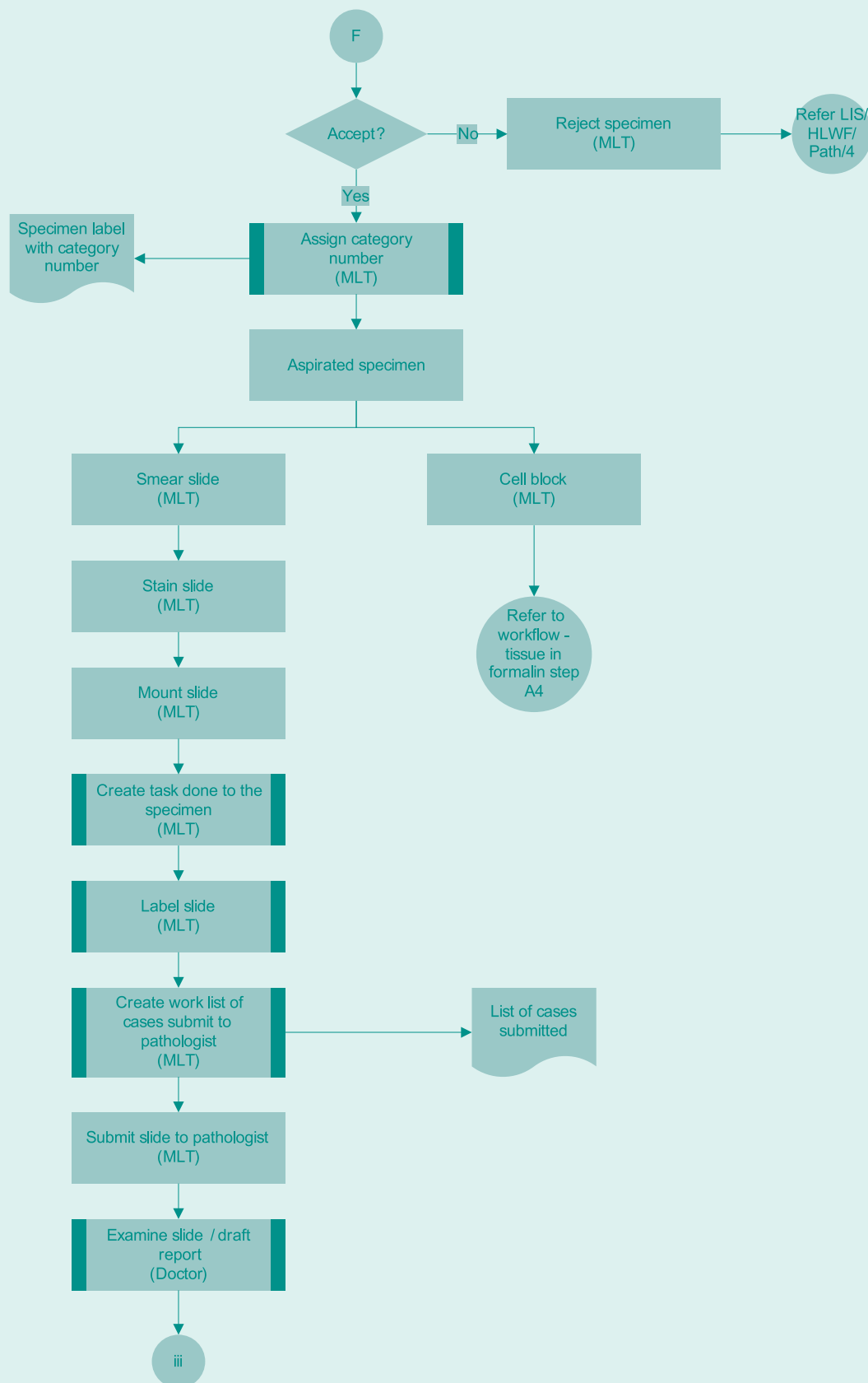


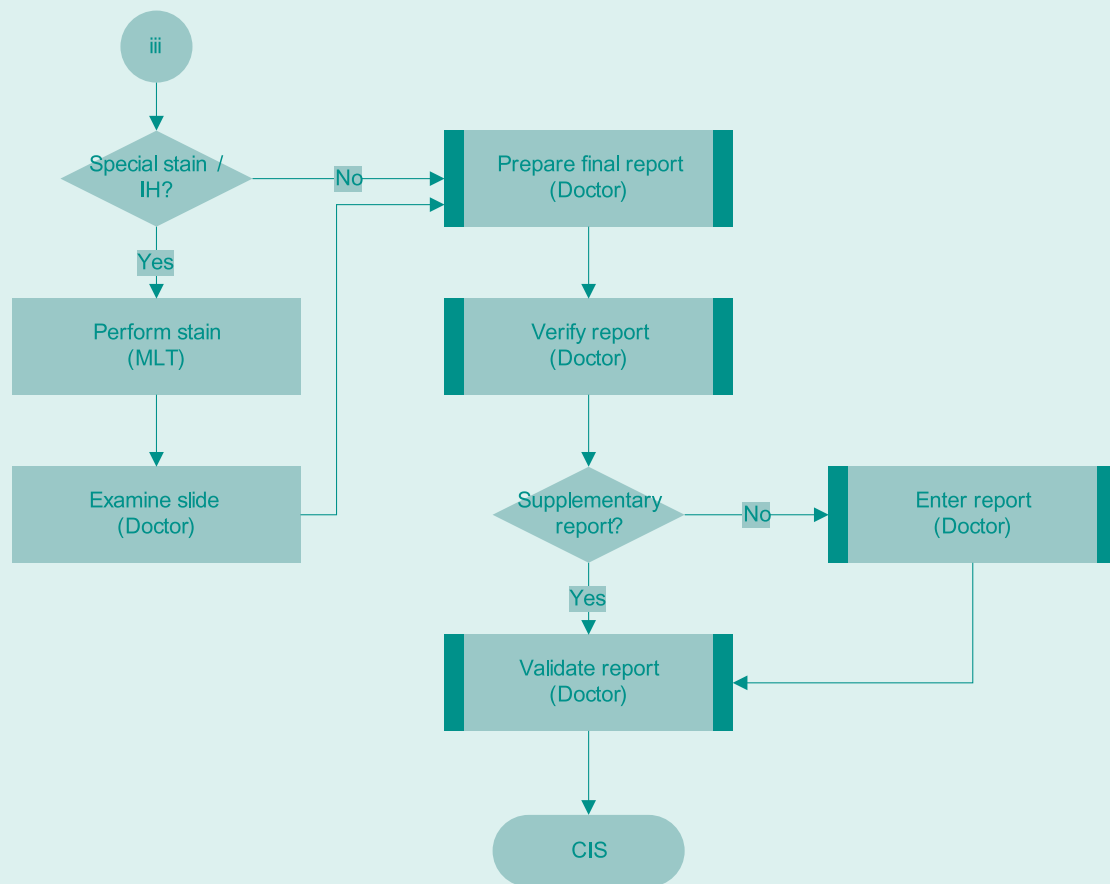


**High Level Work Procedure Pathology Department- Receive Test Request & Process of Non-Gynaecology Work Order.**  
**LIS/HLWP/Path/17**

1. This work procedure is applicable for receiving test request and processing non-gynaecology cytology sample.
2. Once the specimen is accepted, a unique category number will be assigned to the specimen.
3. Subsequent list of task needs to be created, based on the nature of specimen.
4. A list of cases submitted to primary screener needs to be generated and given together with the stained slides.
5. The primary screener will examine the stained slides and verify the unsatisfactory reports.
6. A list of cases submitted to doctor needs to be generated and given together with the stained slides.
7. Only validated reports will be viewed by the Clinician through the system.
8. Supplementary reports can be produced as and when necessary.

# High Level Workflow Pathology Department - Receiving and Processing Work Order for FNAC in Cytological Laboratory LIS/HLWF/Path/18



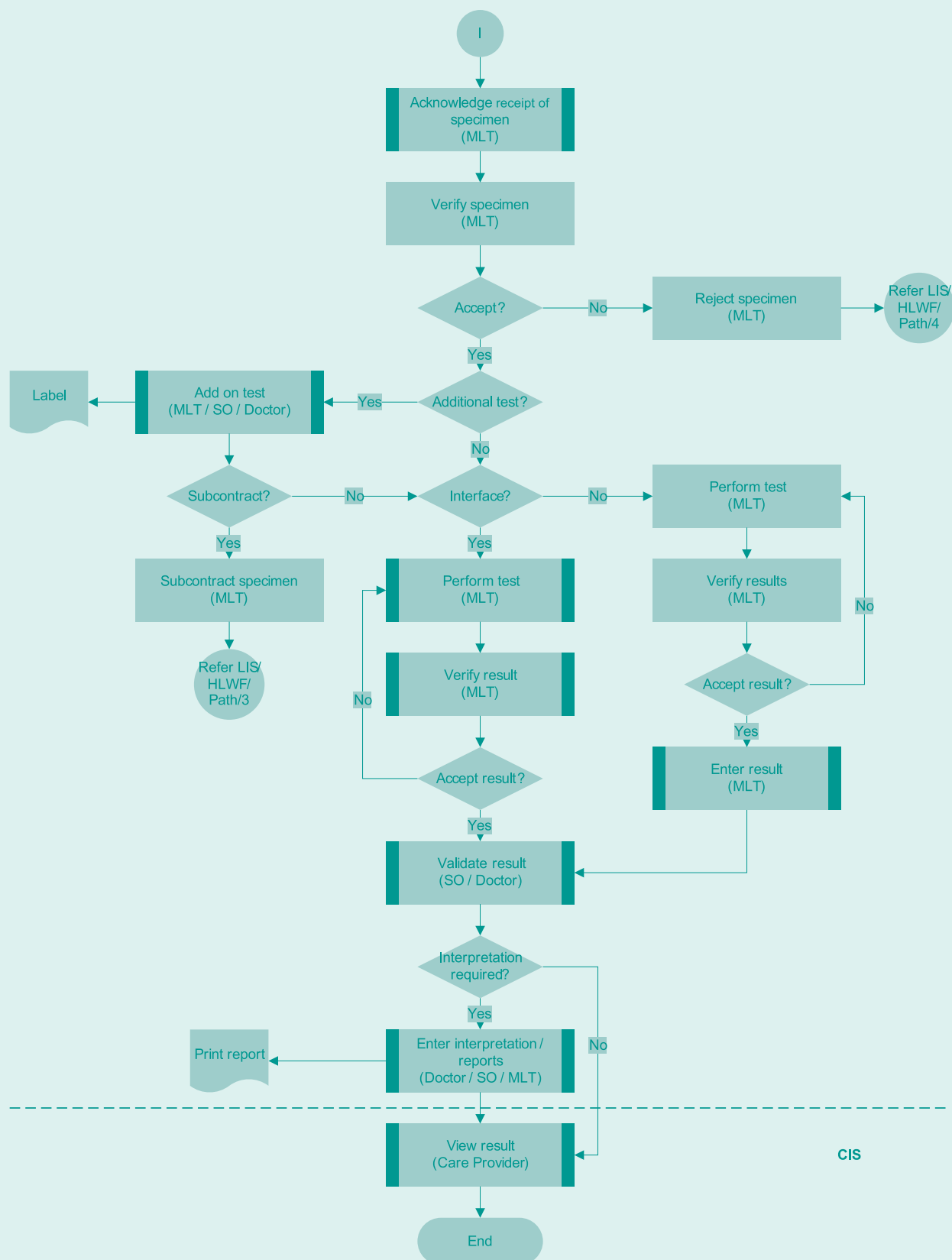


**High Level Work Procedure Pathology Department- Receiving & Processing Work Order  
for FNAC in Cytological Laboratory  
LIS/HLWP/Path/18**

1. This work procedure is applicable for receiving test request and processing Fine Needle Aspiration Cytology sample.
2. Once the specimen is accepted, a category number will be assigned to the specimen.
3. Subsequent list of tasks need to be created, based on the nature of specimen.
4. A list of cases submitted to Doctor needs to be generated and sent together with the respective slides.
5. Pathologist shall examine the slides and draft report for all cases.
6. Additional sets of tasks can be ordered pertaining to the specimens.
7. Only validated reports will be viewed by the Clinician through the system.
8. Supplementary reports can be produced as and when necessary.

# High Level Workflow Pathology Department - Receiving and Processing Test Request in Blood Bank

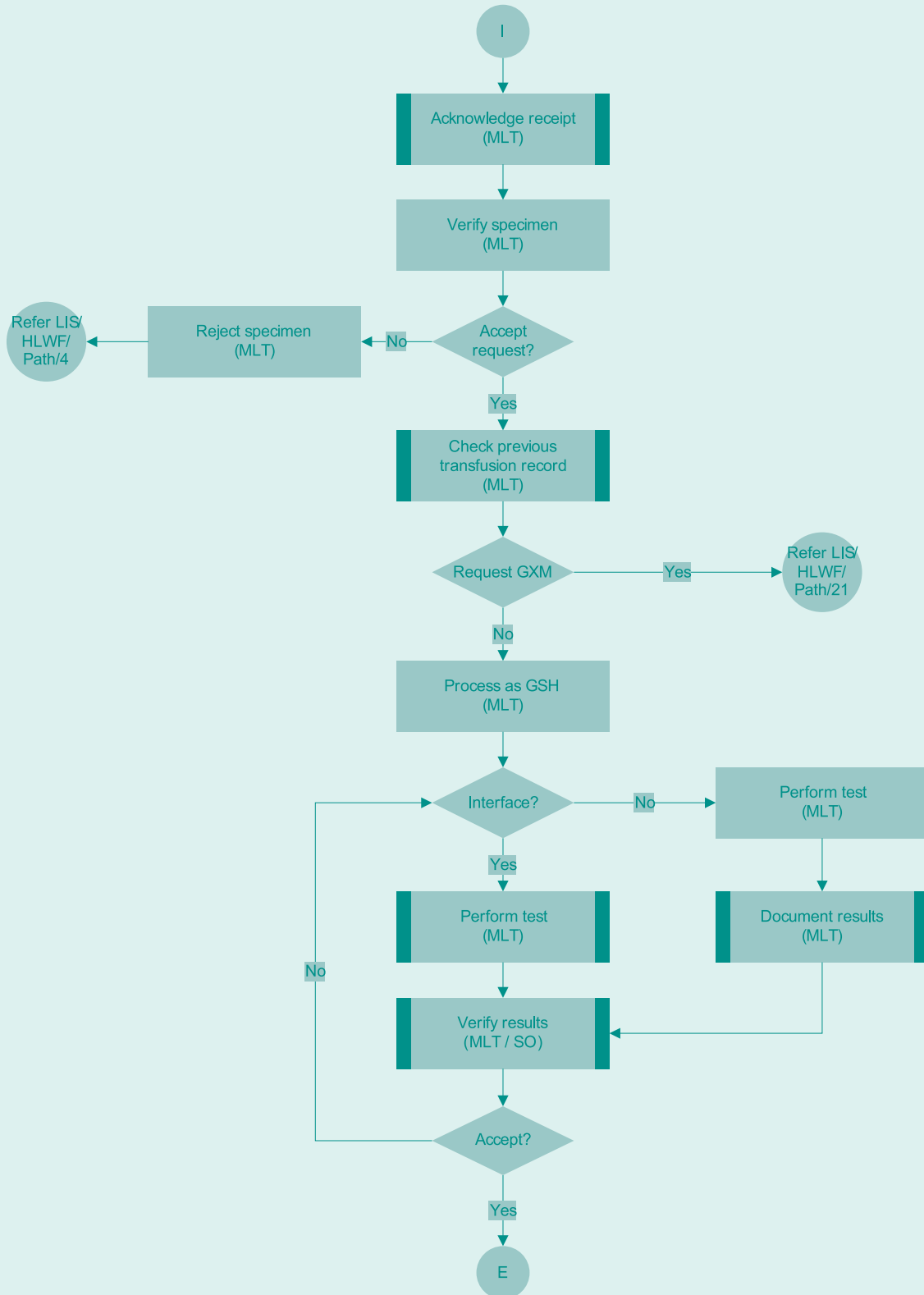
## LIS/HLWF/Path/19

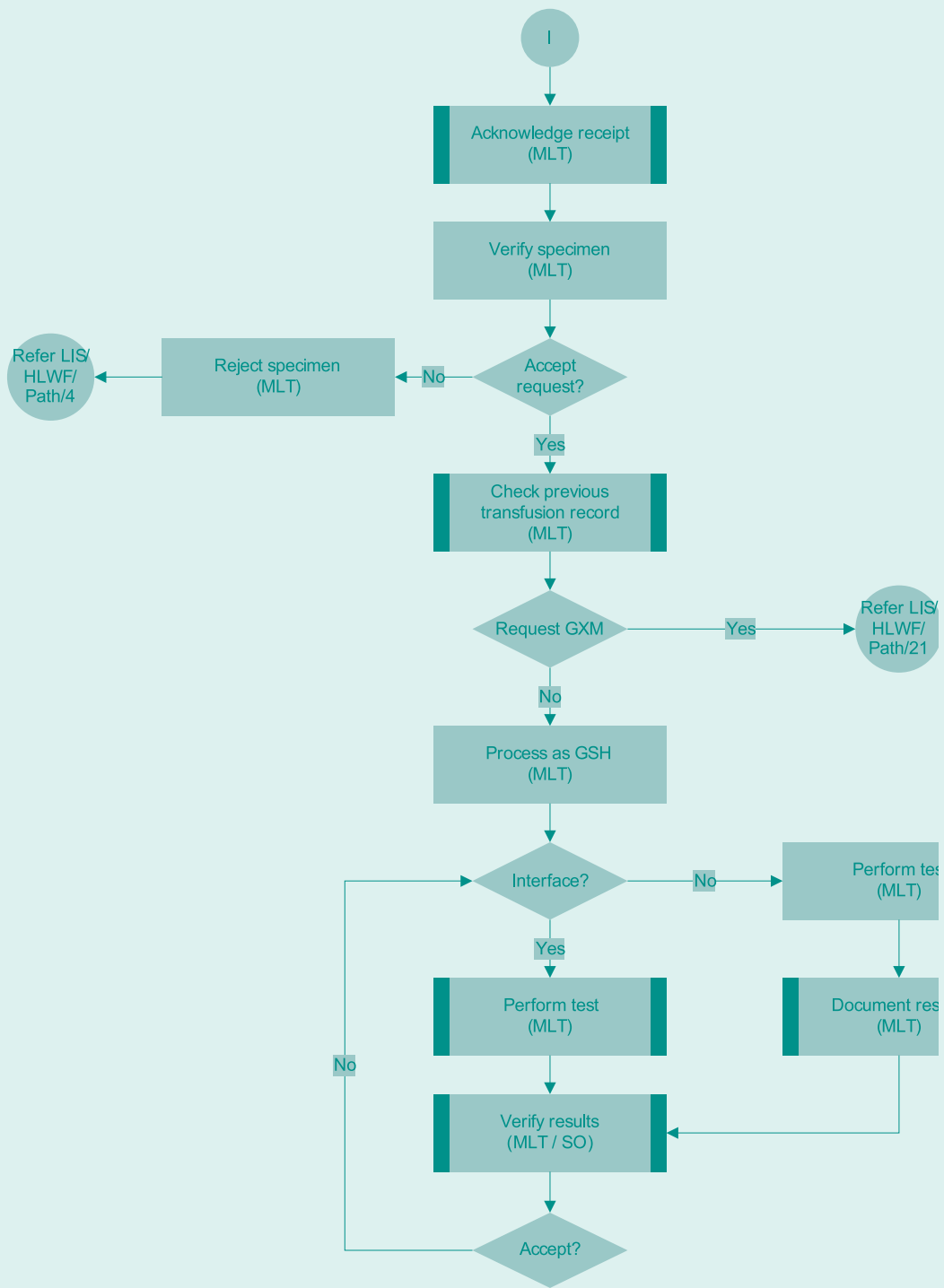


**High Level Work Procedure Pathology Department – Receiving and Processing Test Request  
in Blood Bank  
LIS/HLWP/Path/19**

1. This high-level work procedure is applicable for all tests requested in Blood Bank Laboratory.
2. The MLT in the workstation shall check and verify the specimens to confirm the acceptance of the specimens for testing. If not acceptable, the specimen shall be rejected, the reasons shall be given to the care provider. (Refer to LIS/HLWP/Path/4).
3. If additional tests are required, MLT shall check whether they need to be outsourced or done internally. Labels shall be reprinted. (Refer to LIS/HLWP/Path/3)
4. For tests which need to be performed manually, once the results are accepted, the MLT/SO/MO shall enter the results.
5. For interfaced tests, the results shall be verified by the MLT/SO/MO.
6. If the results are not accepted, the tests shall be repeated.
7. If the result requires interpretation, Dr/SO/MLT shall record the interpretation.
8. Only validated results can be viewed by the care provider.

High Level Workflow Pathology Department - Processing Group , Screen and Hold (GSH) and Cross Matching (XM) Test Request in Blood Bank Laboratory  
LIS/HLWF/Path/20





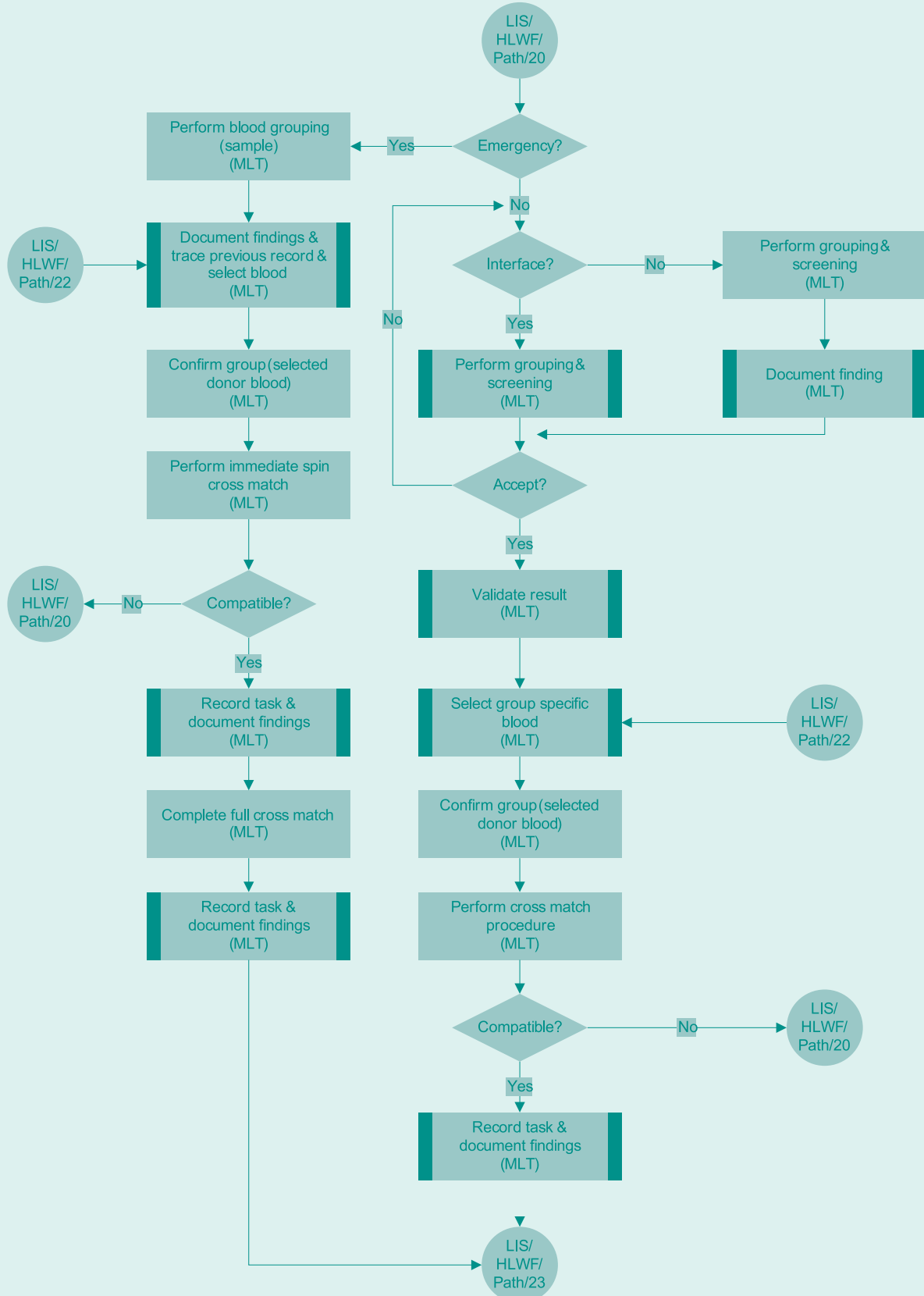


**High Level Work Procedure Pathology Department –Processing Group, Screen and Hold (GSH) & Cross Matching (XM) Test Request in Blood Bank Laboratory.**  
**LIS/HLWP/Path/20**

1. This high-level work procedure is applicable for processing test request for GSH in Blood Bank.
2. The MLT at the workstation shall verify the specimen, to confirm the acceptance of the specimen for testing. If not acceptable, the specimen shall be rejected, the reasons shall be given to the care provider (refer to LIS/HLWP/Path/4).
3. If acceptable, the MLT shall check for previous transfusion record including previous request for blood and blood components, transfusion history and antibody identification.
4. If the request is for GXM, refer to LIS/HLWP/Path/21 or if not, the specimen shall be processed for ABO & Rh Grouping/GSH.
5. For tests which need to be performed manually, once the results are accepted, the MLT/SO/MO shall enter the results.
6. For interfaced tests, the results shall be verified by the MLT/SO/Dr.
7. If the results are not accepted, the test shall be repeated.
8. Once the result is accepted, the MLT shall check for the presence of antibody. If no antibody is detected, the sample shall be kept for 48 hours before the request is cancelled.
9. If there is any antibody detected, the MLT shall place a request for antibody identification which can be performed in the hospital laboratory or to be outsourced (refer to LIS/HLWP/Path/3).
10. Once the antibody is identified, the MLT shall select matched blood unit.
11. The care provider shall request for blood transfusion through the system and by phone.
12. Upon receiving the request for transfusion the MLT shall select matched blood unit and perform the cross match (refer LIS/HLWP/Path/21).

# High Level Workflow Pathology Department - Performing Cross Match in Blood Bank Laboratory

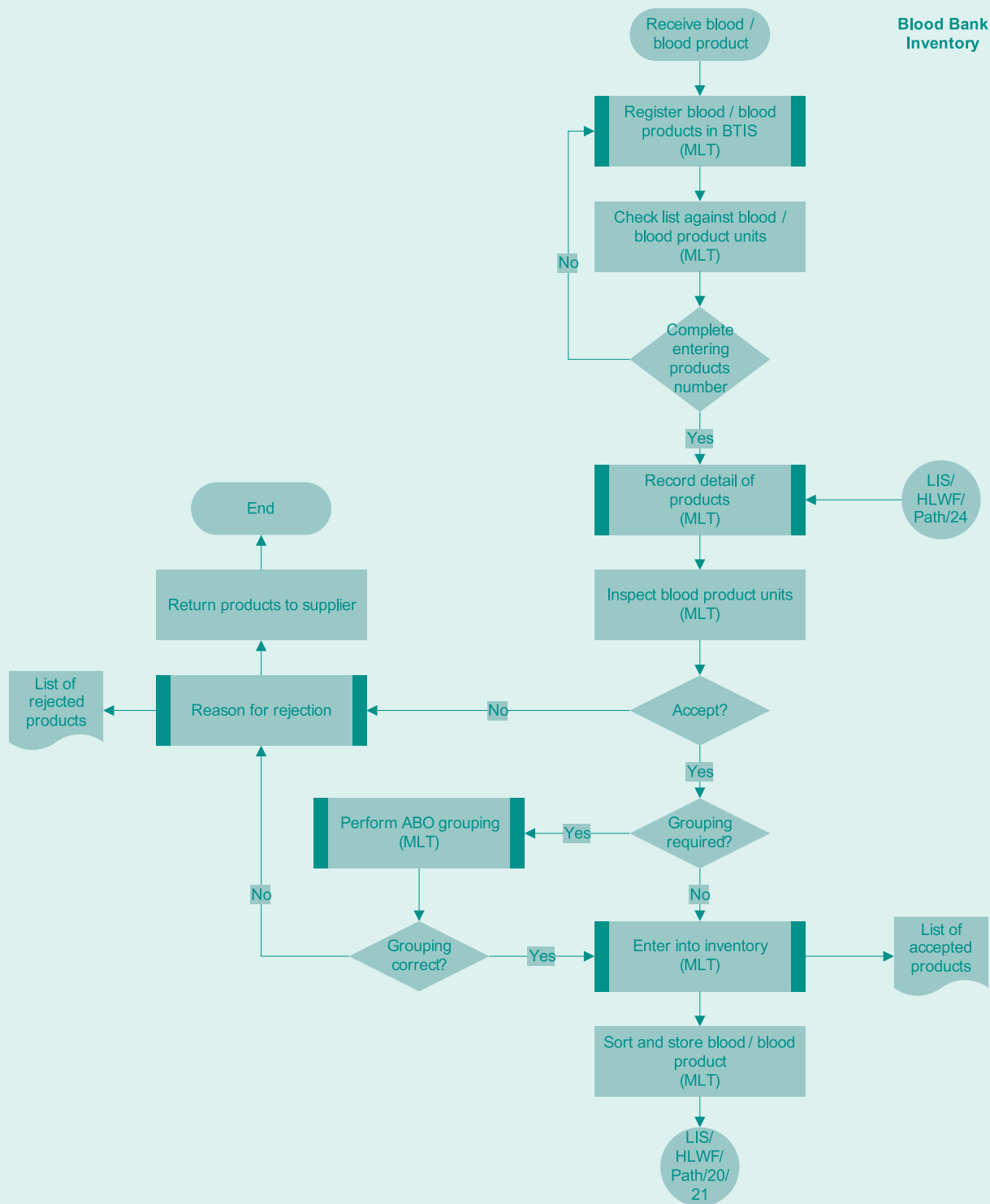
LIS/HLWF/Path/21



**High level Work Procedure Pathology Department- Performing Cross Match in Blood Bank laboratory**  
**LIS/HLWP/Path/21**

1. This high level work procedure is applicable for processing emergency and non emergency request for blood cross matches in the hospital blood bank. The request is made by Medical Officer (MO) (refer LIS/HLWP/Path/20).
2. For emergency blood transfusion request, the MLT shall proceed to trace previous record and test the blood group of the patient.
3. Upon conforming the patient's blood group, the MLT shall select the blood and confirm the selected donor blood group.
4. Subsequently, the MLT shall perform immediate spin cross match for patient with the selected blood.
5. If incompatible, the MLT shall process the antibody identification (refer LIS/HLWP/Path/20).
6. If found compatible, the MLT shall document the results and proceed with the supply (refer LIS/HLWP/Path/23) and complete the cross match procedure.
7. If the request for cross match is not for emergency transfusion, the MLT shall perform the grouping and screening test.
8. Upon completion, the results shall be documented and verified by the MLT.
9. Once the result is validated, the MLT shall select the blood and reconfirm the blood group of the selected donor. Perform cross match procedure.
10. If incompatible, the MLT shall proceed with antibody identification refer LIS/HLWP/Path/20).
11. If found compatible, the MLT shall document the results and proceed with the supply (refer LIS/HLWP/Path/23).

High Level Workflow Pathology Department - Receiving of Blood / Blood Product from  
Regional Blood Bank Laboratory  
LIS/HLWF/Path/22

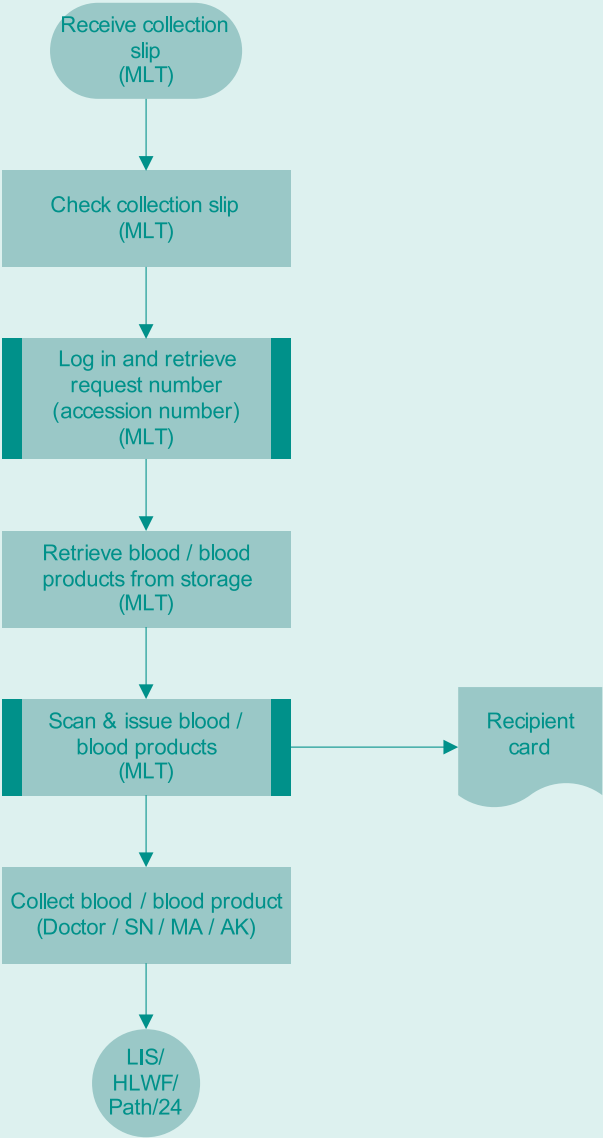


**High Level Work Procedure Department Pathology- Receiving of Blood/Blood Product  
from Regional Blood Bank laboratory  
LIS/HLWP/Path/22**

1. This high-level work procedure is applicable for receiving blood/blood products from Regional Blood Bank.
2. The MLT shall register all blood / blood products unit number into the system.
3. The MLT shall check the blood / blood products against the list given by the Regional Blood Bank.
4. If there is no discrepancy, the MLT shall record all details of blood/blood products into the system.
5. If there is any discrepancy between the blood / blood products with the accompanying list and any physical defect, the reason for rejection shall be entered into the system.
6. If the blood / blood products are accepted, for Red Cells, the MLT shall recheck the ABO grouping. Any discrepancies with the blood grouping, the findings shall be entered into the system as reason of rejection. If ABO Grouping is correct, the details for each unit shall be entered into the inventory. Blood Products shall also be entered into the inventory in the same manner.
7. The MLT shall sort out and store the blood / blood products in the proper storage condition.
8. Rejected blood / blood products shall be returned to the supplier accompanied by a rejection list. Refer to Pathology Department Blood Bank Policy.
9. Unused matched blood products shall be returned to the inventory.

High Level Workflow Pathology Department - Issuing of Blood / Blood Product in Blood Bank (THIS) Hospital  
LISHLWF/Path/23

Blood Bank

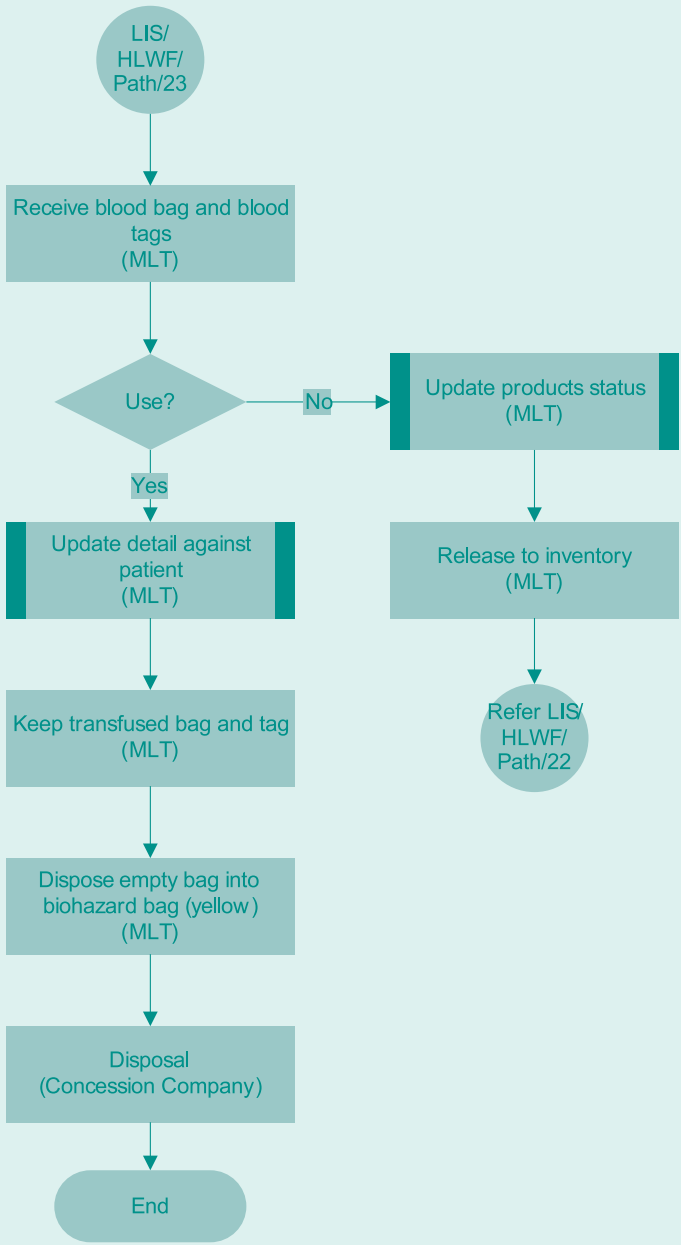


**High Level Work Procedure Pathology Department – Issuing of Blood / Blood Products in Blood Bank**  
**LIS/HLWP/Path/23**

1. This high-level work procedure is applicable for issuing blood/blood products for in house patients.
2. Upon receiving the collection slip, MLT shall check for Ward/Clinic (Patient Location), Product, Number of unit assigned, Name of Care Provider and Staff Nurse In-charge and confirm that details on the collection slip match with the data in the system.
3. The MLT shall retrieve blood/blood products based on the number of units assigned on the collection slip.
4. Before issuing blood / blood products, the MLT shall scan the blood / blood products label to acknowledge the issuance.
5. At this point, the MLT shall enter the name of the Doctor who made the request, the person who collect the blood/blood products and print the recipient card.
6. The Dr/SN/MA/AK shall collect the blood/Blood Products together with the recipient card.

High Level Workflow Pathology Department - Used and Unused Blood / Blood Product in Blood Bank  
LIS/HLWF/Path/24

Blood Bank



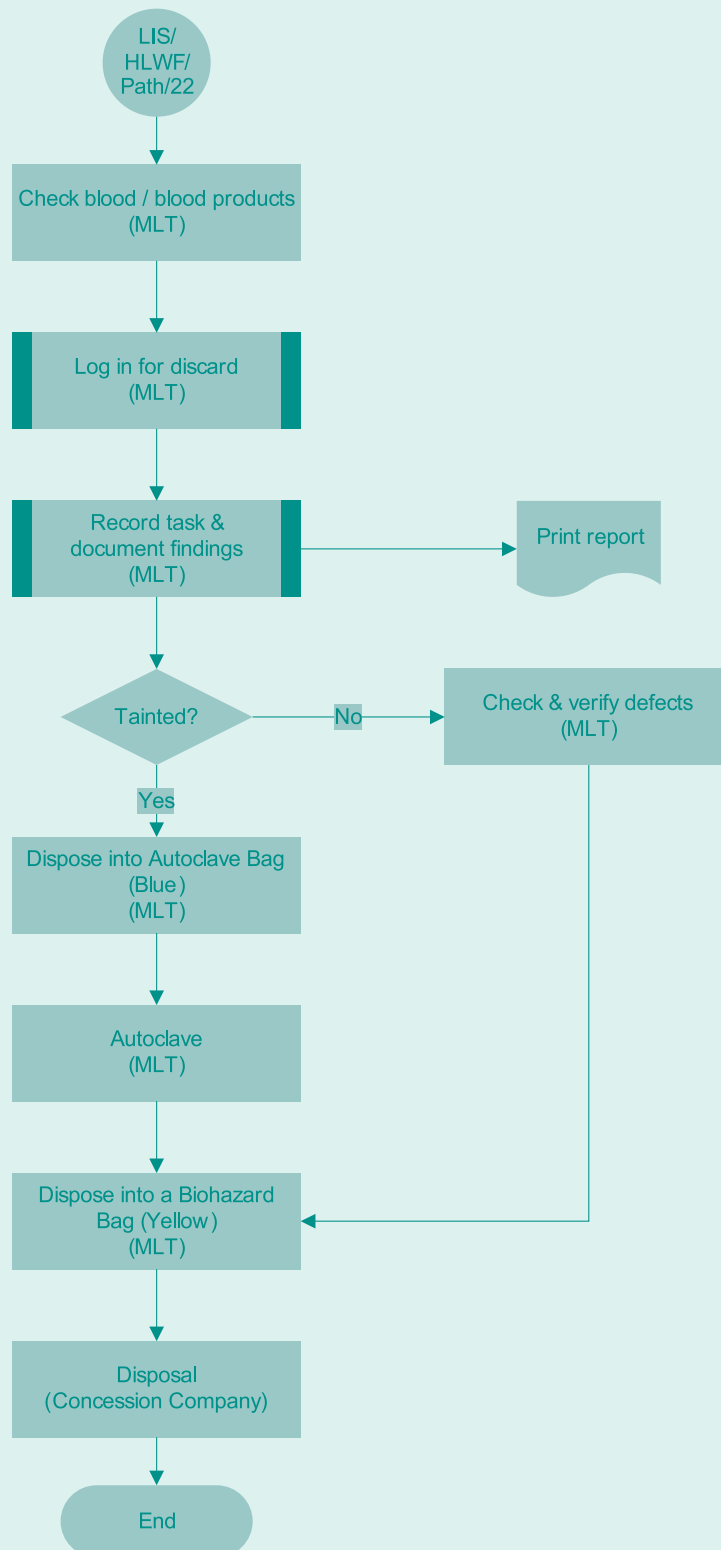


## High Level Work Procedure Pathology Department – Used And Unused Blood / Blood Products in Blood Bank.

### LIS/HLWP/Path/24

1. This high-level work procedure is applicable for receiving used and unused blood / blood products.
2. The MLT shall receive and check the blood bag and blood tag returned by care provider. Ensure that the used products are returned in the proper manner (Used bag in yellow biohazard bag and blood tag attached separately).
3. The MLT shall change the status of the unused blood/blood products and release it to the inventory. Refer to LIS/HLWP/Path/22.
4. The MLT shall update details against patient for the used blood/blood products.
5. The used blood bag shall be kept for 7 days in a specific refrigerator and the blood tag kept for 7 days.
6. After 7 days, the used blood bag shall be disposed by the concession company.

High Level Workflow Pathology Department - Management of Discarding Tainted / Not Tainted Blood / Blood Product in Blood Transfusion Section  
LIS/HLWF/Path/25



**High Level Work Procedure Pathology Department – Management of Discarding Tainted / Not Tainted Blood / Blood Products in Blood Transfusion Section.**  
**LIS/HLWP/Path/25**

1. This high-level work procedure is applicable for discarding blood / blood products from Blood Bank Inventory.
2. The MLT shall check blood/blood products that needs to be discarded from the inventory.
3. He shall enter the reason for discarding each blood/blood products.
4. For tainted blood, the blood bag shall be autoclaved before disposal.
5. All blood bags shall be packed in yellow biohazard bags and disposed of by Concession Company.

The system functionality identified under the generic lab function is applicable to all labs in addition to functionality required for specific labs have been defined under the lab concerned.

## 5.1. Generic Lab Functions:-

### 5.1.1. CIS:-

- 5.1.1.1. Ability to interface with LIS.
- 5.1.1.2. System should be user friendly for test requests.
- 5.1.1.3. Ability for the system to provide for selection of multi tests for a specimen / procedure in the CIS.
- 5.1.1.4. Ability to create and support templates e.g. request form PER-PAT301.
- 5.1.1.5. System shall allow mandatory fields as in request format and shall be highlighted.
- 5.1.1.6. Ability to support system generic request number.
- 5.1.1.7. Ability to capture time, date and person to verify the sending of the specimen.
- 5.1.1.8. Ability to provide type of operation / procedure and specimen
- 5.1.1.9. Ability to view results of patient by ward and print results as in accordance to local policy.
- 5.1.1.10. Ability to support textual and graphics reports and comments.
- 5.1.1.11. Ability to support system generic request number.
- 5.1.1.12. Ability to support digitized images/graphics.
- 5.1.1.13. Ability to print and reprint specimen labels after order.
- 5.1.1.14. Ability to display the following information on the labels:-
  - Patient Name.
  - Barcode lines.
  - The actual alpha numerical number of the barcode lines.
  - IC Number.
  - Location.
  - Date.
  - Time.
  - Type of test.
- 5.1.1.15. Ability to demarcate clearly the labels for the different patients, which are issued in sequence.
- 5.1.1.16. Ability of the system to net multiple tests onto a single label (as per suitability of the specimen).
- 5.1.1.17. Ability to gain limited access to LIS for designated personnel.
- 5.1.1.18. Ability to capture the time, date and person to verify the sending of the specimens (specimen tracking).
- 5.1.1.19. Ability to create and support templates e.g. request form PER-PAT301.

- 5.1.1.20. Ability to provide list of physician order entries for lab request
- 5.1.1.21. Ability to select and deselect tests for specified lab order sets (e.g.: renal profile).
- 5.1.1.22. Ability to provide information on specimen type, specimen containers and appropriate collection procedures.
- 5.1.1.23. Ability to maintain appointment schedule, alert and remind the ordering doctor of the booking of special procedure/test.
- 5.1.1.24. Ability to schedule and reschedule test request based on pre agreed criteria defined by user.
- 5.1.1.25. Ability to alert the ward of incoming critical, urgent results and rejection list.
- 5.1.1.26. Ability to provide alert to test result with significant finding as per user defined criteria.
- 5.1.1.27. Ability to support Pharmacy to view certain lab results e.g. TDM and other related tests, e.g. Renal Profile and Liver Function Test for interpretation of therapeutic drug monitoring results. (Link PHIS & CIS).
- 5.1.1.28. Ability to denote the test status through colour coding/icon.
- 5.1.1.29. Ability to alert ordering source when test is ordered more than once.
- 5.1.1.30. Ability to filter rejected test request by type of test, ward / clinic, receiving person and date.
- 5.1.1.31. Ability to retrieve and trend results according to pre-determined parameters.
- 5.1.1.32. Ability to support prompts and alerts.
- 5.1.1.33. Ability to create display screen/page for rejected specimens, reports generated for the day.
- 5.1.1.34. Ability to create appointment books, example frozen section, FNAC.
- 5.1.1.35. Provision for limited LIS access to designated personnel e.g. Clinician shall be able to access the infection control data stored in the laboratory, QC/QA performance data for the laboratory.
- 5.1.1.36. Ability to create and support templates for specific function e.g. point surveillance antibiotic usage, needle stick injury, notification of nosocomial infection, HIV 97 and KKM PER. PAT 301, occupationally acquired infection for health care workers, consumer satisfaction.
- 5.1.1.37. Provision for generating notification reports for notifiable diseases on a daily basis.
- 5.1.1.38. Provision for the end user to access regarding the number of cases per designated infectious diseases in the hospital on a daily basis:-
  - 5.1.1.38.1 Quality and inkfast barcode labels shall be provided. Barcode labels size should vary according to the size of the specimen tubes.
  - 5.1.1.38.2 Reprints for labels should be specific for the type and number of tests requested.

## 5.1.2. LIS:-

### 5.1.2.1. Generic Lab Functions:-

5.1.2.1.1	Ability to generate textual report based on discrete data.
5.1.2.1.2	Ability to interface and access CIS.
5.1.2.1.3	Ability for the system to create appointment for scheduled tests and to capture date, time, requesting doctor, patient's demographics, indication, previous patient's reports and cancellation reasons.
5.1.2.1.4	Ability of the system to capture and store data from the input form.
5.1.2.1.5	Ability to register new entry and / or retrieve previous record of external clients and connect to billing module.
5.1.2.1.6	Ability to set different access level as determined by need to know basis.
5.1.2.1.7	Ability to print and reprint multiple bar coded specimen / slides labels.
5.1.2.1.8	Ability to print aliquot labels with the following information:- <ul style="list-style-type: none"> <li>• Name of patient.</li> <li>• The barcode lines.</li> <li>• The actual alphanumerical number of the barcode.</li> </ul>
5.1.2.1.9	Ability to demarcate clearly the labels for the different patients, which are issued in sequence.
5.1.2.1.10	For host query, the barcode features should comply with all analyzers.
5.1.2.1.11	Ability to transfer test requests between analyzers.
5.1.2.1.12	Ability for the barcode scanner to scan curved specimen containers.
5.1.2.1.13	For host query, the barcode features should comply with all analyzers.
5.1.2.1.14	Ability to provide audit trail to capture the following:- <ul style="list-style-type: none"> <li>• The site, date, time and person who log in to receive the specimen at all working stations.</li> <li>• Display the time, date and person receiving to verify the acceptance of the specimen.</li> <li>• Date, time, person and reason for rejection and communication of the rejection to the client.</li> <li>• Display date and time by default on receiving the specimen at different workstations.</li> <li>• Date, time and person who logged in the sample at specific workstations.</li> <li>• Date and time of the analysis and the equipment performing the analysis at the specific workstation.</li> </ul>

- Date, time and person who validated the results at the specific workstation.
  - Date of dispatch and receiving results from the subcontracted labs.
- 5.1.2.1.15 Ability to generate a unique serial bar coded number across enterprise (algorithm to be worked out later prefix number / year / serial lab number).
- 5.1.2.1.16 Separate accession/ request number shall be given to the test request received from external referring institution.
- 5.1.2.1.17 Ability to assign specimens to the respective medical officer or pathologist.
- 5.1.2.1.18 Ability to record time and date by default on receiving the specimens.
- 5.1.2.1.19 Ability to add on additional tests.
- 5.1.2.1.20 Ability to scan request forms and documents from external clients.
- 5.1.2.1.21 Ability to enter and maintain sequential order accession number issued manually during system down time.
- 5.1.2.1.22 Ability to print multiple specimen labels.
- 5.1.2.1.23 Ability to create work list and worksheets by type of lab.
- 5.1.2.1.24 Ability to extract incomplete list.
- 5.1.2.1.25 Ability to denote the test status through colour coding/ icon.
- 5.1.2.1.26 Ability to retrieve previous reports and other related reports.
- 5.1.2.1.27 Ability for the system to selectively display reports / results to CIS while maintaining a complete record of the original reports / results.
- 5.1.2.1.28 Ability to provide alert for frequent test request as determined by pre-determined criteria.
- 5.1.2.1.29 Ability to capture by default, time and date slides submitted to doctor. (Transfer to Histo Haematology).
- 5.1.2.1.30 Ability to capture by default, time and date preliminary report made.
- 5.1.2.1.31 Ability to capture by default, time and date report verified by doctor.
- 5.1.2.1.32 Ability to demarcate clearly the labels for the different patients, which are issued in sequence.
- 5.1.2.1.33 Ability to import digitized images from the macro and microscopic features to the report.
- 5.1.2.1.34 Ability to import and export digitized images from and to the referring institutions.

5.1.2.1.35	Ability to import digitized images from the analyzers to the system.
5.1.2.1.36	Ability to edit, update and append results by designated personnel.
5.1.2.1.37	Ability to support textual, templates and free text.
5.1.2.1.38	Ability to capture the following features in the reference range:- <ul style="list-style-type: none"> <li>• By sex.</li> <li>• By age.</li> <li>• By time.</li> <li>• Unit of measurement (SI unit).</li> </ul>
5.1.2.1.39	Ability of the system to support calculated/derived parameters.
5.1.2.1.40	Ability of the system to flag abnormal results with the following features:- <ul style="list-style-type: none"> <li>• Reference High.</li> <li>• Reference Low.</li> <li>• Critical Low.</li> <li>• Critical High.</li> <li>• Delta check - Ability to retrieve, provide and alert based on the previous results.</li> <li>• Data map Decimal point.</li> </ul>
5.1.2.1.41	Ability of the system to display cumulative results and trending pattern as defined by user.
5.1.2.1.42	Ability to produce preliminary and final reports as per requirement of ISO/IEC 15189 standard or other current standards as defined.
5.1.2.1.43	Ability to provide online templates for reporting.
5.1.2.1.44	Ability to replace preliminary report once the final report is ready.
5.1.2.1.45	Ability to attach addendum to the final report.
5.1.2.1.46	Ability to provide listing of report according to parameters as defined by users e.g. MRN, sex, age, test, place of occurrence.
5.1.2.1.47	Ability to archive record as specified by local policy.
5.1.2.1.48	Ability to easily retrieve archived data.
5.1.2.1.49	Ability to print out reports as specified.
5.1.2.1.50	Ability to do data mining based on user requirement.
5.1.2.1.51	Ability to ensure security and confidentiality of patients' data.
5.1.2.1.52	Ability for the system to provide library code for data entry.
5.1.2.1.53	Ability for the system to generate pre-coded report format in the LIS and conversion to the textual format in the result.
5.1.2.1.54	Ability for the system to provide audit trail to capture date, time and person who review the result in LIS / CIS.



- 5.1.2.1.55 Ability for the system to generate hard copy reject forms to be sent back to requesting location for external client.
- 5.1.2.1.56 Ability for the system to create a reject file list by lab/ward/discipline that can be viewed in LIS / CIS.
- 5.1.2.1.57 Ability to add new test panel when required.
- 5.1.2.1.58 Ability for the system to recognize completion of a task and repeat testing which can only be performed on request.
- 5.1.2.1.59 Ability for the system to implement QC chart monitoring and documentation of troubleshooting procedures.
- 5.1.2.1.60 Able to track the patient's test results to that analyzer, QC performance, date, time, type of sample received and personnel that performed the test.
- 5.1.2.1.61 Quality and ink fast barcode labels shall be provided. Barcode label's size should vary according to the size of the specimen tubes.
- 5.1.2.1.62 Reprints for labels should be specific for the type and number of tests requested.
- 5.1.2.1.63 Ability for the system to identify item for disposal and to provide alerts.

#### 5.1.2.2. System Functionality – Chemical Pathology:-

- 5.1.2.2.1 Ability to generate unique system generic request (accession) number for routine and interval requests (for host query) and timed specimen.
- 5.1.2.2.2 Ability to support alpha response in result entry.
- 5.1.2.2.3 POCT –
  - Ability for the system to implement QC chart monitoring and documentation of troubleshooting procedures.
  - Should be able to interface to LIS.
  - Able to track date, time, test & person performing the test or QC.
  - The system should be able to lock-off the analyzer automatically or by the laboratory staff if the performance is not acceptable.
  - The analyzer should have the capacity to log in for the users, store the QC and patient result in situ to be transmitted later by the lab to the LIS.

#### 5.1.2.3. System Functionality – Microbiology:-

- 5.1.2.3.1 Ability to support real time transfer of results from the analyzers to LIS.

- 5.1.2.3.2 Ability to create and support templates for specific functions in lab e.g. supplementary test e.g., anti-HCV confirmatory test, anti HIV confirmatory test, ELISA neutralisation assay.
- 5.1.2.3.3 Ability to create and support templates for specific function for notification e.g. point surveillance, antibiotic usage, needle stick injury, notification of nosocomial infection, HIV 97 and KKM PER.PAT 301, occupationally acquired infection among health care workers.
- 5.1.2.3.4 Ability to identify serial order test requests by date and time taken e.g. blood culture test for SBE, sputum AFB smear.
- 5.1.2.3.5 Ability to create work order for additional test for confirmatory and follow through purposes and connected to billing module.
- 5.1.2.3.6 Ability to provide alert as per defined threshold by test, organism, TAT, etc.
- 5.1.2.3.7 Ability to provide support for management of stock/ cell culture collections.
- 5.1.2.4. System Functionality – Haematology:-
  - 5.1.2.4.1. Ability to generate serial bar coded Haematology number (prefix number / year / serial lab number).
  - 5.1.2.4.2 Ability to enter and maintain sequential order of Haematology numbers issued manually during system down time (manual override).
  - 5.1.2.4.3 Ability to print multiple Haematology labels.
  - 5.1.2.4.4 Ability for the system to create appointment book for bone marrow tests and others to capture date, time, requesting surgeon, patient's demographics, indication, previous patient's reports and cancellation reasons.
  - 5.1.2.4.5 Ability for the system to directly view patients EMR during reporting.
  - 5.1.2.4.6 Ability to integrate the latest IT technology inside the system e.g:- Voice Recognition System, Intelligent Character Reader, as per MOH Policy.  
Others:- refer Generic Function.
- 5.1.2.5. System Functionality – Histopathology:-
  - 5.1.2.5.1 Ability to generate serial bar coded HPE number (prefix number / year / serial lab number).
  - 5.1.2.5.2 Ability to enter and maintain sequential order of HPE

- 5.1.2.5.2. Ability to generate serial bar coded cytology number (prefix number / year / serial lab number).
- 5.1.2.5.3. Ability to print multiple HPE labels.
- 5.1.2.5.4. Ability to create work list, worksheets and inventory.
- 5.1.2.5.5. Ability for the system to create appointment book for frozen section and to capture date, time, requesting surgeon, patient's demographics, indication, previous patient's reports and cancellation reasons.
- 5.1.2.5.6. Ability for the system to directly view patient's EMR during transcription.
- 5.1.2.5.7. Ability to integrate the latest IT technology inside the system e.g. Voice Recognition System, Intelligent Character Reader as per MOH Policy.

#### 5.1.2.6. System Functionality – Cytopathology:-

- 5.1.2.6.1. Ability to generate serial bar coded cytology number (prefix number / year / serial lab number).
- 5.1.2.6.2. Ability to enter and maintain sequential order, cytology number issued manually during system down time.
- 5.1.2.6.3. Ability to print and reprint multiple cytology labels.
- 5.1.2.6.4. Ability to create work list, worksheets, and inventory.
- 5.1.2.6.5. Ability to denote every 1 in 10 normal pap smear cases for rescreen by pathologist and create a QC Folder.
- 5.1.2.6.6. Ability for the system to directly view patient's EMR during reporting.

### 5.2. Laboratory Management Functions:-

#### 5.2.1. System Functionality – CIS:-

- 5.2.1.1. Ability to create and support templates for specific function e.g. customer satisfaction survey.

#### 5.2.2. System Functionality – LIS:-

- 5.2.2.1. Ability to interface and access CIS.
- 5.2.2.2. Ability to set different access level as determined by need to know basis.
- 5.2.2.3. Ability to edit, update and append reports and statistics.
- 5.2.2.4. Ability to provide online templates.
- 5.2.2.5. Ability to import and export digitized images from and to the referring institutions.
- 5.2.2.6. Ability to support textual, templates and unlimited free text.
- 5.2.2.7. Ability to facilitate audit trail.

- 5.2.2.8. Ability to produce reports as per requirement of ISO/IEC 17025 standard.
- 5.2.2.9. Ability to archive record as specified by local policy.
- 5.2.2.10. Ability to convert online report to print out format.
- 5.2.2.11. Ability to do data mining based on user requirement.
- 5.2.2.12. Ability for the system to enable users to do statistical analysis, SPSS and EPI INFO and other relevant software.
- 5.2.2.13. Ability for the system to convert textual format to a coded format.
- 5.2.2.14. Ability for the system to generate pre-coded report format in the LIS and conversion to the textual format in the final report.
- 5.2.2.15. Ability to provide listing of report according to parameters as defined by users e.g. MRN, sex, age, test, place of occurrence
- 5.2.2.16. Ability to provide statistical reports according to defined parameters e.g. by diagnosis, by tests, by samples, by types, by source of requests and others i.e. optional parameters defined by user.
- 5.2.2.17. Ability to provide alert as per defined threshold by test, organism, TAT etc.
- 5.2.2.18. Ability to provide alert on the scheduled maintenance and calibrations of the equipment with interface.
- 5.2.2.19. Ability to protect against any source of data corruption e.g. computer virus intervention.

## 6.1. General:-

- 6.1.1. The proposed workflow will apply for an integrated enterprise wide network.
- 6.1.2. Adequate hardware and software provision and all other technical requirements to optimally support the workflow.
- 6.1.3. The workflow is a generic workflow for common work process shared between the labs. For discipline specific workflow refer to individual labs.

## 6.2. All Laboratories:-

- 6.2.1. All analyzers shall be bi directional interfaced to the LIS/CIS.
- 6.2.2. All lab personnel shall be appropriately and continuously trained to work in the LIS environment with adequate funding.
- 6.2.3. Lab System Manager shall be selected and trained from lab personnel to customize test / panel in the LIS and extract user defines statistics.
- 6.2.4. Adequate funding shall be made available at all times to continuously maintain, and upgrade the LIS / CIS.
- 6.2.5. Backup facilities shall be made available to ensure minimum downtime.
- 6.2.6. Placement of competent System Analysts / System Programmer and Technicians to ensure smooth running of LIS operability 24 hours a day.

## 6.3. Microbiology:-

- 6.3.1. The proposed workflow will apply for the laboratory working on integrated laboratory concept.
- 6.3.2. External clients refer to those that are not linked to the system.
- 6.3.3. All relevant laboratory results will be recorded in the discharge summary for patient management and follow up purposes. (Move to Generic LIS).
- 6.3.4. Microbiology laboratory shall provide support for all Infection Control activities.

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
1. Management report:- i) Routine (KKM). ii) Ad-hoc.	<ul style="list-style-type: none"> <li>Generate routine management reports from the application.</li> <li>Hierarchical structured coding.</li> <li>Reports should be produced by default according to specified period.</li> </ul>	IDS: <ul style="list-style-type: none"> <li>Ref PER.SS.206A (Pindaan 1/2006)</li> </ul> Workload statistics (KKM) - outpatient & inpatient:- <ul style="list-style-type: none"> <li>Biochemistry.</li> <li>Microbiology.</li> <li>Haematology.</li> <li>Histopatology.</li> <li>Cytology.</li> <li>Paras Makmal (Level of Lab).</li> <li>Total.</li> </ul> <ul style="list-style-type: none"> <li>Starting And Ending Date (time frame of report based on date of procedure done).</li> <li>By default, monthly.</li> </ul>	<ul style="list-style-type: none"> <li>Date of completion of test order by:-</li> <li>Type of lab (KKM).</li> <li>For microbiology extracted data from:-               <ul style="list-style-type: none"> <li>Bacteriology.</li> <li>Serology.</li> <li>Virology.</li> <li>Immunology.</li> <li>Parasitology.</li> <li>Mycology.</li> <li>Clinical tests*.</li> <li>Opportunistic infections.</li> </ul> </li> <li>Haematology extract data from:-               <ul style="list-style-type: none"> <li>Routine haematology.</li> </ul> </li> <li>Special haematology test:-               <ul style="list-style-type: none"> <li>Full blood picture.</li> <li>Bone marrow aspiration and trephine.</li> <li>Thalassaemia / haemoglobinopathy.</li> <li>Haemostasis / thrombosis.</li> <li>Cytogenetic.</li> <li>Flowcytometry.</li> <li>Molecular haematology.</li> <li>Bone marrow transplant.</li> <li>Clinical tests*.</li> </ul> </li> <li>Biochemistry extract data from:-               <ul style="list-style-type: none"> <li>General chemistry.</li> <li>Cardiac markers.</li> </ul> </li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
			<ul style="list-style-type: none"> <li>• Endocrine.</li> <li>• Specific protein.</li> <li>• Perinatal testing.</li> <li>• TDM and Clinical Toxicology.</li> <li>• Drug of abuse.</li> <li>• Trace elements.</li> <li>• Others.</li> <li>• Clinical tests*.</li> <li>• Forensic:-               <ul style="list-style-type: none"> <li>• Forensic.</li> <li>• Clinical.</li> </ul> </li> <li>• Data should be extracted based on date of completion from and to according to desired duration.</li> </ul>
Routine for HKL (programme head).	<ul style="list-style-type: none"> <li>• Generate routine management reports from the application.</li> <li>• Hierarchical structured coding.</li> <li>• Reports should be produced by default according to specified period.</li> </ul>	<ul style="list-style-type: none"> <li>• Workload statistics by:-               <ul style="list-style-type: none"> <li>• Type of lab.</li> <li>• Type of test.</li> </ul> </li> <li>• Starting And Ending Date (time frame of report based on date of procedure done).</li> <li>• By default, monthly.</li> </ul>	<ul style="list-style-type: none"> <li>• Date of completion of test order by:-               <ul style="list-style-type: none"> <li>• Type of lab.</li> <li>• Type of test.</li> </ul> </li> <li>• Data should be extracted by:-               <ul style="list-style-type: none"> <li>• Listing of tests based on groups as specified in POE.</li> <li>• Detailed type of test.</li> </ul> </li> <li>• Data should be extracted from:-               <ul style="list-style-type: none"> <li>• Order completion.</li> </ul> </li> <li>• Data should be extracted for the specified period (from and to).</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
Routine for laboratory management in the Hospitals.	<ul style="list-style-type: none"> <li>Data output elements to be captured by default.</li> <li>Ability to display, print and save report in statistical table and listing form.</li> <li>Query by data input elements:- <ul style="list-style-type: none"> <li>Type of requests (urgent test, non urgent) by date and time of order, from and to.</li> <li>Type of test by lab, by date and time of order, from and to.</li> <li>Type of care provider, location and specific discipline.</li> <li>Out sourced test- type of test out sourced, urgent/non urgent.</li> <li>Type of sample as defined in POE coding.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Test.</li> <li>Sample.</li> <li>type of requests (urgent / non urgent).</li> <li>Test category (type of test by lab).</li> <li>Ordering source:- <ul style="list-style-type: none"> <li>Internal by type of care providers, locations &amp; disciplines.</li> <li>External by type of care providers, locations &amp; disciplines.</li> </ul> </li> <li>Number of additional tests carried out to confirm result.</li> <li>Number of test out source.</li> </ul>	<ul style="list-style-type: none"> <li>Ordering source.</li> <li>Additional orders from lab.</li> <li>Orders to out sourcing lab.</li> <li>Date and time of order.</li> <li>Type of requests (urgent test, non urgent).</li> <li>Type of test by lab.</li> <li>Type of care provider, location and specific discipline.</li> <li>Sample type (urine, blood, body fluid and etc.).</li> </ul>
2. Quality Report:- 2.1 Turn around time for lab.	<ul style="list-style-type: none"> <li>Query by:- <ul style="list-style-type: none"> <li>Test.</li> <li>Urgent / non urgent.</li> <li>Person login.</li> <li>Type of Lab.</li> <li>Phases in lab work process:- <ul style="list-style-type: none"> <li>Receive specimen at central reception counter.</li> <li>Receive specimen in respective lab.</li> </ul> </li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Lab TAT = Date and time of preliminary report released – date and time specimen received.</li> <li>Lab TAT = Date and time of final report released - date and time specimen received.</li> </ul>	<ul style="list-style-type: none"> <li>Date and time specimen received in the central reception counter.</li> <li>Date, time and person receiving the specimen in the respective lab.</li> <li>Date, time and person receiving specimen in the respective section / bench.</li> <li>Date, time and person releasing the preliminary report.</li> </ul>



WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Receive specimen in respective section / bench.</li> <li>Release preliminary report.</li> <li>Release final report.</li> </ul> <ul style="list-style-type: none"> <li>Standard / ad hoc query by from and to for user specified period.</li> </ul>		<ul style="list-style-type: none"> <li>Date, time and person releasing the final report.</li> </ul>
2.2 Rate of specimen rejected.	<ul style="list-style-type: none"> <li>Ability to display, print and save report in statistical table and listing form.</li> </ul>	<ul style="list-style-type: none"> <li>Rate of specimen rejected = no. of specimen rejected / no. of specimen received by lab x 100:-               <ul style="list-style-type: none"> <li>Total.</li> <li>By lab.</li> <li>By reason.</li> <li>By ordering source.</li> <li>By location of rejection in the lab.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Total no. of specimens received by lab.</li> <li>No. of specimens rejected by test, by sample from and to specified period.</li> <li>Reason for rejection.</li> <li>Source of specimen.</li> <li>Source which ordered the test.</li> <li>Location of rejection.</li> </ul>
2.3 Infection control report:- 2.3.1 Sharps injury report (incident reporting).	<ul style="list-style-type: none"> <li>Extracted data utilizing information from PMS and CIS.</li> <li>Allow separate tab for incident report clerking.</li> <li>Access should be strictly provided as need to know basis.</li> <li>Maintain anonymity of the person.</li> <li>Provide template for clerking sharps injury incident reporting.</li> </ul>	<ul style="list-style-type: none"> <li>Total incidence.</li> <li>Total by staff category.</li> <li>Injury details.</li> <li>Lab result:-               <ul style="list-style-type: none"> <li>Staff injured.</li> <li>Index case.</li> </ul> </li> <li>Age = date and time of incident – DOB.</li> </ul>	<ul style="list-style-type: none"> <li>Staff injured details:-               <ul style="list-style-type: none"> <li>Name.</li> <li>IC no. / PMI.</li> <li>Date of birth.</li> <li>Age.</li> <li>Sex.</li> <li>Race.</li> <li>Staff category.</li> <li>Department.</li> </ul> </li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
			<ul style="list-style-type: none"> <li>• Index case details. <ul style="list-style-type: none"> <li>• Name.</li> <li>• IC no. / PMI.</li> <li>• DOB.</li> <li>• Age.</li> <li>• Sex.</li> <li>• Race.</li> <li>• Location of index case.</li> <li>• Diagnosis.</li> </ul> </li> <li>• Injury details:- <ul style="list-style-type: none"> <li>• Nature of injury.</li> <li>• Mechanism.</li> <li>• Site of injury (body).</li> <li>• Date and time of incident.</li> <li>• Location of incident.</li> </ul> </li> <li>• Order details (staff and index case):- <ul style="list-style-type: none"> <li>• Date and time of initial and follow up orders.</li> <li>• Type of test ordered for initial and follow up orders.</li> <li>• Date and time of preliminary report.</li> <li>• Date and time of final report.</li> </ul> </li> </ul>
2.3.2 Antibiotic surveillance report.	<ul style="list-style-type: none"> <li>• Ability to display, print and save report in statistical table and listing form.</li> <li>• Query by date and time, from and to for the specified period:-</li> </ul>	<ul style="list-style-type: none"> <li>• Total no. of positive isolate.</li> <li>• Percentage of antibiotic resistance:- <ul style="list-style-type: none"> <li>• By organism.</li> <li>• By each antibiotic.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Result of test ordered:- <ul style="list-style-type: none"> <li>• List of antibiotics tested.</li> <li>• No. of positive isolate for each type of organism (positive culture).</li> <li>• List of antibiotic sensitive for each</li> </ul> </li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Location.</li> <li>Discipline.</li> <li>Encounter type.</li> <li>Sample type.</li> </ul>	<p>Formula 1 = no. of organism resistance to a particular antibiotic / total no. of positive isolate tested against that particular antibiotic x 100.</p> <p>Formula 2 = no. of organism sensitive to a particular antibiotic / total no. of positive isolate tested against that particular antibiotic x 100.</p>	<p>organism.</p> <ul style="list-style-type: none"> <li>List of antibiotic resistant for each organism.</li> </ul>
<p>2.3.3 Routine surveillance for multiple resistance organism</p> <p>(MRSA, ESBL) for inpatient.</p>	<ul style="list-style-type: none"> <li>Ability to display, print and save report in statistical table and listing form.</li> <li>Query by date and time, from and to for the specified period:- <ul style="list-style-type: none"> <li>Location.</li> <li>Discipline.</li> <li>Sample type</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Total no. of inpatient tested positive for multiple resistance organism:- <ul style="list-style-type: none"> <li>MRSA.</li> <li>ESBL.</li> </ul> </li> <li>Percentage of inpatient tested positive for multiple resistance organism.</li> </ul> <p>Formula = no. of new positive cases for the defined period / total no. of admission for the same period x 100.</p>	<ul style="list-style-type: none"> <li>Total no. of admission by date and time of admission, from and to for the specified period.</li> <li>Total no. of inpatient tested positive for MRSA and ESBL tests, from and to for the specified period.</li> </ul>
2.4 Ad-hoc report.	<ul style="list-style-type: none"> <li>Predefine query tool to facilitate generation of ad-hoc report.</li> <li>Functional requirement to be defined under GDS.</li> </ul>		

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
2.5 Maintain Registry.	<ul style="list-style-type: none"> <li>Functional requirement to be defined under GDS.</li> </ul>	<ul style="list-style-type: none"> <li>Cancer registry.</li> <li>Bone marrow registry.</li> <li>Pap registry:-               <ul style="list-style-type: none"> <li>Diagnosis.</li> <li>Discipline.</li> <li>Age = date and time of incident-DOB.</li> <li>Sex.</li> <li>Ethnic.</li> </ul> </li> </ul>	

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| 7. | Mr. Daud Ismail                      | - Radiologist, Hospital Selayang.         |

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