AUSTRALASIAN COLLEGE
FOR EMERGENCY MEDICINE

The Royal College of Pathologists of Australasia

Guideline (G125)

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INTRODUCTION

Pathology tests are a common and important component of patient management in Emergency Departments (ED) in Australia and Aotearoa New Zealand. For each patient it is important that indicated tests are requested, that specimens are correctly collected and results are reported and reviewed in a timely manner. Similarly, it is important to avoid inappropriate testing which may lead to management delays, difficulties around follow-up and increased costs. An aim of this document is to provide guidance on the pathology request-test-report cycle as it relates to the ED. In selecting tests and communicating results it is noted that the ED setting needs to be considered as part of the continuum of care which may include admission to hospital or community follow-up.

Clear communication between the ED and the pathology provider is a requirement for good governance of these activities. Senior ED clinicians should meet regularly with senior laboratory staff to identify and monitor the specific needs of the respective services. A service level agreement should be developed that documents the arrangements between the ED and the pathology laboratory at each site. While it is acknowledged that the specific content and format of these agreements will be tailored to the needs and circumstances of each site, every agreement should specify information as outlined in the *Governance* section of this document.

PATHOLOGY REQUESTING FOR COMMON CLINICAL PRESENTATIONS

Test selection is a key part of patient diagnosis and management. A matrix is provided below on *test selection* which has been developed to provide a summary of the commonly required tests for a range of ED presentations. The matrix is designed as a rapid reference guide for junior medical and nursing staff for adult patients attending the ED. The matrix is not exhaustive and is for guidance only, recognising there are individual patient factors. It is acknowledged that some tests may not be immediately available on-site in all locations. Senior clinicians should provide education and support to junior doctors and other staff in the ED to assist with appropriate test selection. It is also recognised that there is little empirical evidence for or against the use of any specific pathology tests for a particular condition and so the matrix represents expert opinion from members of ACEM and RCPA.

Some important factors with regard to strategies for pathology requesting that may be useful include:

- Testing should be guided by history and clinical examination - focusing on the urgent problem and any relevant co-morbidity.
- Pathology should generally only be used in those patients where it assists ED management decisions or is critical to the patient's care pathway.
- It is most efficient to order all appropriate tests on a single specimen collection early in the ED visit. Repeat collections may be traumatic for patients and wasteful.
- Add-on tests to samples already in the laboratory may avoid recollection, but are generally less efficient than a correct initial request - both for the laboratory and the ED.
- Test results should be viewed and acted on during the emergency visit when possible. Any results outstanding at the time of ED discharge or transfer should be clearly identified, with a plan communicated for follow up of results to the clinician who will have ongoing care of the patient.

SPECIMEN COLLECTION METHODS

Specimen collection and labelling are a vital component of pathology testing. Education, orientation and competency assessment or 'credentialing' should be considered for all ED staff. Poor collection techniques can produce specimen quality issues, patient misidentification (i.e. wrong blood in tube) and erroneous results. These may lead to direct patient harm from acting on an incorrect result. In addition, specimen recollection and repeat processing cause waste and delays in patient management.

Key components of pathology education for ED staff are outlined in Core *Pathology Training* below. More detailed requirements relating to specimen collection and labelling will be available from the local pathology laboratory.

Collection haemolysis is a common problem in the ED and may lead to aberrant results and has been shown to increase the length of stay in the ED. Modifiable factors associated with haemolysis of venous blood specimens are summarised in Table 1. Peripheral inserted Intravenous Catheters (PIVC) should not be inserted for the purpose of blood collection alone. Complications from PIVCs including thrombophlebitis and infection pose a serious risk to patients.

Table 1. Collection factors associated with haemolysis of venous blood specimens.

- Collection during insertion of an iv cannula yields haemolysis rates significantly higher than a dedicated "straight needle" venous blood collection.
- For collections during the process of cannula insertion, the haemolysis rate for siting in the antecubital fossa is lower than cannulae placed elsewhere.
- Prolonged tourniquet time (greater than 60 seconds) is associated with increased haemolysis rate.
- Underfilled tubes (for example less than 1.5mL in a standard tube) is associated with an increased haemolysis rate.
- Narrow bore collection needles – haemolysis is seen more frequently when smaller gauge needles are used for collection.

GOVERNANCE

Communication

Communication between ED and the pathology provider should include regular, documented meetings and clear lines of communication for addressing urgent or other issues as they arise. These meetings should allow communication of needs of both parties.

The documented meetings should lead to a *Service Level Agreement*. While it is acknowledged that the specific content of these agreements may be varied to meet the needs and circumstances of each site, the Agreement should specify all information as outlined in this section. Additional

information may be relevant, for example detailed information regarding costs of tests and billing arrangements. The Service Level Agreement should be reviewed and agreed between the directors of the ED and the Pathology service on a regular basis, typically at least annually. Additional reviews may be required where there has been a significant change to practice or processes.

Table 2. Components of a Service Level Agreement between ED and Pathology Laboratory

Pathology information to be available to the ED

- Opening hours and out of hours testing arrangements.
- Contact details for results and general enquiries including senior staff for operational or clinical issues.
- A list of the available pathology tests including:
    - expected turnaround times
    - Recommended blood tubes and specimen containers
    - Specimen handling and transport requirements
- Protocols for authorisation of unusual tests or urgent testing
- Protocols and contact details to query unexpected results or requests
- Protocols and contact details for the addition of tests for samples already collected
- Mechanisms for timely access to pathology results for clinical staff
- Mechanism to access:
    - Pathology test information sheets for patients
    - Information about tests/diseases
    - Information/instructions for self-collected samples
    - Pathology request forms/processes

ED information to be available to Pathology

- Contact details for senior medical officer present in the ED to alert urgent service changes
- Contact details for senior staff for operational or clinical issues
- Protocols and contact details to notify critical pathology results / requests for recollection to clinical staff

Information to be available in both locations

- Protocols for communicating critical or significant test results
- Protocols regarding the handling of unlabelled or incorrectly labelled samples
- Protocols for sample identification where the patient's identity is unknown and protocols to update patient's identification when identity becomes known (of particular importance for blood products)
- Protocols for handling of problematic specimens, for example haemolysed, incorrect anticoagulant, missing or spilt specimen.
- Protocols for handling outstanding results for tests requested in the ED which are not available at the time of patient discharge or transfer
- Protocols regarding ordering of pathology tests by non-medical staff (if locally approved)
- Protocols for computer or instrument down-time
- Protocols regarding requirements relating to requests for blood products for patients

Other factors regarding communication between ED and Pathology

There should be review of services and issues in a formalised way where possible. The results of these reviews should be shared between ED and pathology. Examples of such reviews may include:

- Mechanisms/protocol for regular audits of ED requests to ensure appropriate testing.
- Measurement of routine turnaround times for common tests (for example, see ACHS Clinical Indicator Program).
- Measurement and feedback on errors, including, for example, collection, labelling and haemolysis.

- Mechanisms/protocols for identifying tests that require urgent processing (for example, electronic or manual systems to communicate that a pathology test is urgent).

Point of Care Testing (PoCT) Devices

It is recommended that all PoCT and pathology instruments in ED should be selected, installed, maintained and quality assured as a joint activity between the ED and Pathology. Such equipment should be subject to pathology accreditation under the NATA/RCPA program. In practice this generally means accreditation under the laboratory's accreditation and oversight under the laboratory's quality management system.

At the operational level there must be documented training and clear protocols to outline responsibilities for specimen collection, use of the device, maintenance, Quality Control and Quality Assurance, and trouble-shooting procedures for PoCT devices used in the ED. There must also be protocols/mechanisms to ensure accurate recording of results from tests performed on PoCT devices in the patient's medical record, with automated transfer of these results into the laboratory information system whenever possible.

Patients and their results

The primary relationship in the diagnostic process is between the requesting doctor and the patient. As such, the requesting doctor is the person best able to understand the report and its impact on the patient, and with whom the pathologist can best provide advice. However, if a patient has been discharged from ED prior to a result being available, their usual treating clinician such as a GP, or other treating specialist, is usually the appropriate clinician to discuss results with patients. Please refer to ACEM P54 *Follow-up of Results of Investigations Ordered from Emergency Departments* for important information about results handling. Participation in jurisdictional health digital information systems can assist with secure and timely sharing of results with general practitioners and other treating specialists.

CORE PATHOLOGY EDUCATION FOR ED STAFF

A training program for clinical staff should be established. Areas to be emphasised in this program include:

- Knowledge of pathology ordering procedures
- Local test ordering matrix (refer Appendix 1 Matrix) and pathology included in other ED protocols (for example, pathways for chest pain or stroke)
- Correct and complete information on pathology request form. Examples of relevant information include: travel history, medications.
- Correct blood tubes for requested tests and correct sequence of tubes to avoid contamination of samples that may affect results (refer Appendix 1 Matrix)
- Correct patient identification for specimen collection using direct patient enquiry and patient identification armband.
- Correct specimen collection technique:
    - Correct technique for collection and tube filling to minimise haemolysis (Table 1).
    - Sampling from non-drip arm
    - Correct timing, for example drug levels for therapeutic drug monitoring
- Optimal collection techniques for microbiology specimens including blood culture, wound swabs, sputum specimens and urine specimens.
- Correct specimen labelling performed at the patient's bedside and checking strategies for correct patient identification.
- Requirements relating to transfusion requests and blood product administration in the ED:
    - Specific transfusion request and sample requirements for pre-transfusion testing
    - Clinical protocols for blood administration including documentation.
    - Communication protocols for urgent blood product support.
    - Protocols for the supply and use of emergency Group O RhD negative packed cells including Group O RhD negative, Kell negative units for women of childbearing age.
    - Massive transfusion protocol.

- Awareness of locations of blood product refrigerators, and responsibility for record keeping and maintenance of the blood product refrigerators.

External Resources

1. NSW Government. Clinical Excellence Program. Sepsis Kills Program
2. Australian Council on Healthcare Standards. Australasian Clinical Indicator Report 23rd Edition 2014-2021
3. National Blood Authority. Patient Blood Management Guidelines
4. National Pathology Accreditation Advisory Council. Requirements for Point of Care Testing
5. National Pathology Accreditation Advisory Council. Requirements for the Communication of High-risk Pathology Results

RCPA and ACEM Resources

1. RCPA Manual [Link]
2. RCPA The Pathology Request Test-Report Cycle - Guidelines for Requestors and Pathology Providers [Link]
3. RCPA and AACB Guideline: Consensus Statement for the Management and Communication of High Risk Laboratory Results [Link]
4. RCPA. Release of Pathology Results to Patients [Link]
5. ACEM, Follow Up of Results of Investigations Ordered from EDs (P54) [Link]

Appendix 1 Matrix: Side A

Pathology Requesting for Adult Patients in the Emergency Department - Suggested Tests for Common Conditions

Fill tubes to correct level and identify, label and sign at **BEDSIDE** as per local protocol. Ensure **CORRECT ORDER** of draw →	Aseptic collection	Na Citrate	Depending on instrument type and chemistry methodology different hospitals will have a local protocol to follow. The following gel tube colours are a guide only CHECK WITH YOUR LOCAL LABORATORY		∏ =white top	= Gold top	=Orange						K EDTA or	Blood Bank EDTA	Syringe BG	Only send M/C/S if clinical concern UTI	Other Investigations
Presentation	**BC [1]**	**Coags [2]**	**UEG[3]**	**LFT**	**Ca/Phos/Alb**	**Urate**	**Troponin**	**Lipase**	**hCG[4] (female)**	**CRP / PCT**	**CK**	**Drug level**	**FBC**	**Group/Antibody screen[5]**	**Blood Gas[6]**	**Dipstick Urinalysis**	
Abdominal pain severe (upper/epigastric)				Plus LDH													Lactate
Abdominal pain severe (lower)														Female			Lactate
Back pain atraumatic (requiring admission)																	
Cellulitis (requiring admission)																	wound M/C/S if purulent lesions
Chest pain - suspected Ischaemic Heart Disease																	
Chest pain - suspected Pulmonary Embolism		Consider d-dimer															
Confusion/Syncope																	CSF examination / investigations
Cerebrovascular Accident																	
Diabetic Ketoacidosis																	
Fever for Investigation (include returned travellers)																	Infection investigations relevant to history (eg malaria, dengue)
Fractures Neck Of Femur/Major Long Bone																	
Fractures Minor for Theatre >65yo																	
Gastrointestinal Bleed																	
Jaundice For Investigation																	viral hepatitis investigations (serology and/or NAAT)
Febrile Neutropenia																Plus M/C/S	
Overdose (significant)																	Paracetamol level
Per Vaginal Bleed - 1st trimester																	STI investigations (eg chlamydia & gonorrhea NAAT)
Pneumonia (requiring admission)																	Sputum M/C/S, multiplex respiratory moecular testing
Pyelonephritis (not simple cystitis)																Plus M/C/S	
Renal Colic (1st episode)																	
Seizures (1st episode)			Plus bedside glucose		Plus Mg												CSF examination / investigations
Seizures (recurrent)																	
Septic Joint - suspected																	Joint Fluid M/C/S
Sepsis																Plus M/C/S	Lactate + relevant cultures
Snake Bite [7]				consider LDH									Plus film				
Short Of Breath - Asthma (requiring admission)																	Multiplex respiratory molecular testing
Short Of Breath - suspected Acute Pulmonary Oedema																	
Short of Breath - Chronic Obstructive Pulmonary Disease																	Sputum M/C/S
Trauma (Major)																	

Key	This form is a guide for clinical staff initiating pathology tests. Clinical judgment should be exercised. Some patients may not need any tests or have had them performed recently. If in doubt consult with senior ED doctor. Some tests may not be immediately available locally.
Perform test	1. BC = Blood Cultures. History of immunocompromise, fever and/or clinical syndrome suggesting sepsis is a more important indicator to collect BC than whether the patient is febrile at the time of examination/collection. 2. Coags = Standard Coagulation Panel (includes INR/PT, APTT, fibrinogen). 3. UEG = Urea, creatinine, electrolytes and glucose. 4. hCG is usually required prior to drug treatment and radiological investigations in women of child bearing age 5. There are very specific requirements relating to requests and specimen collection/labelling for transfusion. Please ensure requests and specimens fully comply with local requirements 6. Blood gas: Venous blood gas is often acceptable. Arterial sample required for assessment of oxygen status. 7. Snake bite: FBC + film, INR +aPTT, UEG, CK, consider fibrinogen + d-Dimer (false negatives occur with point of care devices), consider LDH
Not Generally Indicated	
Consider or Ask Supervisor	

RCPA The Royal College of Pathologists of Australasia

ACEM Australasian College for Emergency Medicine

From 'Guideline on Pathology Testing in the Emergency Department' developed by the Australasian College for Emergency Medicine (ACEM) and the Royal College of Patholologists of Australasia (RCPA) 2018

Please refer to full guideline document for further information

NOTES ON THE USE OF THE COMMON TESTING SCENARIOS MATRIX (SIDE B)

The matrix is designed as a rapid reference guide for junior medical and nursing staff working in the ED. The aim is to assist appropriate pathology requesting for common emergency presentations. It is intended to be used **after clinical assessment** suggests that pathology testing is indicated. Many less severe or minor presentations of conditions shown in the matrix may not require any pathology tests. Most importantly it is a **guide only** and will not cover all clinical scenarios - so if in doubt, seek senior advice. Pathology testing for common pediatric conditions are not addressed in this matrix.

Key for interpretation

- Green colour box without notes indicates that a test is recommended.
- Green colour box with notes: Notes are used throughout to prompt when a test profile may require tailoring for individual cases.
- Yellow colour box with "Consider" where the individual clinical case may require consideration of actual need. Most other notes in the boxes or presentation area are self-explanatory to prompt appropriate testing. The most important message is if in doubt seek senior advice early before tests are ordered.
- White box indicates that a test is not generally recommended.
- Only more severe cases of some conditions (e.g. requiring hospital admission) will require the recommended pathology tests to be performed.
- There is no Australian national standard for blood tube colours. The common colours and variations are indicated by a rectangular coloured symbol representing the tube top colour in the uppermost frames. The colours of tubes used at each site should be confirmed with the local pathology laboratory.
- Correct collection order is important to avoid sample contamination and thus minimise the possibility of artefactual and/or erroneous results and the need for specimen recollections. Blood tubes are listed on the chart in the **correct order of draw from left to right**. Therefore, tubes on the left side of the chart are **always** filled prior to tubes appearing on the right side of the chart.
- Correct patient identification and specimen labelling **are essential** and some tubes (e.g. for pre-transfusion testing) must also document the time and date of collection and signature of the collector.

Abbreviations

BC = Blood Culture
βhCG = Beta human Chorionic Gonadotropin
Ca/Phos/Alb = Calcium, Phosphate, Albumin
CK = Creatine Kinase
Coags = Standard Coagulation Panel (includes INR/PT, APTT, fibrinogen)
CRP = C - reactive protein
EDTA = Ethylenediaminetetra-acetic acid
FBC = Full Blood Count/Examination
Gp/Antibody screen = Blood Group and antibody screen (Add cross-match only where transfusion is indicated)
INR only = Prothrombin Time/International Normalised Ratio only - not full coagulation profile
K EDTA = Potassium Ethylenediaminetetra-acetic acid
LDH = Lactate dehydrogenase
LFT = Liver Function Test Panel
M/C/S = Microscopy, culture and sensitivity
Mg = magnesium

NAAT = Nucleic acid amplification test (includes PCR)
Na Citrate = Sodium Citrate
PCT = procalcitonin
Syringe ABG = Syringe Arterial Blood Gas (May be venous sample where notated)
Troponin = Troponin I or T
UEG = Urea, creatinine, electrolytes and glucose
UTI = Urinary tract infection

NOTE: The matrix (side A) and notes (side B) can be printed on a single page, laminated, and attached to blood collection trolleys in the ED.