Tipperary University Hospital

Primary Sample Collection Manual

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Quick Reference TippUH Test Menu

Correct Order of Draw:

1st  2nd   3rd  4th  5th  6th 

Blood Cultures for Microbiology should be taken before any blood samples. If a blood culture is not required, a no-additive discard tube should be filled first.

Adult Sample Type	Test	Paediatric Sample Type
	Coag, INR, APTT PT, D-Dimers, Derived Fibrinogen ***(Fill to the line/arrow on tube, under or overfilled samples cannot be processed)***	
 TippUH  GPs	General Biochemistry tests	
	Full Blood Count & Monospot Troponin (separate sample required)	
	Crossmatch, DCT, Group & Save, Transfusion Reaction Investigation	
	Glucose	
	Pregnancy Test (hCG), CSF	

1. Definitions & Abbreviations

IBTS	Irish Blood Transfusion Service
INAB	Irish National Accreditation Board
RBCs	Red Blood Cells
MU	Measurement Uncertainty
STGH	South Tipperary General Hospital
TippUH	Tipperary University Hospital
PDA	Personal Digital Assistant or Handheld PC
UHW	University Hospital Waterford
Author/Document	The person responsible for the preparation of any document.
Approver	The person responsible for approval of a document.
Approval	The process of final checking of a document prior to use
Document	Any recorded item of a factual or informative nature, either paper or electronic.

Mission Statement

The Laboratory is committed to providing a service of the highest quality to all its users, by the use of examination procedures and methods which will ensure the highest quality of all tests performed and will report results in ways which are accurate, clinically useful, confidential and in a timely manner.
Please note this manual is intended as a reference guide to give an overall view of the services available in the Laboratory in TippUH. Please contact the Laboratory directly for any queries.

The Master copy is held in the Laboratory with an electronic read only copy available on the network at P:\Regional Shares\STGHLab.

A link to this page exists on the Web Based Laboratory Enquiry (LabWeb Enquiry) page. Read only copies are also available to GPs on the HSE website at http://www.hse.ie/eng/services/list/3/hospitals/Southtipp/

Please ensure that any uncontrolled printed copies are current as the Laboratory cannot be responsible for information contained in obsolete documents. A copy of all Laboratory documents referenced to, are available from the Laboratory on request.

2. Introduction

The Laboratory is a clinical service, which carries out investigations on specimens from patients as an aid in the diagnosis, management and treatment of medical conditions. The service is at the heart of the development of modern scientific medicine, as the practice of the Laboratory has become steadily more diverse and complex.

The Laboratory in TippUH provides a multidisciplinary service 24 hours a day, 7 days a week. It can be divided into three main departments: Biochemistry, Haematology and Blood Transfusion. It provides a clinical diagnostic service in General Haematology and General Biochemistry for TippUH inpatients, local community hospitals and local G.P.'s.
The Blood Transfusion/Haemovigilance service is provided for inpatients of TippUH only. A limited Microbiology service for blood cultures is also provided. The regional services for Microbiology and Histology are based in UHW and all relevant samples are sent there on a daily basis. The Laboratory in TippUH acts only as a collection point for the transport of all UHW samples. No record log is kept in TippUH of individual samples transported to UHW.

The department is led by the Chief Medical Scientist. The department processes over 1 million tests in Haematology & Biochemistry and over 4500 samples in Blood Transfusion annually.

2.1 Laboratory Accreditation

The Blood Transfusion Laboratory is currently accredited to the ISO 15189 standard by the INAB. The registration number for accreditation is 227MT and full details of our current accreditation status can be viewed on line at www.inab.ie. The following tests are currently accredited:

- ABO & Rhesus Blood Grouping
- Antibody Screening
- Antibody Identification
- Compatibility Testing including Transfusion Reaction Investigations
- Red Cell Phenotyping
- Direct Coombs Test

Any changes to the status of the Laboratory Accreditation and scope will be notified to all users of the service.

2.2 Location of the Laboratory

The Laboratory is located on the ground floor, near Pharmacy and the Outpatients Department. It can be accessed from the hospital foyer by passing through the double doors to the left before reaching the lifts; following the corridor to the next set of double doors, turning right and the Laboratory entrance is clearly signposted directly ahead. External delivery of samples to the Laboratory is from the Outpatients Entrance. This entrance is open Monday to Friday, 08.00 to 18.00. Access to the Laboratory is strictly controlled and all samples can be left at the Laboratory reception through the hatch /post box.

2.3 Laboratory Hours

Laboratory	Hours of Business
Specimen Reception	Monday to Friday 08.00-20.00.
Routine Laboratory Diagnostic Service*	Monday to Friday 08.00- 20.00.
Emergency On Call Service	Monday to Friday from 20.00 until 08.00. Saturday, Sunday and Public Holidays (24hr). Contact Duty Medical Scientist 7056 or via switchboard.

*Routine samples should be received in the Laboratory between 09.00 and 17.00. Due to reduced staffing levels only urgent samples can be processed between 17.00 and 20.00 and 08.00 and 09.00.

2.4 Normal Working Hours

Routine hospital samples for Haematology and Biochemistry analysis should be received in the Laboratory before 17.00 each evening. Routine GP samples for Haematology and Biochemistry analysis should be received in the Laboratory before 15.00 each day. Routine samples for Blood Transfusion (this includes samples for elective surgeries) should be received in the Laboratory before 15.30 each day, and at least 24 hours prior to elective surgeries/transfusions.

2.5 Emergency on Call Service

At all other times, an **Emergency on Call** service is provided. Only **emergency samples** should be sent to the Laboratory out of hours and the Medical Scientist on call **MUST** always be notified via 7056. The Medical Scientist is on site i.e. on hospital grounds, however he/she **MUST** be contacted regarding clinically urgent bloods especially during the night. **Please do not assume that samples sent to the Laboratory out of hours will be processed if the on Call Medical Scientist has not been contacted.** Tests available on call are indicated within the discipline specific information.

2.6 Laboratory Department Contact Details

Postal address: Laboratory,
Tipperary University Hospital,
Western Road,
Clonmel,
Co. Tipperary.
E91 VY40

Telephone Numbers:

Section	Contact Number within TippUH	Contact Number outside of TippUH
Specimen Reception	7056	052 6177056
Laboratory Fax	-	052 6177978
Secretary	7055	052 6177055
Blood Transfusion Department	7974	052 6177974
Haemovigilance CNS	7514	052 6177514
Blood Sciences	7973	052 6177973
Chief Medical Scientist	7056/7992	052 6177056/6177992
Quality Officer	7150	052 6177150
Laboratory On Call	7056	052 6177056

Please use the ward enquiry facility for all Laboratory results and direct any enquiries to the Laboratory secretary at 7055 during routine hours 09.00 – 17.00. For external results etc. please ensure to ring between 14.00 – 16.00. We regret we are unable to deal with external result enquiries after 17.00hrs.

All Blood Transfusion enquiries should be directed to 7974.

2.7 Laboratory Supplies

Supplies of specimen containers, request forms and specimen bags are available from central stores. To avoid unnecessary delays in obtaining Laboratory supplies always ensure that the identification of the person requesting the supplies is clear. TippUH central stores phone number: ext. 7425.

The only consumables supplied directly by the Laboratory are the following:

- Blood culture bottles
- Quantiferon kits
- 24 hr urine containers (plain and acid)
- Viral, high nasal, Chlamydia swabs and flu swabs
- Cervical cytology containers
- GEM blood gas cartridges

Please ensure that all supplies are requested **during routine hours only** and send a porter to collect. All supplies for GPs are sent via the Laboratory Supplies Department in University Hospital Waterford,
Tel: 051 842638 Fax: 051 848565.

Types of specimen containers

Adult Vacutainer Specimen Bottles		
Cap Colour	**Anticoagulant**	**Test**
Red/Yellow	Clotted (No Anticoagulant)	All serum tests
Grey	Fluoride Oxalate	Blood Glucose
Purple	E.D.T.A	FBC/Troponin
Green	Lithium Heparin	Plasma tests
Blue	Sodium Citrate	Coagulation tests
Pink	E.D.T.A	Blood Transfusion tests

Paediatric Specimen Bottles		
Cap Colour	**Anticoagulant**	**Test**
Red	E.D.T.A	FBC
Yellow	Fluoride Oxalate	Blood Glucose
Orange	Lithium Heparin	Plasma tests
Green	Sodium Citrate	Coagulation tests
Pink (Adult Size)	E.D.T.A	Blood Transfusion Tests
Clear	Clotted (No Anticoagulant)	All serum tests

Other Specimen Containers	
Container	**Test**
24 Hour Urine Container	24 Hour Urine Tests
24 Hour Urine Container with acid	24 Hour Acid Urine Tests
EMU Bottles 250ml	ZN/ TB testing

Microbiology Specimen Containers	
Container	**Specimen / Test**
Boric Acid Container (Red Top)	Urine (Microscopy, Culture)
Yellow Urinary Syringe Vacuettes	Urinary Sodium
Sterile Universal (polypropylene) 30ml	CSF, Pregnancy Test, Urine (Microscopy)
Purple and Blue	Blood Cultures
Pink	Paediatric Blood Culture

2.8 Types of Request Forms

- The provision of legible and appropriate clinical details and therapy on the request form, together with a properly collected specimen, allows the Laboratory to issue relevant and accurate results.
- The Laboratory scientific staff should be consulted where uncertainty exists about the availability, appropriateness, or selection of tests and the nature of the specimen required.

All Biochemistry and Haematology samples for the Laboratory in TippUH should be sent on a TippUH request form. The time and date of sample collection is important information required for the interpretation of Laboratory results. All fields of the request form should be filled in including consultant/ward, along with all patient details. If addressograph labels are used, these must state the patient's current location/consultant – do not use labels with incorrect details as this will result in Laboratory reports being sent to the wrong wards/consultants.

Note for Paediatric requests only: Please be advised that the tests predominately refer to blood sample requirements for adults. The specimen type/anticoagulant for paediatric samples will be the same however the colours coding of the specimen containers differ. The specimen volume for paediatric samples is 1.3mls (exception coagulation samples =1.4mls). Any further queries on paediatric blood sampling contact the Laboratory.

Please ensure that the tests requested are clinically justified and that unnecessary duplication of tests is avoided.

- Any specialised external tests which require special handling such as freezing etc. prior to dispatch must also be sent on a TippUH request form. Ensure that such bloods are handed directly to Laboratory staff, who must be informed that the sample requires freezing.
- CSF samples for xanthochromia require a specific request form; ensure the sample is protected from light and the sample will be sent to Beaumont.
- Blood Transfusion requests for TippUH must be sent on a TippUH pink Blood Transfusion Request Form (TippUH-BT-LF-015) and not white UHW Ante-Natal Request Forms.
- All samples for testing in UHW must have separate samples and request forms for each department.
- Samples for UHW Haematology and Biochemistry can be sent on one form WRH-PATH-LF-299.
- Refer to the UHW User Guide on the Web Browser for further information on tests and sample requirements.

2.9 Preanalytics

Taken from Vacuette Preanalytics Manual 980183 rev02, Click on link below for further information http://www.gbo.com/preanalytics

All determining factors and processes, which influence the specimen material before it is analysed in the Laboratory, are part of preanalytics. This covers preparation of the patient, sample collection, pre-processing, storage and transport of specimen material as well as handling in the Laboratory prior to analysis. It should be noted that the majority of the preanalytical phase is outside of the control of the Laboratory, so it is important that robust procedure/policies are defined for these processes. The people with responsibility for the quality of the specimen material include:

Activity	Persons involved
Test Request	Treating Doctor.
Preparation of Patient	Treating Doctor, nursing staff, doctor's assistant, and patient.
Identification of patient and specimens	Treating Doctor, nursing staff, doctor's assistant, and patient.
Patient Consent	Treating Doctor, nursing staff, doctor's assistant, and patient.
Blood Collection	Treating Doctor, nursing staff, doctor's assistant.
Mixing with anticoagulants	Treating Doctor, nursing staff, doctor's assistant.
Storage until transportation	Nursing staff, doctor's assistant.
Transportation	Porter, courier service, pneumatic tube system.
Acceptance, storage and preparation of samples	Laboratory staff.

2.9.1 Phlebotomy

The phlebotomy service provided in TippUH is not located in the Laboratory. The phlebotomy service is managed by the Director of Nursing. Contact number – Bleep 411. The phlebotomy department does not routinely provide a service for GPs.

2.9.2 Sample Quality (Blood Collection)

Haemolysis occurs when the cell membrane of the red blood cells is destroyed. Even a slight haemolysis can cause increased serum/plasma values e.g. potassium, bilirubin, LDH, AST, ALT, Mg, Urea, glucose. The following errors lead to haemolysis and should be avoided in any case;

- Tourniquet applied too tightly.
- Needles with too small diameter being used.
- Aspiration of tissue fluid after puncturing vein.
- Transfer of blood into other containers with a syringe.
- Shaking the sample instead of mixing.
- Delayed separation of cells from serum/plasma >3 hours.

Other factors that can affect sample quality include;

- Lipaemic and icteric samples.
- Expiry date on tubes. The function of the additives only work if used prior to their expiry date printed on label.
- Mixing ratios and specimen volumes. It is essential that tubes are filled exactly taking fill tolerances into account. Particularly serious errors can occur when citrate tubes for coagulation diagnostics are either over- or under-filled.
- Mixing blood and tube additives. **All tubes must be completely inverted 8 times after filling, except coagulation tubes which are inverted 4 times. Do not shake.**
- Disinfecting the puncture site incorrectly. Disinfection solution used should have dried completely before the vein is punctured.

- Repeated venepuncture can lead to contamination due to tissue thromboplastin (affects coagulation)
- If collection from a horizontal catheter is unavoidable, great care should be taken to avoid contaminating the sample with remains of infusion solution.
- Correct order of draw of samples. If a blood culture is not required, a no-additive discard tube should be filled first.
- Wrong anticoagulant. Carelessness or lack of knowledge can lead to taking the blood in wrong anticoagulant or tube. Such samples cannot be used by the Laboratory. Samples should never be poured from one tube into another tube, even if the tubes have the same anticoagulant.

2.9.3 Disposal of Consumables used during Blood Collection

It is the responsibility of the person performing the blood collection that all consumables used during the process, including needles, butterfly needles, discard tubes etc., are disposed of in the correct fashion, as per local defined policies.

2.10 Completing the Request Form and Labelling the Specimen

For accurate identification of specimens and patients, it is essential that specimens are labelled properly and that request forms are completed clearly and accurately. Upon receipt in the Laboratory every specimen is checked to ensure it is suitable for processing. Discrepancies or omission of essential information may result in the specimen not being analysed. Up to date addressograph labels are acceptable on Laboratory request forms.

Positive Patient Identification

- The Blood Track System is in use at TippUH for collection of Blood Transfusion samples. This system allows pre-transfusion sampling, blood collection and transfusion practices to be electronically recorded using dedicated hardware (Blood Track Kiosks and PDA devices), software (Blood Track Manager and ward enquiry) and barcoded user identification badges.
- It is vital that the request form is labelled prior to phlebotomy (either handwritten details or addressograph label attached to the request form). This allows positive patient identifications to be carried out at the patient's bedside.
- The Blood Track Transfusion device can then be used to generate a suitable 'COLLECT' sticker to attach to the specimen bottle and to the declaration section of the Blood Transfusion and Compatibility and Request Form TippUH-BT-LF-015.
- Positively identify the patient by requesting verbal confirmation of the surname, forename and date of birth.
- Verify that the details provided match that indicated on the patient's hospital ID band. Details for labelling should be taken from the patient's wristband if worn. This applies for all specimens taken for Blood Transfusion. Where ever possible, all samples should be taken and labelled using Blood Track PDA's and printed labels.
- When dealing with unconscious/ unidentified patients, the minimum information necessary on the sample tube and request form is a unique chart ('J') number and patient gender, and also the date and signature of the person who took the blood sample (NBUG 2004).
- It is recommended that unconscious patients, confused patients, new born infants and neonates should have two identification bracelets applied (NBUG 2004). **At present, this is only in use for new-born infants and neonates in TippUH.**

- Multiple unknown patients who may be admitted to Emergency Department should be identified as per Health Service Executive South / South West Area Major Emergency Plan. (2011).
- Outpatients without hospital identification bracelets in situ must verbally confirm the following before a sample can be taken- first name, surname, date of birth and address. Clinical staff must verify these details are identical on the Blood Transfusion Request Form and on the patient's medical records.

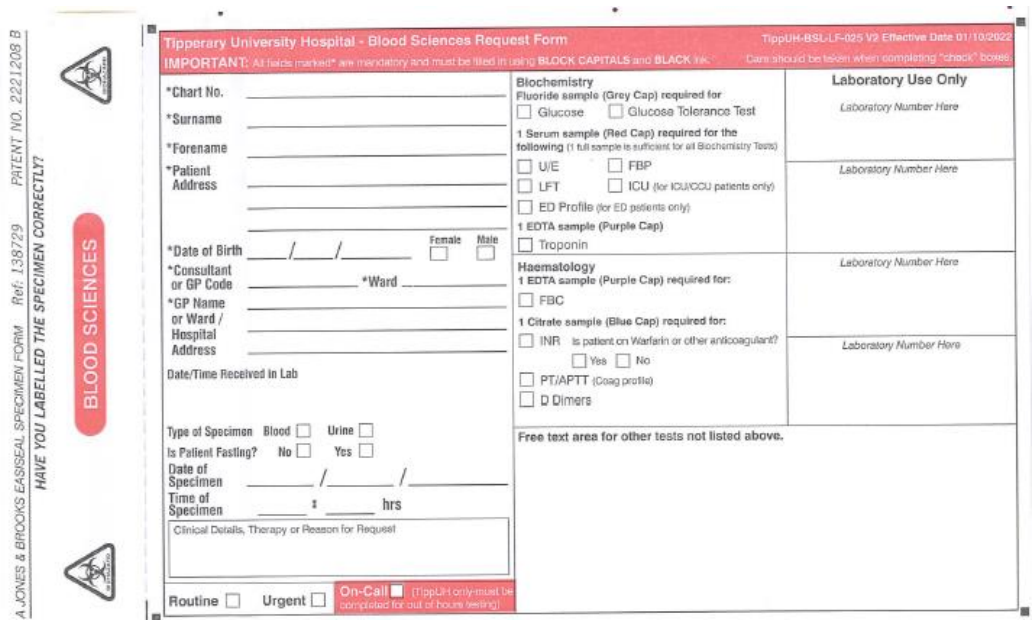
Ensure that all materials used in the collection of specimens are disposed of in accordance with Health Service Executive South South West Area Policy for the Safe Use, Handling and Disposal of Sharps and Sharps Containers.

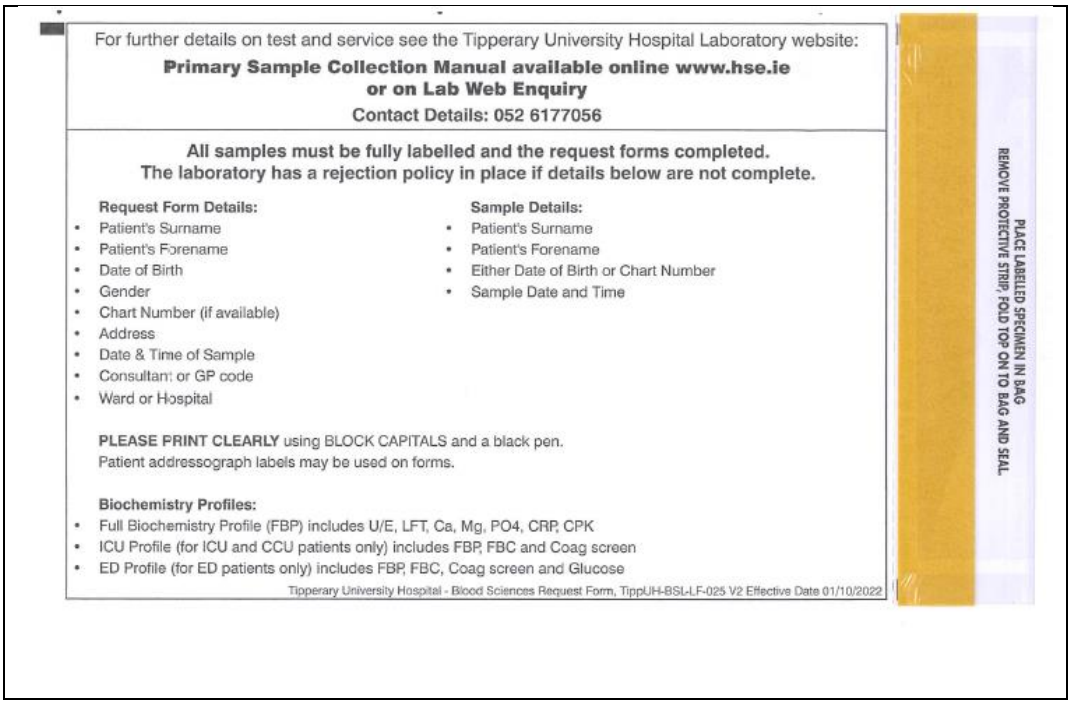
To avoid processing delays or sample not being processed please fill in samples and request forms with the following information

Mandatory information on Haematology/Biochemistry Specimens	
Patients **FULL** name (First name and surname)	
D.O.B and hospital number (where available)	

Mandatory information on Blood Transfusion Specimen		
Details on specimens must be handwritten or use the Blood Track 'Collect' Label– **Addressograph label is not accepted on Blood Transfusion Specimens**		
Patient's **FULL** name (First name and surname)		
D.O.B	or Blood Track	
Hospital Number	Collect Label	
Signature of phlebotomist		

Blood Science Request Form (Haematology/Biochemistry) **Mandatory information highlighted**
Patient's **FULL** name (First name and surname)
D.O.B. and hospital number
Patient's Gender (Enables correct reference ranges to be applied to results)
Tests Requested
Patient's Address
Patient Consultant or GP/ GP code
Ward/Location of Patient
Bleep number of requestor
Date of Specimen
Time of Specimen
Tests Requested and Specific Clinical Information





For further details on test and service see the Tipperary University Hospital Laboratory website:

Primary Sample Collection Manual available online www.hse.ie or on Lab Web Enquiry

Contact Details: 052 6177056

All samples must be fully labelled and the request forms completed.
The laboratory has a rejection policy in place if details below are not complete.

Request Form Details:
- Patient's Surname
- Patient's Forename
- Date of Birth
- Gender
- Chart Number (if available)
- Address
- Date & Time of Sample
- Consultant or GP code
- Ward or Hospital

Sample Details:
- Patient's Surname
- Patient's Forename
- Either Date of Birth or Chart Number
- Sample Date and Time

PLEASE PRINT CLEARLY using BLOCK CAPITALS and a black pen.
Patient addressograph labels may be used on forms.

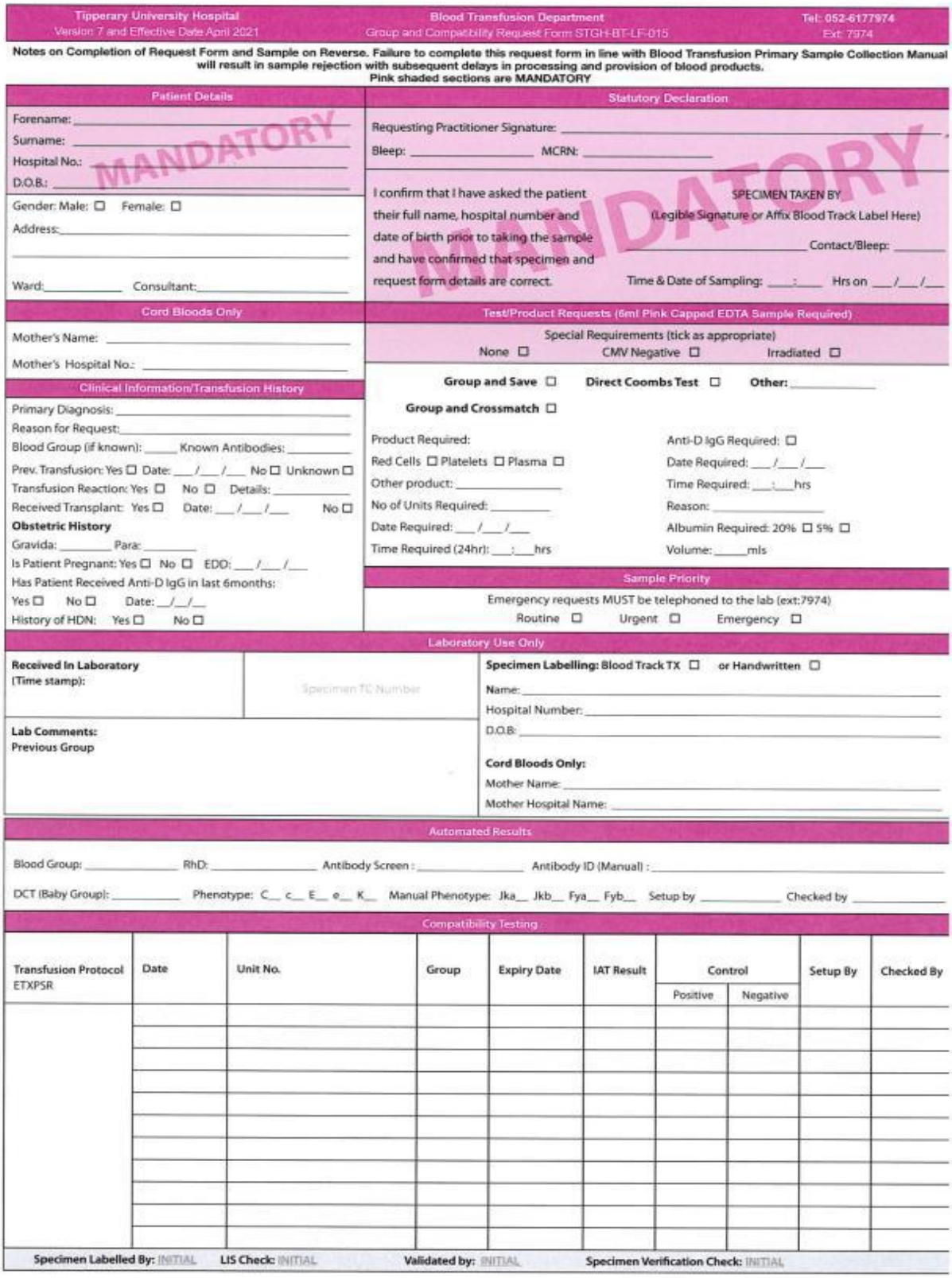
Biochemistry Profiles:
- Full Biochemistry Profile (FBP) includes U/E, LFT, Ca, Mg, PO4, CRP, CPK
- ICU Profile (for ICU and CCU patients only) includes FBP, FBC and Coag screen
- ED Profile (for ED patients only) includes FBP, FBC, Coag screen and Glucose

Tipperary University Hospital - Blood Sciences Request Form, TippUH-BSL-LF-025 V2 Effective Date 01/10/2022

PLACE LABELLED SPECIMEN IN BAG
REMOVE PROTECTIVE STRIP, FOLD TOP ON TO BAG AND SEAL

Blood Transfusion Request Form – Mandatory information highlighted	
Patient's **FULL** name (First name and surname)	
D.O.B.	or Blood Track
Hospital Number	Collect Label
Patient's Gender	
Time and date of specimen and signature of phlebotomist	
Doctors Signature and contact details	
Specific transfusion requirements for individual patients. If modified blood components are required e.g. CMV negative and/or Irradiated, this should be indicated on request form	
Patient's Consultant or GP	
Hospital & Ward or GP Address	
Tests requested and Specific Clinical Information	
Number of units of blood required, date and time required (if for cross matching)	
Product required and amount.	
Transfusion history/history of administration of Anti-D/Antenatal history etc. is also relevant	
The specific clinical indication for a transfusion request must be documented on the transfusion form	
A clear indication as to whether the tests/services requested are urgent or routine.	
Sample will be processed but blood or products will not be released until the requestor comes to the lab and fills in details retrospectively	

TippUH-BT-LF-015 Blood Transfusion Group and Compatibility Request Form



Tipperary University Hospital
Version: 7 and Effective Date April 2021

Blood Transfusion Department
Group and Compatibility Request Form STGH-BT-LF-015

Tel: 052-6177974
Ext: 7974

Notes on Completion of Request Form and Sample on Reverse. Failure to complete this request form in line with Blood Transfusion Primary Sample Collection Manual will result in sample rejection with subsequent delays in processing and provision of blood products.
Pink shaded sections are MANDATORY

Patient Details

Forename: _____
Surname: _____
Hospital No.: _____
D.O.B.: _____
Gender: Male: ☐ Female: ☐
Address: _____
_____
Ward: _____ Consultant: _____

Statutory Declaration

Requesting Practitioner Signature: _____
Bleep: _____ MCRN: _____

I confirm that I have asked the patient their full name, hospital number and date of birth prior to taking the sample and have confirmed that specimen and request form details are correct.

SPECIMEN TAKEN BY
(Legible Signature or Affix Blood Track Label Here)
_____ Contact/Bleep: _____
Time & Date of Sampling: ___:___ Hrs on ___/___/___

Cord Bloods Only

Mother's Name: _____
Mother's Hospital No.: _____

Clinical Information/Transfusion History

Primary Diagnosis: _____
Reason for Request: _____
Blood Group (if known): _____ Known Antibodies: _____
Prev. Transfusion: Yes ☐ Date: ___/___/___ No ☐ Unknown ☐
Transfusion Reaction: Yes ☐ No ☐ Details: _____
Received Transplant: Yes ☐ Date: ___/___/___ No ☐
Obstetric History
Gravida: _____ Para: _____
Is Patient Pregnant: Yes ☐ No ☐ EDD: ___/___/___
Has Patient Received Anti-D IgG in last 6months:
Yes ☐ No ☐ Date: __/__/__
History of HDN: Yes ☐ No ☐

Test/Product Requests (6ml Pink Capped EDTA Sample Required)

Special Requirements (tick as appropriate)
None ☐ CMV Negative ☐ Irradiated ☐

Group and Save ☐ **Direct Coombs Test** ☐ **Other:** _____
Group and Crossmatch ☐

Product Required:
Red Cells ☐ Platelets ☐ Plasma ☐
Other product: _____
No of Units Required: _____
Date Required: ___/___/___
Time Required (24hr): ___:___hrs

Anti-D IgG Required: ☐
Date Required: ___/___/___
Time Required: ___:___hrs
Reason: _____
Albumin Required: 20% ☐ 5% ☐
Volume: _____mls

Sample Priority

Emergency requests MUST be telephoned to the lab (ext:7974)
Routine ☐ Urgent ☐ Emergency ☐

Laboratory Use Only

Received In Laboratory
(Time stamp):

Specimen TC Number

Specimen Labelling: Blood Track TX ☐ or Handwritten ☐
Name: _____
Hospital Number: _____
D.O.B: _____
Cord Bloods Only:
Mother Name: _____
Mother Hospital Name: _____

Lab Comments:
Previous Group

Automated Results

Blood Group: _____ RhD: _____ Antibody Screen : _____ Antibody ID (Manual) : _____
DCT (Baby Group): _____ Phenotype: C__ c__ E__ e__ K__ Manual Phenotype: Jka__ Jkb__ Fya__ Fyb__ Setup by _____ Checked by _____

Compatibility Testing

Transfusion Protocol ETXPSR	Date	Unit No.	Group	Expiry Date	IAT Result	Control		Setup By	Checked By
						Positive	Negative		

Specimen Labelled By: INITIAL **LIS Check:** INITIAL **Validated by:** INITIAL **Specimen Verification Check:** INITIAL

2.11 Mislabelled Laboratory Specimens and Request forms

Laboratory Policy on Mislabelled Forms / Samples

The Laboratory procedure TippUH-BT-LP-001 Acceptance, Rejection and Labelling of Inpatient Specimens procedure outlines the Laboratory's rejection policy for request forms and samples which are not appropriately labelled.

Laboratory staff are acting correctly in refusing to accept a request for testing when either the request form or the sample is inadequately/incorrectly labelled.

The Laboratory staff will inform the ward/doctor if a sample is inadequately/incorrectly labelled and request a new sample. The Laboratory will not be responsible should any problems arise due to delays caused by inadequate/incorrect labelling of samples or forms. All rejected samples are logged in the Laboratory Information System and the reason for the rejection documented.

Definition of replaceable and irreplaceable samples

Replaceable samples:

Can be re-obtained without any significant risk to the patient and whose results are not likely to be different from those obtained initially because of any therapeutic intervention.

a. Among blood and urine samples, all but a few types are considered replaceable. **Samples from patients with difficult or inconvenient venous access are considered replaceable unless they meet one of the criteria listed below in irreplaceable samples.**
b. All blood samples sent to the Blood Bank for purposes of obtaining material for transfusion are automatically viewed as replaceable; that is, if misidentified or unidentified, they must be redrawn even if they fall under one of the qualities listed below.

Irreplaceable samples:

Samples which cannot be re-obtained are detailed below. Some irreplaceable samples may be processed provided certain specific procedures are followed to determine and document the unique identity of the samples.

a. Samples obtained by invasive procedures such as surgery, biopsies, fluid aspirates and foetal amniotic sampling.
b. Samples obtained before an intervention that might alter the result (e.g. a sample sent for blood culture where antibiotic therapy was administered before a repeat sample could be obtained).
c. Umbilical cord blood, blood samples from neonates or from infants less than 6 months of age for whom the total blood volume is problematic.

General Rules for Specimen/ Request Form Evaluation

- On receipt in the Laboratory both the test request form and the sample are checked for accuracy and completeness.
- Sample is rejected if essential criteria is not correct as outlined above.
- When specimens are being sorted, and labelled all discrepancies are documented on the request form.
- Laboratory staff are not permitted to amend details on specimens or request forms.

- Addressograph labels will be accepted on specimens **except** for Blood Transfusion specimens.
- Identification criteria for X-match specimens and request forms are as laid down by the Hospital Transfusion Committee.
- Staff should err on the side of caution and never process a discrepant specimen unless they have good reason to believe that the specimen belongs to the person identified on the request form/sample
- Users will be informed if a decision is made to reject a specimen.
- All samples will be held in the Laboratory for at least 48 hours' post authorisation of results.
- Only the patient's consultant, GP, or a pathology consultant can direct the Laboratory to process a sample not meeting the minimum requirements set out above
  (A note of which will be recorded on the final report.)
- If the Blood Transfusion request form is not signed and dated by the person who took the sample, the phlebotomist or doctor will be contacted and allowed to come to the Laboratory to sign the request form. Otherwise the sample will be rejected.
- If blood/products are ordered on the Blood Transfusion request form without the doctor's signature who prescribed the blood/products, the doctor will be contacted to come to the Laboratory to sign the request form. A new request form with the doctors' signature re-ordering the blood/products may also be sent to the Laboratory. Otherwise the blood/products will not be issued.

2.12 Specimen Transportation to the Laboratory

Samples should be placed in the specimen transport bags attached to the forms as soon as the sample has been taken. This should then be sealed properly to ensure that samples do not fall out of the bag during transport. **Collection staff are acting correctly in refusing to collect samples that are not sealed correctly.** Large specimens such as some histology specimens or 24-hour urines should be put in large specimen bags and the request form placed in the outer pouch.

- Specimen containers that are contaminated externally must not be sent to the Laboratory.
- High risk specimens should be identified.
- Under no circumstances should anyone transport specimens in their hands or pockets. Transport containers are available on the wards & in the Laboratory for the internal collection and transport of samples.

High risk specimens

It is the policy of the laboratory department to treat all samples as potentially infectious or high risk. Therefore, it is advisable to take universal precautions in the collection, packaging and the delivery of samples being sent to the laboratory for analysis. It is a requirement that laboratory specimens from patients who have known or suspected risk group 3 infections be labelled in such a manner that this knowledge be conveyed to the Laboratory. Specimens from these patients should be labelled biohazard or danger of infection. The specimen container should be labelled on the outside and clearly visible. The accompanying paperwork should be appropriately labelled. It is good practice for those requesting tests to provide as much information as is relevant, consistent with maintaining patient confidentiality, with any request for a laboratory investigation.

Specimen Transport within TippUH

Please refer to the Procedure for the Internal Transport of Laboratory Specimens TippUH-LAB-LP-100 and PPPPG-O-NON-049 Protocol for the Pneumatic Tube System.

In TippUH the pneumatic tube system is used to transport samples to the Laboratory. For certain samples e.g. CSFs and larger samples, the porters transport the specimens to the Laboratory. Specimens are collected from the wards on an hourly basis from 09.00 to 16.00. The porter should be contacted on *5250 or bleep 287 for any samples requiring transport to the Laboratory after 16.00. Urgent and all on Call samples that cannot be sent through the pneumatic tube system and requiring immediate collection should be notified to the porter as soon as possible. Internal transport boxes are available for the safe carriage of bloods to the Laboratory. All blood samples are collected from designated collection points on each ward.

Note: The Laboratory is not responsible for the transport of samples, or delays in transport, either in the pneumatic tube system, or via porters, to the Laboratory. In the case of Blood Transfusion samples specifically, they are time and date stamped when they are received by the Laboratory staff in the Laboratory, and turnaround times are calculated from the time the sample is received by the Laboratory. Also, during on-call hours, it is the responsibility of the person requesting the test, and not the porter, to contact the Medical Scientist via 7056 or the switchboard to inform them of any urgent samples being sent to the Laboratory.

External Transport to/from Outside TippUH

All samples for processing by external Laboratories must be sent to the Laboratory in TippUH for forwarding. The Laboratory is equipped with packaging materials and containers, which comply with the requirements of the transport of biological samples and ADR regulations. All samples forwarded to external Laboratories are sent in sealed containers and transported by hospital approved transport.
Refer to TippUH-LAB-LP-098 Processing of Samples for External Laboratory Testing.

Specimen Dispatch Times to UHW and Other External Sites

Collection Point	Collection Time	Comments
Laboratory, TippUH	08.00 and 12.00 Monday to Friday. 09.00 Saturdays, Sundays and Bank Holidays. All urgent samples for dispatch outside of these times must be communicated to the Laboratory in TippUH ASAP.	Transported to UHW by Eurofins Biomnis Samples may be sent by taxi if transport is unavailable or if delivery is required urgently after this time. Samples to Biomnis may be sent through UHW Laboratory or by Biomnis courier if required. Samples to overseas destinations are sent by courier (ordered through Biomnis).

2.13 Reporting of Results

Back to Contents

Laboratory reports from TippUH are issued by computer, and reference ranges for different analytes are printed with the test results. A hard copy printed report of internal results is delivered to wards and Consultant's secretaries daily, and external results are downloaded by GPs via Health Link or sent by external mail to the requester of the tests.

Results are available on the wards via the Lab Web Browser function on all TippUH networked computers. Please email Lab.SystemSTGH@hse.ie to request user access and passwords to Lab Web Browser.

GPs may access their patients' results through Health link. The Health link provides a web based messaging service, which facilitates the secure transmission of clinical patient information between hospitals, health care agencies and general practitioners. GPs requiring access to electronic access to results should contact the Primary Care Unit, Health Service Executive - South Eastern Area, Lacken, Dublin Road, Kilkenny. Tel: (056)7784113

Hard copies of the ward enquiry screen should never be printed off as some results could be missing from this print off. Relevant staff have been given access to results on the wards. Histology results are only available to ward staff that has been given specific access to histology results. Histology reports are printed in the Laboratory in TippUH daily and distributed to the appropriate Consultant. TippUH Laboratory Medical Scientists and Secretaries do not have access to histology results.

For Histology Ward Enquiry Access, contact Dr Michelle Griffin, Chief Medical Scientist, Histology Department, University Hospital Waterford on 051-848586

2.14 Back up for Lab Web Enquiry

In the event that the Lab Web Enquiry is down, please contact the Laboratory for paper reports for urgent samples only.

2.15 Reporting of Results by Phone

On occasion the Laboratory will phone results on a patient when:

- The results fall within established alert or critical intervals, as defined by procedure. *TippUH-LAB-LP-089 Phoning Critical / Essential Results.*
- The result deviates significantly from previous results.
- It is necessary to notify the requester that testing will be delayed, where it may compromise patient care. *A note of results reported by phone is recorded in the Laboratory Information System.*
- The Medical Scientist on call is unable to handle telephone calls from GP practices after hours. All GP results can be accessed by electronic link if the surgery has been set up for web based access.
- Results delivered by telephone should only be delivered to authorised recipients and should not be communicated directly to the patient.

2.16 Amended Reports

Where it is discovered that the original report issued is incorrect or contains false information a revised or amended report is issued. The incorrect results are de-authorised as soon as the error has been identified. The ward / GP are notified immediately and all telephone communications are recorded on the LIS. The revised report is retained on APEX with a comment indicating that it is an amended report and that it is a deviation from the original.

2.17 Reports from Referral Laboratories

- Some requests referred by the Laboratory in TippUH are documented as a generic CPOST request on the LIS.
- The nature of the request and the referral Laboratory are noted under specimen comment.
- When the results are returned to the Laboratory, the original hard copy is sent to the requesting clinician.

2.18 Uncertainty of Measurement

Certain tests give results as a numerical value. Within this reported value there is an inherent uncertainty, or variability, in the data generated. Data obtained from these tests enable an assessment of this measurement uncertainty (MU).

2.19 Laboratory Complaints Procedure

The Laboratory has a complaints procedure for users of the service. This procedure maintains the method for receiving and processing complaints. This procedure is audited with results feeding into the quality management system. Complaints can be made verbally or in writing to any member of Laboratory staff. All users of the service are encouraged to contact the Laboratory with any complaints and they will be fully investigated. If a verbal complaint is being made details will be recorded on a Complaint Form TippUH-LAB-LF-302.

2.20 Laboratory Policy on Protection of Personal Information

The Laboratory, Tipperary University Hospital policy on patient confidentiality is as per Tipperary University Hospital Confidentiality Policy and HSE Data Protection. The Laboratory is fully compliant with the national standards on protection of personal information. All staff working in the HSE are legally required under the Data Protection Acts 1988 and 2003 to ensure the security and confidentiality of all personal data they collect and process on behalf of service users and employees. Data Protection rights apply whether the personal data is held in electronic format or in a manual or paper based form. Procedures are in place to detail the requirements for security, access, confidentiality and data protection, backup systems, storage, archive and retrieval and safe disposal of laboratory equipment and the pathology computerised systems. This procedure applies to any system that captures, stores, controls, manages or reports data subject to review.

3. Blood Transfusion Department

3.1 Service Description

The Blood Transfusion Laboratory performs a range of tests including, blood grouping, antibody screening, compatibility testing etc. The Laboratory provides blood components/products to hospital inpatients and some day-care patients in TippUH when required. The Haemovigilance Clinical Nurse Specialist (CNS) ensures the provision of a quality transfusion surveillance service and is based in TippUH.

The Consultant Haematologist participates on an on call rota in UHW so clinical advice is available 24 hours a day 7 days a week.

Contact	Internal ext.	External Phone No
Blood Transfusion Laboratory Enquiries	7974	052 6177974
Haemovigilance – Adela Burke	7514	052 6177514
Dr Ahmed Bannaga Consultant Haematologist Clinical Advice University Hospital Waterford	Via UHW switchboard	051 848433 (Secretary)
Haematology Registrar, University Hospital Waterford		051 842105

3.2 Tests available

The following tests are available in the Blood Transfusion Department:

- Group and Screen
- Crossmatch
- Blood Component/Product Issue
- Antibody Identification
- Phenotype
- Direct Coombs Test
- Cord Blood

3.3 Turnaround Times

Turnaround times for Emergency Crossmatch/Blood Component Issue.
(Laboratory staff MUST to be contacted by phone).

Time sample arrives in Laboratory*	Blood Products available**
Uncrossmatched blood	Within 10 minutes
Urgent Crossmatched blood	Within 1 hour
Plasma Platelets – from IBTS Cork	Within 20 minutes Within 2 hours

Turnaround Times for routine Cross-matching/Blood Component Issue

Time sample arrives in Laboratory*	**Blood Products available****
Before 10.30	14.00
Before 15.30	18.00
After 15.30	Check with Laboratory Staff

* If specimen/request-form does not comply with acceptance criteria, identified by Blood Transfusion staff, the ward will be notified, and a repeat sample/request form may be requested.

Laboratory staff will not be responsible for delays caused by errors of this nature.

** If delays are unavoidable, e.g. Antibodies present, the ward will be notified of such, and a repeat sample may be requested to either re-test locally or send to IBTS Cork.

Turnaround Times for Group & Screens, DCTs, Cord Bloods

Time sample arrives in Laboratory	**Final Report****
Routine Samples	24 hours after arrival in lab
Urgent Group and Screen	Within 1 hour

** If delays are unavoidable, e.g. Antibodies present, the ward will be notified of such, and a repeat sample may be requested to either re-test locally or send to IBTS Cork.

Turnaround Time for In House Antibody Identification and Phenotyping:

- Samples requiring antibody identification are initially tested in TippUH and only complex investigations are referred out to the IBTS.
- In house turnaround time is 4-5 hours for full authorisation; however, this can vary with each individual investigation and the ward / team will be notified of any delays.

3.4 Specimen Requirements

Samples received in the Laboratory which are over 48 hours old are unsuitable for processing. A repeat sample must be requested.

3.4.1 Group & Save (also called Group Only, Group and Screen or Group and Hold)

- 6ml EDTA (pink capped bottle) 
- An ABO & Rh D Blood Group and Antibody Screen for irregular antibodies is performed on the sample.
- If a handwritten sample with no previous history of a first time patient is received a second sample **MUST** be requested for confirmation of the ABO group prior to transfusion, See *Appendix 3.*
- The sample is held in the Laboratory should crossmatching be required within 72 hours of sample collection. The only exception is placenta previa where samples are valid for 7 days.

- Group and Save requests for elective surgery / transfusion should be received in the Laboratory at least **24 hours** prior to the scheduled surgery time.
- Blood is not reserved or available for immediate use for a patient on a Group & Save sample. If a patient has no antibodies and/or special requirements, crossmatched blood should be available within 1 hour of the Laboratory receiving a phone request and completed request from.

3.4.2 Group & Crossmatch (adult)

- 6ml EDTA (pink capped bottle) 
- Compatibility testing of donor red cells against the patient's sample is performed.
- The requested number of red cell units are issued to that patient and are held in the Blood Transfusion issue fridge for 24 hours from the time the blood is required. Following this time, the red cells are returned to the Blood Bank stock fridge. The Laboratory must be notified if there is a clinical need for blood to be held for longer, or if surgery is deferred to a different day.
- Where a patient's plasma contains an irregular antibody, a delay may be unavoidable in providing antigen negative blood that is suitable for that patient.
- Refer to the TippUH MSBOS (Appendix 1) when requesting red cells for surgical procedures. Deviations from the MSBOS should be notified to the Blood Transfusion Department.
- Crossmatch requests for elective surgery/transfusion should be received in the laboratory at least **24 hours** prior to the scheduled surgery time.
- Where a patient has special requirements a delay may be unavoidable in providing blood that is suitable for that patient.
- A historical or second blood group sample is required for issue of all group specific crossmatched red cells.

3.4.3 Antibody Identification

- 6ml EDTA (pink capped bottle) 
- Antibody investigations most often arise from the detection of a positive antibody screen or an incompatible crossmatch.
- When antibodies develop, it is most often the result of exposure to donor red cells through blood transfusion or through exposure to fetal cells during pregnancy.
- A delay in the provision of compatible red cells occurs when an irregular antibody is identified; close liaison with the Blood Transfusion Department is advised in such instances.

3.4.4 Phenotyping

- 6ml EDTA (pink capped bottle) 
- Antigen typing of patient red cells is most frequently performed in conjunction with antibody investigation testing in Blood Transfusion Department.

3.4.5 Cord Blood Testing

- 6ml EDTA (pink capped bottle**)** 
- Cord blood samples are required for testing on all Rhesus D negative women following delivery. Based on the blood group result of the infant, prophylactic Anti-D immunoglobulin may need to be given to the mother.
- Cord blood samples are required for testing for maternal antibodies which can result in HDN.
- A cord blood sample must be labelled with both mother and baby's details (mothers name, mother's hospital number, baby's surname, baby's hospital number and baby's DOB) signed by the person taking the sample and Compatibility Request Form TippUH-BT-LF-015.
- A post-delivery maternal sample and Blood Transfusion and Compatibility Request Form TippUH-BT-LF-015 must also be received along with the cord blood sample**.**
- A blood group and Direct Coombs Test are performed on the baby's cord blood sample. Additional testing on a cord blood may be required in cases where the mother has developed clinically significant red cell antibodies.

3.4.6 Direct Coombs Test

- 6ml EDTA (pink capped bottle) 
- A Direct Coombs Test indicates if a patient's cells are coated in vivo with either immunoglobulin and/or complement.

3.4.7 Cold Agglutinin Testing

- This test is no longer performed in the Blood Transfusion Laboratory due to the unavailability of External Quality Control Material. Please contact the Consultant Haematologist if further advice required.

3.4.8 Additional Examinations & Requests

- Any additional testing can be requested by phoning the Blood Transfusion Laboratory at extension 7974. Once a request has been placed for a blood component or product to be issued, the Medical Scientist will ensure that a suitable sample is available in the Laboratory. It may be necessary to take a repeat sample from the patient depending on pregnancy or previous transfusion history of the patient.
- Any additional request for blood components or products requires that a request form signed by the requesting doctor is sent to the Laboratory once the request has been made. Units will not be released from the Laboratory until this request form is received in the Laboratory.

3.4.9 Repeat Samples Requested by the Laboratory

- Repeat samples may be requested by the Laboratory if a sample or the quality of a sample is not suitable for testing i.e. samples may be insufficient, haemolysed, extra samples may be required for antibody investigation or required for referral to the IBTS.
- Repeat samples must also be accompanied by a request form.

3.5 External Tests

3.5.1 Fetal Rh D Genotyping

Non-invasive pre-natal testing (NIPT) using cell free foetal DNA in maternal plasma can be used to determine fetal Rh D status so that Rh D negative pregnant women can avoid receiving antenatal anti-D if they are carrying an Rh D negative baby.

Current practice is to provide antenatal anti-D prophylaxis at 28-30 weeks gestation, and that means about 40% of healthy Rh D-negative pregnant women are exposed to a pooled human blood product that they do not require as their baby is Rh D negative.

International Blood Group Reference Laboratory (IBGRL) is part of NHS Blood and Transplant, located at the Bristol site. The Molecular Diagnostics department offers blood group genotyping to provide molecular typing support for routine maternity and transfusion services both nationally and internationally. This department offer rapid, non-invasive, convenient and reliable service for prediction of fetal Rh D, status, using cell-free fetal DNA in maternal blood for women.

3.5.1.1 Sample and Request Form Requirements 

- Request form FRM5197 is not available from the Laboratory in TippUH. It is available from frm5197-4-cffdna-request-form.pdf (windows.net)
- A minimum of 6mL maternal EDTA blood
    - The sample tube must not be opened following blood collection or used for any testing prior being sent to IBGRL.
    - Samples MUST be labelled, dated and signed by the person taking the blood. -Labels pre-printed prior to phlebotomy e.g. addressograph labels are not acceptable on samples. They are, however, acceptable on request forms providing they do not obscure other vital details.
    - Samples must have handwritten unless demand printed labels (PDA Collect label) are produced at the time of phlebotomy.
- Hand written alterations on either the sample or request form may make the sample invalid for testing. Any minor alterations must be initialled by the person taking the sample to be acceptable for testing
- Request form FRM5197 must accompany every sample.
- The NHSBT will not test samples unless three or more identical points of identification for the patient are used on both forms and samples.
- Request forms that contain hospital name abbreviations, partial codes or where the referral location is not clear will not be tested. A No-Test report will be generated once we are contacted by the referring hospital, *see appendix 5.*

- Minimum patient identification (Request Form and Sample)
  - Full name
  - MRN number
  - Date of birth
  - Date of venepuncture
  - The name of the person taking the sample
  - Estimated delivery date by dating scan (the gestational week is not acceptable)

A NIHR funded multi-centre study investigated test sensitivity at different gestational ages and concluded that the test is reliable after 11+2 weeks gestation.

Requests which do not meet the above minimum specification for hospital and patient identifiers as well as EDD and date of venepuncture will be rejected at receipt.

3.5.2 HLA Typing

- 6ml EDTA (pink capped bottle) 
- Full completed TippUH-BT-LF-015 Blood Transfusion and Crossmatch Compatibility Form
- Minimum patient identification (Request Form and Sample);
  - The patient's full surname correctly spelt.
  - The patient's/donor's forename(s) (initials are not sufficient)
    The patient's/donor's unique hospital number and/or date of birth (year of birth or age is not sufficient).
  - The sample or request form must be date labelled.
  - Specimen labelling details must be legible.
  - When multiple blood tubes are collected, each tube must be individually labelled.

3.6 Transfusion Reaction Investigation

Refer to the 'Administration of Blood Components and Blood Products' procedure, TippUH-BT-HP-005 in the Blood Transfusion User Manual (available on all clinical areas).

All suspected reactions reported will be fully investigated by the Haemovigilance CNS and reviewed by Consultant Haematologist. It is a mandatory requirement (EU Directive 2002/98/EC) for all Serious Adverse Reactions (SAR) and Serious Adverse Events (SAE) which fit criteria to be reported to the National Haemovigilance Office (NHO).
On discovery of a suspected transfusion reaction:

- Stop transfusion of blood product immediately where a suspected reaction has occurred and verify Patient ID, ABO group of patient and donor unit immediately.
- Medical advice should be sought immediately from the patient's team and/or the Haematology team.
- Contact the Blood Transfusion Laboratory during both routine and on-call hours.
- Contact the Haemovigilance CNS during routine hours.
- Record the reaction on blood track if used.

To serologically investigate the suspected reaction:

- Complete the 'Report of a Suspected Adverse Reaction/Event' form on the reverse of the Blood Component and Product Transfusion Record TippUH-BT-HF-001 and follow this report form for suggested actions.
- Return the implicated red cell pack and administration set to the Laboratory for investigation.
- A repeat grouping sample (**6ml pink capped EDTA bottle**) is required with Blood Transfusion and Compatibility Request Form TippUH-BT-LF-015.
- Repeat grouping, antibody screening, crossmatching and Direct Coombs Testing of both the pre and post transfusion reaction samples are performed to determine any possible red cell incompatibility.
- Patient blood cultures as well as cultures from the suspect blood pack* must be sent to the Laboratory if temperature rise ≥ 1.5ºC above the baseline temperature together with another acute symptom such as chills or rigor.
- Full Blood Count.
- Renal Profile.
- MSU for culture/sensitivity if required.

***Procedure for Blood Culturing of implicated red cell pack**

Carry this procedure out at the patient's bedside using an aseptic technique. Ensure that both the patient and the implicated unit of blood are cultured at the same time and that both sets of bottles are clearly differentiated.

Requirements:

- Clean tray containing sterile gloves, alcohol swabs, 20ml syringe and 23g needle (blue)
- Sharps container
- Blood Culture bottles
- Microbiology Request form.
- Wash and dry hands. Apply sterile gloves.
- Collect a set of blood cultures from patient as per normal procedure. Label bottles with patient's labels and write "Peripheral blood" on both labels.
- Wash and dry hands. Apply sterile gloves.
- Remove the cover of the second set of blood culture bottles. Wipe the rubber bung on the bottle tops with an alcohol swab. Allow to dry.
- Swab the un-opened port of the blood unit. Allow to dry.
- Attach needle and syringe to un-opened port of blood unit using aseptic technique.
- Withdraw approx. 20mls of blood into a syringe maintaining asepsis.
- Place 8 – 10mls of blood into each blood culture bottle.
- Label blood culture bottles with patient's labels and write: "Blood from blood pack and Donor Unit No."
- Complete the Microbiology Request Form with following details:

  - Patient's Addressograph label plus name of Consultant Haematologist and address for reporting.
  - Fill in Specimen as "Blood culture X 2. Peripheral blood + Blood from pack".
  - Fill in Clinical details as "Transfusion reaction. Donor Unit No: XXXXXX".
  - Fill in Tests Required as "C/S"
- Send bottles and accompanying request form immediately to the Laboratory in a bio-hazard bag.
- Dispose of sharps in the correct manner and wash hands.

3.7 Emergency Testing and Requests

Emergency sample processing in Blood Transfusion must be accompanied by a telephone call to the Laboratory or Medical Scientist on duty explaining the urgency of the situation.

From receipt of sample in Blood Transfusion Laboratory:

- Allow 1 hour for provision of compatible red cells providing all serological compatibility tests are negative.
- Any incompatible test /positive antibody screen results will increase the delay in providing compatible blood. The Medical Scientist dealing with the request will inform the team concerned with the patient.

3.7.1 Emergency Requests for Uncrossmatched Blood

- In emergency situations, uncrossmatched O Rh D Negative units or group specific red cells can be issued where there is insufficient time to wait for complete compatibility testing.
- There are four units of O RhD Negative red cells labelled as **Emergency Blood** and available at all times from the Blood Bank Issue Fridge.
- There is a fresh < 5 days old O Rh D Negative red cell unit available in the blood bank stock fridge for use in an emergency for neonates. **Note: The emergency neonatal unit is not suitable for transfusion to a neonate where maternal Anti-c is present.**
- If there is a current sample available and completed in the Laboratory – Group Specific Group O Rh matched red cells or patient group specific red cells can be issued uncrossmatched (dependent on previous history etc.). Allow ten minutes from receipt of request.
- No sample available in the Laboratory and patient blood group unknown – Group O Rh D Negative red cells must be issued. All known patient details to be given to the Medical Scientist taking the request for blood. Allow ten minutes from receipt of request. **(Please send blood grouping sample immediately).**
- **It is a Medical Decision to Transfuse Uncrossmatched Red Cells**.
- The traceability label must be completed and signed at administration and returned to the Laboratory, as proof of transfusion. This is a mandatory legal requirement, alternatively use Blood Track for recording administration

Refer to "A Guideline for the use of Blood and Blood Components in the Management of Massive Haemorrhage" issued by the National Blood Users Group, Nov. 2002. Refer to www.ibts.ie/publications

Other Recommended Websites:
www.transfusionguidelines.org.uk
www.bcshguidelines.com

3.8 Requests for Unidentified Patients

Requests for blood components / products for unidentified patients can be made using the patients' gender and healthcare record number. As soon as the patient is identified the information as listed under section 3.10 of this procedure, must be used for all further requests and a **repeat crossmatch sample must be sent** to the Laboratory.

Multiple unknown patients who may be admitted to Accident and Emergency should be identified as per HSE South/South West Area Major Emergency Plan and the TippUH Patient Identification Policy.

3.9 On-Call Testing

- On-call testing in the Blood Transfusion Laboratory is performed on emergency and/or urgent samples only.
- On call staff should be contacted via the switchboard or on the Laboratory on call phone.
- Requests for emergency issue of blood must be accompanied by a **phone call** to the Medical Scientist on call.

3.10 Maximum Surgical Blood Ordering Schedule (MSBOS)

A Maximum Surgical Blood Ordering Schedule (MSBOS) is a mechanism to maximise usage of blood and minimise wastage in elective surgery. A MSBOS can reduce the workload of unnecessary crossmatching and issuing of blood and optimise stock management. The MSBOS only applies to elective surgery and requires samples being in the Blood Transfusion Laboratory at least 24 hours prior to surgery.

For operations / procedures requiring a "Group & Screen" Only the following applies:

- In patients with a negative antibody screen, blood can be available within forty minutes if it is required urgently.
- If a patient has a positive antibody screen detected pre-op, then the group & save will automatically transfer to a group & crossmatch.

For operations requiring crossmatched blood:

- The designated number of units is reserved for the patient for 24 hours from the proposed date of surgery.
- The blood will automatically be returned after 24 hours unless otherwise requested by the clinical team**. If surgery is re-scheduled it is the responsibility of the team to notify the Blood Transfusion Laboratory of the new date for surgery.**

In all cases, should blood be required urgently then 4 units of emergency O Rh D Negative blood are available in the issue fridge at all times.

The current MSBOS has been prepared and reviewed by the Blood Transfusion Department in consultation with the Departments of Surgery/ Anaesthetics/ and Obstetrics/ Gynaecology and issued via the Hospital Transfusion Committee.

See Appendix 1 for current TippUH MSBOS

3.11 Blood Component/Product Information / Major Haemorrhage Pack

Product	General Description	Volume	Storage Temp	Shelf life	Storage outside of controlled environment/after preparation	Compatibility Testing Requirement	Prescription/ Requesting Information
Red Cells (additive solution) Leucocyte depleted	Red cell suspension obtained from whole blood	280mls ±60 ml	2 - 6°C	35 days	4 hours to complete transfusion from time of removal from Issue fridge.	Yes- to be compatible with recipient ABO & Rh D type	
Platelet concentrate (Pooled/ Apheresis)	Platelet preparation from pooling of 5 single donor units or single apheresis donor	>300ml per pooled unit >160ml per apheresis prep.	22±2°C	5-7 days under gentle agitation	Immediate use i.e. less than 60 minutes	Preferably ABO identical with recipient group, depending on availability.	If >1 unit of platelets – ordered by Consultant or Registrar only.
Human Pooled Plasma	Octaplas pooled plasma, solvent detergent treated	200ml	≤ 18°C	4 years -frozen	Immediate use preferable, must be used within 8 hours at room temperature or 5 days stored in the Blood Issue fridge once defrosted.	Preferably ABO identical with recipient group	
Human Fibrinogen	Riastap freeze dried powder for re-constitution	50ml when re-constituted	2 - 6°C	Do not use after expiry date	Immediate use preferable – Refer to product insert for reconstitution	None	
Human Albumin (Flexbumin)	Pooled donor plasma	50g/L 250ml (5g)or 200g/L 100ml (20g)	2-25°C	Do not use after expiry date	Immediate Use	None	Monitor Fluid Balance.
Anti-D Immunoglobulin	Ready to use IM concentrate of anti-D Ig produced from human plasma	1250 IU (250µg) per IM injection	2-8°C	Do not use after expiry date	Solution to be used immediately after preparation	G&S sample required. Only for Rh D Negative females when clinically indicated	

Human Prothrombin Complex (Octaplex)	Contains human Vitamin K dependant factors II, VII, IX, X, Proteins C & S, freeze dried for reconstitution	Contact the Haematology team	2-8C	Do not use after expiry date	Octaplex is to be used immediately after reconstitution and on one occasion only	None	Haematologist in UHW must be contacted when ordering Factor concentrates and Octaplex
Clotting Factor Concentrates	Freeze-dried human or recombinant factor concentrates	Contact the Haematology team	2-8°C	Do not use after expiry date	Immediate use preferable – Refer to product insert for reconstitution	None	Haematologist in UHW must be contacted when ordering Factor concentrates and Octaplex.
Points to Note: Administration	Record transfusion of each component/product in the Blood Component and Product Transfusion Record TippUH-BT-HF-001. Follow the TippUH protocol for ordering and administering blood components. For special blood product requirements i.e. irradiated, washed or reconstituted products, the shelf-life may be shortened. Contact the Laboratory for further information						

Major Haemorrhage Pack 1

- 4 units RCC (may contain emergency O Rh D negative units)
- 2 units of plasma (Octaplas LG)
- 1 adult therapeutic dose of platelets ordered from the IBTS (approx. 2 hours)
- 4g fibrinogen if derived fibrinogen is ≤1.5g/l.

Major Haemorrhage Pack 2

- 4 units RCC (group specific or crossmatched)
- 4 units of plasma (Octaplas LG)
- 1 adult therapeutic dose of platelets ordered from IBTS irrespective of platelet count

3.12 Specialised Blood Products

These recommendations aim to ensure that specialised products, which are a limited resource, are available to the patients who derive most benefit from them.

Cytomegalovirus (CMV)
Cytomegalovirus is a significant cause of mortality and morbidity in immunocompromised patients: -

Indications for CMV Negative Blood Products at TIPPUH

- All pregnant women.
- All children <1 year.
- All children with malignancies or immunodeficiency's having shared care with Our Lady's Hospital, Crumlin.
- CMV negative patients in the following categories are at risk of CMV disease but remember where CMV status is unknown assume the patient is CMV negative:
    - Bone Marrow / Stem cell transplant (SCT) recipients.
    - Solid Organ recipients
    - Kidney transplant patients from the time of transplant if negative
    - Liver transplant patients from the time of transplant if negative
- **N.B** All "pedi-pack" blood is CMV-negative and also plasma-reduced blood for exchange transfusion is CMV negative.

Irradiated Blood Products

Graft Versus Host Disease
This was first recognised as a serious complication of allogeneic bone marrow transplantation. It occurs when a donor marrow contains some viable lymphocytes, which once transfused, can survive in the immunosuppressed patient. In such patients these donor lymphocytes can become activated by recipient antigens and cause Graft versus Host Disease (GVHD). It is characterised clinically by skin rash, diarrhoea and hepatitis.
The risk of GVHD is now minimised by the use of specific immunosuppressive drugs.
The foetus and neonate are the other group of patients who are "naturally" immunosuppressed

Later in Japan it was recognised that another more serious form of Graft versus Host Disease occurred in immunocompetent patients. The initial reports were from recipients of fresh blood in cardiac surgery and the common features were:

- High numbers of viable lymphocytes in fresh blood
- High incidence of shared HLA haplotypes between donor and recipient.

The latter features happen frequently because the Japanese population contains relatively few haplotypes. The recipient does not recognise the donor lymphocytes as "foreign" as they share a haplotype so the donor lymphocytes can become activated and cause Transfusion Associated Graft Versus Host Disease (TA-GVHD). This is characterised clinically by skin rash, hepatitis, and severe bone marrow failure and almost universally fatal. Irradiation of cellular blood products prevents donor lymphocytes proliferation thus preventing TA-GVHD. There

are increasing reports of TA-GVHD in patients receiving lymphotoxic chemotherapy, which has lead to a widening of the indications for irradiated blood products.

Indication of Irradiated Blood Products at TippUH

Paediatrics

- Congenital immunodeficiency states.
- All children with malignancies or immunodeficiencies having shared care with Our Lady's Hospital, Crumlin.

Haematological Malignancies

- Hodgkin's Disease.
- Patients who have received Purine analogues or anti-T cell monoclonal antibody therapies e.g. Fludarabine, Cladribine, Deoxycoformicin, Campath, Clofaraine, Bendamustine, Anti-lymphocyte globulin therapy
- All platelets now issued from IBTS are routinely irradiated whether required for the individual patient or not.
- Irradiated components are recommended for aplastic anaemia patients receiving immunosuppressive therapy with anti-thymocyte globulin (ATG).
- Irradiated components indicated for patients receiving the biological immunosuppressive agent alemtuzumab (anti-CD52).

HLA-matched platelets

- Used in cases of platelet refractoriness – additional testing required for provision of HLA matched platelets

References:

- Practical Transfusion Medicine. Murphy and Pamphilon 2005 Blackwell Publishing
- Handbook of Transfusion Medicine 2001 HMSO
- BCSH Guidelines on the prevention of transfusion-transmitted CMV infection. Transfusion Medicine, 1999, 9, 115-123.
- BCSH guidelines on gamma irradiation of blood components for the prevention of transfusion-associated graft versus host disease. British Journal of Haematology, 2011, Vol 152 Issue 1, Pg35-51.

3.13 Collection of Blood Component/Products from the Laboratory

- Blood components / products should only be collected from the Blood Transfusion Laboratory by trained personnel. Access to the issue fridge in the Blood Transfusion department is controlled by means of the staff electronic swipe card.
- Prior to collection of any blood component/product, patient details and the blood component/ product required must be filled out on 'Blood Collection' Form TippUH-BT-HF-002.
- A suitable transport container must be used to bring the blood component/product to the ward, i.e. 'Blood Transport box' or 'Cell Safe Igloo' (Resus or theatre usually).
- All red cells and platelets must be scanned out of the Issue fridge using the Blood Track system. All products must be signed out in the Blood Bank Sign Out Log TippUH-BT-LF-010 which is beside the Blood Bank Issue fridge before being taken to the ward. The 'Blood Collection' form must also be signed and returned to the ward with the blood component/product. The blood & form must be handed directly to nursing staff, who must then sign for the receipt of the blood component/product.
- Check for patient's compatibility form.
- Avoid delays as components/products taken should be transfused as soon as practicably possible.
- If any blood component/product should be returned to the Laboratory/fridge, the Laboratory must be contacted both during routine and on-call hours, scanned and signed back in with time, date and patient details.
- **Red cells that have been out of the fridge for > 30 minutes cannot be returned to the fridge and must be discarded.**

3.14 Storage of Component/Products for Collection

- Red cells: stored in the Blood Bank Issue Fridge in Specimen Reception.
- Albumin: stored in the Blood Bank Issue Fridge in Specimen Reception.
- Platelets: Platelet agitator in Blood Transfusion Laboratory.
- Plasma: stored in the Blood Bank Issue Fridge in Specimen Reception.
- Fibrinogen/Coagulation factors: collection from within the Blood Transfusion Laboratory from Medical Scientist.
- Anti-D: stored in the Blood Bank Issue Fridge in Specimen Reception.
- **Blood component/products should only be collected from the Blood Transfusion Laboratory by trained individuals. Access to the issue fridge in the Blood Transfusion Department is controlled by means of the Blood Track system and staff barcoded ID card.**

3.15 Traceability

- Article 14 of the Blood Directive 2002/98/EC mandates full traceability of all blood components.
- Collection forms must be used when collecting any blood component or product from the Laboratory.
- When pre-transfusion checking, procedure is completed and the component/product is connected to the patient, the peel able section of the traceability label containing the donor number is removed from the product and placed in the observation section of the prescription.

- The 2nd (detachable) section of the traceability label is removed from the pack, signed dated and timed by the person commencing/witnessing the transfusion. This part of the label is then returned to the laboratory.
- These procedures are described fully in the Haemovigilance SOPs available in the Blood Transfusion User Manual in all clinical areas.
- TippUH are using phase 3 of Electronic Blood Track System (EBTS). This allows for the electronic recording of red cell and platelet transfusions.
- If using Blood Track, it can record the start, end of transfusion and the fate of the unit and is automatically updated to the Laboratory LIS, therefore no requirement to return blue traceability label when using blood track.
- Blood Track is now live in all areas. Blood track is the preferred method for administration of red cells and platelets.

4. Haematology Department

4.1 Service Description

The Haematology Laboratory provides a diagnostic service for TippUH. This Laboratory provides diagnostic investigations in general Haematology and Coagulation. FBC samples and coagulation samples are processed in the Laboratory each day. Some specialised investigations not performed at TippUH are sent to the Haematology Laboratory in University Hospital Waterford. Other more specialist tests are referred out to external Laboratories. The clinical Haematology service is governed by a Consultant Haematologist based in UHW. Referrals for consultations should be directed to one of the secretaries below in UHW.

Department Telephone Numbers:

Contact	Title	Phone Number
Haematology Dept.		052-6177973 Ext:7973
Dr. Ahmed Bannaga	Consultant Haematologist	051 848433 (Secretary) or via UHW switchboard
Haematology Registrar	Haematology Registrar	051-842105

4.2 Specimen Labelling and Completion of Request Forms

For accurate identification of specimens, it is essential that all samples are labelled properly and that request forms are filled out clearly and accurately referring to 'Completing the request form and labelling the specimen' (See Section 3.10). In the interest of patient safety, samples that do not meet these minimum sample identification requirements cannot be accepted for analysis.

All samples are labelled with a unique Laboratory accession number, they are then recorded in the LIS linking the unique Laboratory accession number to the patient's details provided on the request form.

4.3 Emergency Specimens

Samples from Accident & Emergency Department, MAU and ICU in TippUH are automatically treated as urgent samples. These samples are given priority and labelled using Laboratory accession number.

If there is an emergency request from other areas, the Laboratory should be telephoned and the specimen request form clearly marked as **urgent** so that it can be easily identified.

Outside normal working hours, on call staff must be contacted via 7056 or switchboard.

4.4 Turnaround Times Haematology

The following turnaround times apply to Haematology Tests:

Test	Urgent	Routine	Cut off time for routine samples
FBC	2 hours	4 hours	19.00 (15.00 for GPs)
Coagulation/ D Dimer/Derived Fibrinogen	2 hours	4 hours	19.00 (15.00 for GPs)
IM Screen*	N/A	24 hours	19.00 (15.00 for GPs)

Critical tests can be available sooner than the times above, however please contact the Laboratory at 7056 to advise that a test is required urgently. All blood films are referred to UHW and their turnaround times apply (see UHW user manual). If a blood film requires urgent review, the Laboratory must be informed immediately and the slides will be sent to UHW as soon as possible.

*IM Screen is a screen test and a negative result does not preclude the possibility of an Infectious Mononucleosis infection. Additional testing for Epstein-Barr viral antibodies is recommended if clinical symptoms persist. The IM Screen is used for the detection of Infectious Mononucleosis antibodies in serum or plasma only, quantitation or rate of increase in antibody concentration cannot be determined by this qualitative test. If the test result is negative and clinical symptoms persist, additional testing using other methods (Epstein-Barr viral antibodies in UHW) is recommended. A negative result does not at any time preclude the possibility of an Infectious Mononucleosis infection.

4.5 Haematology Tests Available

4.5.1 General Haematology

If abnormalities are detected in the full blood count profile which fit set criteria set out by the Haematology Laboratory in UHW, Laboratory staff will make a blood film and forward it to UHW for examination. The Laboratory has set criteria, which will prompt a blood film examination on the patient.

Test	Specimen /bottle	Notes
FBC	EDTA/purple top 2.5ml Blood 	FBC should be less than 24 hrs old at time of testing
Blood Film	EDTA/purple top 2.5ml Blood 	Blood film should be made from fresh FBC sample by the laboratory staff.
IM Screen (Monospot)	EDTA/ purple 2.5ml Blood  or 1ml serum 	IM should be < 24 hrs old **(this test is done during routine hours only)**

- EDTA FBC samples are stored for 24 hrs at room temperature, allowing for add on requests where suitable. Add on requests require a form to be sent to the Laboratory identifying the test to be performed.

4.5.2 Coagulation Profiles

Routine coagulation samples (PT/INR and APTT) are analysed daily in the TippUH Laboratory. D Dimers are also tested in TippUH. Samples for special coagulation are frozen, sent to UHW and subsequently done in batch in the Haematology Laboratory, UHW. More unusual coagulation assays are dispatched frozen to the special Coagulation Laboratory in St. James Hospital, Dublin. If required urgently in a particular clinical case please discuss with the Laboratory and/or Consultant Haematologist who will advise on guidelines for Thrombophilia screening etc.

It is essential that all tubes be filled accurately to the marked line on the bottle. **They should not be taken from heparin containing IV lines**. Please contact the Laboratory for advice if any other clotting assay is required which is not listed below.

Prothrombin Time/INR

- The Prothrombin time (PT) is a measure of the activity of the extrinsic pathways. It is useful in the monitoring of liver disease and Warfarin therapy. It may also be prolonged in Disseminated Intravascular Coagulation (DIC).

Activated Partial Thromboplastin Time (APTT)

- The APTT measures the intrinsic pathway. It is used to monitor heparin therapy. It may also be prolonged in some factor deficiencies (e.g. Factor VIII, factor IX, factor XI and factor XII), von Willebrand's disease and DIC. Occasionally it may be prolonged due to the presence of an auto-antibody such as the Lupus anticoagulant.

D Dimers

- D-Dimers have replaced fibrinogen degradation products. They are of little use in the diagnosis of disseminated intravascular coagulopathy (DIC) as this is really a clinical diagnosis supported by prolonged

PT, APTT and falling platelet count. D Dimers provide a useful guide to the presence of DVT or PE but **must only be used in conjunction** with a clinical probability scoring system.

- "The diagnosis of deep vein thrombosis in symptomatic outpatients, and the potential for clinical assessment and D Dimer assays to reduce the need for diagnostic imaging."
- Refer to www.bcshguidelines.com Guidelines on Oral Anticoagulation.

Test	Specimen /bottle	Notes
Coagulation Screen (PT, INR, APTT)	3ml blood Sodium Citrate (blue top)  **Fill to black line**	Specimens should be tested on the same day of collection and received in the Laboratory before 19.00 hrs. Samples for INR only can be stored over night at room temperature if not required urgently. **APTT tests must be performed within 4 hours of sample being taken.** If a requestor wishes to add on tests, these time requirements must be satisfied or otherwise a fresh sample will be required.
Derived Fibrinogen	3ml blood Sodium Citrate (blue top)  **Fill to black line**	A derived fibrinogen screen test is available in TippUH on request. Clauss Fibrinogen assay can be performed in UHW if quantitation is necessary.
D-Dimers	3mls blood Sodium Citrate (blue top)  **Fill to black line**	**D Dimer tests must be performed within 4 hours of sample being taken.** If a requestor wishes to add on tests, these time requirements must be satisfied otherwise a fresh sample will be required.

4.5.3 Repeat Samples Requested by the Laboratory

- Repeat samples may be requested by the Laboratory if a sample or the quality of a sample is not suitable for testing i.e. samples may be insufficient, haemolysed, clotted etc.
- Coagulation samples are stored for 48 hrs at room temperature, allowing for add on requests where suitable. Add on requests must be accompanied by request form to the Laboratory.

4.6 On-Call Haematology Tests

The following tests are available on call in Haematology Laboratory

- FBC
- Coagulation Screen
- D-Dimers

4.7 Haematology Samples for University Hospital Waterford

All samples for UHW Haematology are dispatched twice daily Monday-Friday. For urgent samples to UHW after the routine dispatch time, please contact the Laboratory in TippUH and appropriate transport arrangements will be made. Please note that to process therapeutic drug levels or any other urgent samples, the latest times for receipt in UHW is 16:00 Monday to Friday and 12:00 at the weekend.

4.8 Haematology Samples for External Laboratories

All samples for external Laboratories are dispatched twice daily at 08.00 and 12noon Monday-Friday. Samples for Biomnis are sent via UHW or directly with the courier. If samples are required to be sent urgently outside these times, a taxi is necessary and Laboratory staff must be contacted to organise same.

Critical Alerts for Phoning Haematology Tests (1st Occasion Only)

Parameter	Critical Low Phone Limit	Critical High Phone Limit
Haemoglobin	7g/dl	-
White Cell Count	-	30 x 10^9/L
Neutrophils	0.5 x 10^9/L	50 X 10^9/L
Lymphocytes	-	75 X / 10^9L (new cases only)
Platelets	30 x 10^9/L	1000 x 10^9/L
Haematocrit	-	0.60
INR	-	5.0
APTT	-	70 seconds
Derived Fibrinogen	< 2g/L on screen test for in-patients	
Monospot		Positive result

5. Biochemistry Department

5.1 Service Description & Contact Details

Clinical Biochemistry deals with the biochemical basis of disease and the use of biochemical tests for its diagnosis, prognosis, screening and management. Routine Biochemistry requests (renal, liver, cardiac & bone profiles) are processed locally in TippUH, however many tests such as endocrinology etc. are processed centrally in University Hospital Waterford Biochemistry Laboratory.

Contact	Internal ext.	External Phone No
Biochemistry Enquiries	7973	052 6177973
Dr. Mike Louw – University Hospital Waterford Consultant Chemical Pathologist Clinical Advice University Hospital Waterford		051 842475

5.2 Specimen labelling and Completion of Request Forms

5.2.1 Routine Specimens

For accurate identification of specimens, it is essential that all samples are labelled properly and that request forms are filled out clearly and accurately using the guidelines issued by TippUH.

Refer to *Completing the Request Form and Labelling the Sample – in Section 3.10*
In the interest of patient safety, incorrectly labelled (or unlabelled) samples will NOT be accepted, unless in limited critical situations where repeat bloods cannot be obtained and the responsible consultant authorises the processing of the samples.

All samples are labelled with a unique Laboratory accession number, they are then recorded in the LIS linking the unique Laboratory accession number to the patient's details provided on the request form.

5.2.2 Emergency Specimens

Samples from Accident & Emergency Department, MAU and ICU in TippUH are automatically treated as urgent samples. These samples are given priority and labelled using Laboratory accession number.

If there is an emergency request from other areas, the Laboratory should be telephoned and the specimen request form clearly marked as **urgent** so that it can be easily identified.

Outside normal working hours, on call staff must be contacted via 7056 or switchboard.

5.3 Turnaround Times

All tests for routine Biochemistry should be written on one request form. The turnaround time for routine in-house Biochemistry tests is 4 hours from time of sample receipt in the Laboratory. Turnaround times for MAU/A&E/ICU bloods is **2 hours from** time of sample receipt in the L**aboratory**.

Critically urgent samples may be available sooner depending on the test required and must be accompanied by a phone call to 7056.

5.4 Referral Specimens

For primary sample requirements on examinations that are referred to UHW, check UHW user manual: Lab Web Enquiry available on all PC's under departments. Click on Laboratory services then in the test library search all tests from A-Z by name for all required information.

Tests not done in-house or in UHW are sent to external Laboratories for analysis. Many tests are referred to Biominis Laboratories whose website www.biomnis.ie has the latest referral information.

Information on the tests sent to referral Laboratories is found in the UHW Laboratory user manual (web link available in Lab Web Browser). All samples referred out by the Laboratory in TippUH are captured on the system as either a CPOST or Biomnis request which records details of the test request and where it was sent. Due to the expense of some external tests, it may be necessary to restrict ordering of such tests to a Consultant only.

If separation of the primary sample into a secondary container is required for any reason all portions of the primary sample must be an unequivocally traceable to the primary sample. This is achieved by ensuring all sample containers are labelled with the patient's unique Laboratory accession number.

Please note

- If the test requested is not processed in-house but is sent to UHW, please send a separate sample and request form with extra addressograph labels
- **It is essential that any specialised test requiring special handling e.g. freezing prior to dispatch is sent on a TippUH request form and the Laboratory is informed that the sample is being taken. Please ensure that the sample is then handed directly to Laboratory staff.**
- Failure to do so may result in the sample being missed and therefore unsuitable.
- All such samples are identified in UHW Laboratory user manual.

5.5 Biochemistry Tests Available in TippUH

Please Note

- One FULL vacutainer is sufficient for ALL general biochemistry tests.
- Please refer to Section 2.7 for colour coded adult and paediatric vacutainer sample bottles.
- A separate EDTA sample, filled to the mark is required for Troponin (must be tested within 8 hours of sampling) tests.
- Please send a separate form and sample for all tests that are dispatched to UHW Laboratory and external referral Laboratories.
- Send/Bring to Laboratory as soon as possible –within four hours. Altered levels of electrolytes and LFTs can occur if separation is delayed.
- All Biochemistry samples are retained for 48hrs, stored at room temperature, allowing for add on requests where suitable.
- Any add on tests require a form to be sent to the Laboratory with the test requested.

The following table is a list of all tests processed here in TippUH.

Test profiles in use in TippUH:
U/E – comprises Urea, Electrolytes and Creatinine.
LFT – comprises ALT, ALP, AST, Albumin, Bilirubin, GGT and Total Protein.
FBP – comprises U/E, LFT, Ca, MG, PO4, CPK and CRP.
ICU1 – FBP, FBC and Coag screen.

Test	Type B-Blood U-Urine	Specimen	Vol.	Frequency of Assay	Comments.
Acetaminophen (Paracetamol)	B	Clotted 	4ml	On Demand	**Sample should be tested at least 4 hours post ingestion.**
Alanine Amino Transferase (ALT)	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Albumin	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Alkaline Phosphatase (ALP)	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Amylase	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Aspartate amino-transferase (AST)	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Bilirubin (Total)	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Calcium	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Chloride	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	

Test	Type B-Blood U-Urine	Specimen	Vol.	Frequency of Assay	Comments.
Cholesterol	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	**Full Lipid profile should be sent to UHW for processing.**
CPK	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	**Sample should be tested within 4 hours of collection.**
Creatinine	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
CRP	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
GGT	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Glucose	B	Fluoride oxalate plasma. 	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Glucose Tolerance Test (GTT)	B	Fluoride oxalate plasma. 	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	**A min of two samples are required – one fasting sample and one 2 hour post Prandial sample.**
LDH	B	Clotted specimen  /Lithium Heparin.	4mls.	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Magnesium	B	Clotted specimen  /Lithium Heparin.	4mls.	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Phosphate	B	Clotted specimen 	4mls	Continuous – however routine specimen should be received before 15.00 hrs.	

Test	Type B-Blood U-Urine	Specimen	Vol.	Frequency of Assay	Comments.
		/Lithium Heparin.			
Potassium	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	**Sample should be received in lab within 4 hours of collection or sample must be separated.**
Sodium	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Total Protein	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	
Triglyceride	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	**Full Lipid profile should be sent to UHW for processing.**
Troponin	B	EDTA 	2.5 mls	On Demand	**Separate sample required and should be tested within 8 hours of collection.**
Urea	B	Clotted specimen  /Lithium Heparin.	4mls	Continuous – however routine specimen should be received before 19.00 hrs (before 15.00 for GP samples).	

5.5.1 24 Hour Urine

- All 24 hour urine containers and bags are available from the laboratory and should only be requested 09.00 to 17.00 Monday to Friday.
- The following 24 hour collections require acid: Catecholamine, 5-HIAA, VMA, Calcium.
- A plain container is required for Protein, Creatinine and Cortisol.

5.6 On Call Biochemistry Testing

All the above tests are available on call in the Biochemistry Department. All the tests listed in the table above are available on call where the clinical need requires it. Occasionally GPs may require a blood to be done out of hours, however this must be phoned to the Medical Scientist on call in advance and there must be a clear urgent clinical need and contact details given for the Medical Scientist to report the results to.

5.7 Biochemistry Samples for University Hospital Waterford

All samples for UHW Biochemistry are dispatched twice daily at 08.00 and 12noon Monday-Friday. For urgent samples to UHW after the routine dispatch time, please contact the Laboratory in TippUH and appropriate transport arrangements will be made. Please note that to process therapeutic drug levels or any other urgent samples, the latest times for receipt in UHW is 16:00 Monday to Friday and 12:00 at the weekend.

5.8 Biochemistry Samples for External Laboratories

All samples for external Laboratories are dispatched twice daily at 08.00 and 12noon Monday-Friday. Samples for Biomnis are sent via UHW or directly with the courier. If samples are required to be sent urgently outside these times, a taxi is necessary and Laboratory staff must be contacted to organise same.

5.9 Critical Alerts for Phoning Abnormal Results (1st time only)

Below is a list of action limits for contacting medical practitioners and wards with urgent abnormal results. These limits are based on the first abnormal set of results or repeat results that have shown a markedly notable change for an individual patient

Parameter	Critical Low Phone Limit	Critical High Phone Limit
Sodium	120 mmol/L	150 mmol/L
Potassium	2.5 mmol/L	6.0 mmol/L
Urea	-	30 mmol/L
Creatinine	-	300 mmol/L
Glucose	2.5 mmol/L	20 mmol/L
Calcium (adjusted)	1.8 mmol/L	3.5mmol/l
Magnesium	0.4 mmol/L	-
Phosphate	0.3 mmol/L	-
AST	-	300 U/L
ALT	-	300 U/L
ALP	-	300 U/L
CPK	-	500 U/L
Amylase	-	500 U/L
CRP	-	300 U/L
TnI	-	0.04 ng/ml
Trig	-	20 mmol/L

6. Andrology (Semen Analysis)

There is no Andrology service provided in TippUH.
Contact the Histology Laboratory in Waterford for details on semen analysis.

Hospital	Contact
UHW Histology Department	051-842494

7. Additional Tests

- Pregnancy Test
- Blood Culture incubation
- CSF for Xantochromia

7.1 Pregnancy Test (Alere hCG rapid test)

Type of container and optimal time of specimen collection:

- Use sterile universal containers in a sealed plastic bag. Samples cannot be tested if containers with preservatives are used.
- It is possible to use the Alere test with a urine sample collected at any time of day, however a first morning sample will usually contain the highest level of hCG.
- Samples may be stored at 2-8°C for 72 hours if necessary, but must come to room temperature before testing.
- Detects hCG levels at a concentration of 25mIU/ml.

Safety requirements:
Ensure specimens are placed in a sealed plastic specimen bag with request form in pouch for transport to the Laboratory. Samples which have leaked in transit may not be processed by staff, so ensure that containers are fully closed.

Time between collection and processing:
Laboratory staff will endeavour to process samples within 2 hour of receipt in Laboratory, however there may be instances where delays are unavoidable i.e. staff shortages etc. if a result is required urgently, staff must be informed by phone before sending sample to the Laboratory.

Expected values:
Urine samples from healthy males and post-menopausal females generally contain <10mIU/ml hCG. Levels are generally <5mIU/ml in pre-menopausal females. On the first day of the first missed period, the levels of maternal hCG are normally 50-250mIU/ml.

Limitations:

- Positive results from very early pregnancy may later prove negative due to natural termination of pregnancy. It is therefore recommended that weak positive results be re-tested 48-72 hours later with an early morning sample.

- A negative result can be obtained if the sample is too dilute. If pregnancy is still suspected, it is therefore recommended that the patient be re-tested 48-72 hours later with an early morning sample.
- hCG remains elevated for a time after pregnancy. Pregnancy tests carried out less than 3 weeks after giving birth or 9 weeks after natural loss or termination may need further evaluation.
- Several conditions other than pregnancy may cause elevated levels of hCG e.g. menopause, trophoblastic disease and certain non-trophoblastic neoplasms.
- Occasionally samples containing less than 25mIU/ml hCG may test positive, Alere cassette has been shown to be over 99% accurate.
- Drugs containing hCG may interfere and cause misleading results.
- False positive and false negative pregnancy tests may be found in patients with abnormal bladder or kidney function.

7.2 Blood Cultures

All Blood cultures taken in TippUH are incubated in TippUH Laboratory. The optimal time for collection is before antimicrobial therapy and as soon as possible after a spike of fever. They must be transported to the Laboratory for incubation onto the blood culture system within 4 hours of collection for maximum recovery of organisms. Specimen Volume: 8-10ml (1-3ml paediatric). Where there is a delay in transport to the Laboratory or loading onto the blood culture system, blood cultures MUST NOT be refrigerated. In suspected endocarditis, two sets of blood cultures should be taken from separate venipuncture sites. They are incubated for 5 days (7 days for suspected Bacterial endocarditis (BE), Infective Endocarditis (IE), subacute bacterial endocarditis (SBE), cardiac vegetation, prosthetic valves in situ & Brucella cases). Negative reports are available after 36hrs incubation for paediatric and 48hrs for adults, with further reports issued if positive after this time.

All positive blood cultures are forwarded to the Microbiology Laboratory in UHW. All positive gram stains/isolates are phoned to the requesting clinician. All gram stains phoned to the clinical area within 2 hours of turning positive on the BACTEC. Identification and susceptibility are available within 2 days of growth. All blood culture bottles should be clearly labelled with patient details and date and time of collection. Do not place patient addressograph label over barcode label of bottles as this is used to identify the specific bottle on the analyser.

If a blood culture bottle is received in the Laboratory unlabelled, the clinical area is contacted and the person who took the samples are asked to come to the Laboratory to label the samples. A record of this is recorded both on the request form and the LIS. These samples are considered irreplaceable samples, as they are often taken pre –antibiotic treatment.
For further information: How to collect Blood Cultures.

7.3 CSF – Xanthochromia

Please note that Beaumont do not process these samples on a routine basis.

Specimen Timing:
CSF must be sampled a minimum of **12 hours** after suspected event. This is essential to avoid false negative results.

Request Form (yellow form):
The following details are essential:

- Patient demographics
- Name of requesting clinician
- Ward
- Clinical indication for request
- Results of CT scan
- Time of onset of symptoms /event
- Time of lumbar puncture
- If differential diagnosis includes meningitis

Specimen Collection:
Sample must labelled with the patients name, hospital number and date of birth. 1ml of CSF is required for spectrophotometric analysis. This must always be the last sample taken. A separate sample of CSF must be taken for glucose and protein.

Specimen Handling:
It is essential that samples for spectrophotometric analysis are protected from light. If brown tubes are not available, the sample should be wrapped in tin foil or placed in a brown envelope. Failure to protect the sample form light may lead to false negative results.

Note: The accuracy of results of CSF spectrophotometric analysis will be significantly diminished if the above conditions of sample collection and handling are not adhered to.

Safety requirements:
Ensure specimens are placed in a sealed plastic specimen bag with request form in pouch for transport to the Laboratory. Please note that CSF samples must NOT be sent in the pneumatic tube system.

Time between collection and processing:
Specimens should be transported to the laboratory for processing as soon as possible. Laboratory should be telephoned to alert staff that a CSF is en route to the Laboratory.

8. Point of Care Testing (POCT)

Near patient testing is testing performed near or at the site of the patient, by a competent and trained healthcare professional, to provide timely test results that clinically and cost effectively contribute to immediate patient management.

8.1 Blood Gas Analysis

At present, the NPT available in Tipperary University Hospital under the remit of the Laboratory is Blood Gas Analysis using the GEM 5000 blood gas analysers. It is the responsibility of the NPT Co-ordinator (John Lyne), the Chief Medical Scientist and the relevant Consultants to oversee NPT.

As with all diagnostic testing, NPT results may impact significantly on patient management and morbidity. Therefore, all blood gas samples for analysis on the GEM 5000 analysers **must be labelled** with the patient's details e.g. addressograph label.

It is the responsibility of all staff performing NPT to ensure that they are fully trained and competent in accordance with the manufacturer's instructions for use. Training can be organised through the NPT Co-ordinator in the Laboratory on 7056 or by email at POCTippUH@hse.ie

Note: Only trained personnel have access to the GEM 5000 Blood Gas Analysers via their staff card.

There are five GEM 5000 blood gas analysers in Tipperary University Hospital (ICU, A&E, Maternity, CCU and Surgical 3).
Specimen types: arterial blood, venous blood, arterial cord blood and venous cord blood.
The protocol for Blood gas analysis is as follows:

- A heparinised syringe (Westmed 3ml Heparinised Syringe) or capillary tube (for paediatric patient) is required for blood collection.
- Label syringe/capillary tube with patient addressograph label. This includes the patient identifiers i.e. Name, D.O.B and hospital number.
- The needle must be removed and the syringe capped immediately with the stopper before transport to the GEM 5000 analyser.
- Gently roll and mix the blood gas sample for 10 seconds and any air bubble in the syringe/tube must be expelled before analysis. Blood gas samples are unstable and must be analysed within 10 minutes of being taken.

9. Revision and Audit

- Documents can be reviewed at any time if necessary
- All documents must be reviewed at least every two years.
- Compliance with this procedure will be checked regularly and reviewed if necessary.

10. Revision History

Date	Review Number	Section Number	Change/s
January 2023	10	Update of document	Update of document from name change to TippUH from STGH.
		4 and 5	Dr Ahmed Bannaga Consultant Haematologist instead of Dr Ezzat ElHassadi.
		4.4.2	A historical or second blood group sample is required for issue of all group specific crossmatched red cells.
		4.11	Major Haemorrhage Pack added.
		6	POCT email updated.

Appendix 1 Current TippUH MSBOS Maximum Surgical Blood Order Schedule TippUH

A Maximum Surgical Blood Ordering Schedule (MSBOS) is a mechanism to maximise usage of blood and minimise wastage in elective surgery. A MSBOS can reduce the workload of unnecessary crossmatching and issuing of blood and optimise stock management. The MSBOS only applies to elective surgery and requires samples being in the Blood Transfusion Laboratory at least twenty four hours prior to surgery.

For operations /procedures requiring a "group and save only" the following applies:

- In patients with a negative antibody screen blood can be available within one hour if it is required urgently.
- If patients have a positive antibody screen identified in the group and save sample crossmatched blood will be made available but surgery is very likely to be delayed.

For operations requiring cross matched blood:

- The designated number of units are reserved for the patient for 48hours from the proposed date of surgery.
- Crossmatched blood will be returned to the blood bank 48 hours post-surgery unless otherwise requested by the clinician/ward. In the event of surgery being cancelled or postponed it is the responsibility of the clinician /ward to inform the blood bank of the change in circumstances.
- Four units of "O" Negative concentrate red cells in ASL-D are available from the issue fridge in the Laboratory for emergency use only.
- However if patient's 'group & save' is available 'group confirmed uncrossmatched' blood will be issued

This schedule has been constructed by Department of Haematology and Blood Transfusion in conjunction with Division of Surgery, Anaesthetics, and Obstetrics/Gynaecology and is intended to act as a guide for generation of cross-matching requests. It needs to be updated constantly. Using these guidelines will ensure efficient blood utilisation

Transfusion services for TippUH Blood Transfusion Laboratory (052) 6177974

General Surgery	
Cholecystectomy and exploration of common bile duct	G&S
Laparotomy- elective - emergency (? resection)	2– 4
gastrostomy, ileostomy, colostomy	
Liver Biopsy (surgery/radiology)	G&S
Oesophageal Dilation- endoscopic	G&S
Partial Gastrectomy- total	2-4
Endocrine	
Thyroidectomy – partial / total	G&S
Urology	
TURP	3
TUR bladder tumour (large tumour)	G&S
Cystoscopy	G&S
G.I. Surgery	
Panproctocolectomy	2-4
Creation of ileal pouch	2-4
Colon Cancer	
Right Hemicolectomy	2-4
Left Hemicolectomy	2-4
Sigmoid colon	2-4
Insertion of PEG Tube	FBC & Coag
Oesophageal Stent	FBC & Coag
Insertion of Portocaths	FBC & Coag

Obstetrics and Gynecology

Elective Day Surgery

Description:	**MSBOS (number of units)**
Maternity	
LSCS	G + S
ERPC	G + S
Gynaecology	
Laparoscopy	No blood transfusion tests
Hysterectomy- abdominal or vaginal	G + S
Simple	G + S
Extended	2
Pelvic Floor Repairs	G + S
Hydatidiform Mole	2

NOTE: Variations on above requires approval from a Consultant Obstetrician / Gynaecologist

Non Elective Events -Additional non-elective events require a decision by consultant or registrar

APH	G + S depends on clinical judgement
PPH	G + S depends on clinical judgement
Placenta Previa	4
Ectopic Pregnancy	G + S depends on clinical judgement

Appendix 2 Biochemistry and Haematology Reference Ranges

Assay	Age		Gender	Unit Of Measure	Reference Interval Low	Reference Interval High	Critical Low	Critical High	Review Low	Review High
	Age	Age Units								
ALP	0-4	weeks	All	IU/L	70	380	N/A	N/A	N/A	N/A
	4W - 16Y	weeks to years			60	425	N/A	N/A	N/A	N/A
	16 - 120	years			30	130	N/A	300	N/A	300
Albumin	0 - 1	years	All	g/L	30	45	N/A	N/A	N/A	N/A
	1 - 16				30	50	N/A	N/A	N/A	N/A
	16 - 120				35	50	N/A	N/A	N/A	N/A
ALT	All	N/A	Male	IU/L	5	41	N/A	300	N/A	300
			Female		5	33	N/A	300	N/A	300
Amylase	All	N/A	All	U/L	28	100	N/A	500	N/A	500
AST	All	N/A	Male	IU/L	5	40	N/A	300	N/A	300
			Female		5	32	N/A	300	N/A	300
Bilirubin	0-14	Days	All	umol/L	no reference range		N/A	N/A	N/A	N/A
	14D - 120Y	days to years			2	21	N/A	N/A	N/A	N/A
Ca	0 - 4	weeks	All	mmol/L	2.0	2.7	1.8	3.5	1.8	3.5
	1 - 16	years			2.2	2.7	1.8	3.5	1.8	3.5
	16 - 120	years			2.2	2.6	1.8	3.5	1.8	3.5
Cholesterol	All	N/A	All	mmol/L	2.0	5.0	N/A	N/A	N/A	N/A
Chloride	All	N/A	All	mmol/L	95.0	108.0	N/A	N/A	N/A	N/A
CK	All	N/A	Male	IU/L	40	320	N/A	500	N/A	500
			Female		25	200	N/A	500	N/A	500
Creatinine	All	N/A	Male	umol/L	62	106	N/A	300	N/A	300
			Female		44	80	N/A	300	N/A	300

CRP	N/A	N/A	All	mg/L	0	5	N/A	300	N/A	N/A
GGT	All	N/A	Male	IU/L	3	60	N/A	N/A	N/A	N/A
			Female		3	40	N/A	N/A	N/A	N/A
GLU	0 - 1	day	All	mmol/L	2.2	3.3	N/A	N/A	N/A	N/A
	1D - 4W	days to weeks			2.8	4.4	2.5	20	2.5	20
	4W - 16Y	weeks to years			3.3	5.5	2.5	20	2.5	20
	16 - 120	years			2.8	5.5	2.5	20	2.5	20
LDH	0 - 20	days	All	IU/L	225	600	N/A	N/A	N/A	N/A
	20D - 15Y	days to years			120	300	N/A	N/A	N/A	N/A
	16 - 120	years			10	250	N/A	N/A	N/A	N/A
Magnesium	0 - 4	weeks	All	mmol/L	0.6	1.0	0.4	N/A	0.4	N/A
	4W - 16Y	weeks to years			0.7	1.0	0.4	N/A	0.4	N/A
	16 - 120	years			0.7	1.0	0.4	N/A	0.4	N/A
Paracetamol	N/A	N/A	All	mmol/L	None Given. Clinicians refer to treatment chart		N/A	N/A	N/A	N/A
Phosphorous	0 - 4	weeks	All	mmol/L	1.3	2.6	0.3	N/A	0.3	N/A
	4W - 1Y	weeks to years			1.3	2.4	0.3	N/A	0.3	N/A
	1 - 16	years			0.9	1.8	0.3	N/A	0.3	N/A
	16 - 120	years			0.8	1.5	0.3	N/A	0.3	N/A
Potassium	0 - 4	weeks	All	mmol/L	3.40	6.00	2.5	6.0	3	5.7
	4W - 1Y	weeks to years			3.50	5.70	2.5	6.0	3	5.7
	1 - 16	years			3.50	5.00	2.5	6.0	3	5.7
	16 - 120	years			3.50	5.30	2.5	6.0	3	5.7
Sodium	All	N/A	All	mmol/L	135	145	120	150	130	150
Triglycerides	All	N/A	All	mmol/L	0.5	1.7	N/A	20	N/A	N/A
Urea	0 - 4	weeks	All	mmol/L	0.8	5.5	N/A	30	N/A	30
	4W - 1Y	weeks to years			1.0	5.5	N/A	30	N/A	30
	1 - 16	years			2.5	6.5	N/A	30	N/A	30
	16 - 120	years			2.5	7.8	N/A	30	N/A	30
Troponin	N/A	N/A	All	ng/mL	0.00	0.04	N/A	0.04	N/A	N/A

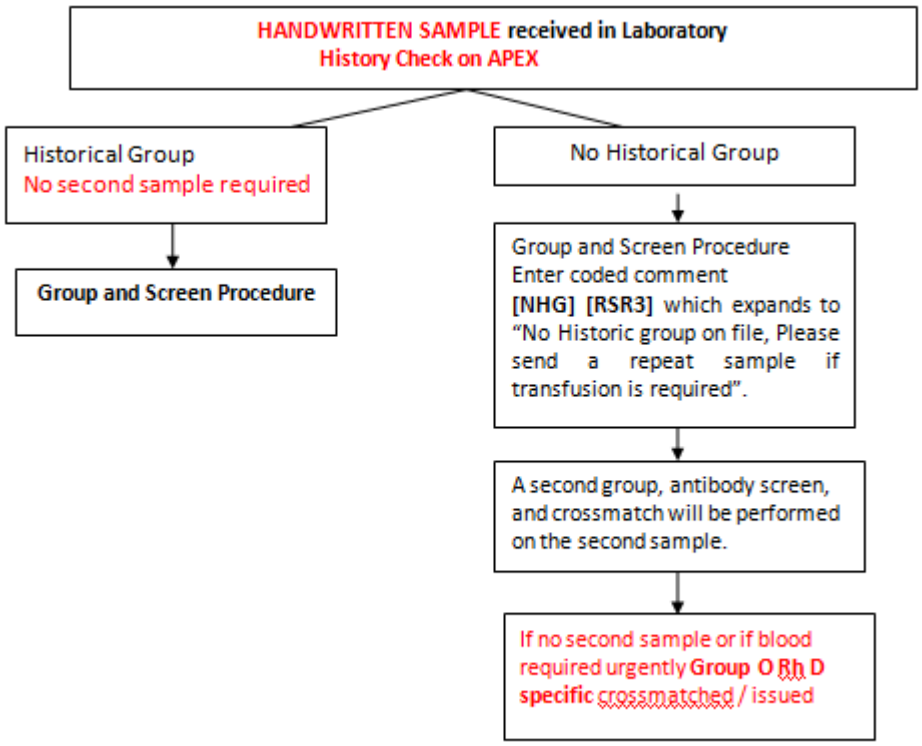
Assay	Age		Gender	Unit Of Measure	Reference Interval Low	Reference Interval High	Critical Low	Critical High	Review Low	Review High
	Age	Age Units								
FULL BLOOD COUNT										
Haemoglobin	0 - 3	Days	All	g/dL	14.0	22.0	7	N/A	8	20
	3 - 28	Days			15.0	21.0				
	1 - 2	Months			11.5	16.5				
	2- 3	Months			9.4	13.0				
	3 - 6	Months			11.1	14.1				
	6 - 12	Months			11.1	14.1				
	1 - 6	Years			11.0	14.0				
	6 - 12	Years			11.5	15.5				
	>12	Years	Male		13.0	17.0				
	>12	Years	Female		12.0	15.0				
Red Blood Cell Count	0 - 3	Days	All	10^{12}/L	5.00	7.00	N/A	N/A	N/A	N/A
	3 - 28	Days			4.00	6.60				
	1 - 2	Months			4.00	5.40				
	2- 3	Months			3.10	4.30				
	3 - 6	Months			4.10	5.30				
	6 - 12	Months			3.90	4.10				
	1 - 12	Years			4.00	5.20				
	>12	Years	Male		4.50	5.50				
	>12	Years	Female		3.80	4.80				
White Blood Cell Count	0 - 3	Days	All	10^{9}/L	10.0	26.0	N/A	30	N/A	30
	3 - 28	Days			7.0	23.0				
	1 - 2	Months			5.0	19.0				
	2- 3	Months			5.0	15.0				
	3 - 6	Months			6.0	18.0				
	6 - 12	Months			6.0	16.0				
	1 - 6	Years			5.0	15.0				
	6 - 12	Years			5.0	13.0				
	>12	Years			4.0	10.0				
Haematocrit	0 - 3	Days	All	l/l	0.45	0.75	N/A	0.6	N/A	N/A

	3 - 28	Days			0.45	0.67				
	1 - 2	Months			0.33	0.53				
	2- 3	Months			0.28	0.42				
	3 - 6	Months			0.30	0.40				
	6 - 12	Months			0.30	0.38				
	1 - 6	Years			0.34	0.40				
	6 - 12	Years			0.35	0.45				
	>12	Years	Male		0.40	0.50				
	>12	Years	Female		0.36	0.46				
Mean Cell Haemoglobin	0 - 3	Days	All	pg	33.0	37.0	N/A	N/A	N/A	N/A
	3 - 28	Days			33.0	37.0				
	1 - 2	Months			30.0	36.0				
	2- 3	Months			27.0	33.0				
	3 - 6	Months			24.0	30.0				
	6 - 12	Months			25.0	29.0				
	1 - 6	Years			24.0	30.0				
	6 - 12	Years			25.0	33.0				
	>12	Years			27.0	32.0				
Mean Cell Haemoglobin Concentration	0 - 3	Days	All	g/dL	30.0	36.0	N/A	N/A	30	37.5
	3 - 28	Days			29.0	36.0				
	1 - 2	Months			29.0	36.0				
	2- 3	Months			28.5	.5.5				
	3 - 6	Months			30.0	36.0				
	6 - 12	Months			32.0	36.0				
	1 - 2	Years			29.0	36.0				
	2 - 6	Years			31.0	36.0				
	6 - 12	Years			31.0	36.0				
	>12	Years			31.5	36.0				
Mean Cell Volume	0 - 3	Days	All	fl	100	120	N/A	N/A	N/A	110
	3 - 28	Days			92	118				
	1 - 2	Months			92	116				
	2- 3	Months			87	103				
	3 - 6	Months			68	84				
	6 - 12	Months			72	84				

	1 - 6	Years			75	87				
	6 - 12	Years			77	95				
	>12	Years			83	101				
Basophil Count	0 - 999	Years	All	$x10^9/L$	0.02	0.10	N/A	N/A	N/A	1
Eosinophil Count	0 - 3	Days	All	$x10^9/L$	0.1	1	N/A	N/A	N/A	2.0
	03 - 28	Days			0.1	2				
	1 - 2	Months			0.2	1				
	2 - 144	Months			0.1	1				
	>12	Years			0.02	0.5				
Lymphocyte Count	0 - 3	Days	All	$x10^9/L$	3.0	8.0	N/A	75	N/A	>Ref Interval High
	3 - 28	Days			2.0	8.0				
	1 - 2	Months			3.0	16.0				
	2- 3	Months			4.0	10.0				
	3 - 6	Months			4.0	12.0				
	6 - 12	Months			3.5	11.0				
	1 - 6	Years			6.0	9.0				
	6 - 12	Years			1.0	5.0				7.0
	>12	Years			1.0	3.0				5.0
Monocyte Count	0 - 3	Days	All	$x10^9/L$	0.5	2.0	N/A	N/A	N/A	3.0
	3 - 28	Days			0.5	1.0				
	1 - 2	Months			0.3	1.0				
	2- 3	Months			0.4	1.2				
	3 - 6	Months			0.2	1.2				
	>6	Months			0.2	1.0				
Neutrophil Count	0 - 3	Days	All	$x10^9/L$	4.0	14.0	0.5	50	1.0	30
	3 - 28	Days			3.0	5.0				
	1 - 2	Months			3.0	9.0				
	2- 3	Months			1.0	5.0				
	3 - 6	Months			1.0	6.0				
	6 - 12	Months			1.0	7.0				
	1 - 6	Years			1.5	8.0				

	6 - 12	Years			2.0	8.0				
	>12	Years			2.0	7.0				
Platelet Count	0 - 3	Days	All	$x10^9/L$	150	450	30	1000	100	800
	3 - 28	Days			210	500				
	1 - 3	Months			210	650				
	3 - 6	Months			200	550				
	6 - 12	Months			200	550				
	1 - 6	Years			200	450				
	6 - 12	Years			180	400				
	>12	Years			150	400				

Appendix 3: Second Sample Requirement Algorithm



Appendix 4 List of Laboratory Samples NOT to be sent in the Pneumatic Tube System

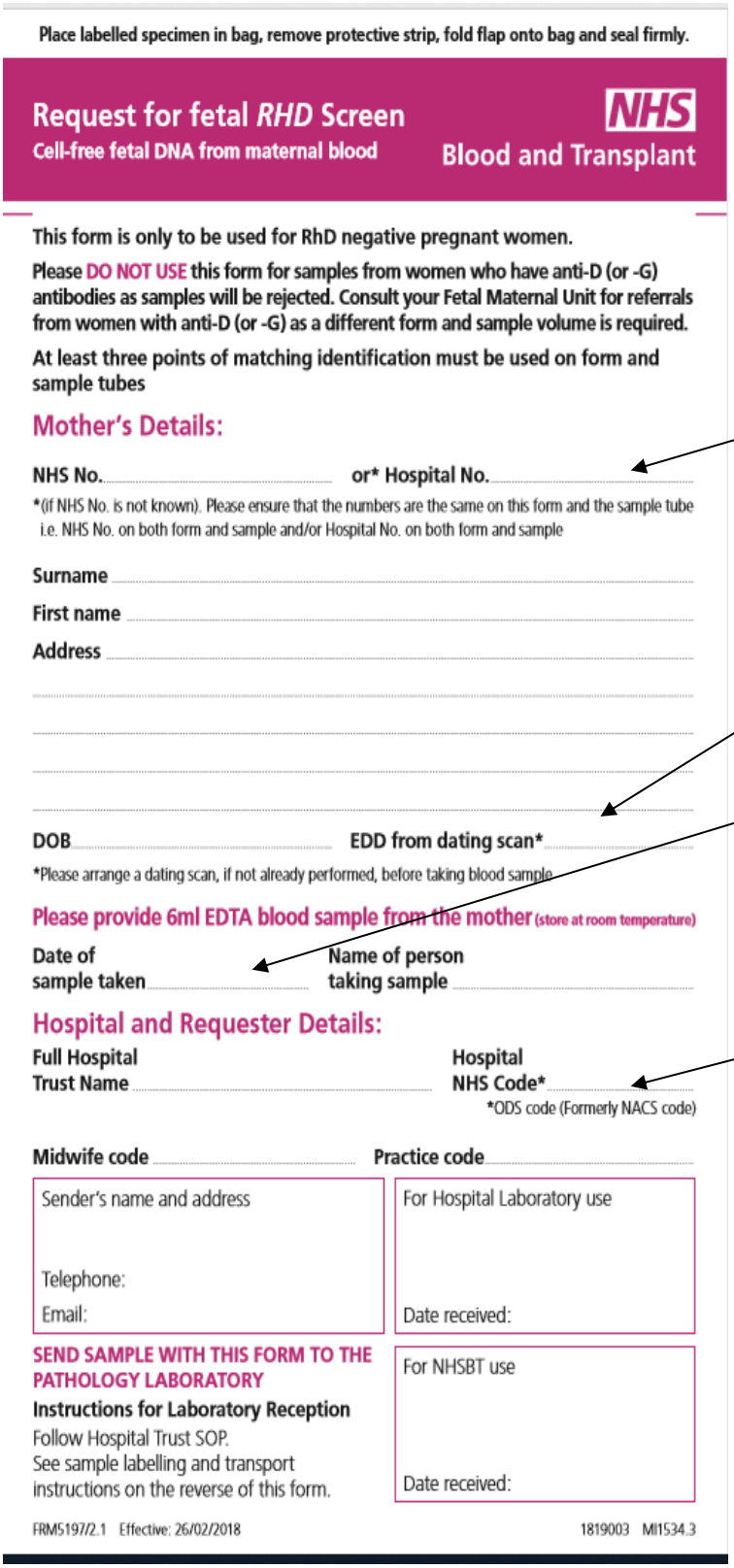
Please contact Blood Porter to deliver the samples listed below to the Laboratory.

- CSFs, Tissue Samples, Fluid Aspirated i.e. irreplaceable specimens
- Blood Gases
- Glass Containers
- Specimens that must be transported at 37C or on ice
- Samples from patients with TB / SARS, i.e. high risk samples
- Histology / Cytology Samples
- Blood Products
- Blood Packs
- Patient Reports or any Confidential Information

No item should be put in the station unless it has first been placed in a carrier pod. Do not attach anything to the outside of the pods.

Please Note: The Blue Traceability label on Blood Components and Products can now be returned to the Laboratory via the Pneumatic Chute system. Ensure the label is fully completed with date, time and signed, **place in a clear specimen bag** and return to Laboratory via chute system.

Appendix 5 Completion of Request Form for Fetal Rh D Screen



Place labelled specimen in bag, remove protective strip, fold flap onto bag and seal firmly.

Request for fetal *RHD* Screen
Cell-free fetal DNA from maternal blood

NHS Blood and Transplant

This form is only to be used for RhD negative pregnant women.

Please DO NOT USE this form for samples from women who have anti-D (or -G) antibodies as samples will be rejected. Consult your Fetal Maternal Unit for referrals from women with anti-D (or -G) as a different form and sample volume is required.

At least three points of matching identification must be used on form and sample tubes

Mother's Details:

NHS No. ..... or* Hospital No. .....

*(if NHS No. is not known). Please ensure that the numbers are the same on this form and the sample tube i.e. NHS No. on both form and sample and/or Hospital No. on both form and sample

Surname .....

First name .....

Address .....

DOB ..... EDD from dating scan* .....

*Please arrange a dating scan, if not already performed, before taking blood sample

Please provide 6ml EDTA blood sample from the mother (store at room temperature)

Date of sample taken ..... Name of person taking sample .....

Hospital and Requester Details:

Full Hospital Trust Name ..... Hospital NHS Code* .....

*ODS code (Formerly NACS code)

Midwife code ..... Practice code .....

Sender's name and address

Telephone:
Email:

For Hospital Laboratory use

Date received:

SEND SAMPLE WITH THIS FORM TO THE PATHOLOGY LABORATORY

Instructions for Laboratory Reception
Follow Hospital Trust SOP.
See sample labelling and transport instructions on the reverse of this form.

For NHSBT use

Date received:

FRM5197/2.1 Effective: 26/02/2018 1819003 MI1534.3

A hospital number must be used

An EDD is essential for fetal RHD screening for identification of the pregnancy. EDD must be determined by scan before taking a sample. **Number of weeks' gestation is not sufficient**

Date on sample submitted with this form for investigation. Must include year, e.g. 01/02/16, not just 01/02.

The full hospital name must be included. **Please do not abbreviate.** The hospital name and code determine where the report will be sent

Appendix 6 Signature Sheets

I have read, understand and agree to adhere to the attached Policy, Procedure, Protocol or Guideline.

Print Name	**Signature**	**Date**
Michelle Ni Luanaigh		
Ruth Myers		
Caroline Hough		
Anne Marie O'Keeffe		
John Lyne		
Majella Moloney		
Mags Gill		
Rosemarie Burke		
Lisa Hickey		
Jeff Roberts		
Frances Maher		
Eleanor Prendergast		
Eleanor Butler		
Gail Long		
Kieran Ryan		
Louianne Amii Maranan		