Title: Blood Transfusion Laboratory User Handbook

No.of copies :	1
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	2.

Contents

Introduction

Dear Colleagues,

In this handbook you will find basic information concerning the Blood Bank laboratory at The Rotherham NHS Foundation Trust (TRFT) including contact names and telephone numbers. Details of tests performed and other services are given along with the turnaround time for the tests. You may already be in possession of some of these facts and this guide is really a compilation of the appropriate information in one booklet which we hope you will find useful.

Blood Bank Staff and contact details

Medical Consultant Haematologists	
Consultants	(01709) 42 followed by 7419, 4720, 7111,4188
Secretaries	(01709) 42 followed by 7112 or 7119
Scientific/Administrative staff	
Blood Transfusion Manager	(01709) 424088
Deputy Blood Bank Manager	(01709) 427107 or 01709 424088
Transfusion Practitioner	(01709) 427666
Integrated Pathology Quality Manager	(01709) 424008
HTT Administrator	(01709) 424760
Blood Transfusion Laboratory	(01709) 427107

Laboratory Hours

Monday – Friday (08:45 – 17:15 hrs) as of 02/03/2020	Routine Service
Saturday Morning (09:00 – 13:00 hrs)	Routine Service
All other times (incl Bank Holidays)	Out of hours service

Out of hours
The Blood Bank/Haematology Biomedical Scientist on-call can be contacted via telephone number (01709) 424236 or the hospital switchboard (01709) 820000. All out of hours requests must be phoned.

The Consultant Haematologists are available via the hospital switchboard and radio pagers – ask for the Clinical Haematologist on-call. The Haematologists are available 24/7 to offer clinical advice and interpretation of results.

Location of the laboratory
The Blood Bank Laboratory is situated on 'A' level (top floor). Following the signs for Pathology and at the T junction near the central lifts go down the corridor opposite the lifts and the Pathology Department is first on the left. Pathology Reception is straight ahead.

Patient consent
Information can be found on the General Laboratory Medicine homepage and in the TRFT Blood Transfusion Policy.

Protection of personal information.
Information can be found on the General Laboratory Medicine homepage.

Laboratory complaint procedure
Information can be found on the general laboratory medicine homepage.

Completing the Blood Transfusion Request Form

The labelling requirements for request forms and blood specimens are derived from BSH and National guidelines and the Blood Transfusion Department operates a zero tolerance policy – in the event of omission, illegibility, error or crossings out the request will not be processed. Request forms and blood specimens once received by the laboratory cannot be amended.

The request form must be fully completed by a registered medical practitioner. It is the clinician's responsibility to ensure that any special requirements, e.g. CMV negative, irradiated products, bone marrow transplant or solid organ transplant are communicated to the Blood Transfusion Department. The clinical indication for transfusion should be written in the patient's case notes and on the request form, (which should comply with local and national guidelines).

The details on the request form are important and could have medico-legal implications. The request form should be clearly handwritten. (An addressograph label may be used on the request form for the patient identifiers but all other details/information must be handwritten). The correct request form must be used, there are three request forms as follows, Antenatal Serology, Neonatal Request form and Blood Transfusion Request Form.

Specimens and Request forms for Blood Transfusion / Antenatal Serology / Kleihauer requests **MUST** meet minimum labelling requirements that are:

Essential Information

The request form **must** contain the following information:-

- Patient details e.g. Surname, first name, gender, DOB and patient identification number. (If the patient details are unknown click here). Please note this links to the Barnsley BRILS webpage and the criteria is the same across Barnsley and Rotherham.
- Ward/Location and Consultant in charge.
- Diagnosis/operation and reason for transfusion
- "High Risk" sticker if appropriate.
- Transfusion history: – ask the patient for details and check the case notes. The date, time and number of units transfused should be documented.
- Previous pregnancies
- Number and type of blood components required or batch products, including any special requirements.
- Date and time products are required
- Signature of person authorising the request
- Surname (printed) and bleep number of requesting doctor.

The request form **MUST** be signed by a medical officer responsible for the patient and ALL details must be completed.

It is important that the name of the doctor is printed legibly and the bleep number is given so that any problems that arise may be discussed with the relevant medical team.
Blood Transfusion Department staff and the Clinical Haematologist are available for advice if required.

Suitably trained and competency assessed staff may collect samples for pre-transfusion testing. However, they must comply fully with appropriate Trust policies which are included in the 'Trust

Phlebotomy Training Package'. A copy of this policy is also given to all staff completing the course. Inadequate patient identification or sample labelling may lead to fatal ABO incompatible transfusions.

All staff responsible for pre-transfusion sample collection must undergo additional recorded 3 yearly reassessments, in line with the requirements set out by the NBTC (2016b), Requirements for Training and Assessment in Blood Transfusion.

Computer System Failure

In situations where the computer is unavailable downtime numbers may be used. Please note the full downtime number must be written on the sample and form. It is important that the sex of the patient and the approximate age is stated as it may influence the selection of blood and blood products.

Sample Acceptance Criteria

Immediately the sample has been taken, it must be hand-written, legibly and accurately, in ball point pen to avoid smudging by the person taking the blood at the site of collection. The sample tubes should never be pre-labelled.

Please note: Addressograph labels **MUST NOT** be used to label the sample.

All samples **MUST** be labelled with the following information

- Full Name i.e. Surname & First name (click here if the patient is unknown).
- Patient identification number (Please note that if a Hospital unit number is present this must be given priority).
- Date of Birth
- Ward/Location.
- Gender.
- Date and time of sample collection
- Signature of person taking the specimen.
- "High Risk" sticker if appropriate.

Sample Requirements

Test required	Sample required	Sample bottle	Turnaround Time
Group and screen (Adult)	4.9 ml of EDTA blood	Blood Transfusion tube (blue top)	24 Hours
Group and screen (Adult) Antibodies present – not refered to RCI	4 x 4.9 ml of EDTA blood	4 x Blood Transfusion tube (blue top)	1 days
Group and screen (Non antenatal) (Adult) Antibodies present – refered to RCI	4 x 4.9 ml of EDTA blood	4 x Blood Transfusion tube (blue top)	5 working days

Test required	Sample required	Sample bottle	Turnaround Time
Antenatal Group and screen (Adult) Antibodies present – referred to RCI	4 x 4.9 ml of EDTA blood	4 x Blood Transfusion tube (blue top)	5 woirking days
Group and DAT (Baby)	0.5 ml EDTA blood (minimum)	Blood Transfusion tube (blue top)	24 Hours
Group and Cross match (no antibodies detected)	4.9 ml of EDTA blood	Blood Transfusion tube (blue top)	Routine 4 Hours Urgent 1 hour
Group and Cross match Antibodies present	4.9 ml of EDTA blood	Blood Transfusion tube (blue top)	Routine 8 Hours Urgent 2 hours
Transfusion reaction Investigation	4 x 4.9 ml of EDTA blood, plus implicated unit and transfusion reaction paperwork	4 x Blood Transfusion tube (blue top)	Serological investigation – 24 hours
Kleihauer/FMH (During pregnancy)	2 x 4.9 ml of EDTA blood	1 x Blood Transfusion tube (blue top) 1 x Full blood count tube (red top)	72 Hours
Kleihauer/FMH (At delivery)	2 x 4.9 ml of EDTA blood (Maternal) A minimum of 0.5 ml EDTA blood (Baby)	1 x Blood Transfusion tube (blue top) 1 x Full blood count tube (red top) 1 x Blood Transfusion tube (blue top)	72 Hours
Direct Antiglobulin Test	A minimum of 0.5 ml EDTA blood	Blood Transfusion tube (blue top)	24 Hours

Test required	Sample required	Sample bottle	Turnaround Time
Cross match for patient with antibodies or positive DAT/on monoclonal antibody treatment e.g. Daratumumab	4 x 4.9 ml of EDTA blood	4 x Blood Transfusion tube (blue top)	72 hours
Crossmatch for patient with no transfusion History	4.9 ml EDTA 'CHECK GROUP' Please see – 2 sample rule.	1x Blood Transfusion tube + form. (blue top check group) ONLY AVAILABLE FROM BLOOD BANK	24 hours
Issue of plasma products (FFP, Platelets and Cryo) with transfusion history	4.9 ml of EDTA blood	Blood Transfusion tube (blue top)	FFP and Cryo – 40 minutes Platelets – 3 hours (Sourced from NHSBT on named patient basis)
Issue of plasma products (FFP, Platelets and Cryo) with no transfusion history	4.9 ml EDTA 'CHECK GROUP' Please see – 2 sample rule.	1x Blood Transfusion tube + form. (blue top check group) ONLY AVAILABLE FROM BLOOD BANK	FFP and Cryo – 40 minutes from receipt of sample Platelets – 3 hours (Sourced from NHSBT on named patient basis)
Fetal RhD Screening (cffDNA testing)	1 x 6ml EDTA blood	1 x 6ml Blood Transfusion Bottle (blue top) – supply held by laboratory and Greenoaks	7 working days
Fetal genotyping	6ml EDTA blood	3 x 6ml Blood Transfusion Bottle (blue top) – supply held by laboratory and Greenoaks	7 working days

The sample required is 4.9mls of blood in a blue EDTA Sarstedt Blood Transfusion bottle (NHS supply number KCM 131). Minimum blood required for processing is 2ml. Paediatric samples must also be collected in the same tube, a minimum of 0.5 ml is required.

Inadequate, clotted and haemolysed samples will not be tested as they prevent accurate interpretation of results. Also, blood specimens must **NOT** be obtained from the tubing of an IV set or from a vein in which an IV solution is flowing.

The 2-Sample Rule (Check Group)
What is the two-sample rule?

Bloodbank must ensure that there are **TWO** distinct samples from a patient that have generated the same blood group from both samples. If Bloodbank have seen the patient before and already have a historic blood group registered on the Laboratory Information System (LIMS), then only one group and save/cross-match sample is required as per normal protocol. If the patient has no previous records in Bloodbank then you **MUST** repeat the group and save/cross-match with a second sample using a **specific request form & sample** bottle that will be provided by Bloodbank. This national recommendation is based on the evidence from –

- The BEST studies as referenced in BSH Guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories.
- National data from the IBCT and the Near Miss chapters in recent SHOT reports (SHOT, 1996 to 2010) – 386 cases of "wrong blood in tube" (WBIT) were reported as near misses in 2010.
- Local data confirms an unacceptable number of WBIT cases among patients where it can be detected due to having a historical group on record.

Why is this rule being introduced?

Wrong blood in tube (**WBIT**) is a 'never event', it should not happen, however on occasions it does. The consequences of transfusing a patient with blood of the incorrect blood group are very serious and can lead to death. In the 6 months prior to implementation, there were 4 WBIT incidents within the Trust, 2 of which would have resulted in a major ABO incompatible transfusion if blood products had been requested. WBIT is a SHOT (Serious Hazards of Transfusion) reportable incident.

The two-sample rule is a national guideline to improve patient safety when receiving transfusions and has been routinely adopted by the majority of NHS Trusts across the UK.

How does the two-sample rule work?

If the patient is not known to Bloodbank then the two-sample rule is invoked. The two samples must come from separate venepuncture events and ideally should be carried out by two different people. A specific request form & sample will be issued by the laboratory and should be collected from Bloodbank upon delivery of the 1st G&S sample in urgent situations or as required for routine requests. If a cross-match request or group & save request with clinical details implying the patient will be undergoing surgery within the next 24hrs is received and this is the first time Bloodbank has seen the patient, then Bloodbank will notify the clinical area informing them that a 'check group' is required. It is then the responsibility of clinical staff to organise collection of this sample bottle.

It is **NOT** acceptable to take two samples at one venepuncture event and send them to Bloodbank on separate request forms. This will not negate the possibility of WBIT.

How will I know if a second sample is required?

If you are unsure if Blood bank already have a historic blood group, clinical staff can check ICE for previous requests or contact the laboratory to confirm.

What happens in an emergency situation?

If blood is required in an emergency e.g. Major Haemorrhage protocol activation, the two-sample rule will still apply, however, the Bloodbank will only be able to issue Group O red cell products and AB

plasma products in the absence of a check group sample. It is the responsibility of clinical staff to organise collection of the 'check group' bottle. Blood will be issued as per the MH protocol and will not be delayed.

Why can't I use one of our own bottles?

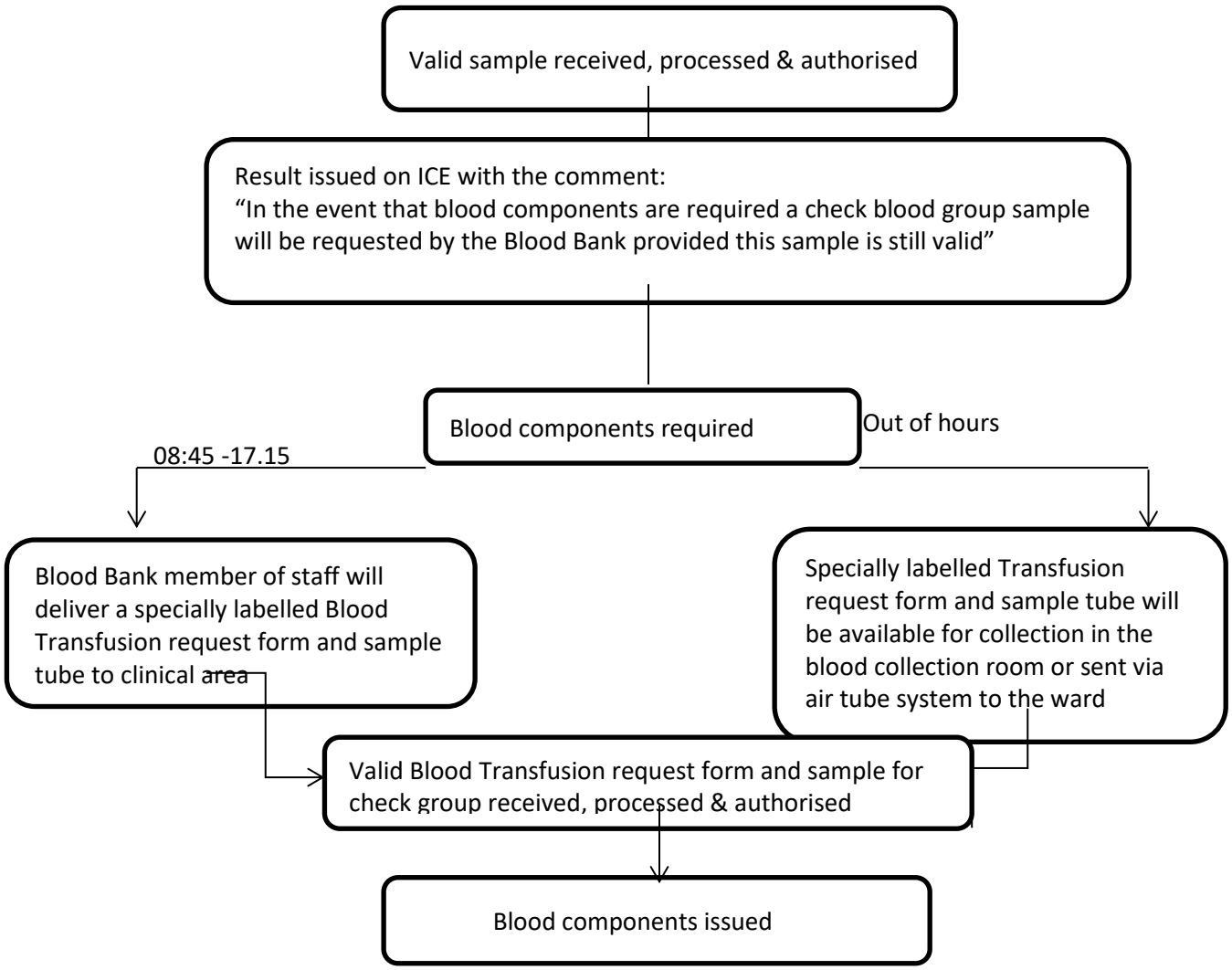
The 2 sample rule needs to involve two separate venepuncture events. 'Check Group' request forms and bottles are specially labelled by the Transfusion Laboratory and are signed for upon collection by clinical staff. This is to assure the Laboratory that the second venepuncture event involves a different sample and that clinical staff are not obtaining two G&S samples from the same venepuncture site at the same time and labelling them with different times.

These steps are in place solely for patient safety.

Check groups are there for patient safety and follow the same strict labelling, zero tolerance policy as for normal group and screens – NO EXCEPTIONS.

Overview flowchart

A check group sample is only required when the first time patient sample is still valid i.e. there is no transfusion history for the patient.



Urgent requirement for blood: The Check Group sample procedure should not interfere with the urgent delivery of blood and has been introduced to help prevent ABO incompatible blood transfusions. With this in mind Group O Rh D Negative* blood will be issued until the patient group has been confirmed.

In the event of major bleed please activate the Massive Haemorrhage Protocol by contacting switchboard on 2222 and stating 'This is not a cardiac arrest but I would like to activate the MHP in *…(state clinical area)…..*'

*** In some instances Group O Rh D Positive blood may be issued to patients of non-child bearing potential.**

High risk specimens

All samples which are regarded as high risk should have both the request form and the specimen labelled with the appropriate "high risk" sticker.

Samples from patients falling into the categories below should be regarded as high risk for the laboratory:-

- Anthrax
- Creutzfeldt-Jakob Disease
- Viral haemorrhagic fever
- Typhoid fever
- HIV antibody positive
- Hepatitis B surface antigen or e antigen positive
- Hepatitis C positive
- IV drug user
- Recent jaundice - cause not known
- Patients with clinical features of AIDS

Sample validity

Patients over 4 months old	Provided that the patient has not been transfused with red cells or platelets within the last 3 months and if the patient is not pregnant or has not been pregnant within the last 3 months the sample is valid for 7 days. If during this time the patient is transfused with red cells or platelets the sample validity reduces to 72 hours from the time that the transfusion commenced. If a patient has been transfused with red cells or platelets within the last 3 months the sample is only valid for 72 hours. If the patient is currently pregnant or has been pregnant within the last 3 months the sample is only valid for 72 hours.
Patients under 4 months old	No new sample is required until the patient is 4 months old. However, if the patient has a positive DAT or the mother has atypical red cell antibodies the maternal sample, which is required for crossmatching the baby, will be valid for only 72 hours.

Transportation of specimens

Hospital samples are delivered either via the air tube system or by hand to the Pathology Specimen Reception Department. Blood Transfusion requests are given high priority by the Specimen Reception

Department – the requests are firstly time/date stamped and then sent to the Blood Bank as soon as possible.

Blood transfusion samples must be no more than 4 days old when tested. Small, clotted and haemolysed samples may be unsuitable for testing.

Antenatal serology samples are usually delivered by hand or transported using Courier Logistics from G.P practices. If the sample cannot be transported to the laboratory on the day of collection, please store in a suitable refrigerator (2-8^{o}C) for transport on the next routine collection.

Referred work

The Blood Bank refers work to the NHSBT Red Cell Immunohaematology Laboratory, Histocompatibility and Immunogenetics Laboratory in Barnley, and to the Internation Blood Group reference laboratory in Filton. The laboratories are UKAS accredited.

Services offered by NHSBT Red Cell Immunohaematology can be found here: http://hospital.blood.co.uk/diagnostic-services/red-cell-immunohaematology/

Services offered by NHSBT Histocompatibility and Immunogenetics can be found here: http://hospital.blood.co.uk/diagnostic-services/hi/

Services offered by NHSBT Internatiol Blood Group reference Laboratory can be found here: https://ibgrl.blood.co.uk/services/molecular-diagnostics/

Specific sample requirements can be sourced from the laboratory protocol Blood Transfusion Referral List, **LI-BB-LAB-104**, which is available on request.

Measurement of Uncertainty
All pathology assays carry an inevitable degree of uncertainty. Whilst many factors are well recognized (pre-analytical variables, analytical precision) some occur by random error alone.
(A random error is associated with the fact that when a measurement is repeated it will generally provide a measured value that is different from the previous value. It is random in that the next measured value cannot be predicted exactly from previous such values).
Users should bear in mind these uncertainties when interpreting any laboratory value.
The laboratory is happy to discuss analytical variation with any user of the service.
Laboratory NEQAS performance data is available to any interested user – please contact the laboratory Manager.

Urgent Issue of Blood Products & Major Haemorrhage
Urgent request for blood – Emergency Issue

In an emergency, requests can be made by telephone. The Blood Transfusion staff will then give an indication on the products that would be available and the time scale.

- During the core working day the Blood Bank can be contacted by phone. Ext. 7107
- Monday – Friday 08:45 – 17:15hrs.
- Outside of these hours – please phone 4236 Biomedical Scientist for Haematology.
- Major Haemorrhage Protocol activation – via switchboard **(Strictly for MH activation only)**

Life-threatening haemorrhage – Immediate transfusion

For life-threatening situations where the patient is likely to die from exsanguination before blood can be crossmatched, a limited stock of emergency group O is available in the issue fridge. Blood bank **MUST** be informed if this is required.

A neonatal flying squad unit is also available. Please contact Blood Transfusion staff as soon as possible if it is thought this unit may be required to ensure the unit is issued in preparation for immediate collection by the clinical staff on their arrival.

- In an emergency situation, group O blood should be given until the patient's blood group is established. Blood grouping should be carried out as quickly as possible to minimise the 'blind' use of group O blood, and this should be limited to no more than two units in most instances. Once the patient's blood group has been determined, a switch to group specific blood should be made.
- In order to conserve stocks of group O Rh D negative blood, O Rh D positive blood should be used in large volume blood replacement (e.g. more than eight units of blood) in females with no child-bearing potential (over the age of 60 years old) and adult males over 18 in whom no anti-D is detectable.
- When O Rh D negative blood is unavailable or in extremely short supply, it is acceptable to use O Rh D positive blood for O Rh D negative female patients with no child-bearing potential and unimmunised males, provided no anti-D is detectable on pre-transfusion testing.
- **It is no longer a requirement to issue cde/cde (rr) HT negative red cells for use as flying squad units.**

Emergency Blood

Emergency blood will only be supplied at the request of MEDICAL STAFF who will liaise with the Blood Bank and accept full responsibility for un-crossmatched blood issued. Blood will either be group O or type specific depending upon degree of urgency.

Flying squad O RhD Negative blood can be found in the bottom of the blood issue fridge.

Major Haemorrhage Protocol

Full Trust guidance and protocol for the Haematological Management of Major Haemorrhage can be found in the Blood Transfusion Policy

Antenatal Screening Service

Antenatal serology screening involves blood group determination and identification of atypical antibodies associated with haemolytic disease of the newborn and Microbiology screening – see flow chart. A separate Microbiology request form and sample (4.9ml brown top blood) is required – for further information regarding microbiology screening of antenatal patients refer to the Microbiology Handbook.

Blood group and red cell antibody screening (see flow chart below)
These tests are performed twice during each pregnancy, once at booking (6-16 weeks) and again at 28 weeks.
Samples on patients who have developed significant red blood cell antibodies may be required more often than usual, the frequency of which will be indicated on the antenatal report along with the number of blood samples required. The samples are required to monitor the strength (titre) of the antibody (ies) concerned and to identify pregnancies which may be at risk from Haemolytic Disease of the Newborn (HDN). The samples also monitor the possible formation of additional allo-antibodies during the pregnancy. Patients who have developed red cell antibodies should be referred to an Obstetrician.

The current guidelines state that women with anti-c, D, K or K related antibodies require repeat samples every 4 weeks until the 28th week of pregnancy and thereafter every 2 weeks until delivery.
Other specificities commonly implicated as causing HDN include anti-C, E, Fy(a) and Jk(a) though there are many other rarer antibodies. Guidelines recommend testing these patients at booking and at 28 weeks of pregnancy only although further testing will be performed as required.
Anti-Le(a), Le(b), N, Lu(a), P1, H and A1 are not considered to be clinically significant with respect to HDN.
When the mother develops a significant red blood cell antibody a biological father sample may be requested. This is to determine the father's phenotype and predict the likelihood of the foetus carrying the relevant red cell antigen which may indicate whether there is the possibility of HDN.
The red blood cell membrane contains numerous antigenic molecules which may induce the production of plasma antibodies. Currently there are more than 600 known red cell antigens. Immunisation is caused by exposure to 'foreign' red cells via pregnancy or transfusion although some plasma antibodies are naturally occurring.

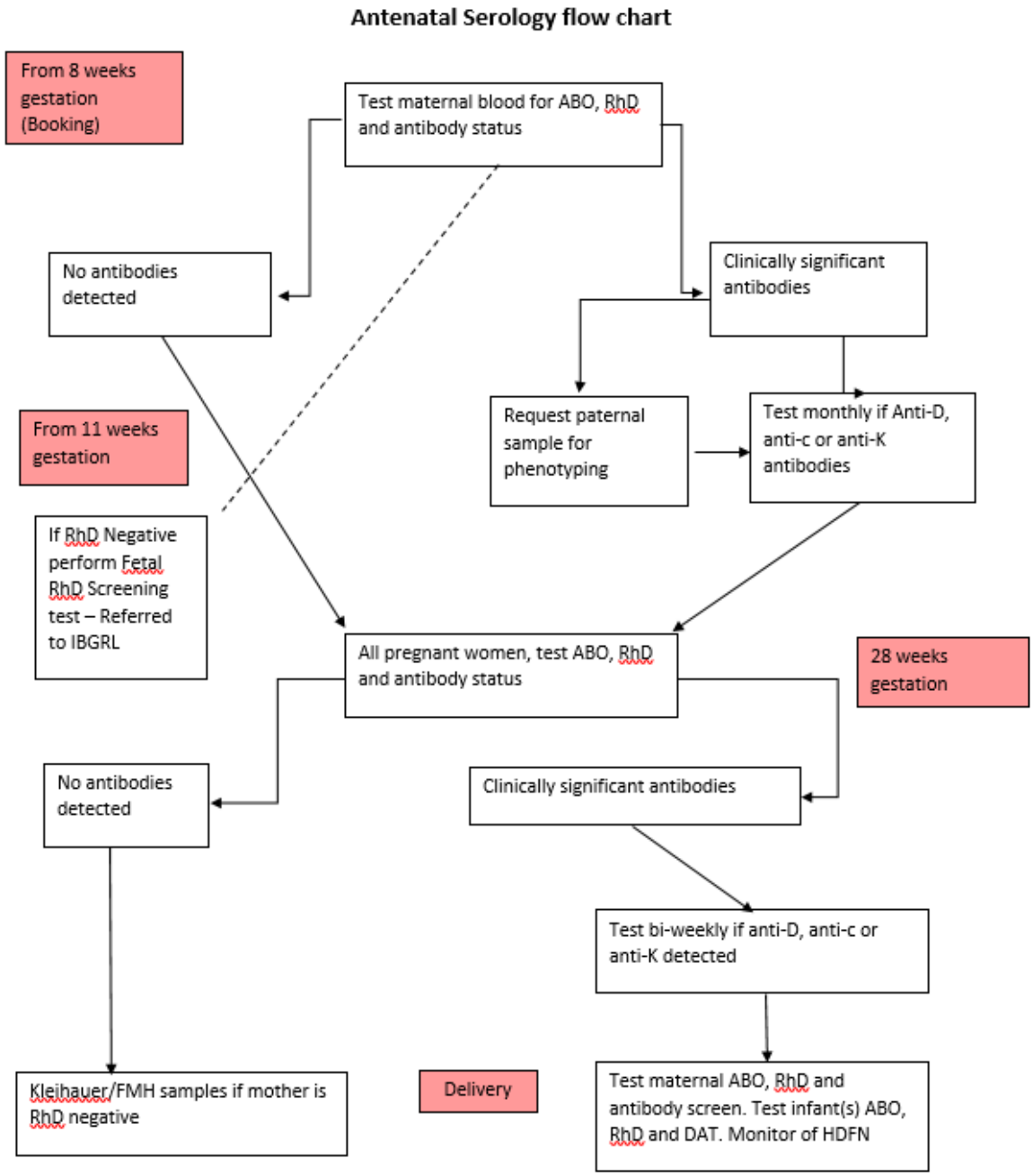
The following table shows important antibodies that are encountered:

Blood Group System	Antibody	Causes Transfusion Reaction?	Causes HDN?	% Blood Compatible
Rh	Anti-c	Probable	Common	20
Rh	Anti-C	Probable	Possible	32
Rh	Anti-C^w	Probable	Possible	98
Rh	Anti-D	Probable	Common	15
Rh	Anti-e	Probable	Possible	2
Rh	Anti-E	Probable	Possible	71
Kell	Anti-k (Cellano)	Probable	Possible	0.2
Kell	Anti-K	Probable	Possible	91
Kell	Anti-Kp^a	Probable	Possible	98
Duffy	Anti-Fy^a	Probable	Possible	34
Duffy	Anti-Fy^b	Probable	Possible	17
Kidd	Anti-Jk^a	Probable	Possible	23
Kidd	Anti-Jk^b	Probable	Possible	26
Lewis	Anti-Le^a	Rare	Unlikely	78
Lewis	Anti-Le^b	Unlikely	Unlikely	28
MNS	Anti-M	Unlikely	Unlikely	22
MNS	Anti-N	Unlikely	Unlikely	28
MNS	Anti-s	Probable	Possible	11
MNS	Anti-S	Probable	Possible	45
MNS	Anti-U	Probable	Possible	<0.1
P	Anti-P1	Unlikely	Unlikely	21
Lutheran	Anti-Lu^a	Unlikely	Unlikely	92
Lutheran	Anti-Lu^b	Probable	Possible	<0.2

Anti-D Prophylaxis

To help prevent Rh D haemolytic disease of the newborn injections of prophylactic anti-D are administered to Rh D negative women either prophylactically at 28 - 30 weeks of pregnancy or following a possible sensitising event, provided that the Fetal RhD screen predicts a RhD Postive baby.
The Blood Bank holds stocks of 1500 IU/ml prophylactic anti-D (standard dose) that are stored in a controlled environment of 4°C.
The dose of routine prophylactic anti-D (RAADP) given between 28 and 30 weeks of pregnancy is 1500iu/mL. The dose of anti-D required following a possible sensitising event is determined according to the protocol **LP-BB-LAB-038** FMH testing.

A Flow Chart for blood grouping and antibody testing during pregnancy is shown below:



Current guidelines used in Antenatal Serology and prevention of HDN :

BSH - Guideline for Blood Grouping and Red Cell Antibody testing in Pregnancy (2016)
BSH - Guidelines for the use of prophylactic anti-D immunoglobulin
NICE - Routine antenatal anti-D prophylaxis for women who are Rh D negative
NICE - Routine care for the healthy pregnant woman

Blood Transfusion Risk Management

When an incident is reported the following must be undertaken:

- Full details of all incidents must be passed to the Transfusion Practitioner.
- The Transfusion Practitioner and/or other Hospital Transfusion Team (HTT) members as appropriate will investigate the incident.
- The HTT are responsible for informing SABRE and/or SHOT of any reportable incident via the online reporting system.

Incidents must be investigated as soon as possible and:

- Appropriate corrective action taken.
- Where required, further preventative measures implemented.
- Fed back to all relevant staff.
- If the adverse event is an externally reportable incident the member of staff involved must be removed from all aspects of the transfusion procedure.
- Following full investigation of the incident the staff member(s) involved will receive appropriate training and competency assessment.
- The timeframe for reinstatement of a member of staff into the transfusion chain will be determined by the HTT following full deliberation of all the information and circumstances surrounding the incident.
- The HTT will review all incidents, and consider any changes that may be required to existing policies and procedures.
- Any changes must be communicated to the appropriate professionals in order to ensure compliance to these changes. For Laboratory staff this would be via the Q-Pulse document control system.
- All serious incidents are reported to the Trust Patient Safety Group