2.7: Compatibility procedures in the hospital transfusion laboratory

2.7.1: Group and screen

The patient’s pre-transfusion blood sample is tested to determine the ABO and RhD groups and the plasma is screened for the presence of red cell alloantibodies capable of causing transfusion reactions. Antibody screening is performed using a panel of red cells that contains examples of the clinically important blood groups most often seen in practice. Blood units of a compatible ABO and Rh group, negative for any blood group alloantibodies detected, can then be selected from the blood bank, taking into account any special requirements on the transfusion request such as irradiated or cytomegalovirus (CMV) negative components.

Almost all hospital laboratories carry out blood grouping and antibody screening using automated analysers with computer control of specimen identification and result allocation. This is much safer than traditional manual techniques and eliminates most transcription and interpretation errors. ABO grouping is the single most important test performed on pre-transfusion samples and the sensitivity and security of testing systems must never be compromised. Robust identification procedures outside the laboratory at patient blood sampling, collection of blood from the blood bank and administration of blood at the bedside are vital (see Chapter 4). The current British Committee for Standards in Haematology (BCSH) guideline for pre-transfusion compatibility procedures (2012) recommends that a second sample should be requested for confirmation of the ABO group of a first-time transfused patient provided this does not impede the delivery of urgent red cells or components (http://www.bcshguidelines.com).

2.7.2: Compatibility testing

Traditionally, the final step in providing safe blood is to carry out a serological crossmatch between the patient’s plasma and a sample of red cells from the units of blood selected for transfusion. This is performed by the IAT method at 37°C, looking for evidence of a reaction that would indicate incompatibility.

2.7.3: Electronic issue

This is sometimes known as computer crossmatching. Most hospitals now issue the majority of blood by this safe and rapid technique. It relies on the fact that if the patient’s ABO and RhD groups are reliably established, and a sensitive antibody screen is negative, the possibility of issuing incompatible blood is negligible. The laboratory computer can identify all compatible units in the blood bank inventory without the need for further testing. National guidelines require the use of automated testing systems interfaced with laboratory information systems before electronic selection is used and all results must be transmitted electronically to remove human error. Electronic issue should not be used:

- If the patient’s plasma contains, or has been known to contain, red cell alloantibodies of clinical significance
- If the antibody screen is positive
• If the patient has had an ABO-incompatible marrow or haemopoietic stem cell transplant
• If the patient has had an ABO-incompatible solid organ transplant in the last 3 months
• For neonates or fetuses, if the mother has an IgG red cell antibody present in her plasma.

2.7.4: Blood for planned procedures

Many operations rarely need transfusion. As long as the laboratory can provide components quickly in an emergency, there is no need to reserve blood units in the blood bank. Group and screen and electronic issue are now widely used in this situation and allow more efficient use of blood stocks and laboratory scientist time.

Patients undergoing planned procedures that may require transfusion, such as major surgery, ideally have samples for group and screen taken at preadmission clinics. Problems in providing compatible blood are then identified before admission to hospital. There is a (usually small) risk that the patient may develop new blood group alloantibodies between the time of initial testing and the date of operation, especially if they have recently been transfused or become pregnant. Having reviewed current evidence, the BCSH guidelines for pre-transfusion compatibility procedures (Milkins et al., 2012) made the following pragmatic recommendations for timing of pre-transfusion blood samples:

• Testing should be performed on samples collected no more than 3 days in advance of the transfusion when the patient has been transfused or become pregnant within the preceding 3 months.
• An extension to 7 days may be considered for regularly/frequently transfused patients with no alloantibodies and pregnant women with no significant alloantibodies who need to have blood standing by for a potential obstetric emergency such as placenta praevia.

Remote issue of compatible blood components from satellite blood refrigerators electronically linked to the laboratory computer system allows safe and efficient provision of blood when the transfusion laboratory and operating theatres are on different hospital sites. Successful adoption of this approach requires close collaboration with the clinical team and clear local guidelines and policies.

When electronic issue is not available or appropriate and in procedures with a high probability of requiring transfusion a maximum surgical blood ordering schedule (MSBOS) should be agreed between the surgical team and transfusion laboratory. This specifies how many blood units will be routinely reserved (in the blood bank or satellite refrigerator) for standard procedures, based on audits of local practice. When developing an MSBOS it is usual to aim for a crossmatched to transfused ratio of no more than 3:1 and actual blood use should be audited and reviewed at regular intervals.