EDUCATIONAL COMMENTARY – ELECTRONIC CROSSMATCHES

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Learning Outcomes
Upon completion of this exercise, the participant should be able to:

- describe the patient requirements for electronic crossmatching.
- describe the laboratory information system requirements for electronic crossmatching.
- discuss the advantages to electronic crossmatches.
- discuss the disadvantages of electronic crossmatches.

Crossmatching in the blood bank historically has involved performing an immediate spin crossmatch for patients without alloantibodies to red blood cell (RBC) antigens and has served as a final test to make certain the patient and the donor RBC units are ABO compatible. For patients who have formed RBC alloantibodies, a complete crossmatch using the patient plasma and donor RBCs along with an enhancement media, such as low-ionic-strength saline solution or polyethylene glycol, is used to make certain the donor RBCs are compatible before transfusing to the patient. This testing has been the standard of care for providing crossmatch-compatible blood for decades, but now with the improvement of blood bank information systems, the electronic crossmatch is a new standard. The electronic crossmatch or computer crossmatch has been successfully validated and implemented in many health care facilities.

Currently approximately 2% of facilities in North America perform an electronic crossmatch as their standard operating procedure.

Patient Requirements
Many health care institutions have replaced the immediate-spin crossmatch with the computer crossmatch to detect ABO incompatibilities between a patient and donor units. In 1993, the AABB Standards first permitted the use of electronically stored data to detect ABO incompatibilities between the ABO group of a blood sample labeled with a patient’s name and a donor unit. But patients must qualify for computer crossmatching. Those patients with RBC alloantibodies or a history of an alloantibody are not candidates for computer crossmatching. Potential candidates for computer crossmatching must have two separate confirmations of their ABO group and Rh type. This can be achieved by retesting the same sample; however, the preferred method is to request a second sample from a patient or compare the current sample with the historic blood group and Rh type for the patient. Despite using an electronic crossmatch, the patient still must have a current blood bank sample, less than three days old, with a nonreactive antibody screen (see Table 1).
Laboratory Information System Requirements

Validating the laboratory information system (LIS) is also a crucial part of the computer crossmatch, and the LIS must be validated within the medical center to make certain that only ABO-compatible RBCs are chosen for and dispensed to any patient. The LIS must contain the logic to notify a technologist that an ABO group or Rh type discrepancy is detected between the donor unit and the patient or if any of the required information is missing. The system must also store the following information for each donor unit: the unit number, the component name, the ABO group, Rh type, and confirmation of the donor ABO group/Rh type. Likewise, the software must allow for storage of the following information about the potential recipient of the transfusion: two unique identifiers for each patient, ABO group, Rh type, and results from the antibody screen. Lastly, the LIS must have a method to verify correct entry of data prior to the release of blood components (see Table 2).

Table 1: Patient Criteria for Computer Crossmatches.

1. ABO group/Rh type confirmed on two occasions and agree
2. No history of alloantibodies, and current antibody screen is negative.
3. Current patient sample within three days

Table 2: Laboratory Information Systems Criteria for Computer Crossmatches.

1. Validated to dispense only ABO group/Rh type compatible red blood cells
2. Notifies technologist ABO group/Rh type discrepancy is detected between donor unit and patient or if required information is missing.
3. Stores the following information on a donor unit
   a. Donor number
   b. Component name
   c. ABO group
   d. Rh type
   e. Confirmation of donor ABO group/Rh
4. Stores the following information on a potential recipient
   a. Two unique identifiers
   b. ABO group/Rh type
   c. Antibody screen results
5. Method to verify correct entry of data prior to the release of blood

Advantages and Disadvantages of Computer Crossmatch

The advantages to the computer crossmatch include decreased workload, reduced specimen volume from patients, and decreased specimen exposure to technologists. Using computer crossmatches minimizes the amount of blood required from patients for pretransfusion testing; this is a particular benefit in the pediatric population. Other benefits of the computer crossmatch include elimination of preparing...
donor RBCs in a tube and the concomitant possibility of mislabeling this tube, as well as detection of cold reacting antibodies with immediate-spin crossmatches because these are usually clinically insignificant. The decrease in testing requirements improves the turnaround time for availability of blood products for the patient. One study demonstrated this procedure saves a technologist 2.5 minutes per unit of crossmatched RBCs. Also electronically crossmatching blood immediately before it is needed allows for better management of the blood inventory.

One of the biggest concerns regarding computer crossmatches is that mislabeled patient samples would not be detected. In this respect relying on a historic blood type is critical, and if there are any discrepant results, only group O RBCs should be dispensed. In the event a patient does not have a historic blood type available, two samples collected from two separate phlebotomies is recommended inasmuch as two samples drawn from a single phlebotomy could result in two mislabeled samples. Another recognized disadvantage is that the laboratory cannot bill for an electronic crossmatch (see Table 3).

<table>
<thead>
<tr>
<th>TABLE 3. Advantages and Disadvantages of Electronic Crossmatches.</th>
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<tbody>
<tr>
<td><strong>Advantages</strong></td>
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<tr>
<td>Decreased workload</td>
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<tr>
<td>Decreased exposure to patient samples</td>
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<tr>
<td>Decreased detection of cold reacting antibodies</td>
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<tr>
<td>Decreased patient sample requirements</td>
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<td>Eliminate donor sample preparation and possible mislabeling of tube</td>
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**Summary**

Electronic crossmatches offer numerous advantages to a transfusion center as well as to patients. For patients who have a confirmed ABO blood group/Rh type and negative antibody screen, RBCs can be dispensed within a matter of minutes. The procedure also decreases the amount of sample required from a patient, decreases exposure of technologists, and streamlines the workflow for the laboratory. Overall, the turnaround time for blood products decreases, and better utility of blood inventory is achieved. Before implementing electronic crossmatching, the LIS must be validated within the medical center to be sure the system will notify the technologist if an ABO discrepancy exists between patient samples or if ABO-incompatible blood is selected for a patient.
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