Organizing the Antibody Identification Process

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ABBREVIATIONS: UAB = Universtity of Alabama at Birmingham Hospital; DAT = direct antiglobulin test.

INDEX TERMS: antibody identification summary; delayed surgery; transfusion errors.

Clin Lab Sci 2007;20(2):122

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LEARNING OBJECTIVES

1. Identify two areas in which safety of the blood supply has been addressed by the blood bank community.
2. Identify two possible consequences of an unexpected, complicated antibody problem in a pre-surgical patient.
3. Explain why an antibody identification summary form is useful in communicating with the clinical staff and other members of the laboratory staff.
4. List three items that should be included in the history and serology sections of an antibody identification summary form.

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The focus on patient safety issues in recent years has led to implementation of hospital-wide processes meant to decrease risk of errors that lead to adverse events. The consequences of patient identification errors or testing errors even in as straightforward a procedure as ABO typing have been recognized for years.[1-5] Ongoing concerns about transfusion-transmitted disease have resulted in enhanced testing for viral diseases such as hepatitis C , human immunodeficiency virus, and West Nile virus. Changes in blood donation criteria have been made in response to the emergence of Chagas disease, Lyme disease, and babesiosis. Electronic procedures such as bar-coding for patient identification are additional methods that increase transfusion safety.[6,7] There is a concurrent push for physicians to decrease allogeneic transfusion volume. Some methods for this include re-evaluation of traditional transfusion triggers, review of surgical blood order schedules, and promotion of autologous products and intra-operative blood conservation.[8-11]

Despite the alternatives to allogeneic transfusion, there are occasions when a patient must receive a transfusion during surgery or perhaps a series of transfusions due to chronic disease or treatment for malignancy. Despite the relative safety of the blood supply, there is no way to prevent transfusion-triggered alloimmunization. Patients undergoing chemotherapy may require extensive component support. One study of a group of cancer patients showed that approximately 9% formed alloantibodies and that risk of developing alloantibody was 0.5% per unit transfused.[12] Other studies have shown that once patients had developed a single specificity, they had increased probability of developing additional specificities.[13] Some patients initially developed a single specificity, while others immediately developed multiple antibodies. Alloimmunization as high as 60% has been reported in patients with diseases that require chronic transfusions.[14-17] One study of surgical patients who received transfusions of packed red blood cells showed a 5.9% risk of alloimmunization.[18]

The transfusion workup for many chronically transfused patients may be initially uncomplicated but may become

more difficult as the patients develop alloantibodies or other serologic complications. Most surgical patients, however, have an uncomplicated pre-transfusion workup and generally do not require further transfusions. Some surgical patients may nevertheless demonstrate autoantibodies, multiple alloantibodies, or specificities that are difficult to identify at initial presentation. In these cases, antibody identification is often complex and time consuming.[19-21] The time required for a complete work-up may delay surgery and increase patient length of stay due to lack of compatible units.[22] Costs rise as the delay requires repeated laboratory work for accurate values immediately prior to surgery. In addition, there must be detailed conversations between laboratory personnel and clinical staff to explain the reason for the delay and expected time frame for resolution.

ANTIBODY IDENTIFICATION SUMMARY FORM

Documentation of the antibody identification process should be available to provide accurate and timely transfusions, and facilitate communication with clinical staff. The *AABB Standards* requires review of ABO grouping and Rh typing and documentation of blood typing difficulties, clinically significant antibodies, significant adverse events to transfusion, and special transfusion requirements as part of the pre-transfusion workup.[23] Clinical laboratory scientists are required to conform to written policies and procedures and complete extensive training to prevent technical errors. Clerical errors remain a problem, especially with multiple, complex procedures.

In routine antibody identification and subsequent compatibility testing, errors are minimized by standardized procedures and reporting formats. A complex antibody identification problem and its implications for compatibility testing are not so readily standardized. Multiple pathways and sophisticated procedures are necessary, and many depend on the results of a previous test. Documentation is abundant, and the information generated must be be formatted so that others, such as scientists who perform subsequent testing and supervisors and pathologists who review the test results, can easily understand the process and determine that all testing is complete. The process should be standardized to decrease nonproductive testing time and errors.

One method to standardize antibody identification information is the antibody identification summary form. This organizes patient and serological information and standardizes and expedites the identification process. The documentation on the page should record the serological methods used and antibodies identified, in addition to communications with the patient's clinical team.

Patient history should include the following:

- diagnosis
- transfusion history
- pregnancy history
- phenotype
- medications
- previous antibodies

The combination of laboratory and non-laboratory data can be difficult to organize and standardize. Too often, vital investigational information is relegated to the margin, the back of the panel record, or sticky notes.

In addition to recording the history, a chronology of the antibody investigation ensures a reader can reproduce the investigation process. This may be another scientist performing additional testing or a supervisor or pathologist reviewing the identification and providing transfusion recommendations.

The antibody identification summary form contributes to technical information sharing among the laboratory staff who test or issue components and fosters an environment of open communication with the clinical team. Details discussed with the clinical team include time of notification, with whom the situation was discussed, and when the transfusion is needed.

For example, the transfusion medicine service may warn of a delay in procuring red blood cells for transfusion due to a positive antibody screen, requiring a procedure be rescheduled or canceled. Given the staff involved in care, information sharing is critical. An organized identification process helps provide a timeline and probability for identification of the necessary product.

Reducing organizational errors with knowledge transfer, prioritized workload, and a culture of communication will improve transfusion safety. The process to accomplish this, however, may seem overwhelming.

With these considerations in mind, the laboratory staff at the University of Alabama at Birmingham Hospital (UAB) decided to not agonize but to organize! We developed a summary form to organize antibody information, to make it easy to document transfusion history and procedures that had been performed, and to indicate procedures pending. The sum-

mary form documented which clinicians knew the patient's antibody status and transfusion recommendations.

Designing an antibody identification summary form

The summary form has three sections: history, serology, and interpretation and recommendations (Table 1). A fill-in-the blank format permits scientists to enter systematic information easily. Each section provides a *free text* area for information not covered by the standardized sections. This combination prevents crowded, illegible documentation and standardizes information, minimizing variation. See Figure 1. Collaboration of pathologists, supervisors, and scientists brought about a format workable for everyone. Keep in mind that an antibody information summary form should be tailored to the institution. For example, the institution may require a longer or shorter patient history, gel, solid phase or tube test systems, and specific computer entry.

Table 1. Content areas of the antibody summary page

History
Diagnosis
Demographics - age, gender, race
Transfusions
Transplants
Pregnancies
Rh immunoglobulin
Medications
Intravenous solutions
Previously identified antibodies
Phenotype

Serology
ABO and Rh
Antibody screen / panel
DAT
Potentiators
Neutralizations
Adsorptions
Elutions
Titrations
Phenotyping

Interpretation and recommendations
Antibody specificities
Pathology/ supervisory review
Transfusion recommendations

Information we consider essential is listed in the following sections.

History

The history includes demographics, factors that may stimulate alloimmunization, medications, IV solutions, previously identified antibodies, and phenotype.

Ethnic background provides a clue to specificity since some phenotypes are associated with certain populations. History of previously identified antibodies is essential, especially since the antibody may no longer be detectable. Antigen-negative units may be selected to prevent a delayed transfusion reaction. Transfusion urgency establishes the timeframe available to perform antibody identification.

Serology

Results of the ABO, Rh, antibody screen and direct antiglobulin test (DAT) should be standardized and entered into the blanks provided. Free text areas facilitate complex documentation of ABO discrepancy resolution, panels with various potentiators, neutralizations, adsorptions, elutions, titrations, and phenotypes. A checklist of prompts is included to trigger scientists to complete computer entry and billing.

If the standard operating procedure requires a specific order of testing, these sections may be specifically labeled. For example, ABO, Rh, antibody screen, and auto control may designed to reflect the specified sequence. The conclusion of the serology section should clearly state the antibody or antibodies identified.

Interpretation and recommendations

The supervisor and pathologist review with follow-up testing and transfusion recommendations are documented in the third section.

Working with the "living" summary form

It may become apparent in use that some form areas may need to be added, omitted, or rearranged. A methodology or procedural change that occurs should be reflected in the form. For example, if the transfusion service has used the tube method and changes to either solid phase or gel testing, the form is redesigned to reflect the change. As the form is maintained electronically, revisions are easy.

At UAB the antibody identification summary form is relied upon to organize data and to *prioritize* antibody investigations. As soon as the staff identifies a positive antibody screen, the history section is completed. If a patient is unstable and

Figure 1. Sample antibody summary page

Patient label

Patient History

Age:_____ Race:_____ Gender:_____ Diagnosis:_____

Antibodies:_____ Transplant:_____

Transfusion: UAB: Y / N Date:_____ # of PRBCs:_____

Other location: Y / N Date:_____ Location:_____

Pregnancy: Current: Y / N Gestation:_____ Historical: Y / N / Unk

RhIg: Y / N / Unk Date Received:_____

Notification: Time:_____ Person Notified:_____ Need for Blood:_____

Other:_____

_____

_____

Serology

ABORh:____ ABSC: I:____ II:_____ III:_____ Date / Time:_____

Manual Gel ( ) Provue ( ) Tube ( )

Auto Control:_____DAT:_____IgG:_____C3d:_____ Date / Time:_____

Phenotype:_____ Date / Time:_____

Technique:_____ Date / Time:_____

Technique:_____ Date / Time:_____

Technique:_____ Date / Time:_____

Technique:_____ Date / Time:_____

Conclusion

Antibody(ies) identified_____

Historical antibody(ies) not reacting_____

Review / Recommendations

_____

_____

_____

_____

_____

Update patient history: ( ) Bill patient: ( )

needs a transfusion as soon as possible, their work-up takes priority over a patient in clinic who will not be transfused for several days. By completing the history section immediately, we ensure that the patient's clinical team is aware of any delays and documents when and with whom the transfusion service discussed the situation. Also, the form maps the investigation process, ensuring anyone who reviews the work-up clearly understands the chronology.

SUMMARY

Development of an antibody identification summary form requires input from many individuals and must be tailored to the requirements of a specific institution. This form, which provides extensive data, should be as inclusive as possible in compiling patient history, serological results, and implications for transfusion. This well-organized, comprehensive source of patient information facilitates the serological resolution for a patient's antibody and decreases the chances of organizational and communication-related errors.

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