Analysis of ABO Discrepancies Occurring at a University Hospital, Al-khobar, Saudi Arabia

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Objective: To assess the incidence and causes of all ABO discrepancies.

Setting: The King Fahd Hospital of the University (KFHU), Al-Khobar in Eastern Saudi Arabia.

Design: Retrospective study.

Method: The study was performed between January 1992 to December 2005. ABO discrepancies were detected during routine blood bank laboratory testing by comparing either two current blood specimens or a current and historical specimen.

Result: Two hundred and sixty-one discrepancies were discovered in a series of 549,229 blood group tests performed during the study period, a frequency of 0.05%. The most common cause involved ABO subgroups, then errors of blood collection during phlebotomy that is collecting from a wrong patient and finally clerical errors during patient registration or identification.

Conclusion: ABO discrepancies can result from inaccuracy made by hospital staff during phlebotomy and collection of specimens, clerical errors and ABO subgroups. Technical errors are also a cause but none was found in this study. Careful techniques are needed to ensure proper collection and labeling of specimens during and after specimen collection to avoid any fatal complications. Repeat testing and investigation for ABO subgroups is very important.

Safe blood transfusion depends on a series of interdependent processes, starting from the appropriate medical decision regarding blood therapy, accurate blood typing of patients to administration of the relevant blood component to the right patient.

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ABO incompatibility accounts for 37% of all reported transfusion-associated facilities reported in the USA[1]. While most of the focus now in transfusion medicine is on the risk of transfusion-transmitted diseases, transfusion errors also contribute significantly to adverse outcomes. Human error is a significant factor in iatrogenic injury[2]. Fortunately, most errors do not result in patient injury or lengthen the hospital stay but a small number have serious or even fatal outcomes[3]. In clinical and laboratory medicine, considerable time and effort is invested in instituting policies and procedures, including most important detailed patient and specimen identification. Transfusion medicine is unique among diagnostic laboratory services because of delivery of a biologic product that saves lives but at the same time may be capable of causing death. The delivery of this vital product 'blood', involves many people at different levels and different areas of the hospital. Errors can occur at any point along the way and having checkpoints along the way is to discover these errors before transfusion.

Published reports cite an incidence of ABO discrepancy due to inappropriately identified specimens ranging from 1 in 517 to 1 in 3,400 samples[4,5]. The first step in preventing mistransfusion is obtaining blood for pretransfusion testing from the right patient and ensuring that all labeling is correct. Errors in these critical steps are recognized as the primary source of mistransfusion. Of greatest concern are the errors that cannot be identified by visual inspection of the samples and associated requisitions. The miscollected blood sample (wrong blood in tube) in which tube and requisition appear properly labeled but the sample is drawn from a different patient is the stealthiest of errors and may easily go undetected until the event of an incompatible transfusion. In one multinational study involving 62 hospitals, this accounts for up to 0.09 % of samples collected[6].

The aim of this study is to assess ABO discrepancies during 13 years and how they were handled. To the best of our knowledge, this aspect has not or rarely been addressed in previous reports from the Kingdom of Saudi Arabia.

METHOD

All blood bank ABO typing records kept at the KFHU blood bank laboratory between the January 1992 to December 2005 were reviewed. The protocol used by the laboratory includes the following determinations:

- ABO Rh (D) group. ABO group is determined by testing RBCs with anti-A, anti-B and anti-AB reagents and by testing serum for expected antibodies with A and B red blood cells (rbcs).
- Antibody screen testing for unexpected antibodies for RBC transfusion with an antiglobulin test incubated at 37°C.
- Crossmatch involving patient's serum and donor's red cells by routine method including immediate spin and incubation at 37°C.
- The blood bank policy and procedures manual mandates that all results are compared with historical patients' records filed in the blood bank.
- The ABO discrepancies were detected on comparing the patients' recent result with his previous blood bank records, or two current blood specimens, and any discrepancy between forward and reverse grouping leading to investigation and exclusion of ABO subgroups.
- For A subgroup anti-A lectin is used, Dolichos biflorus in the diluted state, the lectin extract of Dolichos biflorus reacts as anti-A1 which reacts directly with A_1 and A_1B but not A_2 or A_2B red cells. If the red cells agglutinate, the person is subgroup A_1. If

no agglutination takes place, the blood is not A_1, and most probably is group A_2 (A int, an uncommon blood group, can also be agglutinated weakly by D. biflorus).
- IgM Alloantibodies such as Anti-Le[a], Anti-P_1, Anti-M, and Anti-N may cause a serum-mediated discrepancy with the reverse ABO grouping cells. Antibody screen and identification are needed, followed by the selection of blood that lacks the antigen.

RESULT

During the 13 years 549,229 ABO blood grouping tests were performed. ABO discrepancies occurred 261 times giving a frequency of 0.05%, see table 1.

Table 1: Causes of ABO Discrepancies at the KFHU Blood Bank Laboratory

Cause	Number	Frequency (%)
ABO subgroups and alloantibodies **	213	81.6%
Mislabeling	38	14.6%
Patients with same identical medical record numbers	3	1.1%
Patients with two or more different medical record numbers	5	1.9%
Change of medical record number	2	0.8%
Total	**261**	**100.0%**

** Of these 171 were due to subgroups and 42 were those cases with cold or inconclusive antibodies

DISCUSSION

ABO incompatible transfusions due to misidentification of crossmatch samples or recipients result into the death of about two dozen patients each year in the United States (USA)[7]. ABO mismatched blood transfusions are a result of human errors and omission of any safety step. According to some studies, ABO errors probably cause more transfusion-related fatalities than HIV transmission[1,3].

Mislabeled specimens collected for crossmatching procedures are common, and are responsible for approximately one third of transfusion-related deaths[1,3]. Data reported to the food and drug administration (FDA) suggest that an avoidable transfusion fatality attributable to misidentification of the sample, the unit or the recipient occurred once in every 600,000 transfusions from 1990 to 1991[8]. In this study, 38 cases (14.7%) were caused by mislabeling.

To avoid errors, some hospitals have even instituted a policy that requires a second specimen independently drawn to recheck the ABO/Rh on all A, B, and AB patients who are to receive type specific red cells but have no previous blood bank history[9].

The main cause of ABO discrepancy, accounting for the 38 cases, was due to mix-up at sample collection or mix-up in putting labels on the tubes. The other cause of patient misidentification is registration errors. It could be due either different patients have the same name (name similarity) or one patient having several medical record numbers (multiple medical record numbers). There were three cases of ABO discrepancies being caused by name similarity and five cases of the discrepancies being caused by multiple medical record numbers.

Multiple medical records occur when the patient is given a new medical record number without checking for an old one; in these two cases of ABO discrepancies were identified.

In a similar study, ABO discrepancies were due to phlebotomy errors and clerical errors during patient registration including people who usurped the identity of others by using their insurance cards[10]. However, in that study, there was no discussion of ABO subgroups. In our study, the majority of discrepancies were due to ABO subgroups, which are associated with unexpected reactions in the forward and reverse grouping due to weakly reacting or missing antigens[11]. In these cases technologists must proceed to type the patient RBCs with anti A_1 lectin (Dolichos biflorus), and exclude alloantibodies[11]. A subgroup is then identified if the technical results suggest it on two samples and mislabeling and/or misidentification are excluded. Alloantibodies like anti-M, anti P_1 may agglutinate the red cells used in serum tests if the cells carry the corresponding antigen. Special blood bank procedures are used to identify these room temperature alloantibodies[11]. In this study, most of the cases of subgroups 118 (70%) were A_1 or A_1B, according to the agglutination results with anti-A. This figure is close to some figures reported in the literature[11].

Avoidance of transfusion facilities: ABO confirmation on two independently collected samples before releasing packed red blood cells (PRBCS) other than group O, use a handheld electronic system to generate pretransfusion sample labels from data on the patient's wristband at the bedside, use a handheld electronic system to verify from the patient's wristband and unit label that the patient is the intended recipient, and employ a mechanical barrier system[12,13]. Reports of serious errors in transfusion medicine are due to misinterpretation of laboratory test results transmitted by facsimile; therefore, it is recommended that that laboratory results transmitted by facsimile be clarified, or another means of transmission used[14].

A quality assessment/quality improvement (QA/QI) process should be established by a QA/QI team which includes members of the transfusion service, transfusion committee and medical director to monitor assess and audit the tranfusionists' compliance with institutional blood administration policies and initiate corrective actions if needed, including the need for medical and nursing staff education[15,16].

Mislabeling was underestimated, where the tube could have contained the blood from another person with the same ABO group. This likelihood is especially high for blood group O which is the commonest blood group in Saudi Arabia[17]. Most of these mislabeling mistakes (38) came from the obstetrics and gynecology ward and delivery room, where the stress and workload in these areas can be very heavy.

Records are useful to trace back for legal cases and in the case of transfusion transmitted diseases[18]. It should be remembered that errors and deficiencies must be regarded as opportunities to improve the system rather than as human failures[2]. These measures include continued efforts for strict compliance with phlebotomy procedures, careful patient identification and accurate technical procedures in the blood bank. New methods to increase safety and efficiency of blood transfusions, i.e. bar code and radiofrequency technologies should be adopted[19].

CONCLUSION

ABO discrepancies could result from errors made by hospital staff during phlebotomy and collection of specimens, clerical errors and ABO subgroups. Technical errors are also a cause but none was found in this study. Careful techniques are needed to ensure proper collection and labeling of specimens during and after specimen collection to avoid any fatal complications. Repeat testing and investigation for ABO subgroups is very important.

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