Clinical pathology selected abstracts

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Clinical and laboratory predictors of fetal and neonatal alloimmune thrombocytopenia

February 2023—Fetal and neonatal alloimmune thrombocytopenia is the most common cause of intracranial hemorrhage in term infants with thrombocytopenia. It often presents as severe thrombocytopenia in the newborn or a spontaneous intracranial hemorrhage in a fetus in an uncomplicated pregnancy. Fetal and neonatal alloimmune thrombocytopenia (FNAIT) is caused by maternal antibodies against paternal platelet antigens, which cross the placenta and destroy fetal platelets. Studies have shown that FNAIT is underdiagnosed in pregnancies. However, primigravida screening for FNAIT is not performed in the United States. Diagnosing FNAIT involves identifying platelet incompatibility between mother and infant or mother and father and testing for human platelet antigens (HPAs) and the corresponding maternal antibodies. However, maternal antibodies are not found in a percentage of patients with FNAIT. Interventions for FNAIT may include intravenous immune globulin (IVIG) and corticosteroids during the antenatal period or platelet transfusions, or both. The authors conducted a study to determine the laboratory and clinical predictors of severe FNAIT to establish a diagnosis, which, in turn, could lead to treatment to prevent adverse sequelae from FNAIT. They reviewed data from a 30-year period in a retrospective cohort study. The investigators defined the index pregnancy as the first pregnancy where FNAIT was suspected due to the absence of a known cause, or confirmed or suspected intracranial hemorrhage in the fetus or newborn for whom the platelet count was low or unknown, or fetal death where the platelet count was low or unknown. They defined severe FNAIT outcomes as a birth platelet count below 20×10^9/L in the neonate, or neonatal intracranial hemorrhage associated with thrombocytopenia or unknown platelet levels, or neonatal death associated with thrombocytopenia or unknown platelet levels. Candidate predictors of severe FNAIT were maternal anti-HPA antibody, HPA incompatibility alone, a severe FNAIT outcome in a previous pregnancy, administration of antenatal IVIG, and age at pregnancy. These variables were selected based on their association with FNAIT in previous studies. The study results showed that during index pregnancies, 71 of 135 (52.6 percent) infants had severe outcomes, including a platelet count of 20×10^9/L or less (n=45), fetal or neonatal intracranial hemorrhage (n=32), or fetal death (n=4). Forty-two of 72 (58 percent) women in the cohort received antenatal IVIG during subsequent pregnancies. However, the use of antenatal IVIG was not independently associated with prevention of severe FNAIT in subsequent pregnancies. The only independent predictor of severe FNAIT in a subsequent pregnancy was maternal antibodies to HPAs (odds ratio, 25.3; $P=0.004$). Incompatibility for HPA-1a was the most common incompatibility associated with FNAIT in the cohort. The authors concluded that the presence of anti-HPA is highly predictive of the diagnosis of severe FNAIT. They noted that at least one infant without a maternal antibody had severe FNAIT recurrence (FNAIT in a subsequent pregnancy). Additional prospective studies are needed to improve the risk-prediction models for severe FNAIT.

Matusiak K, Patriquin CJ, Deniz S, et al. Clinical and laboratory predictors of fetal and neonatal alloimmune thrombocytopenia. *Transfusion*. 2022;62(11):2213–2222.

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Use of automation and dual verification to reduce wrong blood in tube events

Transfusion is a multistep process that begins with patient identification at the time of blood draw and ends with a transfusion event that is monitored for patient safety. Many steps and checks go into ensuring that patients receive the correct ABO type of red blood cells. Education, training, and competency testing and guidelines are

designed to ensure a safe transfusion process. While many steps are manual, automation is increasingly being used in the transfusion process to help prevent human error. End-to-end electronic systems have been shown to reduce but not eliminate error. Wrong blood in tube (WBIT) may occur when the blood is taken from the wrong patient and labeled with the intended patient's information or when the intended patient's blood sample is drawn but labeled with another patient's information. Although the total number of WBIT events at an institution may be small, such an incident may lead to a patient being transfused with the wrong type of blood, resulting in an acute hemolytic transfusion reaction. The authors conducted a study to evaluate their institution's efforts to reduce WBIT errors. These changes included introducing electronic patient identification at the point of pretransfusion specimen collection (automated system improvement), manual independent dual verification, and periodic education (human process system improvements). The authors studied the hospital's transfusion process retrospectively over a six-year period to show how automated system improvements and human process system improvements played a role in reducing WBIT events. During the study period, the hospital had replaced its blood bank identification bands and handwritten labels with scanners that read patients' hospital ID bands and printed labels. The latter were placed on the specimen at the patient's bedside. The patient's ABO type was compared with historical records, consistent with regulatory requirements. If patients had no prior blood type listed in their records, the hospital performed a second ABO Rh screen at a second venipuncture site at a different time. A transfusion services time-out verification form was filled out in the patient's presence to document dual independent verification of proper specimen labeling. The hospital conducted competency training annually to ensure that employees complied with the process. The study results showed that specimen-rejection rates for improper labeling decreased over the study period. Rejection decreased by 47 percent following the most recent intervention, which was widespread education about the transfusion process initiated at the behest of nursing administrative leadership. After implementing electronic positive patient identification combined with the time-out verification form, the occurrence of WBIT (for blood drawn in the emergency department) was one in 74,255 (0.001 percent) blood bank specimens. The authors noted that the initial WBIT rate was 43 in 100,000 (0.043 percent) at the start of the study. Continuous process improvement helped drive down the WBIT rate over time to one in 100,000 (0.001 percent) in the most recent year of the study. The authors showed that their institution was able to decrease the WBIT rate 10-fold through a multifaceted approach to transfusion process improvement. Because of heightened awareness and education about the transfusion specimen-collection process, the specimen rejection rate decreased by almost half. The authors concluded that further improvement can be achieved by adding more electronic system checks and automated systems at the point of transfusion.

Passwater M, Huggins YM, Delvo Favre ED, et al. Adding automation and independent dual verification to reduce wrong blood in tube (WBIT) events. *Am J Clin Pathol.* 2022;158:212–215.

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