TABLE 1. CP152

	Syringe Pump	Rapid Manual Push
16G, unwashed, -valve	NT	-0.07+/-0.15 (6)
16G, unwashed, +valve	NT	-3.38+/-1.37 (6)
16G, washed, -valve	NT	0.30+/-0.32 (6)
16G, washed, +valve	NT	-2.87+/-1.05 (6)
24G, unwashed, -valve	0.23+/-0.31 (3)	0.1+/-0.17 (9)
24G, unwashed, +valve	-0.20+/-0.23 (3)	-3.25+/-0.69 (27)
24G, washed, -valve	-0.13+/-0.19 (3)	0.33+/-0.20 (9)
24G, washed, +valve	0.03+/-0.29 (3)	-3.88+/-1.31 (21)

Values are average change in hematocrit (%) +/- standard error and (number of samples). NT=not tested.

operating room, each experienced blood-colored urine, laboratory evidence of hemolysis, and acute kidney injury. Clerical and serologic investigations revealed no cause for hemolysis. Mechanical hemolysis from transfusion rate, catheter gauge, or a recently introduced one-way valve was considered.

Study Design/Methods: In vitro simulated transfusions were performed via syringe. Measurements included hematocrit (Hct), free hemoglobin, and visual hemolysis index. Washed and unwashed red blood cells (RBCs) were tested with or without a one-way valve, using a 24 or 16 gauge (G) intravenous (IV) catheter. Each one-way valve was used to test three identical samples. Constant pressure was applied manually (rapidly, 1.43+/-0.49 ml/second) or with a mechanical syringe pump (slowly, 2 ml/min). A subset of the manual transfusions was timed. Control samples for baseline measurements were collected by gravity drip, without passing through the one-way valve or catheter.

Results/Findings: The one-way valve increased hemolysis markedly during rapid transfusion using both catheters as well as both washed and unwashed RBCs (see Table). With the 24G catheter, the mean change in Hct was -3.53+/-0.69% with the one-way valve and 0.22+/-0.13% without ($p<0.00001$). Comparing the one-way valves tested, differences in hemolysis were observed (change in Hct; $p<0.0001$). During rapid manual transfusion with a 24G catheter and unwashed RBCs, hemolysis was greater for samples that took longer to transfuse 4.5ml when using a one-way valve (change in Hct versus time: $r=-0.75$, $p<0.0001$) compared to a significantly different ($p=0.0085$) slight increase in hemolysis for samples that took less time to transfuse 4.5ml when not using a one-way valve (change in Hct versus time: $r=0.58$, $p=0.23$). Correlations between time and hemolysis were similar, but insignificant using 24G with washed RBCs and the 16G IV catheter.

Conclusion: Mechanical hemolysis should be considered when investigating possible hemolytic transfusion reactions, especially with high rates of transfusion and use of a one-way valve. During rapid manual transfusion with the one-way valve, greater resistance was associated with increased hemolysis.

CP153

Multidisciplinary Management of Gerbich Hemolytic Disease of the Newborn

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Background/Case Studies: Gerbich (Ge) antigens expressed on glycophorin C are present in 99.9% of the population. Ge antibodies cause delayed hemolytic transfusion reactions and hemolytic disease of the fetus and newborn (HDFN). Ge antibodies also suppress erythropoiesis resulting in late-onset anemia. We report a case of HDFN due to anti-Ge3.

Study Design/Methods: A woman of Paraguayan origin with prior terminated pregnancies presented at 24 weeks gestation with passive anti-D and an anti-Ge3 titer of 256. She was D- and GE:-2,-3, 4 by antigen typing. Her obstetrician scheduled maternal blood collection near her due date for possible neonatal transfusion, but the woman went into labor at 37 weeks. Cord blood was DAT positive for IgG; the eluate confirmed anti-D and anti-Ge3. The birth hemoglobin (Hgb) was 12.6 g/dL, reticulocyte (retic) was 8.6%, bilirubin (bili) was 2.8 mg/dL; the infant was discharged. On day 7 of life, the infant was referred to Pediatric Hematology for lethargy and poor feeding, with Hgb 7.6 g/dL, retic 2.6%, and bili 6.6 mg/dL. Ge3- blood was not available from the blood center or rare donor registry. The mother was B Rh- and baby was B Rh+. Obstetrics had to authorize maternal blood donation due to her Hgb of 10.9 g/dL. Maternal blood collection and RBC washing was expedited and the infant received 40mL of maternal RBCs within 24 hours, at which time his Hgb was 6.1 g/dL. Post-transfusion Hgb was 10.8 g/dL. One week later, the infant was symptomatic with Hgb 7.1 g/dL, retic 1.0%, bili 2.1 mg/dL. A 2nd aliquot of 60mL washed maternal cells was transfused. Two weeks thereafter, the infant had Hgb 7.8 g/dL, retic 0.7%, anti-Ge3 titer 8, and needed another transfusion. The maternal blood stored for just 3 weeks had hemolyzed necessitating a 2nd maternal donation for baby's 3rd transfusion. At 6 weeks, the infant's anti-Ge3 titer was 2, Hgb 9.2 g/dL, retic 1.7%; no transfusion was necessary. At 8 weeks of life, Hgb was 10.2 g/dL, retic was 3.3%, and the baby was thriving.

Results/Findings: Serologic studies at the hospital and reference blood center confirmed the antibodies and risk of anti-Ge3 HDFN. Molecular analysis revealed that the mother was homozygous Ge3-negative *GE*01.-03*, the father had homozygous wild type *GE*01*, and the infant was heterozygous *GE*01/GE*01.-03*.

Conclusion: The infant had HDFN due to antibodies to the high prevalence Ge3 antigen. The continued need for transfusion was consistent with hemolysis and suppression of erythrocyte production caused by anti-Ge3. Hemolysis of stored maternal blood was consistent with the absence of glycophorin C. This case demonstrates that cooperative multidisciplinary care among the blood bank, donor center, obstetrics, and hematology in a rare case of HDFN resulted in a successful neonatal outcome.

CP154

Pediatric Blood Utilization: Optimizing Transfusions in a Very Heterogeneous Population

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Background/Case Studies: Patient blood management is a collaborative approach to optimize transfusion therapies to improve patient outcomes. In pediatrics, blood management is not 'one size fits all' given the paucity of clinical trials to guide evidence-based practice. In addition, pediatric care encompasses a very heterogeneous patient population such that applying one set of guidelines is difficult.

Because there are no standard, evidence-based clinical best practices regarding blood product usage in all children, unnecessary variation is occurring at our institution. We designed a robust analytics process to study baseline clinical practice and examine blood product usage, and plan to target the three pediatric sub-specialties with highest usage to establish standards in order to decrease variation/unnecessary transfusions.

Study Design/Methods: A data base encompassing all admissions and outpatient visits to a large, tertiary care academic children's and women's hospital was established, and included all relevant patient demographics, diagnostic and procedural codes, attending physician and specialty for each visit/admission, relevant hematology/coagulation laboratory results and blood product orders. We focused on RBC orders given the TRIPICU randomized clinical trial results (1) supporting a hemoglobin trigger of 7 g/dL in stable critically ill children and FFP since anecdotally we noted many children receiving this product for only minimally elevated international normalized ratio (INR) values without bleeding.

Results/Findings: In 2016, 14, 247 RBC orders occurred and the top three patient groups were: 34% in congenital heart disease patients, 25% in hematology/oncology patients and 14% in neonates in the neonatal intensive care unit (NICU). Average hemoglobin of every patient was 9.85 g/dL as measured in the 72 hours prior to RBC order placement. In 2016, 3105 FFP orders occurred and the top three patient groups were: 46% in neonates in the NICU, 28% in congenital heart disease patients and 13% in pediatric intensive care patients. Average INR of every patient was 2.09 as measured in the 72 hours prior to FFP order placement.

Conclusion: We have designed a robust data base that is continually updated for children in a large, tertiary care academic children's hospital. This serves as an important benchmark in pediatric blood utilization, and we plan to leverage usage patterns to make relevant practice changes in the care of children with a heterogeneous set of illnesses.

1. Lacroix J, Hubert PC, Hutchison JS et al. Transfusion strategies for patients in pediatric intensive care units. NEJM 2007;356:1609-19.