Canadian Obstetrical Pediatric Transfusion Network (COPTN)
2018 Survey Report

Introduction

The Canadian Obstetrical Pediatric Transfusion Network (COPTN) is a sub-committee of the Canadian Society for Transfusion Medicine (CSTM). It was founded in 2017 and its mandate is to assess, analyze and strive to implement best practices in pediatric and obstetrical transfusion practice in Canada.

One of the first projects this committee undertook was to send out a Canada-wide survey pertaining to perinatal testing and RhIG administration practice in the perinatal population. The survey was distributed on March 13 2018, with biweekly reminders, and was originally scheduled to end April 30, 2018, but was extended to June 30, 2018 in order to increase the number of respondents.

The objective of the survey was to assess national practice related to perinatal testing and to provide feedback and guidance regarding best practice.

Scope

The survey was distributed to all provinces and territories in Canada. For all hospitals, except those in Quebec, Canadian Blood Services (CBS) distributed the survey to all of their contact hospitals and to centralized laboratories that perform perinatal testing for individual hospitals. In Quebec, the survey was distributed by Héma-Québec to all hospital contacts. COPTN members and other volunteers followed up with individual sites and regions to maximize the response rate.

Survey Content

The survey consisted of five sections:

A. Demographics: 5 questions
B. Antenatal: 35 questions
C. Neonates including scenario questions: 22 questions plus 3 scenarios
D. RhIG and fetal-maternal hemorrhage (FMH) assessment: 32 questions
E. Contact information: 5 items-name, email, laboratory, city/town and province/territory

This was a lengthy survey, but had a great deal of skip logic built in to cover all sizes of transfusion services. The more complex perinatal services had the most questions to complete; the least complex services had few questions to answer.

Results

A. Demographics Highlights

Five hundred and ninety-six (596) hospitals and laboratories were sent this survey and 580 organizations responded, representing a 97.3% response rate. Senior or Charge Technologists were identified as the role that primarily completed the survey (Figure 1).

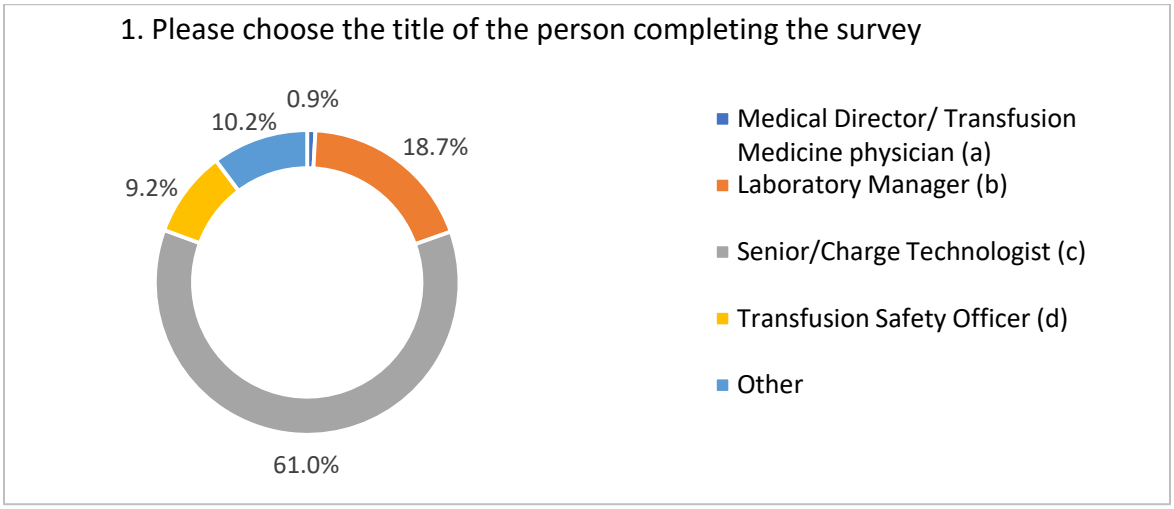

Figure 1: Percentages of the various titles responding to the survey

The types of facilities responding were predominantly community hospitals (Figure 2).

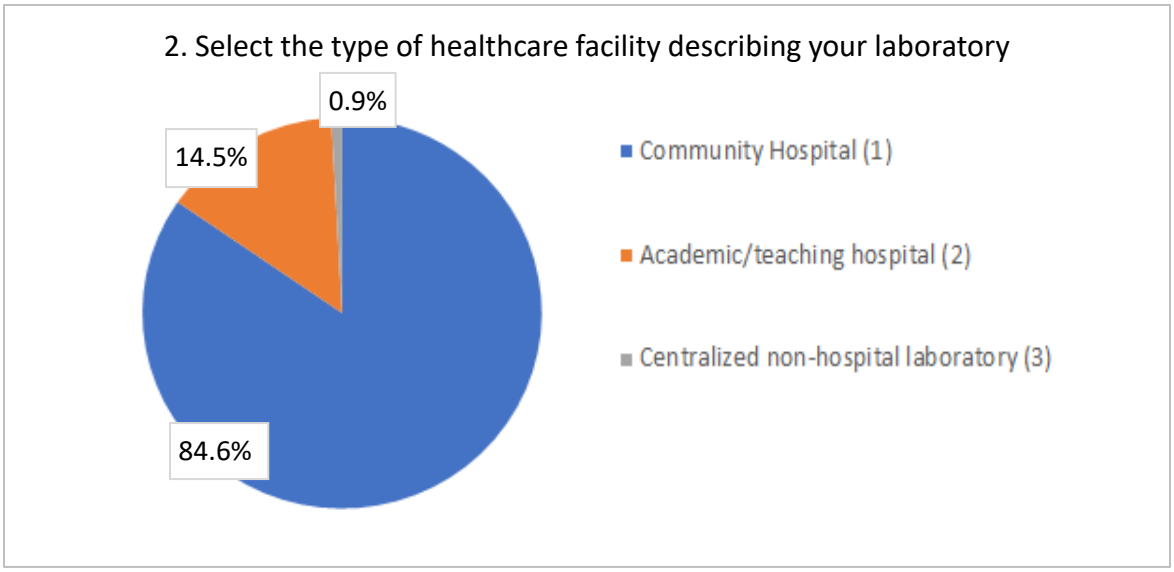

Figure 2: Percentages of healthcare facility types

The number of beds at each hospital ranged from "under 100" at 64.2% to "over 500" representing 6.8% of the responses. Not all facilities perform antenatal testing:

- 41.5% perform testing
- 58.5% do not

It should be noted that even though some facilities do not offer antenatal testing, some corresponding antenatal transfusion activities occur there, such as RhIG administration.

B. Antenatal Highlights

The survey enquired about perinatal guidelines used to guide testing practices:

32.5% used the Society of Obstetrics and Gynecology Canada
7% used the British Committee for Standards in Hematology
0% used the Australian Blood Authority
49% had no guidelines or were unsure
17.7% indicated "other"

Hospitals were asked what tests are performed during the initial antenatal assessment. ABO grouping, Rh(D) grouping and antibody screen were identified by 95% or greater of the laboratories responding. Twenty-five percent also identified weak D testing by IAT as a routine antenatal test. For Rh(D) testing of females with childbearing potential, 51% of the laboratories repeat weaker than normal D tests with another reagent or method (Figure 3).

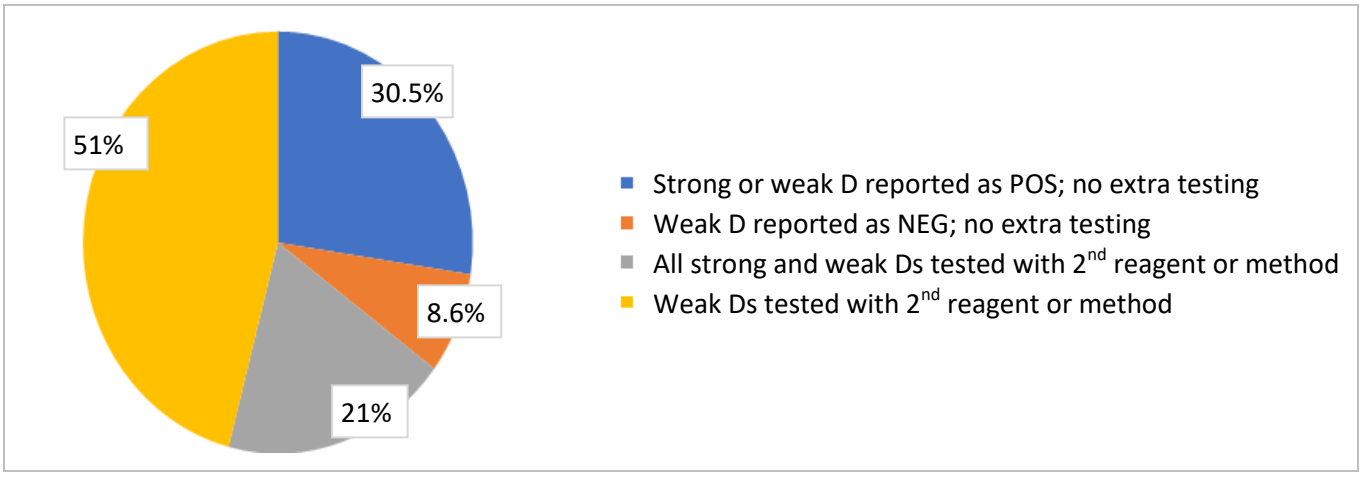

Figure 3: Rh(D) testing in females of childbearing potential

Genotyping was performed on all Rh negative mothers by 3.3% of the respondents.

70.8% perform genotyping when there is a weak reaction with one or more anti-D reagents,
50.2% perform genotyping when there is a discrepancy from the previous testing,
38.3% genotype when there are discrepant reactions between two or more reagents, and
21% do not perform genotype testing at all.

Question 7 in the survey determined the D testing results scenarios in which the hospital would administer RhIG antenatally (Table 1).

Table 1. D testing results determining RhIG antenatal administration	
Statement	**Response Rate**
1. Both D direct testing and indirect IAT testing are negative	71.9%
2. D direct testing negative and IAT testing weakly positive	35.1%
3. Weaker than expected D testing with one or more reagents or techniques	15.8%
4. Discrepant D test results in two or more reagents or techniques	14.0%
5. Discrepancies with previous testing	15.8%
6. Other	14.0%

Antibody screening methods varied across the laboratory spectrum, but the most popular technique was the manual gel method (Figure 4).

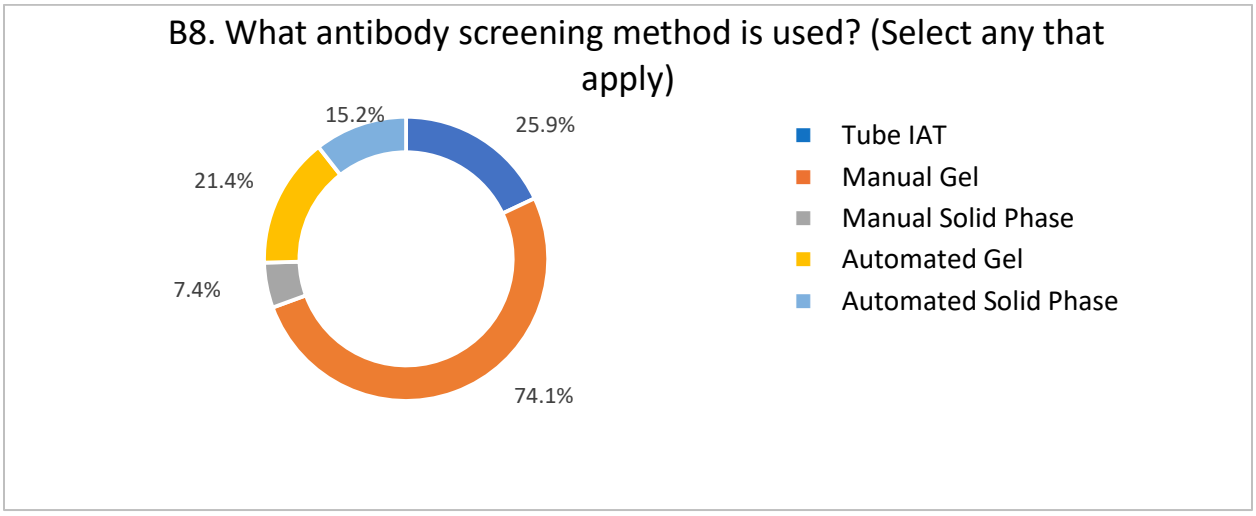

Figure 4: Antibody screening methods

If the antibody screen was positive, 60.4% of the laboratories indicated that the antibody identification was performed on site. The most common method used for antibody identification is the same as the antibody screen: manual gel technique (Table 2).

Table 2. Primary method used for antibody identification	
Method	**Response Rate**
1. Tube IAT	2.8%
2. Manual gel	69.0%
3. Manual solid phase	3.4%
4. Automated gel	7.6%
5. Automated solid phase	15.8%

Fifty nine percent (59%) of the sites titrate clinically significant antibodies on site; of these, 90.7% use a saline IAT technique and 9.3% use manual gel.

Greater than 95% of the laboratories surveyed indicated that the following RBC alloantibodies would be routinely titrated: anti-D, -C, -c, -E, -e, -Jk^{a}, -Jk^{b}, -Fy^{a}, -Fy^{b}, and –S. There was less titration of (between 80-90%) anti-s and anti-K and much less titration of (12-61%) anti-N, anti-M, IgG anti-M and "other" (Figure 5).

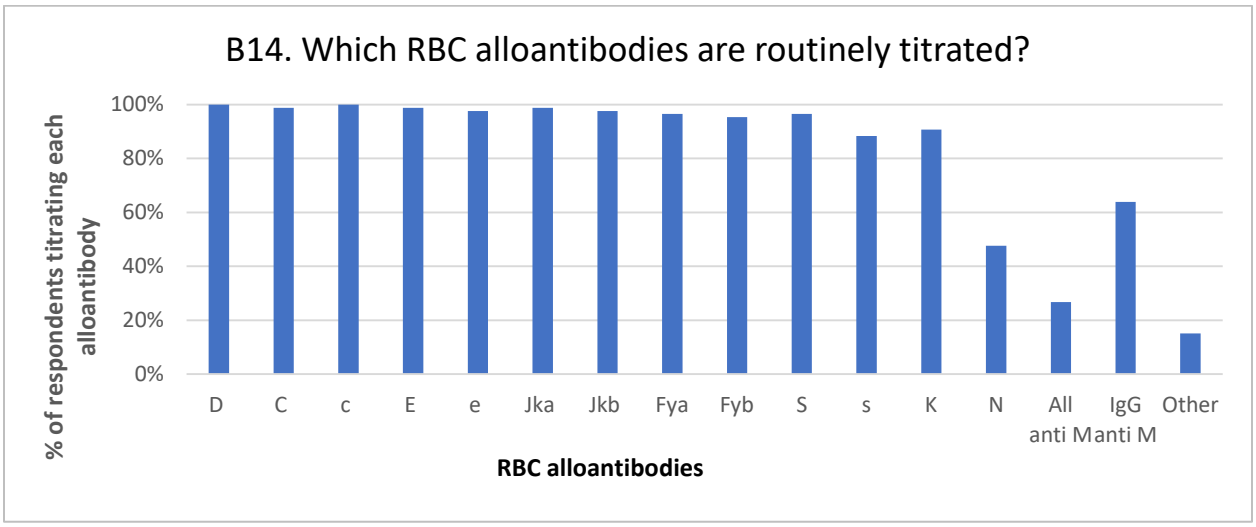

Figure 5: RBC alloantibodies routinely titrated

The critical titre level identified by the laboratories completing the survey ranged from 8 to 64, with the results as follows in Table 3:

Table 3. Critical antibody titres				
Titre of 8	**Titre of 16**	**Titre of 32**	**Titre of 64**	**Other**
3.8%	34.6%	21.2%	1.9%	38.5%

There were a few case scenario questions in this section. One case that pertained to titration, asked about the phenotype of reagent RBCs that would be used for a prenatal patient with both an anti-c and anti-E. Most laboratories (54.9-62.6%) demonstrated a single antigen titration approach as opposed to selecting a cell that would provide a combined titre (Figure 6).

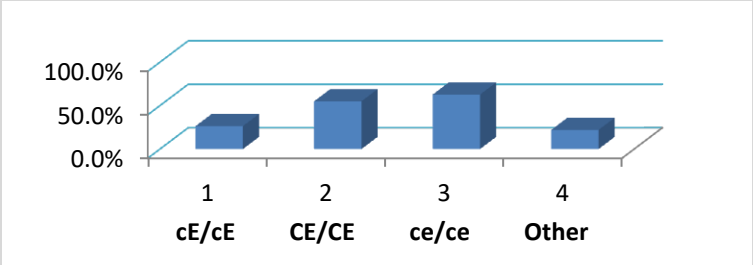

Figure 6: Phenotype of reagent RBCs used for titration of anti-c

When asked about performing mid-pregnancy antibody screens, 75.3% of the laboratories responded that this test is performed on some or all patients. Of those laboratories that do perform this test:

- 55.2% perform it for all patients
- 36.6% perform it for D negative patients
- 29.5% perform it for patients with clinically significant antibodies
- 6.0% indicated it is not routinely performed

There was an even split pertaining to practice for accepting Rh (D) typing and negative antibody screen results from an outside laboratory for the purposes of providing RhIG with 50.2% of respondents indicating that this is acceptable practice, but 47.7% did not.

C. NICU and Baby Highlights

Only 15.6% (90/576) of the sites had a NICU and the distribution across the acuity levels is as follows:

Table 4. NICU acuity level distribution	
Levels	**Response Rate**
I	3.4%
II	39.8%
III	19.3%
IV	9.1%
Centralized with multiple sites	2.3%
Unsure	26.1%

Of the sites that deliver babies, a variety of size of service was demonstrated, ranging from 1-50 deliveries per year to sites that deliver over 1500 babies per year. The type of tests that may be performed on cord blood from these babies is illustrated in Figure 7.

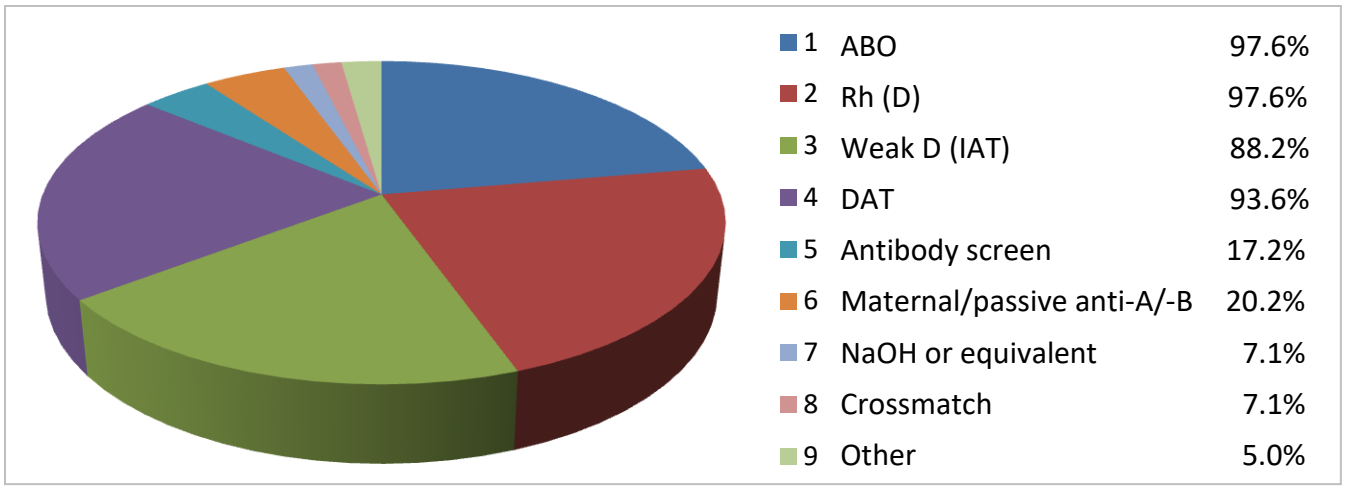

Figure 7: Types of tests performed on cord blood

The majority of laboratories test their cord samples via tube testing for ABO and Rh (90.8%), 19.1% use gel and a few (4.2%) use solid phase techniques. Most respondents (72%) indicated that antibody screening is not performed on cord samples. (Of the labs that do perform cord antibody screening, the most popular method is gel (17.1%), but 6.1% use tube and 2.7% use solid phase. Finally, for cord DATs, 59.9% use the tube method, 33% use gel and 2% use solid phase.)

When asked what DAT reagents are used, most laboratories (52.3%) use monospecific anti-IgG to test their cord samples (Figure 8).

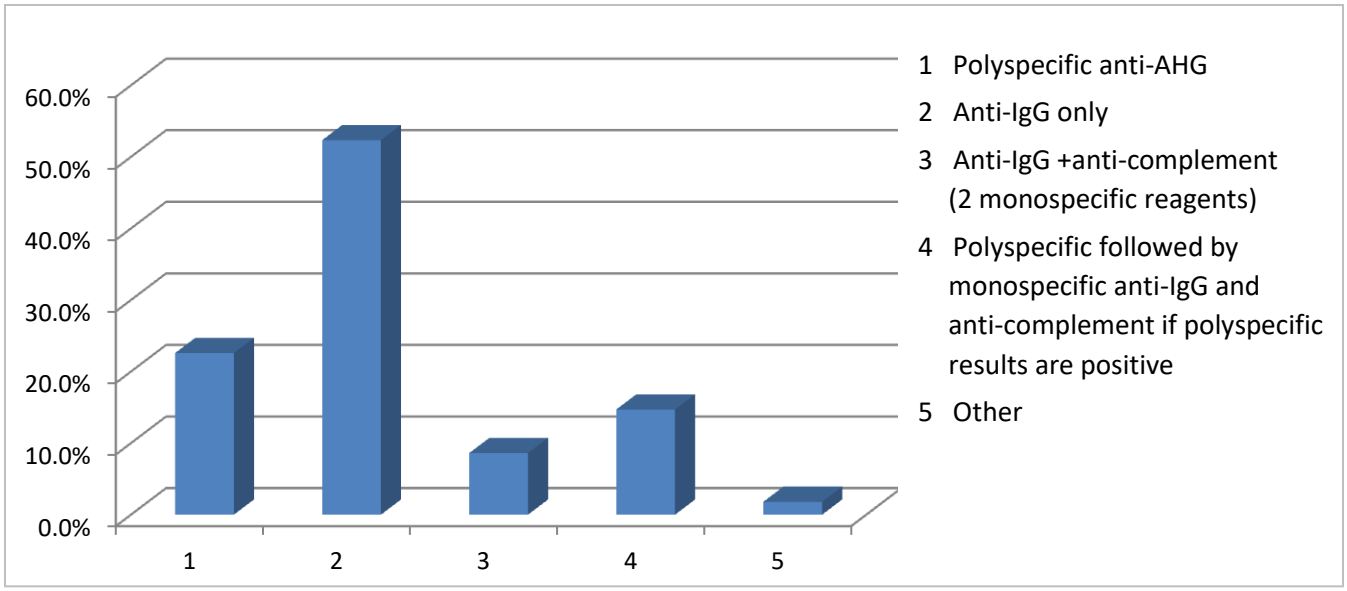

Figure 8: Type of reagents used for cord DAT testing

The next questions determined under which circumstances a cord DAT was performed and 33.2% of the laboratories perform a DAT on all cord samples received. For the 66.8% who do not automatically

perform a DAT on every cord sample, scenarios were presented that would trigger a DAT order and are illustrated in Table 5. A minority of laboratories screen their DAT orders (25.8%) before testing.

Table 5. Scenarios prompting DAT cord testing	
Cords from all group O mothers	17.9%
Cords from all mothers with clinically significant antibodies	65.3%
Cords from all Rh negative mothers	51.6%
On physician request	91.1%
Following a review that indicates hemolysis	25.3%
Cords with fetal ABO incompatibility with the mother	23.2%

A series of scenarios were presented in this section of the survey to determine the type of testing routinely performed in these cases. The first case enquired about the routine cord tests performed for a baby whose mother is Rh negative. The results are summarized in Table 6.

Table 6. Routine cord testing from baby with an Rh negative mother	
ABO	89.6%
Rh (D)	97.6%
DAT	66.0%
Antibody screen	2.7%
Phenotyping	0.7%
No testing	0.3%
Other	16.2%

Another scenario pertained to the routine testing performed on cord samples when the mother is group O. About half of the laboratories perform an ABO, Rh and a DAT (Table 7) in this case.

Table 7. Routine cord testing from baby with a group O mother	
ABO	57.2%
Rh (D)	54.5%
DAT	49.5%
Antibody screen	0.7%
Phenotyping	0%
No testing	29.6%
Other	16.5%

The same panel of tests was used in a scenario about cord testing when the mother has clinically significant antibodies (Table 8).

Table 8. Cord testing from baby with a mother having clinically significant antibodies	
ABO	83.8%
Rh (D)	83.8%
DAT	84.8%
Antibody screen	10.4%
Phenotyping	34.3%
No testing	3.7%
Other	22.6%

D. RhIG and Fetal Maternal Hemorrhage (FMH) Assessment

The majority of the laboratories surveyed (90.1%) responded that they do dispense RhIG for antenatal or postnatal indications. Most facilities use the 1500 IU (300 µg) size for both antenatal (97.3%) and postnatal (76.1%) purposes. Sixty-nine (69.1%) of the respondents also issue the 1500 IU size for potential immunizing events like trauma, amniocentesis and therapeutic or spontaneous abortions.

The majority of laboratories polled perform either a neonatal or cord Rh(D) typing before dispensing RhIG to the mother (Figure 9).

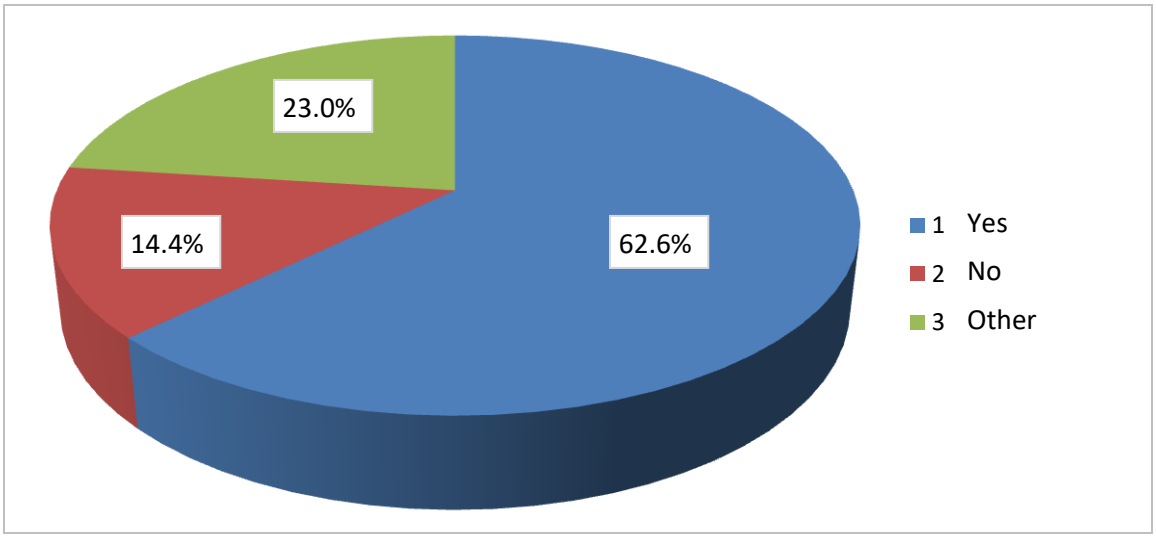

Figure 9: Neonate/cord Rh(D) testing performed before RhIG administration

For FMH assessment, 25.3% of the facilities perform this testing on site, 29.1% refer the samples to another laboratory and the majority of the laboratories (45.6%) do not perform any FMH testing at all. The main screening test used for FMH is the Rosette Test at 48.3% (Figure 10), closely followed by the Kleihauer-Betke (KB) at 45.5%.

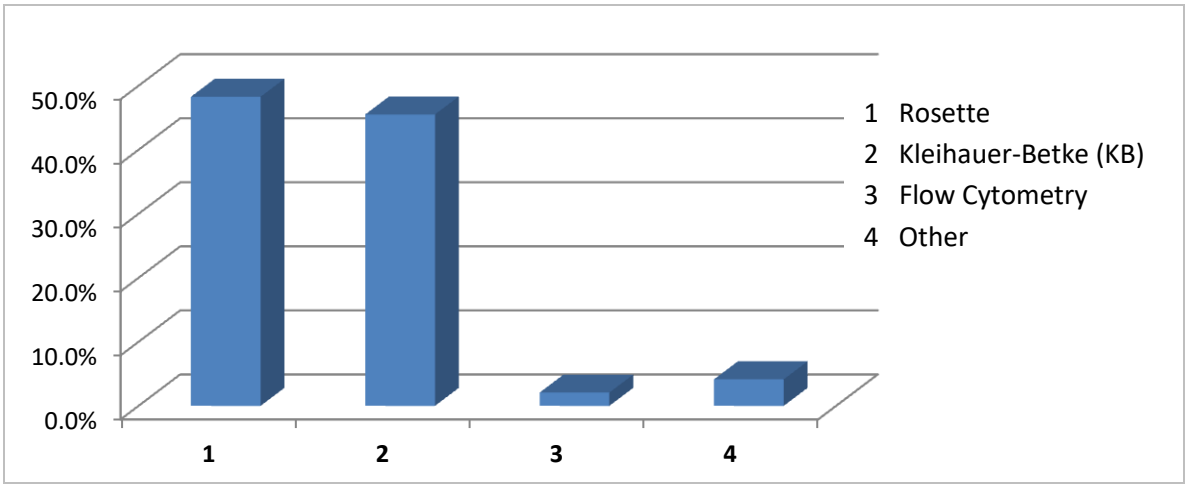

Figure 10: Types of FMH screening tests used

If a FMH assessment is required for an Rh positive mother, most facilities perform a KB test (80%), 1.4% use flow cytometry and 18.6% of the facilities identified that another test was used. For quantification of a FMH, a number of different tests were used to calculate the appropriate dose of RhIG; 69.6% use the KB, 2.9% use flow cytometry and 27.5% selected "other", with a further explanation. All sites selecting "other" indicated that FMH are sent out to another laboratory.

For the KB test, 73% of laboratories use commercial kits and 27% prepare their reagents in house. Many facilities prepare their KB controls in house: 6.2% use commercial controls and 93.8% use in house controls. A small number of facilities (12.5%) follow up a positive KB test with flow cytometry, but most (87.5%) do not.

There are a variety of methods used to calculate the volume of a FMH in the KB as illustrated in Table 9, but the most utilized method is the one described by AABB and CAP (College of American Pathologists).

Table 9. Methods used to calculate FMH volume in KB test	
AABB/CAP formula	57.2%
Mollison formula	5.3%
Other	23.0%
No answer	14.5%

Most facilities (68.2%) did not adjust for individual maternal blood volume.

The majority of the laboratories calculate the appropriate dose of RhIG by either calculating the FMH volume and always rounding up a vial or calculating the FMH volume, round to the nearest vial (up or down), and then adding a vial (Figure 10).

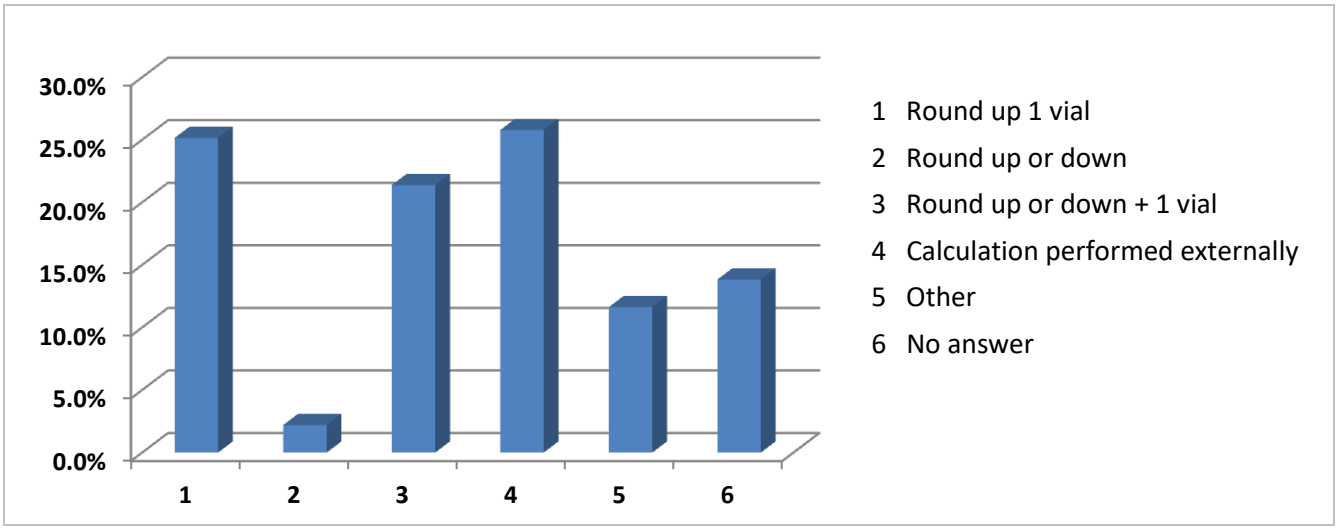

Figure 10: Methods of RhIG dose calculations

Discussion

There is diversity in practice for maternal and cord testing across Canada. Some examples of this diversity are benign like the different testing technology used for blood grouping and antibody screening. All validated, evidence based testing techniques are good techniques, even if they vary from laboratory to laboratory. Other differences may indicate that unnecessary testing is regularly performed which does not match the culture of the Choosing Wisely Canada movement, and may be a waste of time and resources. Other practice differences identified in survey may suggest that a practice improvement would benefit patient care.

Benign differences identified:

- Test methodology for blood grouping and antibody screening
- Critical antibody titre levels (may depend on technology used)
- Phenotype of RBCs used for titration
- Rare use of flow cytometry for a positive KB test
- Various methods used to calculate the postnatal dose of RhIG

Unnecessary testing:

- Performing mid-pregnancy screens on Rh positive mothers
- Testing DATs for all cords, or from all group O mothers or all Rh negative mothers, regardless of hemolysis indications
- Anti-N titrations
- Performing passive anti-A and anti-B testing on cord samples
- Use of polyspecific DAT reagents for cord testing when anti-IgG will suffice

- Performing antibody screening on cords

Practice Improvement Opportunities

- Implementation of perinatal guidelines to guide testing practices
- Weak D (by IAT) testing should NOT be performed on patients except to determine eligibility for Rh immune globulin
- Don't interpret a weaker than normal D (by direct agglutination) results as Rh positive for female patients of child bearing potential
- Perform DATs on cord samples from mothers who have clinically significant antibodies
- Perform phenotyping where possible on cord samples from mothers with clinically significant antibodies
- Perform Rh testing on the cord/neonatal sample and FMH assessment before RhIG administration to the mother, if possible, to ensure the RhIG is necessary and that the RhIG dose is correct
- Limit antibody titrations of anti-K. Are low titres of anti-K being misinterpreted by clinicians as a low risk pregnancy? Any level of anti-K may be clinically significant, so titrations are unnecessary. However, some clinicians use anti-K titration levels as a gauge to determine the frequency of performing Doppler ultrasounds on the potentially affected fetus
- Always perform an antibody screen on Rh negative mothers at 28 weeks. The RhIG may be administered once the sample is drawn and the antibody screen may be completed later
- Do not use cord samples for crossmatching

The survey demonstrates that some sites need to adopt more current perinatal practices to provide both the best patient care and to reduce wastage of precious health care dollars by eliminating unnecessary tests. For some patient safety examples, some survey results indicate that postpartum RhIG is administered without any FMH assessment, so there is no assurance that the RhIG dose is sufficient to prevent Rh immunization in the mother. A few sites use cord samples for crossmatching. This practice contravenes transfusion standards and is not recommended.

Next Steps

This report will be emailed to all of the hospitals in Canada that participated in the survey. It will also be posted on CSTM's website and will guide provincial offices and COPTN members in addressing perinatal priority items in a resource accessible to laboratories and other healthcare professionals.