A Clinical Audit Of RhD Immunoglobulin In New Zealand

Final Report

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EXECUTIVE SUMMARY

A retrospective two part audit was undertaken by six NZBS Transfusion Nurse Specialists & two DHB Clinical Nurse Specialists at eight District Health Boards (DHBs). This audit was conducted in two parts, looking firstly at RhD negative women giving birth and secondly at requests for RhD Immunoglobulin received, ensuring the clinical events in the two audits didn't overlap. Data was obtained from NZBS, DHB and community laboratories, clinical notes and Lead Maternity Carers.

In the first part of the audit, 460 RhD negative women giving birth within public hospitals and birthing centres at eight DHBs where the mother was known to be RhD negative were assessed. 96% of RhD negative women who gave birth to RhD positive babies received RhD Immunoglobulin and 98% of those received it within 72 hours of birth.

In the second part of the audit, 640 RhD Immunoglobulin requests were audited (eighty per DHB). The majority of requests were for births and third trimester obstetric indications. Although no formal Ministry of Health (MOH) policy exists for Routine Antenatal Anti-D Prophylaxis, 5% of requests were for this indication. Only 3 of the 46 requests (7%) relating to events occurring in the first trimester received the recommended 250IU dose of RhD Immunoglobulin. The remaining cases received 625IU.

In both parts of the audit it was noted that four of the eight DHBs seldom performed Kleihauer tests. The difference between the DHBs who did or did not perform Kleihauer tests (87% vs 2%) was highly statistically significant. This marked difference correlated with the absence of, or knowledge of, a policy on Kleihauer testing within the DHB.

Administration was documented in 99% of available records and consent in 93%. The documentation of administration and consent for RhD Immunoglobulin could not be established in 6% of doses because the respective records either could not be found or were not provided by the LMC.

Recommendations:

- That clinical staff are reminded of the significance of post-exposure anti-D prophylaxis, both at birth and antenatally.
- That communication between LMCs when handing over patients includes whether RhD Immunoglobulin administration has occurred.
- That clinical staff need to be further educated on the availability and clinical indications for the 250 IU RhD Immunoglobulin dose.
- That clinical staff are reminded of the importance of maintaining true and accurate records of the prescribing, consenting and administration of RhD immunoglobulin.
- That the importance of testing for fetomaternal haemorrhage is reiterated, and that this is promulgated in DHB policies throughout New Zealand.
- That laboratories anticipating a large increase in Kleihauer testing give consideration to other technologies such as gel agglutination micro columns as a screening test.

INTRODUCTION

RhD immunoglobulin (also known as Anti-D) is used to prevent Haemolytic Disease of the Fetus and Newborn (HDFN). This is a severe and potentially fatal fetal complication of pregnancy and is caused by blood group incompatibilities between mother and fetus. Since the introduction of the Rhesus Intervention Programme in New Zealand there has been a significant reduction in the incidence and severity of HDFN. Despite this programme, some women still become sensitised. Failure of post-exposure prophylaxis has been identified as a significant cause of HDFN, as well as sensitisation due to "silent" fetomaternal bleeds[1,2].

RhD immunoglobulin is a fractionated blood product derived from human plasma. First introduced to New Zealand in 1968, the plasma was donated by women with anti-D titres of over 1000, typically following the loss of a fetus or baby to HDFN[3]. Donations now also come from donors who have been actively stimulated to increase the level of anti-D antibodies.

RhD immunoglobulin products available for use within New Zealand are:

- RhD Immunoglobulin VF, 250 IU (for use in the first trimester) and 625 IU for IM administration (CSL Bioplasma, Australia)
- WinRho SDF 600 IU for IV or IM administration (Cangene, Canada)

During 2008 there were 64,343 births registered in New Zealand according to Statistics New Zealand. From this it is estimated that approximately:

- 14% (9,008) of all births are to RhD negative mothers[3]
- 63% (5,675) of RhD negative mothers gave birth to an RhD positive infant.
- 8.8% (5,675) of all births registered in New Zealand during 2007 were RhD positive babies to RhD negative mothers.
- 1.3% (836) of live births have HDFN requiring treatment (DAT positive babies requiring phototherapy or other intervention).[4]

RANZCOG Indications for Administration

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) Guidelines state that all RhD negative women who have not actively formed their own anti-D antibody should be offered RhD immunoglobulin for the following indications[5]:

First trimester indications: Dose: 250 IU

- Chorionic Villous Sampling
- Miscarriage
- Termination of pregnancy
- Ectopic pregnancy

Second & third trimester indications: Dose: 600 or 625 IU

- Obstetric Haemorrhage
- Amniocentesis, Cordocentesis
- External cephalic version of a breech presentation.
- Abdominal Trauma

Routine Antenatal Anti-D Prophylaxis (Australia)*: Dose: 600 or 625 IU

- All RhD negative women who have not actively formed their own anti-D antibody at approximately 28 weeks gestation and again at approximately 34 weeks gestation.

Post-natally, within 72 hours.

- All women who deliver an Rh (D) positive baby should have quantification of feto-maternal haemorrhage to guide appropriate prophylaxis.

Estimation of the size of fetomaternal haemorrhage, usually performed using the Kleihauer test, is recommended following giving birth and for all sensitising events occurring after 20 weeks gestation.

* Routine Antenatal Anti-D Prophylaxis is not national policy in New Zealand.

Although not part of the RANZCOG guidelines, RhD Immunoglobulin is also indicated in RhD negative recipients of RhD positive platelets[6] and femoral head bones.

AIM

The audit was in two parts.

Part 1: Births

- As the highest risk of sensitisation is at the time of birth, the aim of the first part of this audit was to assess the proportion of RhD negative mothers being appropriately treated with RhD immunoglobulin following birth in eight major centres in New Zealand.

Part 2: Requests for RhD Immunoglobulin

- The aim of the second part of this audit was to assess other indications for RhD immunoglobulin by reviewing RhD immunoglobulin requests in the same eight major centres.
- It is recognised that routine antenatal prophylaxis is RANZCOG policy but not yet Ministry of Health policy. As such, routine antenatal prophylaxis was considered as neither obligatory nor inappropriate.

METHOD

The audit proposal was developed by New Zealand Blood Service (NZBS). The New Zealand College of Midwives was consulted on the proposal and changes made accordingly. Ethics approval was obtained from the Multi-Region Ethics Committee and the audit proposal was also approved by the Hospital Transfusion Committees at the participating DHBs.

Data was collected retrospectively by the six NZBS Transfusion Nurse Specialists (TNS) based in Auckland, Hamilton, Palmerston North, Wellington, Christchurch and Dunedin, and Clinical Nurse Specialists in Transfusion Medicine employed by Counties Manukau and Waitemata District Health Boards.

Part 1: Births

The NHI numbers of the last 500 births at each of the eight DHBs' public hospitals were sourced from New Zealand Health Information Services (NZHIS). This data covered publicly funded hospitals and birthing centres, approximately 95% of deliveries in New Zealand. The mothers' blood group and antibody screen results were sourced from NZBS and community laboratories.

The last 50 births at the public hospitals and birthing centres at each of the eight DHBs where the mother was known to be RhD negative were identified. Each of these births was then assessed for the following:

- Was the mother known to have an immune anti-D?
- Was a cord blood sample received?
- Was RhD immunoglobulin given?
- What dose was given?
- Was consent and administration documented?
- Was a Kleihauer test requested and what was the result?
- Was RhD immunoglobulin given within 72 hours of delivery?

The additional data required to answer these questions was collected from the DHBs' laboratory, NZBS's records and the mother's clinical notes. If the hospital notes did not answer all the questions, the Lead Maternity Carer (LMC) was contacted to check if these details were recorded in separate notes held by the LMC.

Part 2: Requests for RhD Immunoglobulin
80 requests for RhD Immunoglobulin made by each of the eight DHBs were assessed. For Waitemata, Counties Manukau, MidCentral and Otago, the last 80 requests made to the blood banks were identified. For Auckland, Wellington, Waikato and Christchurch, the last 50 requests made to the blood bank and a further 30 requests (10 per month over 3 months) made to the manufacturing sites (including requests for stocking fridges) were identified.

There was no duplication of the events audited in the two parts of the audit.

The requests for RhD Immunoglobulin were assessed for the following:

- What was the patient's RhD group
- What dose was used?
- What was the indication?
- Was consent and administration documented?
- Was a Kleihauer test requested and what was the result?

The additional data required to answer these questions was collected from the DHBs' laboratory, NZBS's records and the clinical notes. This included independent LMCs.

The data was collated via secure password-protected web entry into a secure PostgreSQL database with restricted access, located on the NZBS network. Only the TNS group and the Transfusion Medicine Specialists (TMS) overseeing the audit had access to the database. The only identifying data used was the NHI number and/or Progesa (NZBS blood management system) number. All identifying data was removed prior to reporting. This report was presented in draft to the Hospital Transfusion Committees of the participating District Health Boards for comment. The final report is issued to the audited institutions and to the other thirteen district health boards via New Zealand Blood Service's national Demand Management contacts.

RESULTS

The first part of the audit assessed 460 births from RhD negative mothers occurring between 22 September 2008 and 1 January 2009 (table 1). This exceeded the original target of 50 births per audit site. The low incidence of RhD negative mothers within Counties Manukau DHB, due, in part to racial diversity, necessitated 1500 births at that DHB be reviewed to obtain at least 50 births to RhD negative women. All births were in the third trimester.

Table 1: *Number of births and requests for RhD Immunoglobulin audited by DHB*

DHB	Births from RhD negative mothers	Requests for RhD Immunoglobulin
Auckland	49	80
Canterbury	68	80
Capital & Coast	61	80
Counties Manukau	55	80
Mid Central	49	80
Otago	68	80
Waikato	54	80
Waitemata	56	80
Overall	460	640

The second part of the audit reviewed 640 requests for RhD Immunoglobulin requests, from 600 patients, between 25 November 2008 and 18 June 2009 (table 1) were also assessed. The target of 80 requests was achieved for all sites.

Part 1: Births

Cord blood testing is used to identify which neonates are RhD positive and therefore which RhD negative mothers need RhD Immunoglobulin. Cord bloods were consistently sent for RhD testing, with overall 99% of cord bloods from RhD negative mothers tested (table 2).

Table 2: *Cord bloods sent after delivery*

DHB	Total no of births	Cord blood sent for RhD testing	Cord RhD positive
Auckland	49	100%	53%
Canterbury	68	96%	60%
Capital & Coast	61	100%	61%
Counties Manukau	55	100%	60%
Mid Central	49	100%	67%
Otago	68	99%	59%
Waikato	54	98%	56%
Waitemata	56	98%	73%
Overall	460	99%	61%

RhD Immunoglobulin should not be given to women who already have an immune anti-D antibody. The last antibody screen prior to birth was positive in 6% of mothers. The majority of these were probable passive anti-D antibodies (i.e. secondary to recent RhD Immunoglobulin administration), but four mothers (1%) had an immune anti-D antibody (table 3). Nevertheless, one of these 4 women received RhD Immunoglobulin. Seven women (2%) had antibodies to blood groups other than D.

Those women with immune anti-D antibodies have been excluded in the remaining analysis of the use of RhD Immunoglobulin.

Table 3: *Number of births with Anti-D antibodies detected by site*

DHB	Antibody screen positive	Passive Anti-D	Immune Anti-D
Auckland	5	5	0
Canterbury	3	1	0
Capital & Coast	3	2	1
Counties Manukau	2	0	1
Mid Central	3	2	1
Otago	2	0	1
Waikato	3	2	0
Waitemata	5	3	0
Overall	26	15	4

When a cord blood was identified as RhD positive, almost all women received RhD Immunoglobulin (table 4). However, 12 of the 277 (4%) women did not receive it.

The reason for not administering RhD Immunoglobulin when an indication existed was not assessed in this audit, but was recorded in two cases. In the first case, an LMC transferred the care of a woman with a second trimester stillbirth from the community setting to a hospital. Neither service provider administered RhD Immunoglobulin. In the second case, two babies were born three hours apart with similar surnames. On retrospective review the RhD negative mother was not offered RhD Immunoglobulin. Although unclear, blood group results may have been inadvertently mixed in this case.

Table 4: *RhD Immunoglobulin issued following birth of RhD positive baby*

DHB	% (and number) of mothers issued RhD Immunoglobulin	Number of RhD positive cord bloods
Auckland	100% (26)	26
Canterbury	93% (38)	41
Capital & Coast	94% (34)	36
Counties Manukau	88% (28)	32
Mid Central	100% (32)	32
Otago	100% (39)	39
Waikato	93% (28)	30
Waitemata	98% (40)	41
Overall	96% (265)	277

Six cases were identified where the baby's cord group was unknown. In one, the mother declined cord testing as the father was known to be RhD negative. In one, clinical notes incorrectly recorded the mother as RhD positive, so no testing was thought to be necessary. A third mother had a stillbirth at 23 weeks. The midwife did not give RhD Immunoglobulin as the woman was being transferred to hospital. The medical notes do not discuss RhD Immunoglobulin although the woman had received RhD Immunoglobulin 18 days earlier. The reasons in the remaining three were not noted but all three had Kleihauer tests performed and received RhD Immunoglobulin.

RhD Immunoglobulin was also issued to three women where the cord blood was RhD negative. Two were at Auckland Hospital and one at Wellington Hospital. In the first case the RhD Immunoglobulin was given at the induction of labour. In the second, the mother was discharged within two hours of the birth and RhD Immunoglobulin was possibly given expediently prior to a cord result being available. No records could be found for the third woman.

625 IU RhD Immunoglobulin was used uniformly after delivery, with two exceptions. In the first instance, a 250 IU vial was incorrectly given and was corrected by administering the standard dose shortly thereafter. In the second, the 600 IU intravenous WinRho SDF product was appropriately given to a thrombocytopenic patient.

For optimum efficacy, RhD Immunoglobulin should be administered within 72 hours of the sensitising event. Overall, 98% of women received RhD Immunoglobulin within this timeframe (table 6).

Table 6: *Number and proportion of women receiving RhD Immunoglobulin within 72 hours following birth*

DHB	Number receiving RhD Immunoglobulin	% (and number) issued RhD Immunoglobulin within 72 hours
Auckland	28	96% (27)
Canterbury	41	98% (40)
Capital & Coast	35	94% (33)
Counties Manukau	29	100% (29)
Mid Central	32	100% (32)
Otago	39	100% (39)
Waikato	28	96% (27)
Waitemata	40	100% (40)
Overall	272	98% (267)

Part 2: Request For RhD Immunoglobulin

In the second part of the audit, requests received for RhD Immunoglobulin were tracked back to their recipients.

Apart from two recipients at Counties-Manukau DHB, one of which was an unintended recipient, all patients were either RhD negative (table 7) or their RhD status was unknown. None of the recipients had immune anti-D antibodies but 5% had presumed passive anti-D antibodies from previous RhD Immunoglobulin administration.

Table 7: *RhD blood group and RhD antibodies in RhD Immunoglobulin recipients*

DHB	n	RhD type			Passive anti-D
		D neg	D pos	D unknown	
Auckland	80	100%	0%	0%	5%
Canterbury	80	98%	0%	2%	4%
Capital & Coast	80	99%	0%	1%	6%
Counties Manukau	80	96%	2%	1%	0%
Mid Central	80	99%	0%	1%	3%
Otago	80	100%	0%	0%	14%
Waikato	80	96%	0%	4%	3%
Waitemata	80	100%	0%	0%	5%
Overall	640	98%	<1%	1%	5%

The majority of audited requests for RhD Immunoglobulin were for births and obstetric indications in the third trimester (table 8). 46 (7%) of requests were for first trimester pregnancies, when the recommended dose of RhD Immunoglobulin is 250 IU.

Three issues (0.5% of all requests) were for non-obstetric indications (RhD incompatible platelet concentrate transfusions or femoral head grafts).

Table 8: *Trimester of pregnancy when RhD Immunoglobulin requested*

DHB	Number	Birth	> 20 weeks	12-20 weeks	< 12 weeks	Non-obstetric	Unknown
Auckland	80	69%	19%	8%	4%	0%	1%
Canterbury	80	56%	16%	13%	10%	0%	5%
Capital & Coast	80	61%	19%	8%	8%	0%	5%
Counties Manukau	80	55%	33%	6%	4%	0%	3%
MidCentral	80	70%	11%	9%	6%	0%	4%
Otago	80	54%	19%	6%	13%	5%	4%
Waikato	80	74%	14%	6%	6%	0%	0%
Waitemata	80	70%	13%	10%	8%	0%	0%
Overall	640	64%	18%	8%	7%	<1%	3%

The most common indications for RhD Immunoglobulin requests were following birth and antenatal bleeds (table 9). Routine antenatal prophylaxis, although not officially implemented, was the third commonest indication overall, although with significant variation between DHBs. This accounted for 34 (5%) requests. A variety of other indications were identified (appendix 3).

Table 9: *Four most common indications for RhD Immunoglobulin requests by DHB*

Indication	Total number of requests	Birth	Antenatal bleed	Routine Antenatal Prophylaxis	Miscarriage
Auckland	80	69%	1%	16%	3%
Canterbury	80	56%	26%	0%	9%
Capital & Coast	80	61%	4%	11%	1%
Counties Manukau	80	55%	23%	4%	5%
Mid Central	80	70%	14%	0%	6%
Otago	80	54%	19%	0%	11%
Waikato	80	74%	13%	0%	0%
Waitemata	80	70%	10%	11%	5%
Overall		64%	14%	5%	5%
Total	640	407	87	34	32

99% of requests were for the 625 IU dose. 46 of the 640 (7%) of requests were for first trimester indications. However only 3 of these received 250 IU. It would appear that the use of the lower 250 IU dose is not well embedded in some DHBs (table 10).

Table10: *Use of 250 IU dose of RhD Immunoglobulin in first trimester*

Site	Number receiving RhD Immunoglobulin (any dose size) in first trimester	% (and number) of all first trimester recipients receiving 250 IU dose
Auckland	3	0% (0)
Canterbury	8	13% (1)
Capital & Coast	6	17% (1)
Counties Manukau	3	0% (0)
Mid Central	5	0% (0)
Otago	10	0% (0)
Waikato	5	20% (1)
Waitemata	6	0% (0)
Overall	46	7% (3)

Kleihauer Testing

Kleihauer testing is recommended following a potential sensitising event after 20 weeks gestation to detect large fetomaternal bleeds which may require additional doses of RhD Immunoglobulin in order to prevent immune anti-D antibody formation. Overall less than half of the women (44%) were tested subsequent to an antenatal indication after 20 weeks or at birth (table 11). Two distinct groups of DHBs were apparent – those that perform Kleihauer testing (81-97% of births and antenatal sensitising events tested) and those that don't (2% tested).The difference in the proportion of women tested between the two groups of DHBs (2% vs. 87%) was highly statistically significant ($p<0.0001$, Fisher's exact test)

There were no policies for Kleihauer testing within Counties-Manukau, Mid Central or Waitemata DHBs. Auckland DHB had a number of policies in place discussing Kleihauer testing but there was not one specific Kleihauer testing policy.

Kleihauer testing at birth or following a potentially sensitising event later than 20 weeks gestation identified 3 out of 357 (0.9%) women, with a bleed larger than 6mL fetal red cells. These required additional RhD Immunoglobulin. The largest bleed was 30 mL. The three large fetomaternal bleeds were found at the DHBs that regularly undertake Kleihauer tests.

Table 11: *Kleihauer testing either following birth of an RhD unknown or RhD positive baby or associated with a request for RhD Immunoglobulin at more than 20 weeks gestation*

DHB	Following birth of RhD positive or unknown baby	With request for RhD Immunoglobulin at >20 weeks	Either a birth or RhD with Immunoglobulin at > 20 weeks	DHB policy to test
Auckland	0% of 26	1% of 70	1%	±Yes
Canterbury	93% of 44	88% of 58	90%	Yes
Capital & Coast	83% of 36	66% of 64	72%	Yes
Counties Manukau	3% of 32	3% of 70	3%	No
Mid Central	0% of 32	6% of 65	4%	No
Otago	95% of 40	88% of 58	91%	Yes
Waikato	97% of 31	91% of 70	93%	Yes
Waitemata	2% of 42	2% of 66	2%	No
Overall tested	50% of 283	41% of 521	44% of 804	

Although Kleihauer testing is only recommended after 20 weeks gestation, 16 out of 119 (13%) requests for RhD Immunoglobulin at less than twenty weeks gestation had a Kleihauer test performed (table 12). Paradoxically some DHBs sent proportionately more samples for Kleihauer testing when they were not indicated than when they were.

Table 12: *Kleihauer testing associated with a request for RhD Immunoglobulin at less than 20 weeks gestation*

DHB	% (and number) of Kleihauer tests sent at < 20 weeks gestation	Number of requests for RhD Immunoglobulin at <20 weeks gestation
Auckland	10% (1)	10
Canterbury	23% (5)	22
Capital & Coast	6% (1)	16
Counties Manukau	10% (1)	10
MidCentral	7% (1)	15
Otago	23% (5)	22
Waikato	20% (2)	10
Waitemata	0% (0)	14
Overall	13% (16)	119

Consent and Documentation

Records documenting informed consent and RhD Immunoglobulin administration were available for 860 recipients where RhD Immunoglobulin had been requested as part of the audit of births or requests for RhD Immunoglobulin (tables 13 and 14).

Table 13: *Consent documented for RhD Immunoglobulin administration*

DHB	Number of RhD Immunoglobulin recipients with records available	RhD Immunoglobulin recipients consented (%)
Auckland	104	91%
Canterbury	116	95%
Capital & Coast	104	89%
Counties Manukau	101	93%
MidCentral	106	99%
Otago	115	88%
Waikato	100	94%
Waitemata	114	92%
Overall	860	93%

Table 14: *Documentation of RhD Immunoglobulin administration*

DHB	Number of RhD Immunoglobulin recipients with records available	RhD Immunoglobulin administrations documented %
Auckland	105	99%
Canterbury	114	96%
Capital & Coast	105	100%
Counties Manukau	101	100%
MidCentral	106	99%
Otago	115	99%
Waikato	100	97%
Waitemata	114	100%
Overall	860	99%

The documentation of administration and consent for RhD Immunoglobulin could not be established in 52 (6%) of doses (table 15), because the respective records either could not be found or were not provided by the LMC.

Table 15: *Lack of records to demonstrate documentation and consent for RhD Immunoglobulin administration*

DHB	Number of episodes	Documentation		Consent	
		Clinical records not found	Record not provided	Clinical records not found	Record not provided
Auckland	108	1% (1)	2% (2)	2% (2)	2% (2)
Canterbury	121	4% (5)	2% (2)	2% (3)	2% (2)
Capital & Coast	115	9% (10)	0% (0)	10% (11)	0% (0)
Counties Manukau	109	6% (7)	1% (1)	7% (8)	0% (0)
MidCentral	112	3% (3)	3% (3)	3% (3)	3% (3)
Otago	119	0% (0)	3% (4)	0% (0)	3% (4)
Waikato	108	2% (2)	6% (6)	2% (2)	6% (6)
Waitemata	120	2% (2)	3% (4)	2% (2)	3% (4)
Overall	912	3% (30)	2% (22)	3% (31)	2% (21)

AUDIT LIMITATIONS

It is accepted that an audit provides only a snapshot of activity over a determined period of time.

There were eight Transfusion Nurse Specialists collecting data. This permitted a multi-centre audit to be performed, but an inherent problem with multiple collectors is variation in how data is collected. Efforts were made to reduce this by using a standard national data collection form and regular telephone and face to face meetings to clarify concerns during the audit period.

The audit data was collected from laboratory records and by retrospective examination of the clinical records. Importantly, clinical records may not necessarily reflect what occurred, only what was documented. A proportion of the clinical records were unavailable to the auditors.

This audit did not assess clinical outcome. While desirable, this would have added considerably to the complexity of the audit, and was beyond the resources available.

DISCUSSION

This two part audit reviewing both births and requests for RhD Immunoglobulin is the first multi-centre audit looking at RhD immunoglobulin usage in New Zealand. According to NZHIS approximately 95% of all deliveries within New Zealand are within public hospitals, and approximately 77% of all births within New Zealand are within the boundaries of the audited DHBs.

460 third trimester births from RhD negative mothers and 640 RhD Immunoglobulin requests from 600 patients were reviewed.

Part 1: Births

In order to identify RhD negative women at risk of forming immune anti-D antibodies, cord blood samples are routinely sent to blood bank for RhD testing. This was achieved in 99% of births audited. If the cord blood is identified as RhD positive, it is recommended that women should receive RhD immunoglobulin. This audit found that 12 of 277 (4%) of eligible women did not.

RhD Immunoglobulin is given to prevent the formation of immune anti-D antibodies. Published estimates of D negative women who do not receive RhD Immunoglobulin after giving birth to an ABO-compatible D positive baby suggest that approximately 8% will develop RhD antibodies[7]. The failure to administer RhD Immunoglobulin to 4% of mothers equates to approximately 0.4% of RhD negative women with RhD positive babies in this audit developing an RhD antibody. Correcting this is equivalent to half the anticipated reduction in sensitisation that could be expected from a Routine Antenatal Prophylaxis programme.

It is recommended that RhD Immunoglobulin be administered within 72hrs of a sensitising event and this was achieved for 98% of women. The remaining 2% would have been at increased risk of forming immune anti-D antibody with only partial protection afforded to recipients receiving RhD immunoglobulin after 72 hours but up to 10 days after the sensitizing event[8]. The reason the remaining 2% did not receive the product in time was not audited.

RhD immunoglobulin was also issued to three women when the cord blood tested as RhD negative. Administering RhD Immunoglobulin when not clinically indicated exposes the mother to potential adverse effects without clinical benefit. However the low rate of this inappropriate use suggests that LMCs are generally waiting for the cord blood result before giving RhD Immunoglobulin.

Part 2: Requests for RhD Immunoglobulin

The majority of requests for RhD immunoglobulin were for obstetric indications either at birth or in the third trimester. 46 of 640 (7%) requests were for potentially sensitising events occurring in the first trimester. However only 3 of the 46 women received the 250 IU dose with the remainder receiving the standard 625 IU dose. This is noteworthy in that first trimester indications are the only area where a smaller dose (250 IU) of RhD Immunoglobulin is routinely recommended. This preparation was introduced to New Zealand eight months prior to the commencement of this audit and provided an opportunity to reduce DHB costs.

RANZCOG recommend routine antenatal prophylaxis, however this is not currently Ministry of Health policy in New Zealand. Nevertheless, routine antenatal prophylaxis accounted for 5% of requests for RhD Immunoglobulin in this audit. Australia and the United Kingdom both offer RhD immunoglobulin for routine antenatal prophylaxis and British experience suggests this could reduce the cases of haemolytic disease of the

fetus and newborn due to Anti-D from 1%, the level without routine antenatal prophylaxis, to 0.2% of births[9].

Kleihauer Tests

This was the single largest area of non-compliance with the RANZCOG[5] guidelines. It would appear that there are two groups of DHBs – those that perform Kleihauer testing (81-97% of births and antenatal sensitising events tested) versus those that don't (2% tested). This result is supported by a previous audit of Auckland women showing a similar finding[10]. The marked difference between the two groups of DHBs correlated with the absence or poor awareness of a policy on Kleihauer testing within the DHB.

Achieving good compliance with Kleihauer testing is not limited to New Zealand. Published audits from other countries show Kleihauer testing rates of 39.2%[1], 88.4%[11], 88.7%[12].

The Kleihauer test measures the number of fetal blood cells in the mother's blood, is simple and inexpensive and is used to measure the extent of any fetomaternal haemorrhage to determine if a further dose of RhD immunoglobulin is required[13].

The standard 625 IU dose of RhD Immunoglobulin provides protection for a fetal bleed of up to 6mL of red cells in the maternal circulation. Larger bleeds, as identified in 0.9% of tested births in this audit, need additional RhD Immunoglobulin to prevent immune Anti-D antibodies forming. This percentage is consistent with other published data[14,15]. The consequences of missing a large bleed are an inadequate dose of RhD Immunoglobulin. In turn, this places the woman at risk of forming an immune anti-D antibody, and her subsequent pregnancies at risk of haemolytic disease of the fetus and newborn. This is exemplified in the audit by McSweeney et al[1] of women with anti-D sensitisation, showing that 22 of 28 women with immune anti-D antibody in their first pregnancy had not had a Kleihauer test performed following a previous sensitising event.

Although the Kleihauer test can be subjective[16,17], the Royal College of Pathologists strives to improve the accuracy of reporting with its Quality Assurance Program. It is also one of the few methods available to measure fetal red cells when the fetal RhD type is unknown[13]. Flow cytometry, the alternative used in some countries, is more accurate[13] but the equipment is expensive, not available in all centres and the different results could cause confusion.

Some DHBs could see a 50-fold rise in Kleihauer testing if staff compliance with guidelines rises from 2% to 100%. Because the Kleihauer test is labour intensive, other technologies should be considered. In particular, gel agglutination micro columns are well described as a suitable screening test for large fetomaternal haemorrhages[13], with Kleihauer testing performed only on samples with positive screens.

Consent and Documentation

RhD immunoglobulin is a blood product and as such all patients must be consented[18] prior to it being prescribed and administered, with evidence of this recorded. Of the case notes available to audit it was found that 93% of recipients had been consented and there was a record of administration for 99% of recipients

The documentation of administration and consent for RhD Immunoglobulin could not be established in one in eighteen recipients because the respective records either could not be found or were not provided. This is both an issue for continuity of care as well as traceability of blood products.

CONCLUSION

Overall, this multi-centre audit on the use and prescribing of RhD immunoglobulin has shown that midwifery and obstetric practitioners are generally compliant with RANZCOG[5] and ANZSBT[19] guidelines although there is room for improvement particularly around post-partum provision of RhD Immunoglobulin, Kleihauer testing, first trimester dosing and documentation of RhD Immunoglobulin consent and administration.

RECOMMENDATIONS:

1. That clinical staff are reminded of the significance of post-exposure anti-D prophylaxis, both at birth and antenatally.
2. That communication between LMCs when handing over patients includes whether RhD Immunoglobulin administration has occurred.
3. That clinical staff need to be further educated on the availability and clinical indications for the 250 IU RhD Immunoglobulin dose.
4. That clinical staff are reminded of the importance of maintaining true and accurate records of the prescribing, consenting and administration of RhD immunoglobulin.
5. That the importance of testing for fetomaternal haemorrhage is reiterated, and that this is promulgated in DHB policies throughout New Zealand.
6. That laboratories anticipating a large increase in Kleihauer testing give consideration to other technologies such as gel agglutination micro columns as a screening test.

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APPENDIX

Appendix 1: *Site of births audited by DHB*

DHB	Site of birth	Number of births audited
Auckland	Auckland City Hospital	49
Canterbury	Ashburton Hospital	1
Canterbury	Burwood Hospital	4
Canterbury	Christchurch Women's Hospital	62
Canterbury	Lincoln Hospital	1
Capital & Coast	Kapiti Medical Centre Hospital	3
Capital & Coast	Kenepuru Hospital	3
Capital & Coast	Wellington Hospital	55
Counties Manukau	Botany Downs Maternity Hospital	4
Counties Manukau	Middlemore Hospital	40
Counties Manukau	Papakura Obstetric Hospital	8
Counties Manukau	Pukekohe Hospital	3
Mid Central	Palmerston North Hospital	49
Otago	Dunedin Hospital	68
Waikato	Matariki Hospital	2
Waikato	Te Kuiti Hospital	1
Waikato	Thames Hospital	2
Waikato	Tokoroa Hospital	1
Waikato	Waikato Hospital	48
Waitemata	North Shore Hospital	37
Waitemata	Waitakere Hospital	19

Appendix 2: *Site of requests for RhD Immunoglobulin audited by DHB*

DHB	Site	Number of requests
Auckland	Auckland Hospital	42
Auckland	Birth care Auckland Limited	17
Auckland	Columba Women's Healthcare	3
Auckland	Greenlane Clinical Centre	2
Auckland	Scripts from GP	1
Auckland	Scripts from GP-Auckland Issues	15
Canterbury	Akaroa Health Care	1
Canterbury	Ashburton Hospital	5
Canterbury	Burwood Hospital	1
Canterbury	Christchurch Hospital	1
Canterbury	Christchurch Women’s Hospital	46
Canterbury	Independent Midwives Christchurch	2
Canterbury	Lincoln Hospital	4
Canterbury	Lyndhurst	1
Canterbury	Rangiora Hospital	1
Canterbury	Scripts from GP-Christchurch Issues	3
Canterbury	St Georges Maternity	15
Capital & Coast	Capital Coast Health Hospital	58
Capital & Coast	Kenepuru Hospital	7
Capital & Coast	Paraparaumu Maternity Unit	2
Capital & Coast	Scripts from GP	1
Capital & Coast	Scripts from GP-Wellington Issues	12
Counties Manukau	Botany Downs Auckland	1
Counties Manukau	Counties Manukau DHB	79
Mid Central	Dannevirke Community Hospital	1
Mid Central	Horowhenua Health Centre	2
Mid Central	Manawatu Independent Midwives	3
Mid Central	Palmerston North Hospital	73
Mid Central	Scripts from GP-Manawatu BB Issues	1
Otago	Central Otago Health	3
Otago	Charlotte Jean Maternity Hospital	4
Otago	Clutha Health First	2
Otago	Dunedin Hospital	66
Otago	Mercy Hospital Dunedin	1
Otago	Waitaki Health Services (Oamaru)	4
Waikato	Independent Midwives Waikato	22
Waikato	Matariki Maternity Hospital	1
Waikato	Morrinsville Maternity	1
Waikato	Pathlab Hamilton	1
Waikato	Pohlen Maternity Hospital	1
Waikato	River Ridge Birthing Unit	2
Waikato	Taumarunui Hospital blood bank	1
Waikato	Te Kuiti Hospital blood bank	1
Waikato	Tokoroa Hospital blood bank	3
Waikato	Waikato Hospital	40
Waikato	Waterford Birth Centre	7
Waitemata	Independent Midwives Auckland	1
Waitemata	North Shore Hospital	41
Waitemata	Scripts from GP-North Shore BB Issues	4
Waitemata	Scripts from GP-Waitakere BB Issues	4
Waitemata	Shore Birth Obstetric Specialists	5
Waitemata	Waitakere Hospital	20

Appendix 3: *Indication for requests for RhD Immunoglobulin*

Indication	Number of requests	% of requests
Delivery	407	64%
Antenatal bleed	87	14%
Routine Antenatal Prophylaxis	34	5%
Miscarriage	32	5%
Unknown	18	3%
Amniocentesis	14	2%
T.O.P.	12	2%
Trauma	10	2%
CVS	4	1%
D & C	4	1%
ECV	4	1%
Ectopic	3	0%
Pelvic exam	2	0%
RhD incompatible platelet concentrate transfusion	2	0%
Ruptured membranes	2	0%
Wrong recipient	1	0%
Retroplacental clot	1	0%
RhD pos Femoral head	1	0%
Antepartum haemorrhage	1	0%
Evacuation of retained products	1	0%
TOTAL	640	100%