

RhD immunoglobulin (Ig) in obstetrics audit report 2018

blood matters



Australian Red Cross
BLOOD SERVICE



RhD immunoglobulin (Ig) in obstetrics audit report 2018

To receive this publication in an accessible format phone 9694 0102, using the National Relay Service 13 36 77 if required, or email Blood Matters bloodmatters@redcrossblood.org.au

Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.

© State of Victoria, Department of Health and Human Services, July 2019.

ISBN 978-1-925947-28-1 (pdf/online/MS word)

Available at the Blood Matters website <https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/speciality-diagnostics-therapeutics/blood-matters>

(1907395)

Contents

Definitions/abbreviations	iv
Introduction	1
Aims	1
The guidelines	2
Summary of guideline recommendations (2015)	2
Method	5
Results	6
Policy audit	6
Clinical audit	11
Sensitising events (Recommendation 1)	16
Routine prophylaxis (Recommendation 2)	19
Postnatal prophylaxis	21
Summary	25
Documentation	25
Correct administration of prophylaxis	25
Staff education	25
Education of pregnant RhD negative women	26
Guideline consistency and terminology	26
Result reporting and interpretation	26
Responsibility of antenatal testing and follow up	26
Reporting adverse events related to RhD Ig	26
Recommendations	27
Harmonisation of the guidelines available to support clinicians	27
Increased awareness of the guidelines	27
Education – staff	27
Education of pregnant woman	27
Antibody screening reporting	27
Governance	28
References	29

Definitions/abbreviations

Term	Explanation
ABO	ABO blood group system
ACN	Australian College of Nursing
ACSQHC	Australian Commission on Safety and Quality in Health Care
Antenatal	Occurring before birth
anti-D	Antibody to D antigen
ANZSBT	Australian and New Zealand Society of Blood Transfusion
Blood Service	Australian Red Cross Blood Service
BMI	Body mass index
FAQ	Frequently asked questions
FMH	Fetomaternal haemorrhage
GP	General practitioner
HDFN	Haemolytic disease of the fetus and newborn
Ig	Immunoglobulin
Immune anti-D	When a woman with RhD negative blood is exposed to RhD positive blood and develops antibodies to RhD. This immune response can be evoked by pregnancy or blood transfusion (known as sensitisation). Immune anti-D levels usually remain stable or increase after re-stimulation of the antibody (that is, next pregnancy)
IU	International units
NHMRC	National Health and Medical Research Council
NSQHS	National Safety and Quality Health Service Standards
Passive anti-D	Anti-D antibodies detected in a person that are not made by their immune system but acquired from an external source such as after receiving a dose of RhD Ig. Passive anti-D levels reduce over time
Postnatal	Occurring after birth
PV	Per vagina
RhD	Rhesus factor D antigen
RANZCOG	Royal Australian and New Zealand College of Obstetrics and Gynaecology
STIR	Serious transfusion incident reporting system
Trimester – first	To the end of week 12 of pregnancy
Trimester – second	13 to week 28 weeks
Trimester – third	29 weeks to 40 weeks
VMR	Victorian maternal record – provides pregnant women with a uniform maternity record. The VMR is meant to engage women in decisions regarding their own care and to improve communication between service providers. It is a health assessment of maternity history and examination. See the VMR webpage for more information. < https://www2.health.vic.gov.au/about/publications/formsandtemplates/Victorian-Maternity-Record-VMR-sample >

Introduction

RhD immunoglobulin is used to prevent RhD alloimmunisation and subsequent haemolytic disease of the newborn in RhD negative women. It has been available in Australia since 1967.

Initially, RhD negative women received a dose only following the delivery of an RhD positive infant. This resulted in a reduction of alloimmunisation from 16 per cent to 1 per cent.

Since 2002, it has been recommended that pregnant women who are RhD negative, and who have not formed their own antiD antibodies, receive antenatal prophylactic RhD Ig at 28 and 34 weeks gestation, as well as following sensitising events and delivery. This has resulted in a further reduction of alloimmunisation to about 0.3 per cent of at-risk pregnancies (RANZCOG 2015).

The Blood Matters serious transfusion incident reporting (STIR) system has collected information on incidents, reactions and near misses relating to transfusion since 2007. Further development of the program saw RhD Ig administration errors become reportable to Blood Matters STIR in January 2015. Since reporting commenced, some common error themes emerged:

- omission of prophylactic RhD Ig doses, increasing the risk of alloimmunisation and potential for haemolytic disease of the newborn for future pregnancies
- administration of RhD Ig inappropriately, exposing women to an unnecessary blood product and creating an additional cost for the health system.

To understand current practice, Blood Matters conducted an audit to assess compliance with the current Australian guidelines.

Aims

To review:

- policies and procedures health services have in place to support use of RhD Ig in obstetrics
- clinical practice for compliance with the current *Guidelines for the use of RhD immunoglobulin in obstetrics in Australia* (Royal Australian and New Zealand College of Obstetricians and Gynaecologists 2015)

The guidelines

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) developed guidelines to provide advice on the use of RhD Ig in Australia. The current published guidelines were reviewed in November 2015 and are currently under review (RANZCOG 2015).

Summary of guideline recommendations (2015)

Recommendation 1: Sensitising events

All Rh (D) negative women (who have not actively formed their own anti-D) should be offered anti-D in the following clinical situations:

First trimester (dose 250 IU)

- chorionic villus sampling
- miscarriage
- termination of pregnancy (either medical or surgical)
- ectopic pregnancy.

There is insufficient evidence to suggest that a threatened miscarriage before 12 weeks gestation necessitates anti-D.

Second and third trimester (basic dose 625 IU)

- obstetric haemorrhage
 - amniocentesis, cordocentesis
 - external cephalic version of a breech presentation, whether successful or not
 - abdominal trauma, or any other suspected intra-uterine bleeding or sensitising event.
-

Recommendation 2: Universal prophylaxis

All Rh (D) negative women (who have not actively formed their own anti-D) should be offered a prophylactic dose of 625 IU at approximately 28 weeks gestation and again at approximately 34 weeks gestation.

Recommendation 3: Postpartum – quantification of fetomaternal haemorrhage

All women who deliver an Rh (D) positive baby should have quantification of fetomaternal haemorrhage (FMH) to guide the appropriate dose of anti-D prophylaxis, and the dose should be given within 72 hours if possible.

Recommendation 4: RhD Ig should be administered as a deep intramuscular injection

Anti-D should be administered as a deep intramuscular injection. This can be difficult in women with a high body mass index (BMI), so care needs to be taken regarding the site of injection, accessibility of the underlying muscle, and the length of the needle used.

Recommendation 5: Determination of woman's anti-D antibody status

Blood should be taken for Rh antibody titre [screen] prior to administration of anti-D, in order to detect those who have already become immunised.

Recommendation 6: Determination of woman's anti-D antibody status

At 34 weeks gestation the test may be omitted if prophylactic anti-D was given at 28 weeks.

Recommendation 7: RhD Ig not needed for women with preformed anti-D antibodies

RhD immunoglobulin should not be given to women with preformed ('immune') anti-D antibodies, except where the preformed anti-D is due to the antenatal administration of RhD immunoglobulin ('passive' anti-D).

Recommendation 8: Determining anti-D as passive or preformed

If it is unsure whether the anti-D detected in the mother's blood is passive or preformed, the treating clinician should be consulted. If there is continuing doubt, RhD immunoglobulin should be administered.

Recommendation 9: Sensitising event – quantification of fetomaternal haemorrhage

All women who are given anti-D in response to a potentially sensitising event should have the magnitude of potential FMH assessed and if necessary further Anti-D administered as appropriate. When more than four doses of anti-D are given and testing indicates that further anti-D will be required, consideration may be given to using the intravenous route for subsequent doses of anti-D. This will require anti-D specifically intended for intravenous usage (for example, Rhophylac).

Additional standards and guidelines relevant to RhD Ig

The RANZCOG guidelines do not comprehensively cover patient education or consent. This was felt to be an important area which is covered in recommendations from the Australian Commission on Quality and Safety in Health Care (ACQSHC) National Safety and Quality Health Service (NSQHS) Standards and the Australian and New Zealand Society of Blood Transfusion/Australian College of Nursing (ANZSBT/ACN) Guidelines for the Administration of Blood Products. These guidelines were used to measure compliance in regards to patient education and informed consent.

1. **Communication and education for women** – the *National Safety and Quality Health Service (NSQHS) standards* (second edition, 2017) (Standard 7, Action 7.3) requires clinicians to use organisational processes from the 'Partnering with consumers' standard when providing safe blood management to:
 - a) Actively involve patients in their own care
 - b) Meet the patient's information needs
 - c) Share decision making

Accurate, up-to-date information for Rh negative women should be provided so they can make informed choices about the risks and benefits of RhD immunoglobulin and be involved in their own RhD immunisation prevention program.

2. **Consent** – (NSQHS Standard 2, Action 2.4, RANZCOG and ANZSBT/ACN *Guidelines for administration of blood products*, section 2)

The NSQHS Standards *require that health services comply with an informed consent process. This should involve educating the patient/women (or carer) about the risks and benefits of treatment, determining patient choice, and finally documenting patient consent (or refusal) to treatment.*

RANZCOG (2016) acknowledges that a woman's informed consent must be obtained before an examination or treatment may be conducted, and that the treating doctor must keep clear notes regarding the information provided.

ANZSBT/ACN guidelines of administration (2018) reinforce the documentation of consent as outlined above.

Method

An invitation to participate in the survey was sent to public and private health services in Victoria, Northern Territory, Australian Capital Territory and Tasmania (n = 79) that have maternity services level 2 or higher.¹

The audit consisted of two parts:

- Part 1: Policy for the use of RhD Ig in obstetrics
- Part 2: Clinical audit of 30 RhD negative women who have delivered an infant (live or not) of at least 20 weeks gestation, during the period 1 July 2017 through to 30 June 2018.

To assist with consistent data collection, definitions were provided to submitting health organisations. In addition, the Blood Matters secretariat was available to answer any questions auditors may have had.

Health services were directed to enter data electronically via a purpose-built online tool. Data collection closed on 31 October, with additional data collected up to 16 November 2018.

Inclusions

- Women who are RhD negative and delivered an infant (live or not) of at least 20 weeks gestation during the period 1 July 2017 through to 30 June 2018.

Exclusions

- Women who have had an ectopic pregnancy, termination or miscarriage. These women may not necessarily present to a health service with a maternity centre level 2 or higher.

On conclusion of the audit, each submitting health service organisation received a preliminary report. The preliminary report consisted of the data they submitted and a summary of their data, thus providing an opportunity to make any corrections as appropriate.

¹ The *Capability framework for Victorian maternity and newborn services* (2010) describes the services required at a health service in order to provide a particular level of care, ranging from level 1 (low risk) to 6 (complex pregnancies). This audit excluded level 1 maternity services. (Small, generally rural services that provide comprehensive antenatal and postnatal care. Women travel to larger services to give birth but return to their local community after delivery.)

Results

Sixty-three per cent (n = 50) of invited health services participated in the audit either completing part 1 (policy), part 2 (practice) or both as shown in Table 1.

Table 1: Audit participation

Health service type	Number invited	Number returning policy audit (%)	Number returning practice audit (%)	Number returning policy and/or practice audit (%)
Public	56	41 (73%)	39 (70%)	43 (77%)
Private	23	7 (30%)	4 (17%)	7 (30%)
Total	79	48 (61%)	43 (54%)	50 (63%)

Policy audit

Policy was reported on by 48 of 79 sites (response rate 61 per cent). Of these, 43 of the 48 sites (90 per cent) had a policy for use of RhD Ig.

All specified that RhD Ig should be administered at the timeframes recommended in the guidelines at 28 and 34 weeks (although some stated 34 to 36 weeks for the second dose), and with sensitising events.

Consent

Documented consent was required at 44 (92 per cent) reporting sites (Table 2).

Table 2: Type of consent

Type of consent	Number (%)
Once-only consent that covers the entire pregnancy, including delivery and sensitising events	23 (48%)
Once-only consent that covers the entire pregnancy, including delivery, but excluding sensitising events	2 (4%)
Once-only consent that covers the entire pregnancy, excluding delivery and sensitising events	2 (4%)
Individual consent for each administration of RhD Ig	17 (35%)
Consent not required for RhD Ig administration	4 (8%)

Documentation of consent (Table 3) was generally on blood and blood product consent forms (55 per cent), with some health services using RhD Ig specific consent forms (23 per cent). Only one health service required consent without the need for documentation. Nine health services reported documentation of consent in or on more than one form. The lack of a single consistent documentation of consent may cause confusion, duplication, and may complicate accurate audit of consent.

Table 3: Documentation of consent

Documentation of consent	Number (%)
Transfusion-specific/blood and blood products consent form	24 (55%)
RhD Ig specific consent form	10 (23%)
Notation in medical record	6 (14%)
Generic consent form	4 (9%)
Notation in VMR	3 (7%)
Electronic medical record/recording system	2 (5%)
Informed consent required – but does not need to be documented	1 (2%)

Note: Multiple responses allowed

Blood grouping and antibody screening

Guidelines recommend blood samples should be taken for blood grouping and RhD antibody screening prior to administration of RhD Ig, in order to detect those who may have already become immunised. Of the reporting health services, four did not have a policy specifying when to perform an ABO/RhD type and antibody screen (Table 4).

Table 4: Policy related to blood samples

Policy specifying when to perform an ABO/RhD type and antibody screen	Number (%)
No policy	4 (8%)
At first prenatal clinic	27 (56%)
At 28 weeks	25 (52%)
At delivery	19 (40%)
Other: (as specified 24 weeks, prior to administration, in the first trimester, beginning of third trimester)	5 (10%)

Note: Multiple responses allowed

Responsibility for follow up and testing

Shared care is a model of care in which the majority of antenatal visits take place in the community with a hospital-accredited general practitioner (GP) or community midwife. Antenatal appointments will occur either at the community shared partner or at the hospital, depending on the reason for the visit. Most tests and scans would take place at the hospital. Most public hospitals (93 per cent, 38 of 41) have an arrangement in place for shared care (Table 5). There was no consistency within the shared care arrangements to identify who was responsible for antenatal testing and follow up. When roles and responsibilities are not clearly defined, this leaves a gap where important results or treatments can be easily missed.

Table 5: Antenatal testing shared care follow up responsibility

Who is responsible for antenatal testing and follow up of women in shared care	Number (%)
The delivering health service only (obstetrician and/or midwife)	9 (24%)
Shared care community only (GP, midwife, Level 1 maternity service)	11 (29%)
Either health service or shared care community	18 (47%)

Dispensing and order

RhD Ig may be dispensed from a number of different locations, as shown in the Table 6. In a health service, there may be two or more separate places where RhD immunoglobulin is stored to ensure out-of-hours access.

Table 6: Dispensing location

RhD Ig dispensed from	Number (%)
Pathology/blood bank	34 (71%)
Satellite blood fridge	16 (33%)
Pharmacy	9 (19%)

Note: Multiple responses allowed

The order for administration of RhD Ig occurs on a number of different forms, as shown in Table 7. For some health services there was more than one place for recording of the order, which may cause difficulties if there is a need for lookback, as multiple forms/records need to be searched. This could potentially lead to missing an order if there is uncertainty about which form it will be on.

Table 7: Order documentation

Where the order for RhD Ig is documented	Number (%)
Medication chart	37 (77%)
Blood prescription/administration form	14 (29%)
Other – specific RhD Ig administration form	4 (8%)

Note: Multiple responses allowed

Incident reporting

The *NSQHS Standards* (Standard 7, Action 7.7 and 7.8) recognise the importance of reporting transfusion-related adverse events to drive improvement opportunities.

All health services should be capturing RhD Ig administration errors within their local incident reporting systems. In addition, health services are strongly encouraged to participate in state and national haemovigilance reporting. Since 2015, STIR has collected data on RhD Ig related incidents, and accepts reports from Victoria, Australian Capital Territory, Northern Territory and Tasmania. STIR accepts incidents related to RhD Ig in the following areas:

- RhD Ig is omitted or administered late
- RhD Ig is administered to a RhD positive woman
- RhD Ig is administered to a woman with immune anti-D
- RhD Ig is administered erroneously to the mother of a RhD negative infant
- RhD Ig is administered to the wrong patient
- the incorrect dose of RhD Ig is administered
- failure of prophylaxis
- an expired product is administered.

In this audit, 13 of 48 (27 per cent) health services reported 48 administration errors in a 12-month period, as shown in Table 8 below. In contrast, STIR received only nine reports during this time. All health services are encouraged to report events via STIR.

Table 8: RhD Ig adverse event types reported in audit

Event type	Number
Inappropriate administration (e.g. not required, given to RhD positive woman)	10
Dose omitted or incorrect (when required)	9
Dose given to incorrect patient (i.e. required by patient A, but dispensed and administered to patient B, incorrect ID checking).	1
Storage and handling errors	20
Other	8
Total	48

Data submitted in the practice audit found 288 potentially reportable events. Over the period of the clinical audit, which covered January 2017 to June 2018, STIR received only 18 reports of incidents.

Without auditing and looking at the process, these errors may never be recognised and the opportunity for improvement missed.

Clinical education

The *NSQHS Standards* (Standard 7, Action 7.6) require that health service organisations support clinicians to prescribe and administer blood and blood products appropriately, in accordance with national guidelines and national criteria, which should include developing and/or implementing education activities for the order and administration of blood and blood products.

A question was asked about the health service provision of education in this area to staff. Data submitted highlighted that where policies were in place, these did not include the requirement of specific education for staff ordering or administering RhD Ig at 17 (35 per cent) sites (Table 9).

Table 9: Types of education

Education type	Number (%)
Lectures/updates about RhD Ig administration	18 (38%)
Completing the RhD Ig Clinical Modules eLearning (Blood Service)	10 (21%)
Health–service based eLearning module	3 (6%)
Other (policy available on intranet, part of midwifery qualification)	2 (4%)
None	17 (35%)

Note: Multiple responses allowed

Clinical audit

Individual practice audits were returned by 43 (54 per cent response rate) sites. A number of audits were excluded due to RhD Ig administration dates not provided, or where provided these were illogical (for example, a woman was reported to receive RhD Ig before the baby was conceived) (n = 11), or the women were reported to be RhD positive (n = 25).

The final analysis included 939 women. Average of 22 per site (range 1 to 30).

Summary of audited women

Table 10: Demographics of audited women

Demographics	Average
BMI of woman	26.6 kg/m ² (range: 14–50 kg/m ²); 27% BMI > 30
Gravidity	2.5 (range: 1–9)
Parity	1.1 (0–7)
Multiple pregnancy (e.g., twins)	N = 12 (1.3%)
Gestational age at birth	39 weeks (21–43 weeks)
Baby blood group RhD positive	N = 606 (64%)

The BMI of the audited women reflects that of the Australian population where 27 per cent are reported as obese (AIHW 2018). There has been concern raised about the potential for lack of effect of RhD Ig administered intramuscularly in those with a high BMI; however, the current available evidence does not support a change to clinical and laboratory practice (Blood Service 2015).

In previous studies looking at pregnant RhD negative women, it was found that 37 per cent carried an RhD negative baby (Hyland 2017). The women included in this audit were similar.

A number of maternity care models are currently practised in Australia, with the majority of women receiving care through: private maternity care, public hospital care or shared care. Table 11 outlines the models of care described by the auditors.

Table 11: Types of obstetric care

Type of obstetrics care received	Public (n = 819) (number, %)	Private (n = 120) (number, %)
Private obstetrician	14 (2%)	120 (100%)
At public health service antenatal clinic	460 (56%)	–
Shared care – community GP	280 (34%)	–
Shared care – with a level 1 maternity health service	13 (2%)	–
Other – Midwife care program	20 (2%)	–
Other – combination shared care and health service	10 (1%)	–
Other – GP obstetrician	21 (2%)	–
Other – young parents program	1 (0.1%)	–

In addition to the guideline recommendations, the audit also investigated other issues surrounding administration of RhD Ig included in the *NSQHS Standards* (2017). Of particular interest was provision of education to the patient on the importance of RhD (Action 7.3) and also the documentation of consent (Action 2.4, ANZSBT/ACN 2018 section 2). This is supported by RANZCOG (2016) which acknowledges that a patient’s informed consent must be obtained before an examination or treatment may be conducted, and that the treating doctor must keep clear notes regarding the information provided to the patient.

Communication and education for women (NSQHS Standard 7, Action 7.3)

The *NSQHS Standards* Standard 7 ‘Blood management’ includes criteria addressing partnering with consumers (Action 7.3). This requires clinicians to use processes from the ‘Partnering with consumers’ standard to provide safe blood management by:

- actively involving patients in their own care
- meeting the patient’s information needs
- sharing decision making

It is important to provide accurate, up-to-date information to RhD negative women so they can make informed decisions about the risks and benefits of RhD Ig and be involved in their own RhD immunisation prevention program.

The Australian Commission on Safety and Quality in Health Care (ACSQHC) advocates providing both written and verbal advice to patients. In conjunction with a verbal discussion of RhD Ig prophylaxis, written information allows the woman to reflect and discuss as needed. Koby et al. (2012) suggest that improved communication and patient education for RhD negative pregnant women could improve adherence to the prophylactic RhD Ig regime.

Table 12 highlights that just over half the women were reported to have received written information on RhD Ig. Auditors relied on documentation, and there may be situations where information was given and not documented. The audit did not ask the source of information provided and there is array of information available including from the manufacturers and the Blood Service.

Table 12: Provision of written information

Written information received	Number	Percentage
Yes	498	53%
No	441	47%

Consent (NSQHS Standard 2, Action 2.4)

The NSQHS Standards require that health services comply with an informed consent process. This involves educating the patient (or carer) about the risks and benefits of treatment, determining patient choice, and finally documenting patient consent (or refusal) to treatment.

As shown in Table 13, over one-third of women did not have a documented consent. Even where health service policy states documentation of consent is required, there were 26 per cent of women with no documented consent.

Documented consent is an important communication tool so staff administering the product know the patient has made an informed decision.

Table 13: Evidence of consent

Evidence of consent	Number (n = 939)	Percentage
Yes	585	62%
Evidence of refusal	6	1%
No – obstetrician obtains verbal consent only (health service policy requires consent)	13	1%
No – health service has no policy regarding need for documented consent	81	9%
No – health service has policy regarding need for documented consent	244	26%
N/A – women did not require RhD Ig (baby known to be RhD negative in utero)	10	1%

Documentation of blood management information (NSQHS Standard 7, Action 7.5)

There is a requirement that clinicians document decisions relating to blood management and administration of blood products in the healthcare record.

This area created the most difficulties for the auditors. Information was often stored in a variety of ways or locations that were difficult to access. Although many used the Victorian Maternity Record (VMR) in Victoria, copies of this were not always kept in the patient record and other documentation of events was missing.

This explains some of the problems with missing doses or poor timing of prophylactic doses as the information is not readily accessible to all clinicians/auditors.

Determination of a woman's anti-D antibody status (Recommendations 5, 6, 7 and 8)

Blood samples should be taken for Rh antibody screen prior to administration of RhD Ig, in order to detect people who have already become immunised. RhD Ig should not be given to women with immune anti-D. RhD Ig is of no benefit to women with immune anti-D, and it unnecessarily exposes the woman to a blood product and places pressure on the limited RhD Ig supply.

The blood sample for the antibody screen taken at 28 weeks must be taken before the administration of the RhD Ig to be meaningful. It is not possible to serologically differentiate passively acquired anti-D (due to administration of RhD Ig) from immune anti-D (stimulated by pregnancy or transfusion). If anti-D is detected, the laboratory should discuss with the patient's clinician to determine whether it is likely to be immune or passive. Anti-D should be considered passive, if it is confirmed that RhD Ig was given in the previous 8–12 weeks with the patient treated as unsensitised, and prophylaxis should be administered as per guidelines. Anti-D should be considered immune if the woman has not received RhD Ig in the previous 12 weeks and anti-D is positive. If there is continuing doubt, RhD Ig should be administered (ANZSBT, 2016).

Diagnosis and management of haemolytic disease of the foetus and newborn is aided by laboratory testing, the key elements of which are (ANZSBT 2016):

- RhD typing to identify RhD negative women who should be offered prophylactic RhD Ig
- antibody screening to identify women with clinically significant red cell alloantibodies
- monitoring of the level of maternal antibodies, either by titration or quantitation, to identify at-risk pregnancies and those foetuses or newborns likely to require treatment for haemolytic disease of the fetus and newborn
- detecting and quantifying of FMH using the Kleihauer-Betke test or flow cytometry to determine the required dose of RhD Ig.

For a small number of women (n = 17, two per cent) in this audit, the antibody screen, was positive, that is, anti-D antibody was detected (Table 14). The health services' identification of the presence of anti-D as immune or passive did not always appear to be consistent with the provided clinical history of the women.

Table 14: Antibody screening

Antibody screen taken:	Number tested	Number of positive anti-D and how reported by health service	Most likely clinical interpretation based on history provided as determined by Blood Matters reviewers
at first antenatal visit (n = 939)	837 (89%)	7 passive	Of the 7 reported 'passive' anti-D, 6 women were greater than one gravidity (range 3–4). Women will only have passive anti-D following administration of RhD Ig therefore potentially 6 immune, with incorrect interpretation as passive unless RhD Ig received before first antenatal visit.
at 28 weeks (prior to first administration of RhD Ig) (n = 920)	696 (76%)	9 passive	1 'passive' – also identified as 'passive' at first antenatal screen – no sensitising events recorded in this pregnancy or administration of RhD Ig prior to testing: Possibly immune 2 'passive' – no sensitising events recorded in this pregnancy or administration of RhD Ig prior, gravidity 2. Possibly immune 6 'passive' – had prior sensitising event recorded in this pregnancy and received RhD Ig (2–7 weeks prior). Most likely passive
As above	As above	1 immune	1 'immune' – had a sensitising event recorded in this pregnancy and received RhD Ig 9 weeks prior. Initial first antenatal antibody screen negative: Most likely passive

Two health services requested that results for the 28-week antibody screen be withdrawn, as on review of preliminary data, it became evident that the testing had occurred after administration of RhD Ig rather than prior.

In total, 57 (6 per cent) women did not have an antibody screen at either the first antenatal visit or prior to the 28-week RhD Ig dose, with 651 (69 per cent) having screens at both time points.

ANZSBT (2016) recommends that all women have an ABO/RhD type and IAT antibody screen as early as possible (preferably between 8–12 weeks gestation) and repeated at 28 weeks. For RhD negative women, the specimen should be collected before the administration of Rh Ig prophylaxis. This will enable identification of women with immune anti-D. Management of the pregnancy will be dictated by this result. If immune-anti D is identified, assessment and close monitoring of the foetus is essential and referral to a specialist foetal medicine unit for assessment and monitoring indicated.

Sensitising events (Recommendation 1)

During the first trimester (to the end of week 12)

According to guidelines all RhD negative pregnant women should be offered RhD Ig in the following clinical events: following chorionic villus sampling, miscarriage, termination of pregnancy or ectopic pregnancy. (For the purposes of this audit, miscarriage, termination and ectopic pregnancies were excluded as outlined in the Methods section.)

Table 15 shows the types of sensitising event reported and if RhD Ig was given. There were two patients where the indication required RhD Ig, the woman having chorionic villus sampling (CVS) and the woman with subchorionic haemorrhage. Both received doses, although the woman having CVS received a higher than required dose.

The guidelines indicate that in the first trimester, unless a multiple pregnancy, 250 IU dose is indicated.

The NHMRC (2003) states that 'there is insufficient evidence to support the use of RhD Ig in bleeding prior to 12 weeks gestation in an ongoing pregnancy; however if the pregnancy then requires curettage, RhD Ig should be given'. If the bleeding is particularly heavy or associated with visible subchorionic haemorrhage, RhD Ig should be given as these women may be at higher risk of sensitisation (Blood Service FAQs). Twenty-two reports were submitted relating to per vaginal (PV) bleeds or spotting in the first trimester, of which 63 per cent received a dose of RhD Ig (Table 15).

Table 15: Sensitising events

Clinical event	No. of events reported	Guideline dose given ²	Non-guideline dose/unknown dose	No dose (or dose not recorded)	Dose administered within 72 hours
Chorionic villus sampling	1	–	1 (single pregnancy) (1x 625 IU)	–	1
Other (PV bleeding/spotting) ³	22	8 (no dose – not required according to guidelines)	14 (11x 250 IU 3x 625 IU)	–	na
Other (Subchorionic haemorrhage)	1	1	–	–	1

Overall, 14 women were potentially exposed unnecessarily to a blood product (Table 15).

² Guideline dose (Blood Service FAQs) – 250 IU for singleton pregnancies, 625 IU for multiple pregnancies.

³ According to guidelines, a threatened miscarriage before 12 weeks gestation does not require RhD Ig.

Beyond the first trimester (from week 13 to the end of pregnancy)

The 77 sensitising events reported in 73 women during the second and third trimester are reported in Table 16. Of these events, 60 of 77 (78 per cent) were documented to have received correct management or dose according to guidelines within the appropriate time period (72 hours).

Data highlighted that doses were missed, which put the woman at risk of developing an RhD antibody that could have implications for future pregnancies. There were 17 of 77 (22 per cent) pregnancies where this could be significant.

Table 16: Sensitising events in second and third trimester

Issue	No. of events	Guideline dose given (625 IU)	Additional dose not required	Non guideline dose (too low or unknown dose)	No dose (or dose not recorded)	Correct management/ dose given within 72 hours
Obstetric haemorrhage	26	20	–	2	4	20
Amniocentesis and cordocentesis	5	3	–	–	2	3
External cephalic version	7	6	1 ⁴	–	–	7 ⁵
Other abdominal trauma	18	12	–	–	6	12
Stillbirth	2	2	–	–	–	2
Other: PV bleed	14	11	1 ⁶	–	2	12 ⁷
Other: Motor vehicle accident	2	2	–	–	–	2
Other:	3	1	1 ⁸	–	1	2 ⁹

If a sensitising event occurs up to six weeks after a prophylactic dose of Rh(D) immunoglobulin has been given, should a further dose of Rh(D) immunoglobulin be given?

⁴ No dose given as routine prophylaxis given one week prior, FMH result less than 1

⁵ No dose given as routine prophylaxis given one week prior, FMH result less than 1

⁶ Prior PV bleed reported at 28 week appointment and received 28 week dose at appointment

⁷ Prior PV bleed reported at 28 week appointment and received 28 week dose at appointment

⁸ No dose given as dose given 6 days prior, FMH result zero. (Preterm premature rupture of the membranes)

⁹ No dose given as dose given 6 days prior, FMH result zero. (Preterm premature rupture of the membranes)

The magnitude of the FMH should be quantified and, if positive, the appropriate dose of Rh(D) immunoglobulin should be given. If the FMH screen is negative and anti-D is detected in the maternal serum, a further dose of Rh(D) immunoglobulin is not required. (*Frequently asked questions about the use of RhD immunoglobulin*, Blood Service)

Overall, 18 women were potentially put at risk for alloimmunisation due to low or no administration of RhD Ig.

Quantification of fetomaternal haemorrhage following a sensitising event (Recommendation 9)

Before 20 weeks gestation, the fetomaternal blood volume is sufficiently small to be covered by the guideline dose of RhD Ig (250 IU for singleton pregnancies, 625 IU for multiple pregnancies); therefore, quantitation of FMH volume is unnecessary (ANZSBT 2016).

For potentially sensitising events that occur after 20 weeks gestation, a blood sample should be taken from the mother before administration of the RhD Ig to assess the magnitude of FMH. A single 625 IU dose of RhD Ig will protect against an FMH of up to 6 mL of fetal red cells; for FMH greater than 6 mL, a dose of 100 IU/mL is recommended. Depending on the estimated volume of FMH, more than one standard dose of RhD Ig may be necessary to provide immunoprophylaxis.

Of the reported sensitising events (n = 77) that occurred after the first trimester, 50 (65 per cent) had FMH quantification performed. As shown in Table 17, in all but one case the initial dose given at the time of the event (625 IU) was enough to cover the bleed. One sensitising event had an estimated volume of FMH of 13 mL; this woman received a dose of 1875 IU (625 IU x 3).

Table 17: FMH testing beyond trimester one

Number of sensitising events beyond trimester one (n = 77)	Number of FMH tests	Up to 1 mL fetal cells	FMH >1 mL & up to 6 mL	FMH greater than 6 mL
Kleihauer test	47	42	4	1
Flow cytometry	3	2	1	–

Routine prophylaxis (Recommendation 2)

All RhD negative women with no immune anti-D antibodies should be offered a prophylactic dose (625 IU) at 28 and 34 weeks gestation. Routine prophylaxis has decreased alloimmunisation to 0.3 per cent (RANZCOG 2015), an improvement on post-partum only administration with alloimmunisation rate of 1.5 per cent (NHMRC 1999).

Ideally, antenatal prophylactic doses of RhD Ig should be administered at approximately 28 weeks and 34 weeks; however, this may not always be logistically possible. It is acceptable for doses to be administered within two weeks of the recommended timing (Blood Service 2016). For the purposes of this audit, 'right time' is based on the recommended 28 week dose with a two-week leeway period. Calculated timing for the 34 week dose is based on the second dose being six weeks after the first dose (with a two-week leeway period).

As shown in Table 18, 61 of 939 women were reported as not receiving any prophylactic RhD Ig during their pregnancy. For 13 of these women, there was evidence that they did not require RhD Ig and this management was appropriate. Another six women declined to receive RhD Ig, with three of these women delivering RhD positive babies. For the remaining 42 of 61 women, there was no documentation of prophylaxis given and no indication of the reason for not receiving this. Twenty-six (62 per cent) of these women went on to deliver an RhD positive baby. If these women truly did not receive RhD Ig during their pregnancy, they are at risk of developing an RhD antibody that could put future pregnancies at risk of haemolytic disease of the fetus and newborn. In the shared care and private obstetrician setting, the lack of documentation of administration at the delivery health service does not necessarily equate to the woman not receiving RhD Ig; however, for continuity of care it is important that the information is shared. For the purpose of this audit, undocumented administration was considered as RhD Ig not given.

Table 18: Women not receiving any prophylactic RhD Ig (n = 61)

Issue	Number of women	Baby cord blood group RhD positive
Delivered before 28 weeks gestation	3 (0.3%)	0
Baby's blood group determined in utero	2 (0.2%)	0
Father RhD negative	8 (0.9%)	0
Woman declined/refused with documented reason (religious, concern re additives)	2 (0.2%)	1
Woman declined/refused with no documented reason	4 (0.4%)	2
No documentation of prophylaxis occurring – private obstetrician	36 (3.8%)	23
No documentation of prophylaxis occurring – shared care	3 (0.3%)	1
No documentation of prophylaxis occurring – health service antenatal clinic	3 (0.3%)	2

A further 45 of 939 women (5 per cent) were reported as only receiving one of the two prophylactic doses as shown in Table 19, however this may be due to poor documentation of dose received. Of these women, 28 of 45 (62 per cent) went on to deliver an RhD positive baby, putting them at risk of RhD antibody development that could put future pregnancies at risk of haemolytic disease of the fetus and newborn.

Table 19: Number of women receiving only one routine prophylactic RhD Ig dose

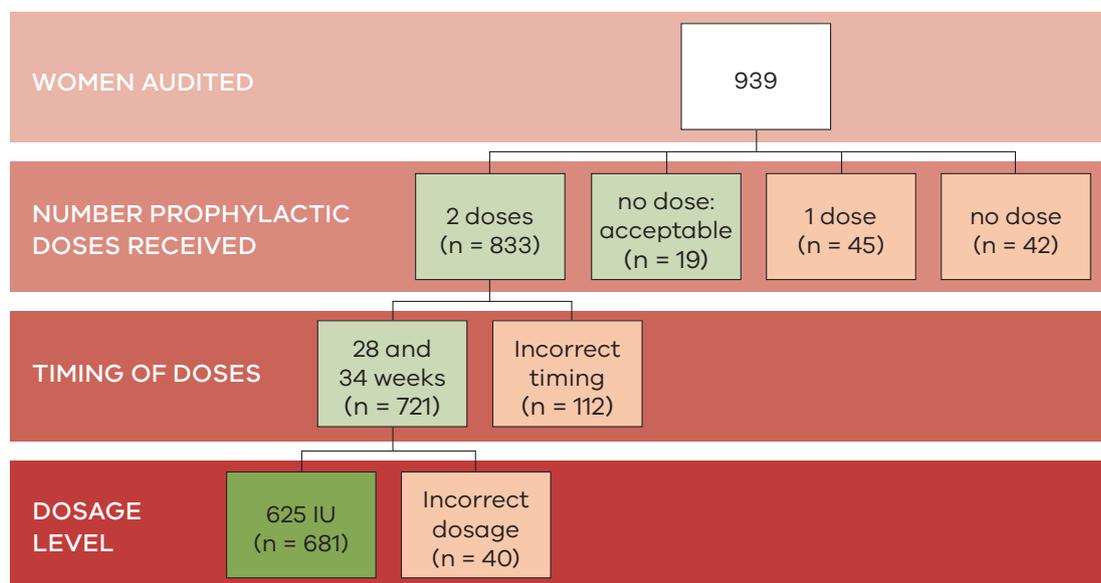
Only one prophylactic dose given (timing may or may not be at 'right time')	Number of women (percentage)	Baby cord blood group RhD positive
Only 28 week ¹⁰	33 (4%)	22
Only 34 week	12 (1%)	6

If a routine prophylactic dose is missed, the dose should be given as soon as it is recognised, rather than waiting for the next scheduled dose. In such a case, the second dose should be delayed until six weeks after the first dose (ARCBS 2016).

Figure 1 shows 681 (73 per cent) women received the appropriate number of prophylactic doses at the appropriate times, leaving 239 (25 per cent) women potentially at risk for alloimmunisation due to non-adherence to guideline recommendations of administration of RhD Ig.

¹⁰ One woman delivered prior to 34 weeks

Figure 1: Number and timing of prophylactic (28 and 34 week) RhD Ig administration



Postnatal prophylaxis

The guidelines state that RhD negative women without confirmed immune anti-D who deliver an RhD positive or RhD unknown baby should receive RhD Ig post-delivery and should have a maternal FMH test to determine if additional doses are required.

This prophylactic dose is particularly important, as FMH is more likely to occur around the time of delivery than at any other time in the pregnancy.

There were 606 RhD positive babies delivered, with 593 (98 per cent) of women receiving the correct dose in the correct time frame, to provide the best protection against antibody development (Table 20). There were a further 68 women who delivered a baby where the RhD status of the baby was not known. In these cases it is recommended the woman receives RhD Ig, however only 49 (72 per cent) received a dose.

Thirty-two women delivering a baby with either RhD positive or unknown grouping, did not receive RhD Ig.

Of note, 11 women who delivered an RhD negative baby received RhD Ig. This indicates either a poor understanding of the reasons for administration of RhD Ig, or poor systems to check on the need for RhD Ig at delivery; resulting in unnecessary exposure of the woman to a blood product and unnecessarily using a limited resource.

Table 20: Administration of RhD Ig postnatal by RhD status of baby

RhD status	No. of events	625 IU dose given	No dose given	Dose administered within 72 hours
RhD positive baby ¹¹	606 ¹²	593 (98%)	13	593
RhD negative baby	265	11 (4%)	254	6 ¹³
RhD status unknown	68	49 (72%)	19	8 ¹⁴

Quantification of fetomaternal haemorrhage postpartum (Recommendation 3)

All women who deliver an RhD positive baby should have quantification of FMH to guide the appropriate dose of RhD Ig.

As shown in Table 21, quantification of FMH occurred in 516 (85 per cent) women who delivered an RhD positive baby, but only 18 (26 per cent) for women with a baby of unknown status.

Table 21: Frequency of FMH quantification by RhD status of baby

RhD status	FMH quantification reported
RhD positive baby ¹⁵ (n = 606)	516 (85%)
RhD negative baby (n = 265)	56 (21%)
RhD status unknown (n = 68)	18 (26%)

FMH testing also occurred in 56 (21 per cent) of women who delivered an RhD negative baby, although unnecessary as RhD Ig is not required.

Results of FMH testing were reported for 458 of 606 (76 per cent) women who delivered an RhD positive baby (Table 22). Of these, the majority (69 per cent, n = 419) were tested using the Kleihauer test. A further 10 per cent, although tested had no results reported.

¹¹ Including two RhD negative babies with a weak D positive result

¹² Including women who refused prophylactic doses for religious reasons (n = 3), with one receiving RhD Ig.

¹³ No date reported for remaining doses.

¹⁴ No date reported for remaining doses.

¹⁵ Including women who refused prophylactic doses (n = 3); however, two women had FMH quantification testing, with one reporting 6 mL and subsequently received a 625 IU dose.

Table 22: FMH results for women who delivered a known RhD positive baby (n=606)

Test	Up to 1 mL fetal cells	FMH > 1 mL and up to 6 mL	FMH greater than 6 mL – < 15mL	FMH 15 mL or greater than
Kleihauer test (n = 419, 69%)	381 (91%)	33 (8%)	1 (0.2%)	4 (1%)
Flow cytometry (n = 39, 6%)	25 (64%)	14 (36%)	–	–
Test type not described and/or no results provided (n = 58, 10%)	–	–	–	–
No FMH (n = 90, 15%)	–	–	–	–

A single 625 IU dose of RhD Ig will protect against an FMH of up to 6 mL fetal red cells. In this audit, 452 women would be covered by a single initial dose of RhD Ig (99 per cent). Five women had FMHs greater than 6 mL, including four greater than 15 mL.

For FMH greater than 6 mL, an additional dose of 100 IU/mL is recommended. Depending on the estimated volume of FMH, more than one dose of RhD Ig may be necessary (ANZSBT 2016).

In this audit, one woman was reported to have a FMH of greater than 6 mL and up to 15 mL. This woman received two 625 IU doses of RhD Ig and a second FMH test.

For large bleeds, follow-up FMH testing should be performed on a sample collected 48 hours post RhD Ig administration, to determine if further RhD Ig is required (ARCBS 2015).

There were four reports of FMH greater than 15 mL (range 15.62–42.7 mL). Of these, only one woman was reported to have FMH quantification retested (with no additional RhD dose required). All four women should have received further testing. Three women received two 625 IU doses of RhD Ig; the fourth woman was administered 3750 IU (IM) in addition to the first 625 IU dose following a FMH of 42.7 mL. This woman received six individual IM doses of RhD Ig. When such large doses are required, an IV RhD Ig preparation should be considered.

Overall, 93 women were potentially put at risk due to failure to quantify FMH and determine need for additional RhD Ig post-partum.

Risk of sensitisation

As indicated in Table 23, a considerable number of women are at risk of sensitisation due to missed doses, inappropriate timing of doses or lack of quantification of FMH to check if further dosing is required. Missed or inadequate doses expose pregnant RhD negative women to an increased risk of developing anti-D antibodies. This has implications for future pregnancies and the development of haemolytic disease of the fetus and newborn.

Table 23: Number of unique women placed at risk at any time throughout their pregnancy

Category of risk	Number (%)
Increased risk for alloimmunisation (poor routine prophylaxis, poor sensitising event response, poor postnatal administration of anti-D Ig)	262 (28%)
Increased risk for alloimmunisation (as above plus no FMH testing where appropriate)	323 (34%)
Unnecessary exposure to blood product/ unnecessary use of limited resource	26 (3%)

Note: A woman may have been exposed to multiple risks at various stages of pregnancy, but has only been counted once in each row of the above table.

Summary

This audit reveals a number of areas for improvement:

1. Documentation
2. Correct administration of prophylaxis
3. Staff education
4. Education of pregnant RhD negative women
5. Guideline consistency and terminology
6. Result reporting and interpretation
7. Responsibility of antenatal testing and follow up
8. Reporting adverse events related to RhD Ig

Documentation

Missing or inaccessible information proved to be a large hurdle for the auditors. Although the VMR is a means of recording pregnancy progression, it is only used in the public sector. As this record is kept by the patient, there may be problems with availability and storage, both for ante- and postnatal visits and at delivery.

Correct administration of prophylaxis

A considerable number of pregnancies were at risk of sensitisation due to omission of doses, inappropriate timing of doses or lack of quantification of FMH to ensure appropriate dosing.

Thirty-four per cent of women in this audit were put at an increased risk of sensitisation and formation of anti-D antibodies because of poor routine prophylaxis, poor sensitising event response, poor postnatal administration of anti-D Ig and no appropriate FMH testing. Three per cent of women were unnecessarily exposed to a blood product (RhD Ig), which is also a very limited resource.

It should be noted, for the purpose of this audit, that undocumented administration was considered as RhD Ig not given, as there was no evidence of the contrary. In the shared care and private obstetrician setting, the lack of documentation of administration at the delivery health service does not necessarily equate to the woman not receiving RhD Ig; however, for continuity of care it is important that the information is shared.

Staff education

Thirty-five per cent of the health services that responded to this audit had no requirement for their staff to undergo education regarding the use of RhD Ig.

Education of staff about the guidelines and the reason for them is important. While we may assume the consultant obstetrician knows what is needed, it is often more junior staff who order the product. Education of medical staff and midwives about the guidelines and some of the issues that are not as clearly covered is important to ensure not only correct ordering but also administration of appropriate dosage.

Education should include the reading of pathology reports and how these should be recorded.

Education of pregnant RhD negative women

Only 53 per cent of women were recorded as having received written information on RhD Ig.

There is a need to provide information in a format that can be understood by the woman in order for her to make an informed decision regarding receiving RhD Ig. By improving this information, including written information, we can better involve the woman in her own care. This includes ensuring she is aware of what a sensitising event is, and the need to present to her health provider in order to determine if RhD Ig is required.

Guideline consistency and terminology

There are a number of sources of information with inconsistencies: the current RANZCOG guideline (2015) which is a summary of the NHMRC (2003) and is not consistent with current terminology, which can be confusing to clinicians and could lead to variations in practice. There is also the *Blood Service FAQ* (2015) designed to support the RANZCOG guidelines and the *ANZSBT Guidelines for immunohematology laboratory practice* (2016) addressing antibody and FMH testing.

Specific examples identified include the:

- requirement for follow-up FMH estimation dependent on the bleed volume
- use of the term 'preformed' referring to immune and passive anti-D status.

Result reporting and interpretation

Information reported demonstrated that results were misinterpreted on a number of occasions and this could be due to inadequate education or confusion by the terminology used to report as there is variation between pathology/laboratory how antibody status is reported.

Responsibility of antenatal testing and follow up

There was no consistency within the shared care arrangements to identify who was responsible for antenatal testing and follow up. When roles and responsibilities are not clearly defined, this leaves a gap where important results or treatments can be easily missed. This is highlighted by the fact that 34 per cent of women (which may include undocumented administration) were put at an increased risk of sensitisation and formation of anti-D antibodies because of poor routine prophylaxis, poor sensitising event response, poor postnatal administration of anti-D Ig and no appropriate FMH testing. A further three per cent were unnecessarily exposed to a blood product.

Reporting adverse events related to RhD Ig

Data submitted found 288 potentially reportable events. Over the period of the audit (January 2017 to June 2018), however, STIR received only 18 reports of incidents. Reporting of adverse events allows an opportunity to look at processes, and it provides an opportunity for improvement to increase safety and reduce risk.

Recommendations

Harmonisation of the guidelines available to support clinicians

The RANZCOG/NHMRC guidelines are currently under review. Blood Matters to provide this report and feedback regarding consistency and terminology. Once these guidelines have been updated, the related documents (*Blood Service FAQ* and ANZSBT 2016 guideline) should be updated accordingly.

If possible, provision of information in one document may be beneficial, rather than multiple documents separate to the guideline.

Increased awareness of the guidelines

Blood Matters to provide this report to relevant colleges and societies, prepare template presentations/tools to promote awareness and publicise in a variety of ways.

Education – staff

Blood Matters to work with relevant stakeholders to provide education regarding the importance of:

- collecting a thorough patient history
- timely and adequate testing
- clearly defining who is responsible to test and follow up
- correctly interpreting results
- ensuring the correct documentation of administration of RhD Ig and sharing that information
- providing patient information for informed consent and documenting consent
- reporting adverse events/incidents locally, and to the state haemovigilance program, to collect data on the overall outcomes related to the RhD Ig immunoprophylaxis program – that is, episodes of sensitisation or failed prophylaxis
- ensure pregnant women are provided appropriate educational material to understand the importance of adherence to prophylaxis regime to reduce potential risks in future pregnancies

Reinforce educational supports currently available – BloodSafe eLearning Australia eLearning module, Blood Service information and tools.

Education of pregnant woman

Provide the report to colleges/societies that care for pregnant women.

Recommend current information is revised to include less-technical language and that consumers are included in the revision process.

Antibody screening reporting

Blood Matters to provide report to relevant colleges and societies.

That pathology/laboratory services review the current reporting of RhD type and IAT antibody screening terminology, so it is clear and cannot be misinterpreted (detected/not detected). The results of antibody testing (positive/negative) have been misinterpreted as RhD type as demonstrated in STIR reporting.

Governance

Policies (all health services) that clearly state patient informed consent and documentation, responsibility of testing, review and sharing of results in the shared care environment and for private obstetricians, the timing of testing and documentation of results, reporting of adverse events and the educational requirements for staff.

Audits – to measure gaps in practice and identify risks and help drive improvements.

Reporting of incidents – through incident management systems and externally to haemovigilance systems.

References

- ANZSBT/ACN 2018, *Guidelines for the administration of blood products*, 3rd ed. <https://anzsbt.org.au/wp-content/uploads/2018/06/ANZSBT_Guidelines_Administration_Blood_Products_3rdEd_Jan_2018.pdf>, accessed March 2019.
- Australian and New Zealand Society of Blood Transfusion (ANZSBT) 2016, *Guidelines for transfusion and immunohaematology laboratory practice*, 1st ed.
- Australian Commission on Safety and Quality in Health Care 2017, *National Safety and Quality Health Service Standards*, 2nd ed.
- Australian Institute of Health and Welfare 2018. *Australia's health 2018*. Australia's health series no. 16. AUS 221. Canberra: AIHW.
- Australian Red Cross Blood Service. *Frequently Asked Questions about the use of Rh(D) Immunoglobulin*. March 2015.
- Australian Red Cross and National Blood Authority Expert Panel *Consensus position statement: use of Rh(D) immunoglobulin in patients with a body mass index > 30*, <<http://resources.transfusion.com.au/cdm/ref/collection/p16691coll1/id/819>>, accessed March 2019.
- Hyland CA et al. 2017, 'Non-invasive fetal RHD genotyping for RhD negative women stratified into RHD gene deletion or variant groups: comparative accuracy using two blood collection tube types', *Pathology*, vol. 49, no. 7, pp. 757–764.
- Koby L, Grunbaum A, Benjamin A, Koby R, Abenhaim HA 2012, 'Anti-D in Rh(D)-negative pregnant women: are at-risk pregnancies and deliveries receiving appropriate prophylaxis?' *J Obstet Gynaecol Can*, vol. 34, no. 5, pp. 429–35.
- National Health and Medical Research Council (Australia) and National Blood Authority 2003, *Guidelines on the prophylactic use of Rh D immunoglobulin (anti-D) in obstetrics*, NHMRC, Canberra, <<https://www.blood.gov.au/system/files/documents/glines-anti-d.pdf>>.
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) 2015, *Guidelines for the use of RhD immunoglobulin in obstetrics in Australia*, <[https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Guidelines-for-the-use-of-Rh\(D\)-Immunoglobulin-\(Anti-D\)-\(C-Obs-6\)-Review-November-2015.pdf?ext=.pdf](https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical-Obstetrics/Guidelines-for-the-use-of-Rh(D)-Immunoglobulin-(Anti-D)-(C-Obs-6)-Review-November-2015.pdf?ext=.pdf)>, accessed March 2019.
- RANZCOG 2016, *Consent and provision of information to patients in Australia regarding proposed treatment*, <[https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical%20-%20General/Consent-and-provision-of-information-to-patients-in-Australia-\(C-Gen-2a\)-Review-July-2016.pdf?ext=.pdf](https://www.ranzcog.edu.au/RANZCOG_SITE/media/RANZCOG-MEDIA/Women%27s%20Health/Statement%20and%20guidelines/Clinical%20-%20General/Consent-and-provision-of-information-to-patients-in-Australia-(C-Gen-2a)-Review-July-2016.pdf?ext=.pdf)>, accessed March 2019.

