

# Clinical audit of platelet use in Victorian and Tasmanian hospitals: 2007



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# 1. Introduction

## 1.1 Background

Platelet transfusion is indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. Previous studies have shown a wide variation in clinical practice in the transfusion of platelets.

The platelet count is the primary trigger for the use of platelets, with the risk of bleeding and the extent of bleeding also used as indicators for platelet transfusion.

The National Health and Medical Research Council and Australian and New Zealand Society of Blood Transfusion has published guidelines for the appropriate use of transfusion of platelets (NH&MRC/ANZSBT, 2001, page 23–24).

These guidelines recommend transfusion of platelets in the following specific situations:

For prophylactic use:

- In bone marrow failure when the platelet count is less than  $10 \times 10^9/L$  without risk factors or less than  $20 \times 10^9/L$  in the presence of additional risk factors (such as, fever, antibiotics, evidence of systematic haemostatic failure).
- To maintain the platelet count at greater than  $50 \times 10^9/L$  in patients undergoing surgery or invasive procedures
- In inherited or acquired qualitative platelet function disorders, depending on clinical features and setting.

For therapeutic use:

- In any patient who is bleeding in whom thrombocytopenia is considered a major contributory factor
- When the platelet count is  $50 \times 10^9/L$  in the context of massive haemorrhage/transfusion and  $100 \times 10^9/L$  in the presence of diffuse microvascular bleeding

## 1.2 Aims and objectives

The overall aim of the audit was to improve the quality of care provided to patients by ensuring the appropriate use of platelet component in patients within Victorian hospitals.

**Objectives:**

- To determine if platelet use in a sample of hospitals is aligned to clinical practice standards developed from NH&MRC/ANZSBT guidelines.
- To determine contemporary patterns of use of platelets in hospitals.

It was also suggested to the invited hospitals that the audit process be used as an opportunity to ensure that relevant and accurate medical record documentation relating to platelet transfusion is being carried out. According to ANZSBT (2004) these are:

- indication for platelet transfusion
- amount of platelets transfused
- assessment of the effectiveness of the platelet transfusion

## 1.3 Methodology

A one page data collection form (audit proforma, Appendix 1) was prepared with instructions (Appendix 2) for use. The audit proforma was piloted by two transfusion nurses within Victorian hospitals. Their comments were fed into the review process. The audit form also received comment from A/Prof Neil Boyce and Dr Marija Borosak (Australian Red Cross Blood Service (ARCBS) Transfusion Medicine Specialist's Blood Matters Program-Victoria), Lisa Stevenson (Blood

Matters Transfusion Nurse) and Dr Kathryn Robinson (ARCBS Transfusion Medicine Specialist BloodSafe Program-South Australia).

The proforma collected basic demographic data, morbidity, pathology (platelet counts) and blood product use with dates and quantities.

### **Auditors**

Each hospital's Transfusion Committee (or equivalent) was advised to designate a member of staff to record the information requested on the proforma provided. The designated data collector in participating hospitals was required to review the patient case notes and using the audit proforma, collect the relevant data. It was also suggested that a clinical sub-group identified by the Hospital Transfusion Committee (or equivalent) review the local data on platelet transfusion.

### **Data Collection**

Participating hospitals were asked to collect data over a three-month period (between 1 June 2007 and 31 August 2007). Hospitals were asked to audit 30 consecutive platelet transfusion episodes (or in low frequency users, all platelet transfusion episodes). For hospitals that transfuse platelets very regularly, it was suggested that every third platelet transfusion be audited, up to a maximum of 30 episodes.

### **Data processing and analysis**

Data were entered into a Microsoft ACCESS database. The ACCESS database was created using AuditMaker, a clinical database development tool, published by the Australian Centre for Evidence Based Clinical Practice (ACEBCP). The data was checked for inaccuracies and inconsistencies using frequency and cross-tabulation procedures. The data check focussed on dates, platelet counts, and missing data. In addition, a manual check of data entry accuracy was completed on 112 (18 per cent) records and revealed an acceptable 0.9 per cent error rate (errors counted only where validation steps do not correct the impact on data quality).

### **Audits excluded**

Twenty audit episodes were excluded from all analyses due to anomalies in the data provided which could have impact on the data integrity:

- multiple transfusion episodes were documented on one proforma (nine episodes)
- excessive missing data on individual proforma (four episodes)
- identification of duplicate episodes provided as individual episodes (seven episodes).

Further details are provided in Appendix 3.

### **Medical reviewer**

A primary medical reviewer assessed all proforma for sufficient data, alignment with guidelines, dose effectiveness, and diagnosis criterion. A secondary medical reviewer completed the same review on approximately 10 per cent of audits. See Appendix 4 and 5 for details of the guidelines and algorithm used.

## **1.4 Summary of findings**

Of the 27 hospitals invited to submit platelet transfusion reports, data was received from 25 hospitals (19 public and six private hospitals) on 621 platelet transfusion episodes. Of the 601 transfusion episodes included in the final analysis, alignment could be determined for 594 (99 per cent) transfusions. Of these 594 transfusions, 23 per cent (136) of the transfusions did not align with the NHMRC guidelines. There was a large variation in range of alignment from hospital to hospital (33 to 100 per cent alignment).

The most common reason for platelet transfusion was prophylaxis for bone marrow failure (54 per cent of aligned platelet transfusions), followed by prophylaxis for surgical or invasive procedures (16 per cent of aligned platelet transfusions).

Patients receiving platelet transfusions for bone marrow failure most frequently were administered only one bag per episode (85 per cent for those with no risk factors and 89 per cent for those with risk factors). Two or more bags were more likely to be administered per episode when the indication for transfusion was based on surgery (44 per cent), microvascular bleeding (42 per cent), haemorrhage (30 per cent), or documented platelet function disorder (30 per cent).

Greater than one bag of platelets transfused was frequently associated with the use of anti-platelet medications. When a patient was receiving anti-platelet medication, they were 1.7 times more likely to be administered more than one bag per transfusion episode. This is an area of interest with the emergence of new anti-platelet agents. Currently no Australian guidelines exist on the optimal therapeutic choice and further study is needed.

The audit highlighted a lack of adherence with documentation of indications for transfusion and reporting platelet counts. Of the 594 transfusions analysed, only 48 per cent complied with the clinical guidelines in these areas.

The reported non-alignment of transfusion episodes does not necessarily indicate that all non-aligned transfusions were inappropriate, but that platelets were transfused at a higher threshold than that recommended by the NHMRC guidelines. Individual hospitals are encouraged to review their own data and assess areas for improvement. To assist in this exercise, individual hospital audit results are presented throughout the report in comparison with all other participating hospital data. Some hospitals submitted fewer audits than other hospitals (due to lower transfusion rates or audits being excluded).

## 2. Your Hospital Results

Number of platelet transfusion episodes reported by your hospital, n= «Count»

Some results are included in this section; hospitals can also review their own data in subsequent tables in Section 3.

Information	Your Hospital	Overall results from contributing hospitals			
		0-25%	26-50%	51-75%	76-100%
Proportion of platelet transfusion episodes aligned with guidelines	<i>Your data</i>	n = 0	n = 3	n = 5	n = 17
Proportion of platelet transfusion episodes with pre-transfusion platelet count results	<i>Your data</i>	n = 0	n = 1	n = 0	n = 24
Proportion of platelet transfusion episodes with post-transfusion platelet count results	<i>Your data</i>	n = 0	n = 0	n = 2	n = 23
Proportion of platelet transfusion episodes with indication recorded in the medical record	<i>Your data</i>	n = 2	n = 5	n = 6	n = 12
Proportion of aligned platelet transfusion episodes with pre-transfusion platelet counts and medical record documentation for indication	<i>Your data</i>	n = 3	n = 9	n = 9	n = 4

A detailed table showing all hospital results covering the above variables is included in Appendix 6.

### 3. Cumulative results from contributing hospitals

A total of 621 platelet transfusion episodes from 25 hospitals were submitted (a mean of 25 episodes per hospital; median 30 episodes per hospital; range 4 to 30 platelet transfusion episodes per hospital). After exclusions based on form completion and duplications, 601 platelet transfusion episodes from 25 hospitals were analysed (a mean of 24 episodes per hospital; median 27 episodes per hospital; range 4 to 30 platelet transfusion episodes per hospital).

#### 3.1 Demographics

##### 3.1.1 Age distribution of patients transfused with platelets

Platelet Transfusion Episodes	< 2 years	2 to 20 years	21 to 49 years	50 to 74 years	> 75 years	Missing Data
n	45	42	108	277	128	1
%	7.5%	7.0%	18.0%	46.1%	21.3%	0.2%

For the age group under two years of age, neonatal patients (aged four months and younger) contributed 40 cases from two hospitals.

##### 3.1.2 Gender of patients transfused with platelets

Platelet Transfusion Episodes	Male	Female	Missing Data
n	353	242	6
%	58.7%	40.3%	1.0%

##### 3.1.3 Range of indications provided for patients treated with platelet transfusion

*Clinical indications	Number of platelet transfusion episodes	
	As indicated in the medical record (identified by auditor)	As determined by the medical reviewer
Prophylaxis bone marrow failure & platelet count $<10 \times 10^9/L$	70	135
Prophylaxis bone marrow failure with risk factors & platelet count $<20 \times 10^9/L$	86	111
Massive haemorrhage/transfusion & platelet count $<50 \times 10^9/L$	23	50
Prophylaxis surgery/invasive procedure & platelet count $<50 \times 10^9/L$	63	71
Abnormal microvascular bleeding & platelet count $<100 \times 10^9/L$	16	33
Documented platelet function disorder	21	55
Other	118	3
†Not entered	204	143
Total	601	601

\*NHMRC/ANZSBT recommended categories for clinical practice.

†Note: "not entered" was used by the auditor when the indication for the transfusion episode was not documented in the medical record; "not entered" was used by the medical reviewer when the platelet transfusion episode did not align with the guidelines or insufficient data was provided to form a decision.

The most common reason for platelet transfusion was prophylaxis for bone marrow failure (54 per cent of aligned platelet transfusions), followed by prophylaxis for surgical or invasive procedures (16 per cent of aligned platelet transfusions).

### 3.2 'Alignment' of decision to transfuse platelets

A medical reviewer assessed each platelet transfusion episode and judged it as 'aligning with the clinical practice guideline', 'not aligned with clinical practice guideline' or 'unable to determine alignment because of inadequate information recorded'. These clinical practice standards are summarised in Appendix 4.

A transfusion episode was considered to be aligned if it met all the clinical practice guidelines, although it did not address the organisational practice guidelines that documentation should be included in the patient's medical record outlining clinical or laboratory indications for the transfusion episode (see Appendix 6 for details).

A total 458 of 594 (77 per cent) of the platelet transfusion episodes (submitted with sufficient data) were deemed to be consistent with current clinical practice guidelines. Table 3.2.1 summarises alignment to guidelines. The rate of platelet transfusion episodes that were aligned with the clinical guidelines varied from hospital to hospital and ranged from 33 per cent to 100 per cent. Table 3.2.2 summarises alignment based on hospital classification.

#### 3.2.1 Transfusion episodes aligned with clinical practice guidelines

Hospital	Total audits reviewed (N)	Proportion (%) of transfusion episodes with indication recorded in medical record	*Proportion (%) of episodes aligned with clinical practice guidelines
<i>Your Hospital</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>
A	30	63	90
B	30	87	83
C	13	100	85
D	25	40	83
E	23	87	83
F	30	73	37
G	26	85	88
H	21	86	70
I	30	33	67
J	24	4	33
K	30	53	80
L	11	82	73
M	30	83	73
N	24	21	52
O	27	89	85
P	29	66	83
Q	28	93	89
R	4	75	50
S	30	83	86
T	26	50	92
U	30	70	79
V	30	47	90
W	30	33	87
X	15	93	87
Y	5	100	100
<b>All Hospitals</b>	<b>601</b>	<b>65</b>	<b>77</b>

\*Alignment with clinical practice guidelines was only determined by the medical reviewer when the audit form was deemed to contain sufficient data to make an assessment (n=594).

### 3.2.2 Proportion of transfusions aligned to clinical guidelines by hospital classification

†Hospital Classification	Frequency of Hospital Type	*Transfusion episodes aligned with clinical practice guidelines	
		Mean (%)	Range
<b>Your Hospital</b>			
<i>Your data</i>	<i>na</i>	<i>Your data</i>	<i>na</i>
Specialist & Major Referral	13 (52%)	80	37-92
Large	7 (28%)	69	33-89
Medium	3 (12%)	87	85-100
Small Non Acute & Multi Purpose	2 (8%)	78	50-83

\*Alignment with clinical practice guidelines was only determined by the medical reviewer when the audit form was deemed to contain sufficient data to make an assessment (n=594).

†See Appendix 7 for definitions of hospital classification.

The 136 platelet transfusion episodes not aligned with the guidelines were further analysed to understand contemporary patterns of use. The table 3.2.3 below lists the reasons why the episode did not meet the clinical guidelines. Two transfusion episodes (not included in the table 3.2.3) were not aligned because decisions to transfuse were based on erroneous pathology results.

### 3.2.3 Patient diagnoses where transfusion episode not aligned with clinical guidelines.

Reason not aligned by patient diagnosis	Number of episodes	Your hospital
Haematological Prophylaxis - platelet trigger too high	57	<i>Your data</i>
Surgery/invasive procedure - platelet trigger too high	32	<i>Your data</i>
Neonates not meeting NHMRC/ANZSBT guidelines	21	<i>Your data</i>
Other Diagnosis - platelet trigger too high	10	<i>Your data</i>
Bleeding - platelet trigger too high	6	<i>Your data</i>
Recent surgery/bleeding but no bleeding on day and platelet count <50	3	<i>Your data</i>
Other	5	<i>Your data</i>

The most common reason for non-alignment came from the use of platelet transfusions as prophylaxis in bone marrow failure when the pre-transfusion platelet count was recorded as higher than the trigger used in the clinical guidelines. This finding is of interest given that the literature supports lower thresholds generally and there is a current randomised prospective trial underway of prophylactic compared to therapeutic use of platelet support. The clinical guidelines state that a platelet transfusion may be indicated in bone marrow failure when platelet counts are below  $10 \times 10^9/L$  or below  $20 \times 10^9/L$  when risk factors are present. The second and third reasons for non alignment were the use of platelet transfusions as a prophylaxis for surgical or invasive procedures where platelet counts were greater than  $50 \times 10^9/L$ , and in the treatment of neonates.

The data was further analysed to determine if there was a difference in rates of non-aligned platelet transfusions depending on the medical indication. In summary,

- 19 per cent of transfusion episodes for bone marrow failure patients were not aligned.
- Furthermore, 31 per cent of transfusion episodes for patients undergoing surgery or an invasive procedure were not aligned. (See table 3.2.4b)

### 3.2.4a Comparison of rates of \*alignment by medical indication

Hospital	Haematological Prophylaxis		Surgery/invasive procedure		†Other Patient Diagnosis/Criterion		Total	
	Number of episodes	% Aligned	Number of episodes	% Aligned	Number of episodes	% Aligned	Number of episodes	% Aligned
<i>Your Hospital</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>
A	17	94	6	83	7	86	30	90
B	16	94	4	100	10	60	30	83
C	2	50	6	100	5	80	13	85
D	10	90	3	67	11	82	24	83
E	21	81	1	100	1	100	23	83
F	9	100	2	100	19	0	30	37
G	20	100	4	25	2	100	26	88
H	14	79	3	0	3	100	20	70
I	5	60	5	20	20	80	30	67
J	24	33	0		0		24	33
K	19	79	5	60	6	100	30	80
L	5	100	3	33	3	67	11	73
M	15	67	11	73	4	100	30	73
N	15	53	3	0	5	67	23	52
O	9	89	3	100	15	80	27	85
P	15	93	2	100	12	67	29	83
Q	14	86	1	100	12	92	27	89
R	0		2	50	2	50	4	50
S	10	90	12	83	7	86	29	86
T	13	92	6	83	7	100	26	92
U	9	78	8	75	12	83	29	79
V	14	86	4	75	12	100	30	90
W	21	90	6	67	3	100	30	87
X	3	100	3	67	9	89	15	87
Y	3	100	0	-	1	100	4	100
<b>All Hospitals</b>	<b>303</b>	<b>81</b>	<b>103</b>	<b>69</b>	<b>188</b>	<b>75</b>	<b>594</b>	<b>77</b>

\*Alignment with clinical practice guidelines was only determined by the medical reviewer when the audit form was deemed to contain sufficient data to make an assessment (n=594).

†Other Patient diagnosis/criterion includes, for example, bleeding, sepsis, and liver disease.

### 3.2.4b Pre-transfusion platelet count for surgery patients receiving platelet transfusions

Type of Surgery/Procedure	Number of episodes	Pre-transfusion platelet count range	Pre-transfusion platelet count average
<b>Surgery/invasive procedure – Non aligned to Guidelines (platelet trigger too high)</b>			
Cardiothoracic Surgery	8	53-309	153
GIT	5	67-133	89
Line insertion/removal	3	52-81	71
Dental surgery	2	56-57	57
Other	14	56-399	117
<b>Surgery/invasive procedure – Aligned to Guidelines</b>			
All Procedures	71	8-65	32

### 3.3 The clinical guidelines and neonates

The NHMRC/ANZSBT 2001 clinical practice guidelines recognise that the recommendations may not be applicable in acute situations, or to specialty areas such as paediatrics and obstetrics. The NHMRC/ANZSBT suggest that the guidelines be adapted to meet the needs of such specialty groups while maintaining the general principles of the guidelines.

Of the transfusion episodes submitted, 40 were neonatal (babies aged 4 months or less) cases. Forty-eight per cent of transfusion episodes for neonatal patients were determined to be aligned with the NHMRC/ANZSBT guidelines, however when reviewed against draft neonatal platelet guidelines (in draft, ANZSBT; see Appendix 5) alignment was increased to 93.5 per cent.

### 3.3.1 Neonatal transfusion alignment: NHMRC/ANZSBT versus draft Paediatric Guidelines

	Transfusion met NHMRC & neonatal guidelines	Transfusion met neonatal guidelines but not NHMRC guidelines	Transfusion did not meet either guidelines	Total
Count	19	18	3	40
Per cent	47.5	45.0	7.5	100

When comparing overall rates of alignment of all transfusion episodes (n=594) to guidelines, the rate was 77 per cent (neonates included in review against NHMRC/ANZSBT guidelines) and only increased to 80 per cent when both guidelines were used to review alignment for the corresponding transfusion episode.

In the next review of the national guidelines for use of platelets, it would be appropriate to consider information on the paediatric setting.

### 3.4 Type and quantity of platelet bags transfused

Two types of platelet components are used for transfusion and are described as either pooled or apheresis.

- Pooled Platelets: a large dose of platelets prepared from a pool of buffy coats from ABO identical donors and resuspended in a nutrient additive solution. The volume of a pooled bag is generally greater than 160 mL, and contains at least  $240 \times 10^9$  platelets per pool. One bag of pooled platelets is approximately equivalent to four units of platelets (a concentrate of platelets separated from a single unit of whole blood and suspended in a small amount of the original plasma; volume 40-60 mL; platelet count  $55 \times 10^9$ /unit).
- Platelets Apheresis: a large dose of platelets prepared by apheresis of a single donor and suspended in a portion of the original plasma or a nutrient additive solution. The volume of a bag is generally greater than 100 mL, and contains at least  $240 \times 10^9$  platelets. One bag of Platelets Apheresis is approximately equivalent to 4 units of platelets.

For adult patients, the majority of transfusion episodes (77 per cent) were prescribed as *single* bag transfusions of apheresis or pooled platelets (four donations/units). Nineteen per cent received a *second* bag and four per cent received *three or more* bags. Overall the mean number of bags given to adult patients was 1.3 per episode.

For paediatric recipients, 86 per cent of patients received a single paediatric bag, nine per cent received a second bag and five per cent received three or more bags.

### 3.4.1 Number of platelet bags transfused per episode by platelet type

	Frequency of multiple platelet bags transfused by episode (Proportion, %, of multiple platelet bags transfused per episode by platelet type)			
	1 Bag	2 Bags	3 or More Bags	Total
<b>Adult</b>				
Apheresis	81 (85%)	11 (12%)	3 (3%)	100%
Pooled	318 (78%)	76 (19%)	14 (3%)	100%
Apheresis & pooled	0 (0%)	12 (80%)	3 (20%)	100%
<b>TOTAL</b>	399 (77%)	99 (19%)	20 (4%)	100%
<b>Paediatric</b>	38 (86%)	4 (9%)	2 (5%)	100%

Note: Data reported on n=562 transfusion episodes. Thirty-two episodes did not report platelet type, including 25 episodes from one hospital, which does not record the information routinely. In addition, seven episodes did not report on the number of bags transfused. (Four episodes reported neither platelet type nor number of bags).

Greater than one bag of platelets transfused was more frequently associated with the use of anti-platelet medications. When a patient was receiving anti-platelet medication, they were 1.7 times more likely to be administered more than one bag per transfusion episode. This is an area of interest with the emergence of new anti-platelet agents. Currently no Australian guidelines exist on the optimal therapeutic choice and further study is needed.

### 3.4.2 Number of platelet bags transfused per episode by use of anti-platelet drugs

	Frequency of multiple platelet bags transfused per episode by use of anti-platelet drugs (proportion, %, of multiple platelet bags transfused per episode by use of anti-platelet drugs)			
<b>Patient receiving anti-platelet drugs in the 5 days prior to transfusion</b>	1 Bag	2 Bags	3 or More Bags	Total
Yes	50 (63%)	24 (30%)	5 (6%)	100
No	349 (79%)	75 (17%)	17 (3%)	100

Patients receiving platelet transfusions for bone marrow failure most frequently were administered only one bag per episode (85 per cent for those with no risk factors and 89 per cent for those with risk factors). Two or more bags were more likely to be administered per episode when the indication for transfusion was based on surgery (44 per cent), microvascular bleeding (42 per cent), haemorrhage (30 per cent), or documented platelet function disorder (30 per cent).

### 3.4.2 Number of platelet bags transfused per episode by transfusion indication

Transfusion indication	Frequency of multiple platelet bags transfused by transfusion indication (Proportion, %, of multiple platelet bags transfused by transfusion indication)		
	1 Bag	2 Bags	3 or More Bags
Prophylaxis bone marrow failure & platelet count <10 x 10 <sup>9</sup> /L	112 (85%)	19 (14%)	1 (1%)
Prophylaxis bone marrow failure with risk factors & platelet count <20 x 10 <sup>9</sup> /L	109 (89%)	13 (11%)	1 (1%)
Massive haemorrhage/transfusion & platelet count <50 x 10 <sup>9</sup> /L	37 (70%)	8 (15%)	8 (15%)
Prophylaxis surgery/invasive procedure & platelet count <50 x 10 <sup>9</sup> /L	39 (56%)	28 (40%)	3 (4%)
Abnormal microvascular bleeding & platelet count <100 x 10 <sup>9</sup> /L	19 (58%)	12 (36%)	2 (6%)
Documented platelet function disorder	38 (70%)	12 (22%)	4 (7%)
Other	4 (100%)	0 (0%)	0 (0%)
Not entered	103 (85%)	15 (12%)	3 (2%)

Note: Data reported on n=590 transfusion episodes. Eleven episodes did not report on number of platelet bags transfused. "Not entered" was used by the medical reviewer when the platelet transfusion episode did not align with the guidelines or insufficient data was provided to form a decision.

### 3.5 Platelet count

The platelet count is one of the primary triggers for the use of platelet transfusion (with clinical risk factors of bleeding and the extent of bleeding also influencing the decision); therefore, performing (and documenting) platelet counts pre-transfusion should be a critical step in the care of patients.

Pre-transfusion platelet count was reported in 97 per cent of transfusion episodes. Where a pre-transfusion platelet count was reported (n=581), it was checked on the same day as the transfusion in 86 per cent of transfusion episodes. In 12 per cent of transfusion episodes the platelet count was checked the day before transfusion. In the remaining two per cent (n=12) of transfusion episodes, platelet count was performed 2 to 31 days prior to the platelet transfusion. For purposes of this audit, it was considered to be good clinical practice to base transfusion decisions on a pre-transfusion platelet count performed on the same day, although it is also dependant on the clinical scenario.

Platelet counts immediately before transfusion were:

- less than 10 x 10<sup>9</sup>/L for 20 per cent of patients,
- 10-19 x 10<sup>9</sup>/L for 29 per cent of patients,
- 20-49 x 10<sup>9</sup>/L for 25 per cent of patients,
- 50-99 x 10<sup>9</sup>/L for 14 per cent of patients, and
- greater than 100 x 10<sup>9</sup>/L for 12 per cent of patients.

### 3.6 Risk factors

Of the 601 transfusion episodes reviewed, 82 per cent of cases had at least one risk factor present (that is, 18 per cent (n=110) had no risk factors reported). Close to 14 per cent of transfusion recipients had more than three risk factors reported per episode.

#### 3.6.1 Proportion (%) of transfusion episodes with identified risk factors

Risk factors	Hospital Classification				All Hospitals	Your Hospital
	Specialist & Major Referral	Large	Medium	Small Non Acute & Multi Purpose		
Same Day Active Bleeding	28	31	60	15	31	Your data
Same Day Surgery/ Invasive Procedure	33	31	60	19	34	Your data
Fever	21	11	13	4	17	Your data
Lab Coagulation Abnormality	14	16	15	0	14	Your data
Anti-platelet Drug	12	18	21	4	14	Your data
Uraemia	9	4	6	19	8	Your data
Cardiopulmonary Bypass	8	15	26	0	11	Your data
IV Antibiotics or Antifungals	68	52	43	33	60	Your data
Total Transfusion Episodes (N)	361	166	47	27	601	Your data

\*Each transfusion episode may have more than one risk factor identified, therefore numbers will be greater than 100 per cent.

Note: Audit forms with risk factors having missing data was assumed to be 'no'.

The most common risk factor present during a transfusion episode was the use of IV antibiotics or antifungals, which was seen in 60 per cent of all transfusion episodes. Specialist and major referral hospitals reported the highest rate with 68 per cent of transfusion episodes with IV antibiotics or antifungals.

## **Appendix 1: Audit proforma**



# Better Safer Transfusion Program

## FORM 1: Clinical Audit of Platelet Use

Hospital Code:  
Audit ID:

Office use only

- During the study period please complete a form for each of 30 consecutive transfusion episodes where the patient has received platelets. For hospitals who transfuse platelets very regularly, every third platelet transfusion may be audited instead.
- **Definition of transfusion episode:** An episode will be defined as each time the participating blood bank issue one or more therapeutic doses of platelets to a patient. Patients can be entered into the database multiple times.

Transfusion

Sex:

Male

Female

Age (years)

Patient Diagnosis:

Pre transfusion **Platelet count**

Platelet Count  
x10<sup>9</sup>/L

Not available  
(please tick)  
or

Dat

Post transfusion **Platelet count**

Platelet count

Not available  
(please tick)  
or

Dat

Platelets Transfused

No. of bags

Type of bags  
(please tick)

Apheresis

Pooled platelets

Paediatric

Same Day Active Bleeding incl. Petechiae or

Yes  No

Same Day Surgery/Invasive Procedure

Yes  No

(refer to instructions sheet for definitions)

**Risk Factors** (if 'Yes', please specify details in NOTES)

Fever (> or equivalent to 38°C)  Yes  No

Laboratory coagulation abnormality (greater than 1.5 x upper limit reference range)  Yes  No

Anti-platelet drugs (Eg Aspirin, ReoPro, Clopidogrel (Plavix) in the 5 days prior to transfusion)  Yes  No

Uraemia (creatinine is >200µmol/l)  Yes  No

Cardiopulmonary Bypass (longer than 2 hours or with deep hypothermic arrest or ECMO)  Yes  No

IV Antibiotics or antifungals  Yes  No

Is the indication for Transfusion recorded in the medical record? (please circle) YES NO

**Recorded Indication:**

(Please tick)

- Prophylaxis bone marrow failure (Platelets <10)
- Prophylaxis bone marrow failure & risk factors (Platelets <20)
- Massive haemorrhage/transfusion & platelets <50
- Prophylaxis for surgery/invasive procedure (Platelets <50)
- Abnormal microvascular bleeding & platelets <100
- Documented platelet function disorder

Other (please specify).....

NOTES



## **Appendix 2:** Information provided to hospitals

# Better Safer Transfusion (BeST) Program - Victoria

## Clinical Audit of Platelet Use

### Background

Platelet transfusion is indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. Previous studies have shown a wide variation in clinical practice in the transfusion of platelets.

The platelet count is the primary trigger for the use of platelets, with the risk of bleeding and the extent of bleeding also used as indicators for platelet transfusion.

Note should be taken of the National Health and Medical Research Council and Australian and New Zealand Society of Blood Transfusion guidelines for transfusion of platelets ((NH&MRC/ANZSBT, 2001).

The Better Safer Transfusion Program wishes to work with Victorian hospitals to ensure that we

- a) Use blood components and products appropriately and effectively, and
- b) Use alternative blood management strategies to limit the need for transfusion where clinically appropriate.

The BeST Advisory Committee has identified the area of platelet use as an appropriate area for targeted clinical audit in order to determine current practice across the State.

### Audit Aims

To improve the quality of care provided to patients by ensuring the appropriate use of platelet product in patients within Victorian hospitals. Medical record documentation relating to platelet transfusion should also be relevant and accurate.

### Objectives

- i. To determine if platelet use in a sample of Victorian hospitals is aligned to clinical practice standards developed from NH&MRC/ANZSBT guidelines.
- ii. To determine contemporary patterns of use of platelets in Victorian hospitals.

### Standards

Clinical practice standards have been developed from the national guidelines for the clinical use of platelets (2001).

### Data Set for platelet Transfusion

Transfusion Committees (or their equivalent) are asked to take this opportunity to ensure that the required data for each platelet transfusion is documented in the clinical notes. According to ANZSBT (2004) these are:

- indication for platelet transfusion
- amount of platelets transfused
- assessment of the effectiveness of the platelet transfusion

## Methodology

The proposed methodology is for an audit of 30 platelet transfusion episodes.

Definition: *An episode will be defined as each time the participating blood bank issue one or more therapeutic doses of platelets to a patient. Patients can be entered into the database multiple times.*

The Transfusion Committee (or equivalent) should designate a member of staff to record the information requested on the proforma provided. The designated data collector in participating hospitals will review the patient case notes and using the audit proforma (Form 1: Clinical Audit of Platelet Use), collect the relevant data. It is suggested that a clinical sub-group identified by the Hospital Transfusion Committee (or equivalent) review their local data on platelet transfusion.

All data collection forms comply with the Privacy Acts.

## Time Frame:

30 consecutive platelet transfusion episodes (or in low frequency users, all platelet transfusion episodes) between 1 June 2007 and 31 August 2007. For hospitals that transfuse platelets very regularly, every third platelet transfusion may be audited, up to a maximum of 30 episodes.

A designated member of Hospital staff will undertake data collection. Further details for data collection are provided on the attached Audit Information Sheet.

The BeST secretariat will co-ordinate the audit, taking responsibility for the distribution of audit collection tools, data entry and analysis, and will collaborate with the BeST Advisory Committee in formulating the audit report. The BeST Advisory Committee will disseminate results to the participating hospitals.

Audit reports are to be **returned by 24 September 2007** to:

Better Safer Transfusion Program  
Quality and Safety Branch, Department of Human Services  
GPO Box 4057  
MELBOURNE 3001

If further information is required please contact:

## AUDIT INFORMATION SHEET

This sheet contains definitions to assist with data collection.

### Recorded indications

The recorded indications are those documented in the medical record as the reason for the platelet transfusion.

1. **Fever (as a risk factor in bone marrow failure patients):** temperature equivalent to or greater than 38 C.
2. **Massive haemorrhage/transfusion:** one blood volume lost in 24 hour period or greater than 20 units transfused in a 24 hour period
3. **Surgery/invasive procedure:** Central or arterial line insertion or removal, broncho-alveolar lavage, lumbar puncture, liver biopsy, upper GI endoscopy, lapartomy/abdominal surgery (procedure is to be described in the 'Notes' section if not on this list).
4. **Abnormal microvascular bleeding & platelets:** complicated massive transfusion/DIC.
5. **Documented platelet function disorder:** transfusion is appropriate in hereditary and acquired platelet function defects (eg drug induced), after correcting anaemia and considering DDAVP and cryoprecipitate, except for Glanzman's Thrombasthenia where Factor VIIa is more appropriate.
6. **Other recorded indications:** may include High risk surgery eg neuro or ophthalmic.

### Other definitions:

1. **Same day active bleeding:** includes petechiae or mucosal bleeding
2. **Same day surgery/invasive procedure:** central or arterial line insertion or removal, broncho-alveolar lavage, lumbar puncture, liver biopsy, upper GI endoscopy, lapartomy/abdominal surgery (procedure is to be described in the 'Notes' section if not on this list).
3. **Bags of platelets:** one bag is equivalent to one bag of apheresis platelets or one bag of pooled platelets. If HLA platelets are used, this subcategory should be noted in the 'Notes' section.

### **Appendix 3: Quality assurance: excluded audits.**

- Nine audits were returned with multiple transfusion episodes recorded. These audits were excluded from all analyses due to the concern for data integrity and the difficulty to analyse usage patterns covering number of bags transfused per episode and assessing pre and post-transfusion counts. One hospital submitted multiple transfusions across multiple days on one proforma five times, and another two hospitals did it on two occasions.
- Four episodes were excluded due to excessive missing data on individual proforma as a result of the auditor unable to locate the medical record. These audits were excluded from all analyses. One hospital was unable to locate the medical records on three occasions and consequently unable to complete the proforma to a meaningful level.
- Seven episodes were excluded due to being a duplicate proforma for another proforma submitted (based on an audit having identical hospital code, patient age, transfusion date, pre-transfusion platelet count and testing dates, post-transfusion platelet count and testing dates). Six of the duplicate records were from one hospital.

## Appendix 4: Assessment of Alignment with Clinical Practice Guidelines

### APPROPRIATE USE OF PLATELETS

Use of platelets is indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function defects. The platelet count is the primary trigger for the use of platelets, with clinical risk factors for bleeding and the extent of bleeding also influencing the decision to transfuse.

Use of platelets is likely to be **appropriate as prophylaxis** for:

Indication*	Considerations
Bone marrow failure	At a platelet count of $<10 \times 10^9/L$ in the absence of risk factors and $<20 \times 10^9/L$ in the presence of risk factors (e.g., fever, antibiotics, evidence of systemic haemostatic failure).
Surgery/invasive procedure	To maintain platelet count at $>50 \times 10^9/L$ . For surgical procedures with high risk of bleeding (e.g., ocular or neurosurgery) it may be appropriate to maintain at $100 \times 10^9/L$ .
Platelet function disorders	May be appropriate in inherited or acquired disorders, depending on clinical features and setting. In this situation, platelet count is not a reliable indicator.

Use of platelets is likely to be **appropriate as therapy** for:

Indication*	Considerations
Bleeding	At a platelet count of $<10 \times 10^9/L$ in the absence of risk factors and $<20 \times 10^9/L$ in the presence of risk factors (e.g., fever, antibiotics, evidence of systemic haemostatic failure).
Massive haemorrhage/transfusion	To maintain platelet count at $>50 \times 10^9/L$ . For surgical procedures with high risk of bleeding (e.g., ocular or neurosurgery) it may be appropriate to maintain at $100 \times 10^9/L$ .

\* The use of platelets for indications not listed in these tables is unlikely to be considered appropriate as prophylaxis or therapy.

Source: National Health & Medical Research Council and Australian and New Zealand Society of Blood Transfusion, 2001, 'Clinical practice guidelines on the use of blood components'.

(Appendix 4- continued)

## Algorithm for appropriateness (for medical reviewer use)

Based on NH&MRC/ANZSBT guidelines 2001 and informed by the NZ Platelet Audit February 2007

Platelet count	Diagnosis		Massive haemorrhage/transfusion bleeding <sup>2</sup>	Prophylaxis for surgery/invasive procedure <sup>3</sup>	Abnormal microvascular bleeding <sup>4</sup>	Documented platelet function disorder <sup>5</sup>	Same day active bleeding <sup>6</sup>	High risk ocular or neurosurgical procedures
	Prophylaxis bone marrow failure	Prophylaxis bone marrow failure & risk factors <sup>1</sup>						
<10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<20		Yes	Yes	Yes	Yes	Yes	Yes	Yes
<50			Yes	Yes	Yes	Yes	Yes	Yes
<100					Yes	Yes		Yes
≥100						Yes		

### Definitions

1. Fever (>38°C), IV antibiotics or antifungals or mucosal bleeding or abnormal coagulation.

2 Blood volume replaced once within 24 hours or >20 units transfused.

3 Central or arterial line insertion or removal, broncho-alveolar lavage, lumbar puncture, liver biopsy, upper GI endoscopy, laparotomy/abdominal surgery.

4 Complicated massive transfusion/DIC.

Complicated cardiopulmonary bypass. That is, lasting longer than 2 hours or with deep hypothermic arrest or ECMO (extra corporeal membranous oxygenation).

5 Regarding documented platelet disorders, transfusion is appropriate in hereditary and acquired platelet function defects (e.g., drug induced), after correcting anaemia and considering DDAVP and cryoprecipitate, except for Glanzman's Thrombasthenia where Factor VIIa is more appropriate.

6 With thrombocytopenia as a major contributory factor.

### Not indicated

Uncomplicated immune thrombocytopenia (ITP).

Thrombotic thrombocytopenic purpura (TTP)/Haemolytic uraemic syndrome (HUS).

Drug induced or cardiac bypass associated thrombocytopenia without haemorrhage.

Heparin-induced thrombocytopenia (HIT).

## Appendix 5: Draft 'ANZSBT Guidelines for platelet use in neonates 2007' (Author, Dr Helen Savoia).

### 2. Transfusion of Platelet Components

Thrombocytopenia is the most common haemostatic abnormality in sick newborn infants. The immature coagulation system in neonates contributes to an increased bleeding risk. Platelet transfusions are indicated for the support of selected neonates with clinically significant quantitative or qualitative platelet disorders. Consideration should be given to the cause and natural history of the thrombocytopenia, as this may alter the type of platelet product given. In the only reported randomised controlled study of platelet transfusion in preterm infants, Andrew et. al. found no benefit (defined as the reduction of significant haemorrhage) in babies where moderate thrombocytopenia ( $50-150 \times 10^9/L$ ) was prevented by platelet transfusion compared to control babies.

Guidelines for platelet transfusion in the neonate acknowledge the lack of evidence on which to make recommendations and aim for a safe approach. Experience from allo-immune thrombocytopenia indicates that in a well term neonate, the risk of significant haemorrhage as a result of thrombocytopenia is unlikely at counts above  $30 \times 10^9/L$ , however for preterm infants, despite the lack of evidence, a higher threshold of  $50 \times 10^9/L$  is recommended.

#### Guidelines for Platelet Transfusion in Neonates

Asymptomatic thrombocytopenia

Stable term or preterm infant consider if platelet count  $< 20-30 \times 10^9/L$

Sick term or preterm infant consider if platelet count less than  $30-50 \times 10^9/L$

Symptomatic thrombocytopenia in any neonate

Major organ bleeding and platelet count  $< 100 \times 10^9/L$

Minor bleeding and platelet count  $< 50 \times 10^9/L$

Thrombocytopenia and invasive procedures

Surgery: consider if platelet count  $< 50 \times 10^9/L$

Exchange transfusion: consider if platelet count  $< 50 \times 10^9/L$

Thrombocytopenia and DIC

Consider if platelet count  $< 50 \times 10^9/L$

#### Alloimmune Thrombocytopenia

Alloimmune thrombocytopenia (sometimes called NAIT) is a serious disease capable of causing significant morbidity or mortality from haemorrhage in-utero or during the perinatal period.

Intracerebral haemorrhage (ICH) secondary to severe thrombocytopenia has been reported as early as 18 weeks gestation. The level of thrombocytopenia which places the fetus at risk is not known, but ICH has rarely been reported in neonates with platelet counts greater than  $30 \times 10^9/L$ . Weekly or fortnightly platelet transfusion given in-utero have been used to reduce the risk of ICH, however others recommend maternal IVIG to raise the fetal platelet count. Appropriate antigen-negative platelets should be available to be given to a fetus undergoing any invasive procedure such as cordocentesis.

For the neonate with Feto-maternal Alloimmune Thrombocytopenia (FMAIT), platelet transfusion is the treatment of choice and should be given to normalise the platelet count in an infant with ICH or to raise the platelet count to at least  $50 \times 10^9/L$  in infants without ICH. Platelet used to neonates with FMAIT should be negative for the implicated platelet-specific antigen.

(Appendix 5 continued)

### **Congenital infections**

Neonates born with CMV infection, rubella, toxoplasmosis, syphilis or herpes simplex may have suppression of thrombopoiesis and/or splenomegaly with shortened platelet survival. Mild to moderate thrombocytopenia may be present. This usually does not require platelet support.

### **Neonates of mothers with immune thrombocytopenia (ITP)**

Neonatal thrombocytopenia may be associated with past or current maternal ITP. The majority of infants are only mildly affected and the thrombocytopenia resolves spontaneously. Severe thrombocytopenia is reported to occur in approximately four per cent of neonates and the incidence of ICH is extremely low. Intravenous immunoglobulin and steroids are the treatments of choice where the thrombocytopenia is severe or bleeding is present.

### **Platelets for Neonatal Transfusion**

ABO and Rh(D) identical or compatible.

HPA compatible in infants with alloimmune thrombocytopenia.

Produced by standard techniques.

Irradiated if appropriate.

CMV negative or leukocyte reduced if appropriate.

A single platelet concentrate prepared from a unit of whole blood provides a suitable platelet dose for infants up to 10kg (40-45ml with 70-80 x10<sup>9</sup> platelets).

Platelets collected by apheresis can be issued in paediatric packs for neonatal use. A single pack provides a suitable platelet dose for infants up to 10kg (~50ml with 60-75 x 10<sup>9</sup> platelets).

## Appendix 6: Proportion of platelet transfusion episodes aligned with clinical guidelines and meeting process indicators

Hospital	Count	*Proportion of platelet transfusion episodes aligned with guidelines	*Proportion of aligned platelet transfusion episodes with pre-transfusion platelet counts and medical record documentation for indication	*Proportion of aligned platelet transfusion episodes with pre- and post-transfusion platelet counts and medical record documentation for indication	Proportion of all platelet transfusions meeting process indicators		
					pre-transfusion platelet count results	post-transfusion platelet count results	indication recorded in the medical record
<i>Your Hospital</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>	<i>Your data</i>
A	30	90.0	63.3	60.0	100.0	93.3	63.3
B	30	83.3	76.7	76.7	100.0	100.0	86.7
C	13	84.6	61.5	61.5	100.0	92.3	100.0
D	25	83.3	37.5	37.5	100.0	80.0	40.0
E	23	82.6	78.3	78.3	100.0	100.0	87.0
F	30	36.7	30.0	30.0	100.0	83.3	73.3
G	26	88.5	76.9	73.1	100.0	92.3	84.6
H	21	70.0	65.0	55.0	100.0	81.0	85.7
I	30	66.7	20.0	20.0	93.3	93.3	33.3
J	24	33.3	4.2	4.2	100.0	100.0	4.2
K	30	80.0	36.7	36.7	93.3	90.0	53.3
L	11	72.7	63.6	63.6	100.0	90.9	81.8
M	30	73.3	63.3	56.7	100.0	80.0	83.3
N	24	52.2	21.7	21.7	100.0	91.7	20.8
O	27	85.2	74.1	66.7	100.0	92.6	88.9
P	29	82.8	55.2	55.2	100.0	96.6	65.5
Q	28	88.9	74.1	70.4	96.4	92.9	92.9
R	4	50.0	50.0	50.0	100.0	100.0	75.0
S	30	86.2	75.9	51.7	93.3	63.3	83.3
T	26	92.3	46.2	46.2	96.2	96.2	50.0
U	30	79.3	48.3	41.4	93.3	86.7	70.0
V	30	90.0	43.3	43.3	96.7	100.0	46.7
W	30	86.7	30.0	26.7	100.0	93.3	33.3
X	15	86.7	40.0	33.3	46.7	86.7	93.3
Y	5	100.0	75.0	75.0	80.0	60.0	100.0
Overall	601	77.1	51.3	48.0	96.7	90.0	64.9

\*Alignment with clinical practice guidelines was only determined by the medical reviewer when the audit form was deemed to contain sufficient data to make an assessment (n=594).

## Appendix 7: Definitions of hospital type

### Classification definitions.

#### Information source:

Department of Health and Ageing 2005, *The State of our public hospitals*, June, Australian Government,  
[http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-ahca-sooph05-outs\\_apps.htm](http://www.health.gov.au/internet/wcms/publishing.nsf/Content/health-ahca-sooph05-outs_apps.htm)

<p><b>Principal referral and specialist hospitals</b></p>	<p>Principal referral hospitals are major city hospitals with more than 20,000 and regional hospitals with more than 16,000 acute casemix-adjusted separations per year. Specialist hospitals are specialised acute womens' and childrens' hospitals with more than 10,000 casemix-adjusted separations per year.</p>
<p><b>Large hospitals</b></p>	<p>Large hospitals are major city acute hospitals with more than 10,000, regional acute hospitals with more than 8,000 and remote acute hospitals with more than 5,000 casemix-adjusted separations per year.</p>
<p><b>Medium hospitals</b></p>	<p>Medium hospitals are:</p> <ul style="list-style-type: none"> <li>- medium acute hospitals in regional and major city areas treating between 2,000 and 10,000 acute casemix-adjusted separations per year</li> <li>or</li> <li>- medium acute hospitals in regional and major city areas treating between 2,000 and 5,000 acute casemix-adjusted separations per year, and acute hospitals treating less than 2,000 casemix-adjusted separations per year, but with more than 2,000 separations per year.</li> </ul>
<p><b>Small acute hospitals</b></p>	<p>Small acute hospitals are:</p> <ul style="list-style-type: none"> <li>- small regional acute hospitals (mainly small country town hospitals) treating less than 2,000 separations per year and with less than 40 per cent non-acute and outlier patient days of total patient days</li> <li>or</li> <li>- small remote hospitals treating less than 5,000 acute casemix-adjusted separations but which are not multi-purpose and not small non-acute. Most have less than 2,000 separations per year.</li> </ul>
<p><b>Small non-acute hospitals and multi-purpose services</b></p>	<p>Small non-acute hospitals, treating less than 2,000 separations per year and with more than 40 per cent non-acute and outlier patient days of total patient days.</p>

## References

National Health & Medical Research Council and Australian & New Zealand Society of Blood Transfusion Inc 2001, *Clinical Practice Guidelines on the Use of Blood Components*, Australian Government, Canberra.