Platelet Survey
2016

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INTRODUCTION

Since 2010 Red Cell transfusions in New Zealand have declined by 18.8% despite an overall increase in population of 7.3% over the same time period[1,2]. This decrease is partially due to the adoption of restrictive transfusion triggers by clinicians. Similarly Fresh Frozen Plasma (FFP) transfusions have declined by 25.4%,[1] a reflection perhaps of an increase in Prothrombinex-VF usage for Warfarin Reversal.

Platelet transfusions have also declined nationally, although, not to the same extent. Between 2010 and 2015 platelet transfusions within New Zealand hospitals have declined by 8% (Fig 1)[1].
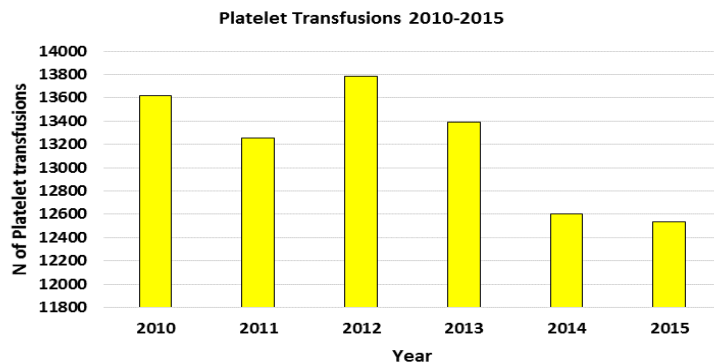

Figure 1. Platelet usage in New Zealand

A significant proportion of platelets are used for haematology and cardiology patients. According to the New Zealand Blood Service (NZBS) Demand Management Reports[3], 64% of platelets issued in 2013 were used for these two groups of patients (48% for haematology and 16% for cardiology/cardiothoracic patients). An audit conducted in 2007 by the NZBS demonstrated that 44% of the haematology recipients had bone marrow depression but were not bleeding[43]. Prophylactic transfusions are still standard of care particularly with patients with AML[5-10] but the 2007 audit found that 13% of prophylactic transfused platelets were classified as been inappropriate[4].

Platelet components are an expensive ($11.4M in 2016 calendar year) limited resource and not necessarily a benign blood component. Therefore the decision to transfuse must be a carefully considered one balancing the expected outcomes with the possible risks which include haemolysis, bacterial sepsis, acute lung injury, refractoriness[1].

To guide clinical practice, the National Blood Authority Australia (NBA) published guidelines in 2012[8] for the appropriate use of platelets. A summary is included below.

- The use of platelets is indicated for the prevention and treatment of haemorrhage in patients with thrombocytopenia or platelet function disorders. The platelet count is the primary trigger for the use of platelets, with other clinical risk factors for bleeding and the extent of bleeding also influencing the decision to transfuse. Prophylactic use of platelets for patients with severe thrombocytopenia is still the standard of care.
- In patients undergoing chemotherapy and haematopoietic stem cell transplantation, the recommended strategy for prophylactic use of platelets is transfusion at a platelet count of $<10\times10^9$/L in the absence of risk factors, and $<20\times10^9$/L in the presence of risk factors (e.g. fever, minor bleeding).
- Surgery/Invasive Procedure: In general, patients with a platelet count $> 50 \times 10^9$/L or an INR<2 can undergo invasive procedures without any serious bleeding; however lower platelet counts and higher INRs may be tolerated. For surgical procedures with high risk

of bleeding (e.g. ocular or neurosurgery) it may be appropriate to maintain the platelet count at 100 x 10^9/L.

- Platelet Function Disorders: Platelet transfusion may be appropriate in inherited or acquired disorders. In this situation, the platelet count is not a reliable indicator, for example, following extended cardiac by-pass surgery of more than two hours duration.
- Bleeding: May be appropriate in any patient in whom thrombocytopenia is considered to be a major contributing factor.
- Massive haemorrhage/transfusion: Use should be confined to patients with thrombocytopenia/or functional abnormalities who have significant bleeding from this cause. The transfusion of platelets may be appropriate when the platelet count is less than 50 x 10^9/L (or less than 100 x 10^9/L in the presence of diffuse microvascular bleeding).
Regular laboratory monitoring, with a platelet count, activated partial thromboplastin time (APTT) and a fibrinogen estimation will normally identify patients at risk of haemostatic failure who will benefit from timely transfusion of appropriate components before this occurs.

Many clinicians have faced situations where the guidelines are not specific enough for the clinical situation that is presented to them. This can result in a high degree of variance in transfusion practice.

AIM

The primary aim was to survey clinicians' use of platelet transfusions in various clinical scenarios, in particular settings where no clear guidance exists. The secondary aim was to provide feedback to clinicians from the findings of the survey to inform and support ongoing decision making on appropriate platelet transfusion in New Zealand clinical settings.

SURVEY METHODS

Twelve clinical scenarios were created, with 26 clinical questions, to ascertain what clinicians would do in specific clinical situations. The scenarios and questions were based on real events that had occurred in New Zealand hospitals.

A list of clinicians that had prescribed platelets in 2015 was obtained from the eight Transfusion Nurse Specialists and verified in eProgesa as having prescribed platelets. From this list, 200 haematologists, oncologists and their registrars were identified and invited to take part in the survey.

The survey was anonymous, but clinicians were asked to identify their region of practice. Survey Monkey® was utilized as the platform. The respondents had between the 12/04/2016 and 11/05/2016 to respond to the survey and a reminder was sent on weeks two, three and four. Clinicians in all District Health Boards were approached. Smaller DHBs were clustered into larger regions, to ensure anonymity of the respondents (see Appendix 1).

RESULTS

From the 200 clinicians invited to participate, 90 (45%) replies were received.

Scenario 1.

A 63 year old male, newly diagnosed with AML, has a platelet count of 27. A tunneled central line is scheduled in two hours' time. How many units of platelets would you recommend/request prior to the procedure?

The majority of respondents (n=52) would have prescribed one unit prior to the procedure (Fig.2). Just over 16% (n=15) would not have prescribed any and a similar 18.9% (n=17) would have prescribed two units. Six respondents made comments. Two suggested retesting after one unit with the aim of getting platelets >50 x 10^9/L. Two respondents wanted further information (weight, coagulation results and bleeding history) before deciding and consulting with the surgeon. The final two comments were incomplete and not included in the results.
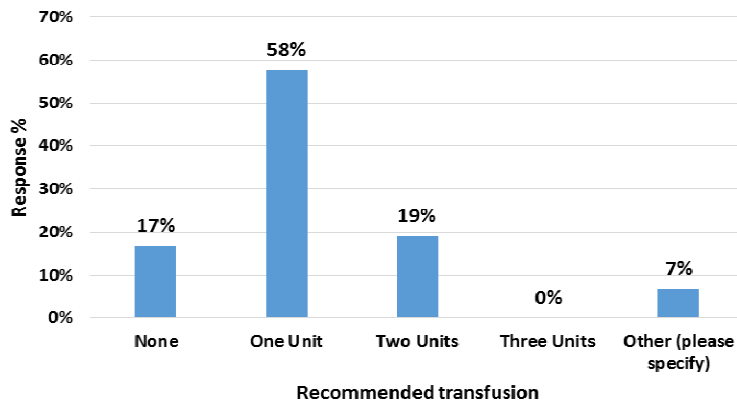

Figure 2: Platelet dose prior to line insertion. (90 respondents)

The 63 year old patient is now two weeks post the line insertion. He is febrile due to a confirmed line infection and the decision has been made to remove the tunnelled central line. He has a platelet count of 20. What platelet cover would you recommend/request for the removal of the tunnelled central line and at what minimum platelet count would you normally recommend a platelet transfusion for removal of a tunnelled central line?
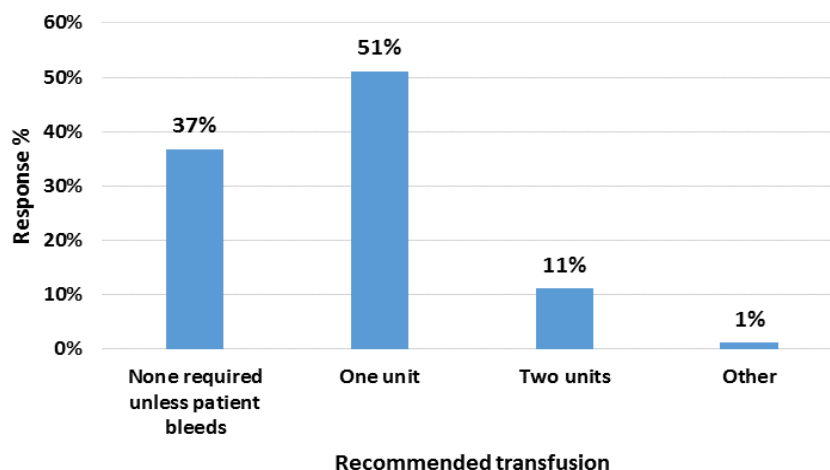

Figure 3: Platelet dose prior to line removal. (90 respondents)

51% (n=46) would request one unit of platelets, with a significant minority not advocating any platelets unless bleeding occurred (Fig.3) There were six comments, three of which suggested giving a unit regardless, because the patient was febrile with a platelet count of

20 x 10^9/L which was that institutions threshold. One comment stated that it would be dependent upon how difficult it would be to remove the line or if it needed a cut down. One respondent would want the platelet count at a minimum of 50 x 10^9/L.

Just under 35% of respondents (Fig. 4) would recommend a minimum level of 50 x 10^9/L platelets before removing the tunneled line, whereas 62% would normally suggest a platelet count of 30 x 10^9/L or lower.
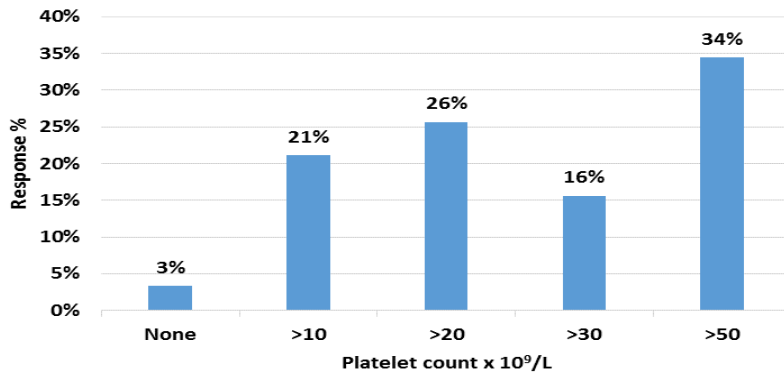

Figure 4. Minimum platelet count prior to line removal. (90 respondents)

Scenario 2.
A young male, aged 13, with osteosarcoma, post chemotherapy, has a platelet count of 37. He requires a bone marrow aspirate and trephine(BMAT) this afternoon. Would you recommend a platelet transfusion before the procedure? And if yes how many units would you suggest?
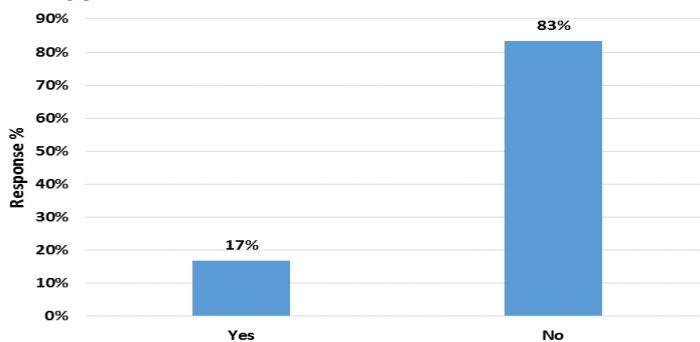

Figure 5: Platelet transfusion prior to BMAT. (90 respondents)

Just under 84% (n=75) would perform the procedure without platelet cover in this scenario. (Fig 5.) Of those who would prescribe platelets (n=15), one unit would suffice.

Scenario 3.
A 49 year old woman with ALL, post consolidation chemotherapy, requires a Lumbar Puncture (LP). Her platelet count is 44. What is the lowest platelet count you would accept without platelet support in this setting?
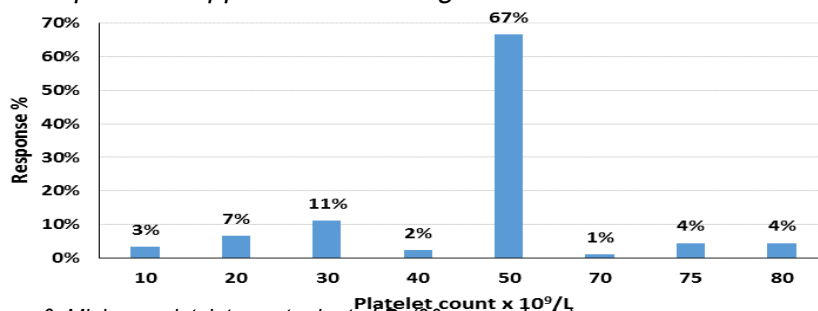

Figure 6: Minimum platelet count prior to LP. (90 respondents)

67% of respondents would accept a platelet count of 50×10^9/L before performing the lumbar puncture, although 23% would accept a lower figure. Nine percent would prefer a higher value up to 80×10^9/L (Fig 6). Almost 75% (Fig. 7) would request one unit prior to the procedure. One respondent would request four platelets prior to the procedure and one respondent would hold off until the platelet count was above 50×10^9/L.
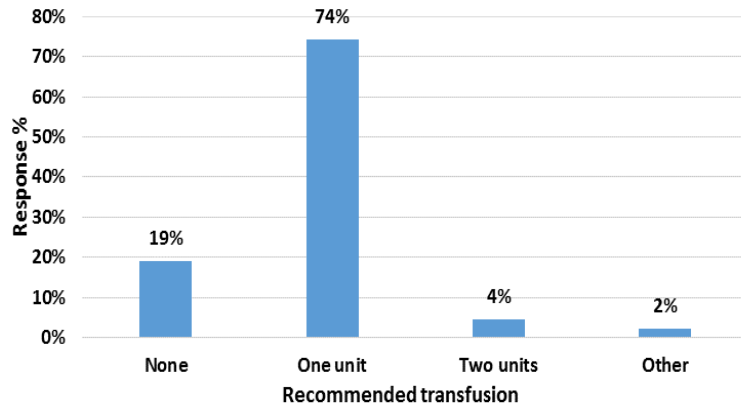

Figure 7: Number of platelet units recommended prior to LP. (90 respondents)

Scenario 4.

A 59 year old man with recently relapsed multiple myeloma, previously treated with an autologous stem cell transplant, presents in Emergency department with a fractured neck of femur (NOF) and multiple lytic lesions of the shoulder girdle. The orthopaedic surgeon wishes to proceed with surgery to fix the fracture. The patient's platelet count is 29. His INR is 1.3. How many units of platelets would you recommend to be transfused?
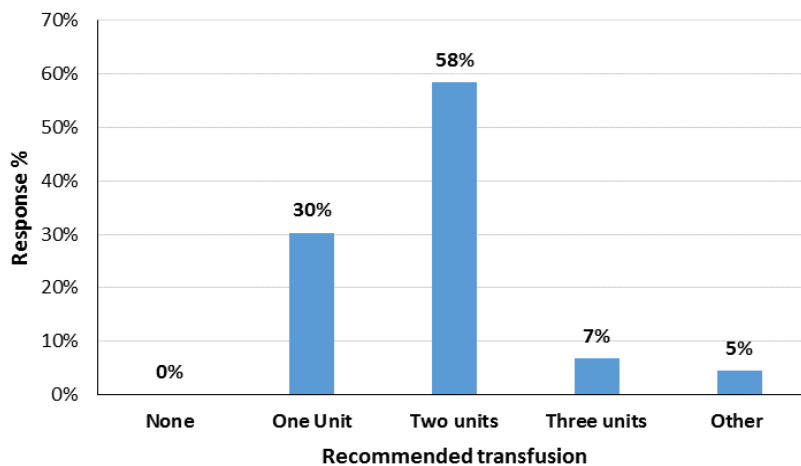

Figure 8. Number of platelet units recommended prior to internal fixation of hip. (90 respondents)

All respondents would transfuse platelets either before or during the procedure (Fig 8.). Just under 59% would automatically choose two units. Five respondents from two main hospitals (Waikato and Auckland) would recommend three units. One respondent recommended platelets only if bleeding occurred during surgery. Two respondents would discuss with the surgeon involved and asked for more information about bleeding history before deciding.

Respondents were asked what the platelet count should be maintained at for the first three day post-operatively for the above scenario. Fig. 9 shows that 76% of the respondents would be satisfied with a platelet level of 50×10^9/L. Three respondents stated that this would be dependent upon bleeding, with one respondent comfortable with a count of $>20 \times 10^9$/L if there was no bleeding.
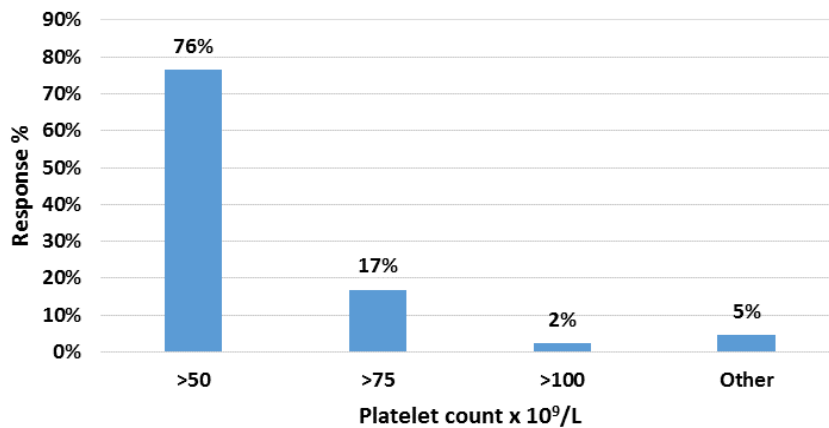
Figure 9. Preferred baseline post-op platelet level. (90 respondents)

Scenario 5.

A 32 year old women is admitted via the Emergency department with a history of fever at home. She is under the haematology team for treatment of AML but is between treatment cycles. She is not bleeding but has a platelet count of 5. Would you recommend platelets in this situation?
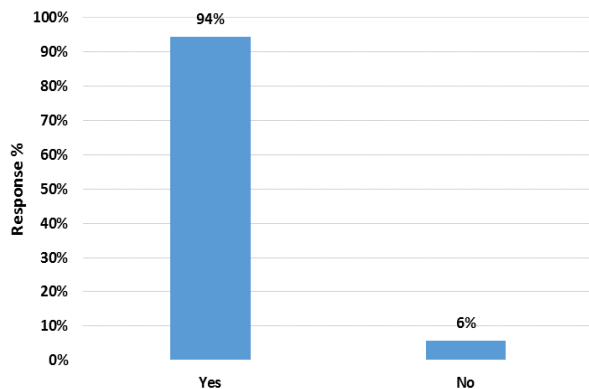

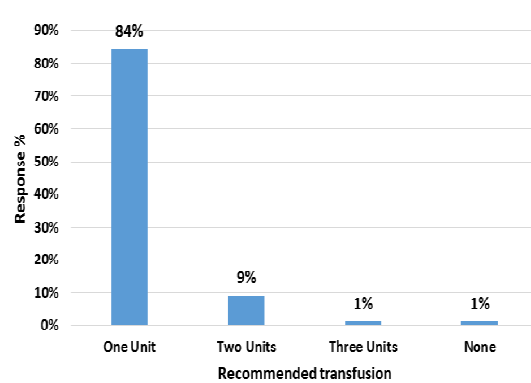Figure 10: Prophylactic transfusion. (89 respondents).

Figure 11: Number of platelet units recommended.

In Scenario 5, 94% of respondents stated that they would prescribe platelets (Fig.10) with the majority stating that they would recommend one unit of platelets. Nine percent would have suggested two units. One respondent would have recommended three units and one respondent would have recommended no units unless the patient was bleeding (Fig.11).

Scenario 6.

A 68 year old neurology patient is booked for urgent neurosurgery but is on aspirin and clopidogrel with the last dose of both medications taken approximately 8 hours earlier. The patient has a platelet count of 179. How many units of platelets would you recommend to transfuse before the surgeon commenced surgery?

The decision to give platelets in this situation was split with 48% (n=42) of respondents withholding platelets and 52% (n=45) of respondents recommending platelets. Of those recommending platelets equal numbers would recommend one or two units with a minority of 9% suggesting three units (Fig. 12). Respondents were also asked what baseline platelet level would they like maintained in the first three days postoperatively. Table 1 shows that the majority of respondents (n=58) stated that a platelet level was not applicable due to medication effect. However a third of respondents recommended that the platelet count should be maintained above 75 x 10^9/L. Fig.13 shows recommended platelet unit doses, by regional cluster.
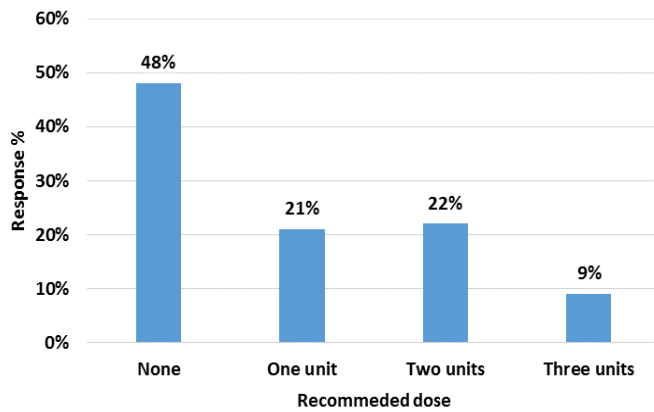
Figure 12: Platelet dose prior to neurosurgery. (87 respondents)

Table 1. Preferred platelet count post neurosurgery.

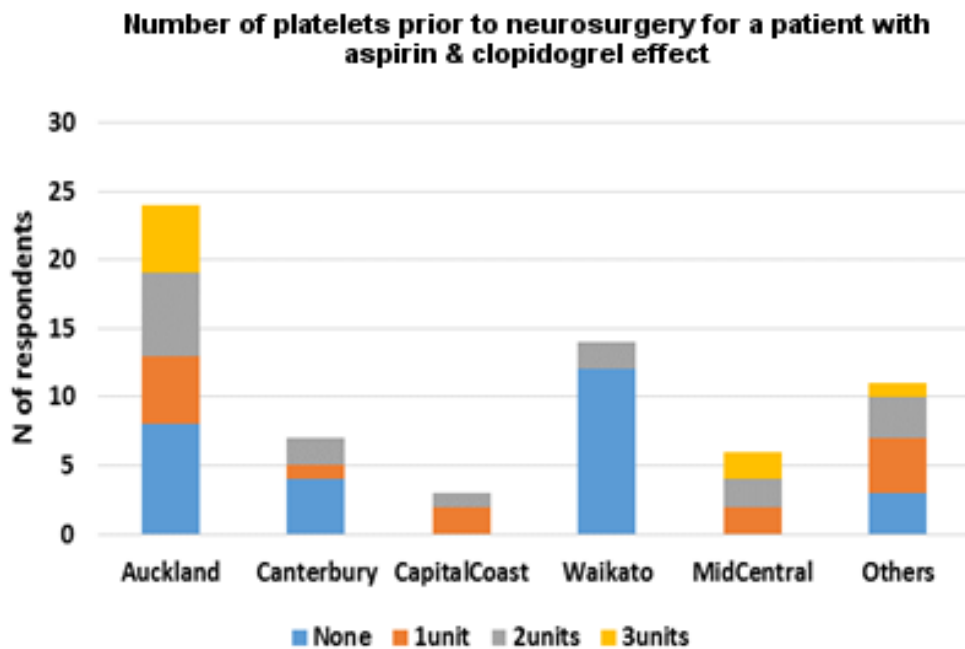| Answer Options	Response Percent	Response Count
Not applicable due to medication effect	67%	58
>75	11%	10
>100	22%	19

Figure 13. Platelet unit dose by region for neurosurgery.

Scenario 7.

A 66 year old woman with liver cirrhosis secondary to hepatitis C infection presented last night with haematemesis and melaena. She is haemodynamically stable but has a platelet count of 40. Would you recommend a platelet transfusion in this situation?
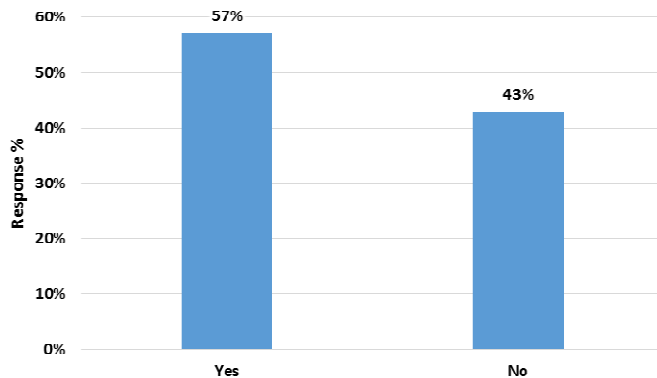

Figure 14. Platelet transfusion in setting of liver cirrhosis and GI bleed. (84 respondents)

Fig.14 shows that more respondents (n=48) would have given a platelet transfusion and of those, 92% would give a single unit (Fig.15). Prior to a gastroscopy the majority of respondents would be comfortable with a platelet count above 50 x 10^9/L (Fig.16).
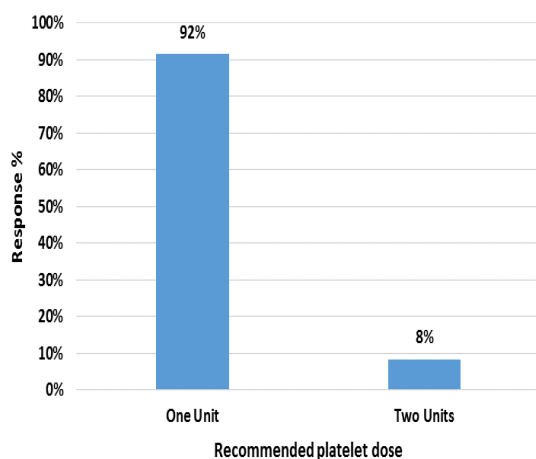

Figure 15. Platelet dose for GI Bleed.
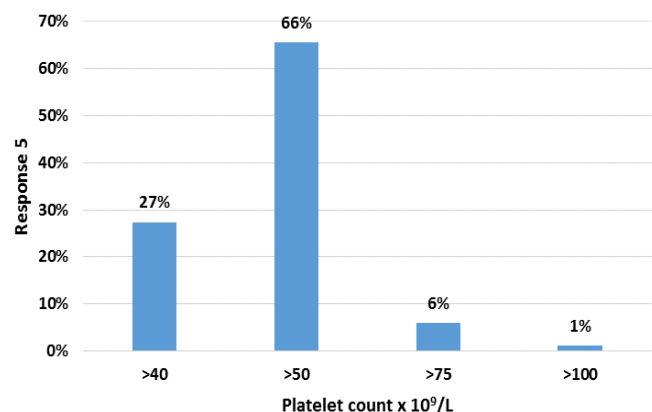
Figure16. Platelet count prior to gastroscopy.

Scenario 8.

A 71 year old man was admitted two days ago to a local rural hospital after being found moribund in his home by his niece. He has been diagnosed with left lower lobe (LLL) pneumonia and treated with intravenous antibiotics. His platelet count has fallen from 62 on admission to the rural hospital to 27 on arrival at your hospital. Would you recommend giving platelets at this stage?

93% of respondents (n=78) stated that they would not prescribe platelets at this stage and of the 7% of respondents that would recommend platelets, only one unit would be prescribed (Fig.17).

Figure 17: Platelet recommendations in the setting of LLL pneumonia (84 respondents)

Scenario 9.

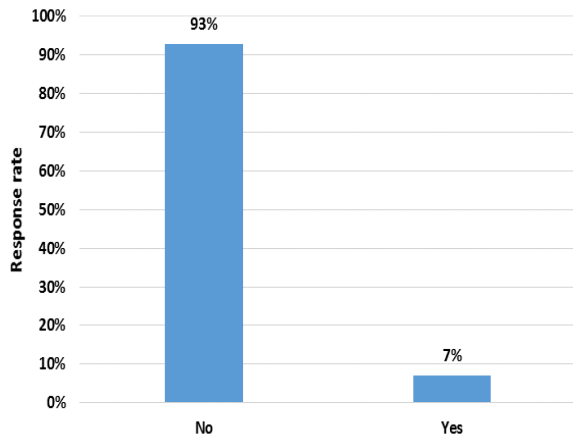*A primigravida with known idiopathic thrombocytopenia purpura (ITP) has had an uneventful pregnancy. There has been no bleeding events during her antenatal period and she has no other medical history of note. During her pregnancy what minimum platelet level would you be comfortable with?*

Seven respondents skipped this question stating that they would confer with a colleague. The majority of respondents stated that a minimum of $>30 \times 10^9$/L would suffice. There were five comments that mentioned that the stage of pregnancy was important and a higher platelet count would be recommended towards the end of the pregnancy.

Table 2. Preferred platelet count during pregnancy.

Answer Options	Response Percent	Response Count
>30	60%	50
>50	29%	24
>75	5%	4
Other	6%	5

During the actual birth, opinion was divided evenly along whether to give platelets or not (Fig. 18). 41% would not give platelets whereas 43% would give platelets and this group was divided between either one or two units. There were thirteen comments. Two respondents would defer to a more experienced colleague in this area. Six respondents would have used intravenous immunoglobulin (IVIg) or steroid therapy and would consider platelets only if a platelet increment was not achieved. Three respondents mentioned the insertion of epidural would be a deciding factor in prescribing platelets.
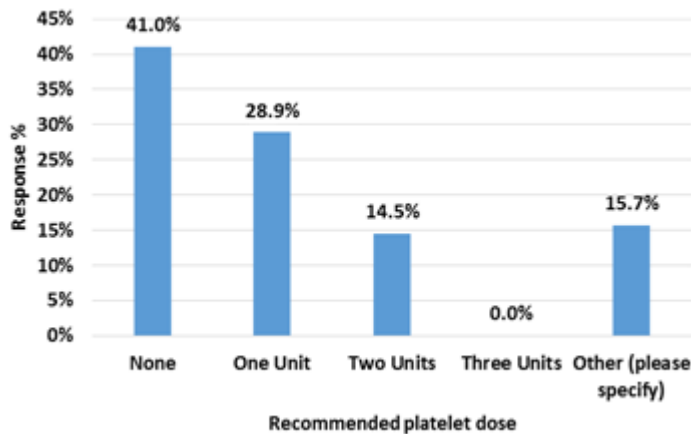

Figure 18: Platelet administration during delivery. (83 respondents)

Scenario 10

An 8 year old girl, weighing approximately 30kg, has been involved in a motor vehicle accident. She has suffered a fractured pelvis and extensive soft tissue and intra-abdominal injuries. The paediatric massive transfusion protocol has been activated. Her blood group is A-negative. Blood bank has informed you that Group A-negative platelets are unavailable although Group O-negative platelets and Group A-positive platelets are available. What advice, regarding platelet transfusions would you give?

Table 3. Non matched platelets.

Answer Options	Response Percent	Response Count
Give O-Negative Unit	72%	59
Give A-Positive Unit	1%	1
Give A-Positive Unit plus one vial of Anti-D	20%	16
Request an urgent supply of A-Negative platelets from NZ Blood Service	7%	6

The majority would request O-Negative units from the blood bank. Just under 20% would request A-positive units plus Anti-RhD. The six respondents requesting an urgent supply of A-Negative units were from the main centres. Only one respondent would advise giving A-positive units without Anti-RhD.

Scenario 11.

A 60 year old man with Burkitts Lymphoma, has a recent history of emphysema, is a one pack/day smoker and is HIV positive on HAART treatment. He was recently treated with R-IVAC protocol and has been admitted into the Emergency department with rigors, fever and increasing shortness of breath. Chest X-Ray findings show left lower lobe pneumonia. His blood count show WCC=0.6, Hb=110, Platelets=5. He is not actively bleeding and his Hb has been stable for several days. Would you prescribe platelets in this situation and if so, how many units and what platelet count is the aim?

Table 4. Decision to transfuse with risk factors.

Answer Options	Response Percent	Response Count
Yes	91%	73
No	9%	7

In Scenario 11, 91% of respondents (n=73) would recommend platelets (table 4). The majority (90%) considered one unit to suffice (Fig 19). Five respondents would have given two units and two would have recommended three units. These seven respondents operate from Auckland, Waikato and Canterbury.

Fig. 20 shows that 36% of respondents recommend a minimum platelet count above 10×10^9/L with another 45% aiming for a count of 20×10^9/L. A smaller number of respondents (n=12) wanted to have the platelet count above 30×10^9/L.
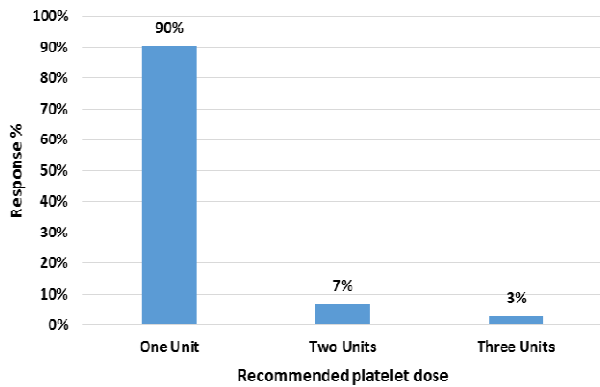
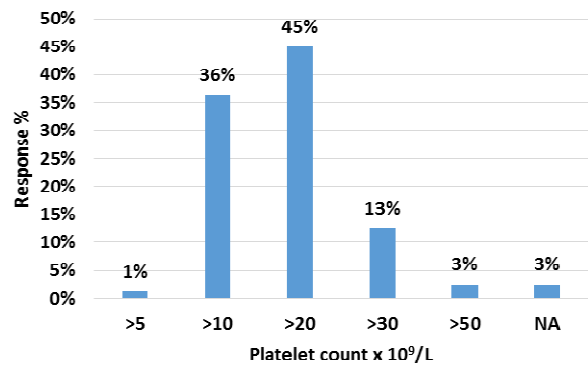*Figure 19: Number of platelet doses. (73 respondents)*

Figure 20: Minimum platelet count.

Scenario 12

A 64 year old man with Double Hit Lymphoma presented in 2013 with cord compression requiring laminectomy. He received CODOX-M and R-IVAC treatment. He had a previous history of ITP requiring conservative treatment but never responded well to platelet transfusions. He was recently admitted for BEAM protocol but quickly developed neutropenia and fevers. Despite the use of Tazocin and Tobramycin, and progressing to Vancomycin and Meropenem, his fevers continued unabated. Chest X-Rays show a left pleural effusion. He is not clinically short of breath. The tunnelled Hickman Line is to be removed. His blood count shows a WCC=2.0, Hb=89, neutrophils=1.3 and platelets=8. In view of his past poor response to platelets would you recommend platelets prior to the procedure, and if yes, how many units?

Table 5: Decision to transfuse prior to line removal.

Answer Options	Response Percent	Response Count	1 unit	2 units
Yes	71%	57	70%	26%
No	29%	23	NA	NA

The majority (n=57) of respondents would recommend platelets for their patient (table 5). Of those that would give platelets, 70% would give one unit (Fig 21). This question resulted in ten comments from respondents. Seven would recommend that the platelets be given immediately before or during the procedure. There were two suggestions of checking for an increment after giving platelets and two suggestions that intravenous immunoglobulin (IVIg) should be trialled.
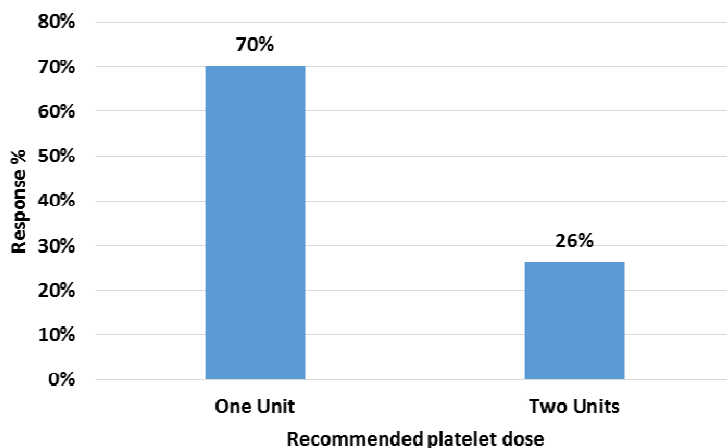
Figure 21: Recommended platelet dose prior to line removal. (80 respondents)

Regional Clusters

Respondents were asked to indicate for which DHB they were employed in. To ensure that individuals from smaller DHBs could not be identified the DHBs were placed in regions rather than singling out each small DHB. 79 respondents indicated their DHB. Fig.20 shows that 90% of the respondents indicated that they were active in the six main regions with blood banks operated by NZBS (ADHB, WDHB, MCDHB, C&CDHB, CDHB, SDHB).

Figure 22: Respondents by Regional Cluster.

A full list of the DHBs in each group is provided in Appendix 1.

DISCUSSION

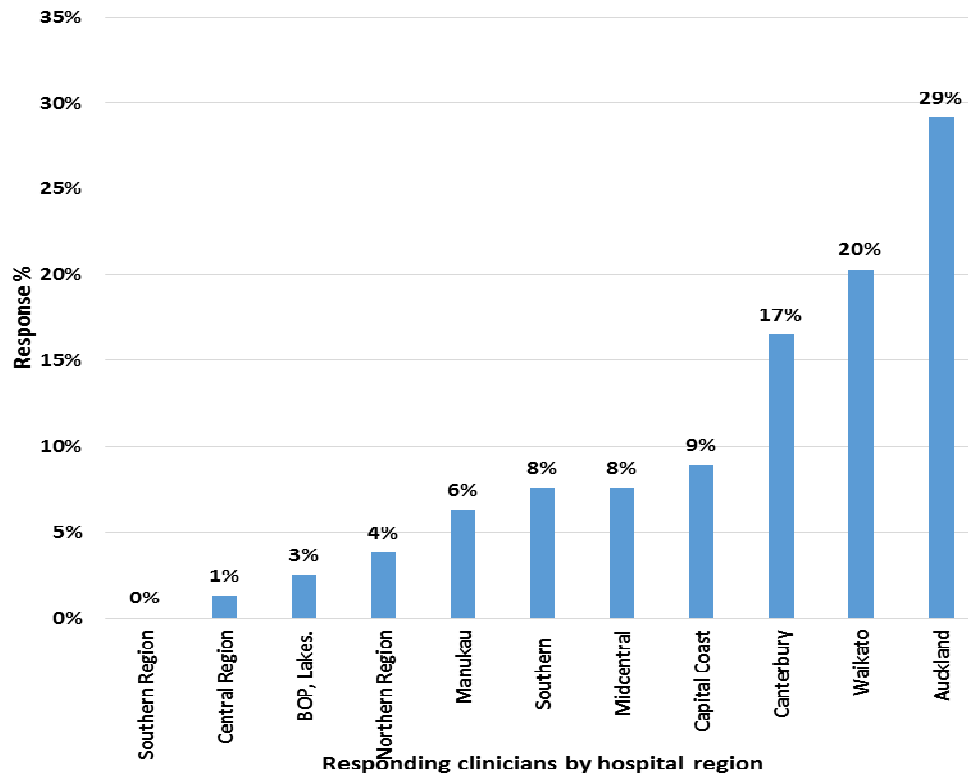Clinicians face many situations where guidelines do not provide clear advice on the appropriate course of action[10]. Treatment of thrombocytopenic patients is an example where a large proportion of transfusions are prophylactic. Existing guidelines provide some assistance for treating patients who have been undergoing chemotherapy and have bone marrow depression with advice differentiated for those patients that are febrile or currently bleeding.[9,11,12]

Surveyed clinicians are in the frequent position of prescribing platelets to the thrombocytopenic patient group. Their responses were generally in accordance with each other and existing guidelines in the patient group with platelet counts below 10×10^9/L and in the patient group with counts of 20×10^9/L with risk factors. A small minority of clinicians, ranging from 6% to 9%, in the various scenarios, would hold off transfusing, presumably until bleeding signs were visible. An equally small minority elected to transfuse platelets if the platelet count was above 20×10^9/L[9].

The number of units to be transfused by clinicians treating severe thrombocytopenia resulting from haematological or chemotherapy-induced causes was generally standard and most clinicians would recommend single unit platelet transfusion. A minority (9%) would recommend two or more units.

Several of the scenarios involved surgical procedures (insertion/removal of tunnelled central lines, gastroscopy, bone marrow biopsy and trephine, lumbar puncture, orthopaedic, neurosurgery as well as birthing) and thrombocytopenia. The National Blood Authority[9] has suggested that a platelet count $>50 \times 10^9$/L would suffice for most surgical procedures but lower counts could be acceptable without specifying those situations. Apart from the removal of a tunnelled central catheter most clinicians would prefer a platelet count of more than 50×10^9/L when a procedure was to be undertaken. It appears that the majority of clinicians would accept a lower platelet count for central line removal, some down to 10×10^9/L.

The gastrointestinal (GI) bleed and birthing scenarios displayed some disagreement between clinicians on whether to transfuse platelets or not. However, as soon as there was a need to perform an intervention (gastroscopy), in the setting of a GI bleed, the majority of clinicians opted for a platelet count above 50×10^9/L.

The transfusion of one dose of platelets (containing $\geq 2.4 \times 10^{11}$/unit) should raise the immediate platelet count by 30×10^9/L and therefore the NZBS advises that one unit of platelets is usually suitable in most situations. This is consistent with the recently published British Society for Haematology guidelines[11] on platelet usage.

Results from this survey show that the decision on platelet dose was relatively uniform with one dose suggested for most scenarios except for orthopaedic, neurosurgical and obstetric cases. For these three situations there was less agreement on whether to give platelets and on the number of units to transfuse. For the orthopaedic situation all clinicians agreed on giving platelets with the majority recommending two units, although 30% would choose one unit. During the post-op period most clinicians would be satisfied with a platelet count of $>50 \times 10^6$/L.

Both the obstetric and neurosurgery scenarios elicited diametrically opposed answers. Almost half would not transfuse at all, whereas a small majority would transfuse either one, two or three units. The variation in results are possibly explainable in the neurosurgery scenario as guidelines suggest that a platelet count $>100 \times 10^9$/L is advised and there may be concern that laboratory results wouldn't take into account the anti-platelet medication effect. However the obstetric scenario showed diverse opinions despite various guidelines

suggesting that patients with ITP (due to lack of effectiveness and to avoid alloimmunisation) should only receive platelets when there is active bleeding and that a platelet count >50 x 10^6/L should be sufficient for a vaginal or caesarean delivery although lower counts can be tolerated.

SUMMARY

All the scenarios are based on actual events that have occurred in New Zealand hospitals. A disadvantage with this is that the episodes were not designed to elicit a specific response that could be measured against defined parameters. However the aim of the survey was to find out what clinicians would recommend in actual situations and was not an audit against accepted guidelines.

This survey had a 45% (90/200) response rate which is considered acceptable by some authors[13]. The results suggest that the majority of clinicians in New Zealand provide clinical advice regarding the need for, and dose of, platelet transfusion is in-line with their colleagues. This should give clinicians some confidence in their decision making where there are no clear guidelines in place.

However there is a minority of clinicians that do vary from their colleagues particularly in the number of platelet doses recommended. One platelet dose is usually sufficient to obtain a clinical response in most settings according to AABB guidelines[10].

The desirable level for prophylactic platelets prior to a surgical intervention is often taken as 50 x 10^9/L however there is only weak evidence (expert opinion and observational data) supporting this cutoff. Several reports have suggested that patients with a platelet count as low as 20 x 10^9/L have similar bleeding events to those transfused above 50, especially where the surgery is relatively minor[8,14].

RECOMMENDATIONS

- Provide the survey findings to all invited clinicians
- Strengthen the advice for single unit transfusions, particularly in prophylactic situations
- Consider the validity of an audit on platelet transfusions involving multiple platelets units at a time
- NZBS to undertake a literature review on the scenarios covered, and develop practice points to assist clinicians.

APPENDIX ONE

DHB Name	Allocated region
South Canterbury, West Coast, Nelson-Marlborough	Southern Region
Whanganui, Taranaki, Tairawhiti, Hawkes' Bay	Central Region
Bay of Plenty, Lakes	BOP, Lakes
Waitemata, Northland	Northern Region
Counties Manukau	Manukau
Southern	Southern
MidCentral	MidCentral
Capital Coast	Capital Coast
Canterbury	Canterbury
Waikato	Waikato
Auckland	Auckland

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