

## A clinical audit on the practice of platelet transfusions at a tertiary paediatric referral centre

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### Abstract

Platelet transfusions are indicated in a wide variety of clinical conditions especially those with **thrombocytopenia**. However, without proper **clinical** practice guidelines, inappropriate transfusions are bound to happen. To ascertain the provision of a quality and appropriate practice of platelet transfusions, an audit study was carried out over a period of one month at the Paediatric Institute, Kuala Lumpur Hospital. A prospective audit was performed during that period whilst a retrospective collection of data was carried out for the previous month for comparison. Based on a set of criteria agreed upon by the audit committee, it was found that in 18.5% (22 of 119) of the cases, the indications for platelet transfusions were inappropriate. The audit committee concluded that there is a need for a more detailed clinical practice guideline for local use to reduce or lower the incidence of inappropriate transfusions of platelets.

**Key words:** *Clinical audit, platelet transfusions, paediatrics*

### INTRODUCTION

Platelets are amongst the most valuable and 'expensive' commodities in transfusion medicine. The demand is increasing and as such proper **clinical** practice guidelines would be helpful in reducing or avoiding inappropriate transfusion of platelets. The clinical indications for platelet transfusions are clear cut for patients with thrombocytopenia and bleeding **although** there are situations whereby their usage are questionable. The use of platelet transfusions as a prophylaxis against bleeding is limited to a few clinical situations<sup>1,2,3</sup>. Here is where there is a lack of consensus on the threshold level of platelet count below which the request for platelets would be deemed to be indicated. Since the preparation of platelets is a tedious and relatively expensive affair, the judicious request and use of platelets must be practised at all levels of medical personnel. It is important that platelets are given to those with proper indications and in whom the transfusions will have a significant benefit on the management of the patients. Guidelines on the use of platelet transfusions are available both locally<sup>1</sup> and **internationally**<sup>2</sup> but there is a lack of published reports on the fulfilment of these guidelines. The use of platelet transfusions has been increasing over the years. Contributory factors for this increase include **the use** of more intensive regimens for pa-

tients with **malignancies**. The main objective of this study was to audit the practice of platelet

**transfusions at the Paediatric Institute, Kuala Lumpur Hospital (KLH)**. The project was a collaboration between the Department of Paediatrics **University Kebangsaan Malaysia, the Department of Paediatrics KLH and the Blood Bank, KLH.**

### MATERIALS AND METHODS

The Paediatric Institute is a tertiary referral centre within the Kuala Lumpur Hospital (KLH) and provide care in both general paediatrics and paediatric sub-specialities. There are 4 general paediatric wards, 1 paediatric surgical ward, 1 multi-disciplinary 2nd class ward, 2 neonatal wards, 1 paediatric **oncology** and haematology ward, 1 bone marrow transplantation ward and 1 paediatric intensive care unit with a total capacity of about 350 beds. The Blood Bank in KLH supplies all the blood and blood products required by the institute. This audit study was carried out over a period of one month from the 1st of August 1996.

#### *Indicators for quality and standards*

To audit the clinical practice of platelet transfusions, four indicators for quality were chosen: (1)

use of platelets according to the **indications/criteria** set by the audit committee which are in turn based on available and existing **guidelines**<sup>1, 2</sup> (Table 1), (2) appropriate amount of platelets **re-**quested<sup>2</sup>, (3) appropriate amount received and transfused, (4) the time interval between requesting and transfusing platelets. The standards for the respective indicators were set as follows: (1) less than 10% of the platelet transfusions are not **indicated**, (2) less than 10% of the amount requested is not sufficient to maintain haemostasis, (3) none of the patients should receive less than the amount requested unless platelets are not available and (4) the time interval between requesting and transfusing should be **≤6** hours in all patients.

**Methods of data collection**

A questionnaire was prepared and pre-approved by the members of the committee which consisted of representatives from all the 3 departments involved. All the wards at the Paediatric Institute were included in the study which started on the 1st of August 1996 for a month. A retrospective and a prospective data collection were **carried out**. **Only** the committee members and one medical officer in charge of each ward had informed knowledge of the ongoing audit. For the retrospective study, a list of all requests for platelets throughout the month of July was obtained **from** the blood bank. The patients or the case notes were then traced and the relevant data obtained. The prospective study was carried out for the

**TABLE 1: Indications for platelet transfusions (as used by the audit committee)**

|  |   |
|--|---|
| Patients with bone marrow failure (secondary to disease, cytotoxics, irradiation) with platelet counts <b>&lt;20x10<sup>9</sup>/L</b> AND bleeding |   |
| Prophylactic transfusion   |   |
| Platelet counts <b>&lt;10x10<sup>9</sup>/L</b>   |   |
| Platelet counts <b>&lt;20x10<sup>9</sup>/L</b> in the presence of any of the following:-   |   |
|  | - fever                                       |
|  | - proven infection                            |
|  | - concurrent coagulopathy                     |
|  | - rapid fall in platelet count                |
|  | - potential bleeding sites (post-op)          |
|  | - ongoing chemotherapy                        |
| Platelet function disorders in the presence of bleeding or patient undergoing surgery  |   |
| Massive blood transfusions ( <b>&gt;1.5x</b> blood volume) – platelet transfusions indicated to increase counts <b>&gt;50x10<sup>9</sup>/L</b>     |   |
| Disseminated <b>intravascular</b> coagulation (DIC) – in the presence of bleeding and thrombocytopenia   |   |
| Immune thrombocytopenia - only for those with major haemorrhage  |   |
| <b>Neonatal alloimmune</b> thrombocytopenia - presence of bleeding despite <b>immunoglobulin</b>   |   |
| Prophylaxis for surgery  |   |
| Platelets at least <b>50x10<sup>9</sup>/L</b> for –  | lumbar puncture                               |
|  | epidural anaesthesia                          |
|  | insertion of indwelling lines                 |
|  | bronchoscopy                                  |
|  | liver biopsy                                  |
|  | laparotomy                                    |
| Platelets at least <b>100x10<sup>9</sup>/L</b> for –   | brain surgery                                 |
|  | eye surgery                                   |
| Dengue haemorrhagic fever in the presence of–  | bleeding AND                                  |
|  | platelet count <b>&lt;20x10<sup>9</sup>/L</b> |

month of August 1996. Questionnaires were distributed to all wards and one medical officer from each ward was assigned to complete the questionnaire for each request for platelets made. Regardless of whether platelets were obtained or not eventually, the intention to transfuse and the request for platelets were deemed sufficient for a patient to be recruited into the study. To be doubly sure that no patients are missed, a list of all the requests made for platelets for the month of August was obtained from the Blood Bank.

**RESULTS**

A total of 81 and 78 requests for platelets were made during the month of July and August respectively (Table 2). Of this total of 159 requests, only 119 were evaluable. The rest were excluded from the evaluation for standards of quality because of failure to trace the patients' notes or because of insufficient data obtained from the notes. The breakdown of requests for platelets according to the ward disciplines is shown in Table 3. As expected, the bulk of requests came from the haematology and oncology disciplines which accounted for 53.4% of the total number of requests. The breakdown of platelet transfusions given according to the clinical diagnosis at the time of the request is shown in Table 4. Understandably, haematological and oncological diagnoses predominate. Another notable clinical condition which was then prevalent in the general paediatric wards is dengue haemorrhagic fever (DHF) and there were a total of 37 requests for platelets for patients with DHF. Another major user was the paediatric intensive care unit from which the major indications were thrombocytopenia secondary to chemotherapy, DHF and disseminated intravascular coagulation.

Table 5 shows the fulfilment of the indicators of quality which was pre-determined by the audit committee. There were 22 out of 119 evaluable requests whereby the indications did not meet the preset guidelines for platelet transfusion. Both the

amount requested (as per body weight calculation<sup>2</sup>) and amount eventually transfused met the indicators for quality. Eight cases received their platelet transfusions  $\geq 6$  hours after the requests were made, the longest interval being 12 hours in 2 cases. The differences in achievement of the quality indicators between the month of July and August with respect to the indications and time interval were statistically not significant.

**DISCUSSION**

A total of 22 cases (18.5% of the 119 evaluable cases) were given platelet transfusions outside the indications preset by the committee. The majority of these, 18/22 or 81.8%, were from the oncology/haematology disciplines (overall, 57.2% of the requests were made by the oncology/haematology disciplines). In all the 22 cases there were no actual bleeding when the platelets were requested, hence the platelets were transfused as 'prophylaxis' against bleeding.

It is believed that the use of prophylactic platelet transfusions to keep the platelet count above  $10 \times 10^9/L$  reduces the risk of haemorrhage as effectively as keeping it above any higher level.<sup>6,7,8</sup> This threshold of  $10 \times 10^9/L$  is not absolute and the general belief is that it can be even lower in certain clinical conditions. On the other hand, in the presence of factors such as fever or infection, ongoing chemotherapy, concurrent coagulopathy, rapid fall in platelet counts or in the presence of potential bleeding sites as a result of surgery, the use of platelet transfusions to keep the count above  $20 \times 10^9/L$  is clinically justified. Out of the 22 cases aforementioned, only 6 had platelet counts less than  $20 \times 10^9/L$  prior to the transfusion of platelets (Table 6). None of these 6 cases had the presence of the additional factors mentioned above which could have increased the risk of bleeding. It would have been interesting if the actual reasons for requesting the platelets in these 22 cases were obtained from the respective medical personnel involved.

**TABLE 2: Number of requests for platelet transfusions at the Institute of Paediatrics, HKL, during the month of July and August 1996**

|                       | JULY<br>(retrospective) | AUGUST<br>(prospective) | Total |
|-----------------------|-------------------------|-------------------------|-------|
| Total requests        | 81                      | 78                      | 159   |
| Total evaluable cases | 56                      | 63                      | 119   |

**TABLE 3: Breakdown of platelet transfusions according to the ward disciplines**

|                                    | JULY | AUGUST | Combined total |
|------------------------------------|------|--------|----------------|
| General paediatric wards           | 14   | 20     | 34             |
| Haematology and <b>oncology</b>    | 45   | 40     | 85             |
| <b>Bone</b> marrow transplant ward | 2    | 4      | 6              |
| Neonatology ward                   | 2    | 5      | 7              |
| Paediatric surgery                 | 5    | 2      | 7              |
| Paediatric intensive care unit     | 13   | 7      | 20             |
| Total                              | 81   | 78     | 159            |

**TABLE 4: Breakdown of platelet transfusions according to diagnosis for the month of July and August 1996**

|   | No. of transfusions<br>in July 1996 | No. of transfusions<br>in August 1996 |
|---|-------------------------------------|---------------------------------------|
| Acute lymphoblastic leukaemia                 | 32                                  | 27                                    |
| Acute myeloid leukaemia                       | <b>10</b>                           | 11                                    |
| Hepatoblastoma                                | 4                                   | —                                     |
| Hepatocellular carcinoma                      | 1                                   | —                                     |
| Lymphoma                                      | 2                                   | —                                     |
| Neuroblastoma                                 | 1                                   | 5                                     |
| Rhabdomyosarcoma                              | —                                   | 3                                     |
| Aplastic anaemia                              | —                                   | 3                                     |
| <b>Idiopathic thrombocytopenic purpura</b>    | 1                                   | 1                                     |
| Dengue haemorrhagic fever                     | 14                                  | 23                                    |
| <b>Septicaemia/DIC</b>                        | 10                                  | 3                                     |
| End-stage renal disease                       | 1                                   | —                                     |
| Portal hypertension                           | 1                                   | —                                     |
| Epidermal abscess                             | 3                                   | —                                     |
| <b>Biliary Atresia</b>                        | 1                                   | —                                     |
| <b>Necrotising enterocolitis</b>              | —                                   | 1                                     |
| Imperforate anus with <b>thrombocytopenia</b> | —                                   | 1                                     |
| Total   | 81                                  | 78                                    |

**TABLE 5: Data on the fulfilment of indicators of quality for platelet transfusions**

|  | JULY          | AUGUST        |
|--|---------------|---------------|
| Inappropriate indication   | 11/56 (19.6%) | 11/63 (17.4%) |
| Amount requested <b>inappropriate</b>                            | <b>0/56</b>   | <b>0/63</b>   |
| Amount transfused inadequate                                     | <b>0/56</b>   | <b>0/63</b>   |
| Time interval between request and transfusion <b>&gt;6</b> hours | 6/56 (10.7%)  | 2/63 (3.2%)   |

**TABLE 6: Platelet counts of 22 patients where platelet transfusions were 'not indicated'**

| Counts (per mm <sup>3</sup> ) | Number of cases |
|-------------------------------|-----------------|
| 10,000-20,000                 | 6               |
| 21,000-30,000                 | 5               |
| 31,000-40,000                 | 3               |
| 41,000-50,000                 | 2               |
| 51,000-60,000                 | 1               |
| 61,000-70,000                 | 3               |
| >70,000                       | 2               |

*Supply of platelets from the blood bank*

In all cases, the amount of platelets **received/released** from the blood bank matched the amount requested. At the Blood Bank, Kuala Lumpur Hospital, the request for platelets are processed promptly by the blood bank as soon as the forms are received (personal communication). The actual release of the platelets much depends on the time the ward porter arrives at the blood bank to collect them.

*Delayed transfusion of platelets*

The indicator for quality was not met in this category although the committee felt that the cases involved were few. The committee also believed that when the 6-hour time interval between request and actual transfusion was chosen as the quality assurance indicator, the 'zero-percentage' for standard practice was too idealistic especially when no current data is available for comparison. Hence, the time interval of 6 hours was an arbitrary figure. For the month of August, only 2 out of 63 evaluable cases received their platelets more than 6 hours after the actual requests were made. Even then, the transfusions were given 7 or 8 hours after the requests. The **cause(s)** for this minor delay in these 2 cases cannot be ascertained from this audit.

For the month of July, there were 13 cases in which a delay occurred. In 7 of these cases, the delay was either justified (2 cases where platelets was ordered by the **surgeons** as a standard pre-operative practice) or would not have cause any potential harm to the patient (5 cases where it was actually not indicated). It is interesting to postulate whether the blood bank **personnel** had purposely delayed the release of the platelets in cases where the platelets were not indicated in the first **place**. It could also mean that where there is no urgency in the need for platelets, little ef-

fort was made by the medical personnel to urgently acquire the platelets! Hence, for the month of July, there were only 6 cases where an 'actual delay' occurred i.e. the time interval between request to transfusion was more than 6 hours. In four of these, the time interval was between 7-8 hours whilst in the other 2, the interval was 12 hours.

*Conclusions and recommendations*

For both the retrospective and prospective study, only two out of the four indicators for quality were achieved. There were no significant differences between data obtained from the retrospective and the prospective study suggesting that even if the clinicians had knowledge about the ongoing audit, it did not make any differences as to their clinical practice pertaining to platelet transfusions. It must be again stressed that these data was obtained based strictly on the criteria set for this particular study. The proportion of cases where platelets were requested when they were not indicated is significant (18.5%). The majority of these came from the **oncology** and haematology disciplines where in most cases bone marrow suppression is prevalent and it is difficult at times to predict the rapidity of drop in the platelet **counts**.<sup>3,4,5</sup> When compounded also by the fear that there is no guarantee that platelets will be available when bleeding occurs, the usual play-safe clinical decision is practised. It is clear that the use of platelet transfusion as a prophylaxis of bleeding must be further evaluated and discussed by clinicians and haematologists.

It is also likely that there is a lot of variation in the 'personal practice' in terms of requesting for platelets. One doctor's criteria, including a specialist or a consultant, may not be valid for another. An optimal policy for prophylactic platelet transfusions has not been defined even at the international level. The general belief amongst haematologists is that clinical practice guidelines are required and it should be based on an audit of the local clinical picture. The criteria used by the committee in this audit is not totally absolute but it can form the basis for a protocol on platelet transfusions in the paediatric practice.

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