

Where did platelets go in 2012? A survey of platelet transfusion practice in the North of England

A. Charlton,¹ J. Wallis,¹ J. Robertson,² D. Watson,³ A. Iqbal⁴ & H. Tinegate⁵

¹Department of Haematology Newcastle Teaching Hospitals, ²NHSBT, RTC Administrator, ³Better Blood Transfusion Regional Lead, NHS Blood and Transplant, ⁴University Hospital of North Durham, Consultant Haematologist, Durham, County Durham, UK, and ⁵NHSBT, Patients Clinical Team, Newcastle, UK

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SUMMARY

Objectives: To record the fate of transfused platelet doses in the North of England, and thereby assist with demand-planning and help target teaching on appropriate use.

Background: Platelet use has risen recently to the extent that donation practice has changed to meet demand. Two national comparative audits have shown inappropriate use and the 2010 audit concluded that current UK guidelines for platelet usage should be completely implemented at a local level. It is necessary to know how platelets are used and by whom in order to facilitate guideline concordance.

Methods: All hospital trusts in the North East and Cumbria recorded data on all platelet doses transfused in two separate 4-week periods in 2012. Data were entered onto an electronic survey tool.

Results: One thousand and five hundred and seventy-four reports were received, documenting 1937 transfused doses – 96% of total issues for the study periods. One thousand and forty-five platelet doses (54%) were given for haematological indications. The second commonest indication was cardiac surgery (201 doses, 10% of the total) followed by non-haematological oncology (127 doses, 6.5%), critical care (106 doses, 5%) and liver disease (50 doses, 2.5%).

The commonest haematological indication was acute myeloid leukaemia, 310 doses, (16% of all platelet use), followed by stem cell transplantation, 271 doses (14%).

Seventy-two percent of platelet doses were given prophylactically, the majority without any planned procedure.

Conclusion: The commonest indication for platelet use, where reinforcement of guidelines will be productive, is prophylaxis in haematological disease. Use of platelets in cardiac surgery is also worthy of close scrutiny.

Key words: appropriate use, indications, platelets, prophylactic.

There has been an unprecedented rise in demand for platelets in the last 5 years within the areas served by National Health Service Blood and Transplant (NHSBT) (Birchall & Estcourt, 2012).

Current NHSBT figures suggest a rise in demand of 3% per year and this increase has led the organisation into developing strategies to meet rising hospital demand for platelets (NHSBT, 2011). Furthermore, recent NHSBT data show that the increase in platelet usage in hospitals in the North East and Cumbria has been even greater than the national average. Regionally, issues for 2011–2012 were 12.3% higher than the previous year, and this trend continued in 2012–2013.

Reasons for this increase have been put forward at both a regional and national level, and include the assumption that an ageing population has an attendant increase in the haematological malignancies and the increase, particularly in the last 10 years, of the use of anti-platelet agents in cardiac disease. A retrospective epidemiological study of platelet transfusion episodes, classifying patients by diagnostic and procedural codes, previously identified the major recipients as haematology, cardiology and paediatric patients (Wells *et al.*, 2009).

In view of the steep rise in platelet issues in our region, and concerns about inappropriate use which have been raised in two national audits of platelet use (Qureshi *et al.*, 2007), (Birchall *et al.*, 2010), this survey of platelet use across the North East of England was carried out. A similar strategy to previous studies of red cell transfusion was employed in which clinical use was ascribed at the time of issue by the hospital department, rather than retrospectively (Wells *et al.*, 2002). The principle aim was to identify the major users of platelets. The information gained was intended to help focus educational initiatives on appropriate platelet use and assist in developing a demand-management strategy.

METHOD

All hospitals in the North of England, that receive blood components from the Newcastle blood centre, agreed to record data on

Correspondence: Hazel Tinegate, NHSBT, Patients Clinical Team, Holland Drive, Newcastle NE2 4NQ, UK.

Tel.: 07764280306; fax: 01912194556;

e-mail: Hazel.Tinegate@nhs.uk

all doses of platelets transfused in two separate 4-week periods in March and June 2012. The details collected were: age and gender of the recipient, primary indication (bleeding vs prophylaxis), and diagnosis for each platelet transfusion episode.

A transfusion 'episode' was defined as a 24-hour period beginning with the first transfusion to a patient, such that several doses (in practice up to 5) might be recorded as given within a single episode. An adult platelet dose was either a single donation collected by apheresis (94% of all platelet issues in Newcastle in 2012/2013) or a pool of buffy-coat derived platelets (4% of all issues). A paediatric dose is prepared by splitting an apheresis donation that is cytomegalovirus (CMV) negative and negative for clinically significant antibodies, into smaller volumes (NHSBT Portfolio, 2012).

Reporters identified whether platelets were given to treat haemorrhage (spontaneous or related to surgery, childbirth or trauma) or for prophylaxis, and in the case of the latter, whether this was routine or prior to a procedure with a risk of bleeding. Special requirements [whether platelets needed to be irradiated, CMV-negative or Human Leucocyte Antigen (HLA)-matched] were recorded.

Reporters were asked to self-assess the appropriateness of platelet transfusions, by stating whether prophylactic platelet transfusions were given according to accepted thresholds of platelet count as set out by the British Committee for Standards in Haematology (BCSH, 2003) and recently updated by the National Comparative Audit (NCA) Platelet Working Group (2012), or an altered threshold. In the case of the latter, if the transfusion was not prior to a planned procedure, reporters were asked to give the reason for using an alternative trigger.

Data were recorded on a paper proforma (Appendix S1, Supporting Information) at the time of, or shortly after, platelet issue by the hospital transfusion department, and then entered via an electronic survey tool (SurveyMonkey™) onto an Excel 2003 spreadsheet for further analysis (Microsoft Corporation, Redmond, WA, USA). Data returns were compared to hospital issues from NHSBT Newcastle, and to internally held Blood Stocks Management Scheme (BSMS) data on wastage rates, to check completeness.

Ten percent of the entries from each 4-week period were validated to ensure reliability. A random selection of the original data forms originating from two large, central hospitals and one large district general hospital, were studied. Four key data points from each form were compared for reproducibility according to the judgment of the validator.

Ethical approval was not sought as the study utilised data provided in the course of normal patient care, and no patient-identifiable data were collected. (NHS Health Research Authority, 2011).

RESULTS

Total usage, and issue data

One thousand and five hundred and seventy-four reports were received in total over the two periods, representing 1937 doses

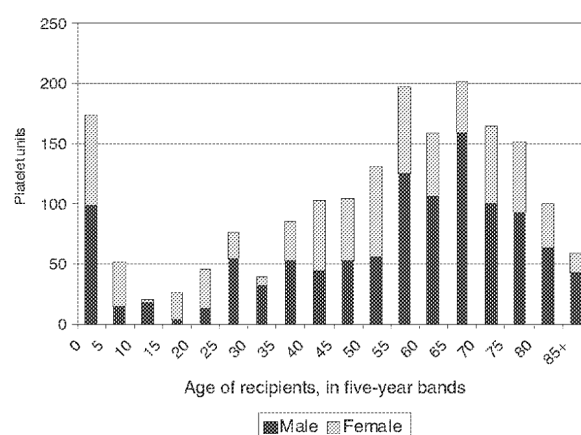


Fig. 1. Recipients by age and gender.

(1830 adult doses, and 107 paediatric doses) transfused. This is estimated to be 96% of the total Newcastle issues to hospitals for the two study periods. For the months under study, March and June 2012, a total of 2019 platelet doses were issued from the Newcastle blood centre. Approximately 200 further platelet doses were collected and processed, but not issued by the centre, for whatever reason. Data from the UK BSMS, designed to improve inventory management, showed that, overall, the region had a hospital platelet wastage rate of 3.8% in 2012.

Age and gender of recipients

The median age of recipients was 57 and the male: female ratio was 1.4:1. Figure 1 shows platelet usage by 5-year age band and gender.

Usage by clinical category

When usage of platelets was split according to broad clinical category, 1045 doses (54%) were given to haematology patients, 472 doses (24%) to surgical patients and 402 (21%) to medical patients other than haematology. Eighteen doses could not be assigned to any broad clinical category due to insufficient information about clinical indication.

Table 1 shows the breakdown of specialties receiving platelets within medicine, (including haematology) and surgery. Cardiac surgery was the largest single indication outside haematological disease (201 doses, 10%).

Haematological indications were analysed further in Table 2 which shows that acute myeloid leukaemia (AML) and stem cell transplant (SCT) patients were the largest platelet users at 29% (310 doses) and 26% (271 doses) of all haematological use respectively. Stem cell transplant could be further split into allogeneic: 218 doses, 11% of all usage, and autologous, 53 doses, 3% of usage.

Across all specialties most doses were transfused in: AML (16% of overall total), allogeneic SCT (11%),

Table 1. Use within medical and surgical specialties

	Specialty	Number of platelets used (% of whole)
Medical	Haematology	1045 (54%)
	Oncology (non-haem)	127 (6.5%)
	Critical care (adult)	106 (5%)
	Liver disease	50 (2.5%)
	Gastro intestinal bleed	45 (2%)
	Neonatal	24 (1%)
	Renal disease	13 (0.5%)
	Other*	37 (3%)
	Total	1447 (75%)
Surgical	Cardiac (not transplant)	201 (10%)
	Urgent aneurysm	43 (2%)
	Gastro intestinal	36 (2%)
	Cardiac transplant	31 (1.5%)
	ECMO	29 (1.5%)
	Neurosurgery	19 (1%)
	Liver transplant	17 (1%)
	Orthopaedic	16 (1%)
	Lung transplant	14 (1%)
	Obstetric	14 (1%)
	Trauma	19 (1%)
	Vascular, non-aneurysm	11 (0.5%)
	Other**	22 (1%)
	Total	472 (24%)
	Unassigned	18 (1%)
	Grand total	1937 (100%)

*"Other medical" includes severe combined immunodeficiency (8 doses), haemolytic uraemic syndrome or thrombotic thrombocytopenic purpura (4), paracetamol overdose (4), single doses in a range of conditions (8), and "not stated" (13).

**"Other surgical" includes neonatal surgery (6 doses), ENT (4), urology (4) renal transplant, pancreatic transplant, gynaecological surgery (1 each) and "not stated" (5).

cardiac surgery (10%), myelodysplastic syndrome (MDS) (6%) and non-haematological oncology (6%).

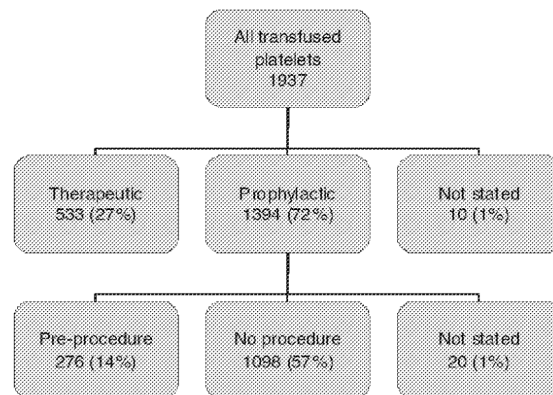
One thousand and three hundred and ninety-four doses were given for a prophylactic indication (72% of total) of which 1098 were for routine prophylaxis with no planned procedure (57% of total). Figure 2 shows these data. Of 1045 platelet doses given to haematology patients, 809 (77%) were given as prophylaxis with no planned procedure. For all the 1098 doses that were given for prophylaxis without a planned procedure, 134 (7% of total) were stated as being prompted by a threshold outside both current BCSH guidelines (BCSH, 2003) and updated guidelines produced by the NCA working group (2012). The latter advise different thresholds depending on the presence or absence of risk factors. Of these 134 doses, only 11 were transfused where a clear reason for deviation from guidelines was given.

Multiple-dosing for prophylactic indications accounted for the following: 57 double-doses, 9 triple doses and 3 quadruples – 153 doses in all (8% of total). Seventy-two of these doses (47%) were given to patients with haematological disease.

Table 2. Use within haematology

Diagnosis	Number of units used (% of whole)
Acute myeloid leukaemia	310 (16%)
Allogeneic transplant	218 (11%)
Autologous transplant	53 (3%)
Myelodysplasia	123 (6%)
Non-Hodgkin's lymphoma	87 (4.5%)
Acute lymphoblastic leukaemia	69 (3.5%)
Myeloma	68 (3.5%)
Chronic lymphocytic leukaemia	48 (2%)
Aplastic anaemia	41 (2%)
Other*	28 (1.5%)
Total	1045 (54%)

*"Other haematological" includes Hodgkin's disease (9 doses) myeloproliferative disease (8) idiopathic thrombocytopenic purpura (7) acute promyelocytic leukaemia (4).

**Fig. 2.** Platelet use by broad category.

Special requirements

Seven hundred and one platelet doses were irradiated (36% of all doses), 82 were HLA-matched (4%) and 366 were CMV-negative (19%). Requirements for irradiated and/or HLA-matched platelets remained similar during both collection periods. The use of CMV-negative doses dropped from 27 to 12% between the March and June collection periods. The Advisory Committee on the Safety of Blood, Tissues and Organs (SaBTO) guidance on restricting the use of CMV-negative blood components had been issued in March 2012 (SaBTO, 2012).

Validation

From 159 inspected records, 94% of data were considered correct. The discrepancies were mostly due to misclassification of episodes in the prophylaxis/bleeding category, which in some cases also caused the standard vs altered threshold data to be incorrect. Discrepant entries were spread equally across data collection periods.

DISCUSSION

We have performed a non-interventional survey of platelet transfusion practice with the intent of improved understanding of changing platelet use. Our study, which reports on platelet usage in all hospital sites in an English region with a population of 2.5 million, was not an audit of appropriate practice, but was intended to analyse current platelet usage. We found as expected that the majority of platelets are used for patients with haematological disease, with cardiac surgery being the next largest user at 10% of transfusions. Our results can be compared to recent reports in the UK and elsewhere, although only one report is similarly population based, providing detailed information on the clinical diagnosis of platelet recipients and giving largely similar results (Pendry & Davies, 2011). In the United Kingdom, the National Comparative Audit assessed the appropriateness of platelet usage in haematology patients only (Estcourt *et al.*, 2012). Other studies have reported analyses of platelet usage in single centres (Greeno *et al.*, 2007), (Verma *et al.*, 2008).

Our figures for use per 1000 persons can be compared with international data. The most recent figures (2008) from the Council of Europe, (Van der Poel *et al.*, 2011), show that in Western European countries for which data exist the number of doses of platelets transfused per 1000 population varies between 3.1 and 6.1. The UK was in the middle of the Western European range at 4.4 per 1000 population in 2008. A comparable figure for the North East and Cumbria in 2008, when 9624 platelet doses were issued to a population of 2.9 million, was 3.3 per 1000 population. Figures from NHSBT show platelet demand has increased substantially since 2008, and in 2012, at the time of this study, platelet use per 1000 population in the North East and Cumbria had risen to 4.6 per 1000 population. Our findings are likely to be applicable to the rest of the regions served by NHSBT in England and North Wales, with the caveat that platelet usage in our region does appear to be rising more rapidly than in the rest of the country. US figures are not directly comparable, but the most recent published data of platelet usage, including those which were transfused, outdated or otherwise unaccounted for, suggest, adjusting for pack size, a figure of 13.6 doses per 1000 population in 2001 (Sullivan *et al.*, 2007).

As expected, the largest number of platelets (54%) was given to patients with haematological disease. This compares to 57% in the North West of England study (Pendry & Davies, 2011). Within haematology, the commonest indication for platelet use was treatment of acute myeloid leukaemia outside the setting of stem cell transplant, followed by stem cell transplantation (mostly allogeneic) for a range of haematological diagnoses. In our region, the second commonest diagnostic category apart from haematological disease was cardiac surgery (201 doses, 10%) whilst in the North West, the second highest category was stated to be the specialty of intensive care, and cardiac surgery only accounted for 6.5% of platelet use (101 U). This difference may be due to the difficulties inherent in assigning diagnostic categories or to the relative rates of cardiac surgery in the two regions.

The majority of platelets transfused to haematology patients were given with prophylactic intent. Use within haematology has been the subject of a comparative audit released in 2011 (Birchall *et al.*, 2011) which showed that 69% of haematological platelet doses were given for prophylaxis. Our study showed that a higher number, 911 doses (87% of all haematology use), were given for prophylaxis in haematology and that, for all patient groups, 72% were given for prophylaxis. The 2010 national comparative audit showed that 34% of prophylactic platelet transfusions in haematology were inappropriate according to existing guidelines (BCSH, 2003). Recent studies have demonstrated that there is a role for prophylaxis (Wandt *et al.*, 2012), (Stanworth *et al.*, 2013), (Slichter, 2013) most particularly in patients with AML, whilst it may be possible to adopt a strategy of using therapeutic platelets in autologous stem cell transplants (Wandt *et al.*, 2012).

Medical use outside haematology is predominantly for oncology patients, 127 doses (6.5% of all use) with only 50 doses (2.5% of all use) reported as being used by patients with liver disease.

Most episodes of multiple dosing occurred in the context of prophylaxis (153 doses, 8% of the total) and of these, 116 doses, 76% of multiple doses, were not prior to a procedure. Forty-seven percent of multiple dose episodes occurred in haematology patients, 29% in medical and 24% in surgical cases. Reasons for multiple platelet doses could not be determined.

One limitation of this study is that the overall number of doses transfused and analysed is relatively small. The accuracy of data for clinically judged findings such as reasoning for the use of altered thresholds relied upon the interpretation of the reporter in each trust. Inter-reporter variability could not be controlled but validation data suggested reasonable accuracy.

Our study has several strengths. There was an excellent return rate from all hospitals in the data collection area, and NHSBT data indicated that survey returns were received on 96% of all platelet issues. We therefore believe the data to be substantially complete. Data were collected as soon as possible after the transfusion episode, by members of the hospital transfusion team, who were able to assign clinically relevant diagnoses rather than be dependent on retrospective coding. Data that were collected over two separate 4-week periods showed similar characteristics. Discrepancies between the original and validated entries were equally spread across different hospitals and data collection period, which suggests that there were no major sources of erroneous or poor quality data that might otherwise skew the results.

This study indicates the clinical conditions for which platelets are currently given in the North East of England. It was not an audit, and, apart from querying the rationale for use of multiple platelet doses in prophylaxis, comment cannot be made on appropriateness of use unless our reporters stated doses were inappropriate. However there can be no doubt that haematology patients are the largest group of platelet recipients, and therefore members of the haematology clinical team would seem to be a prudent target for educational initiatives such as those proposed following the recent NCA.

As regards the use of platelets in cardiac surgery, a recent National Comparative Audit (2011) showed wide variations in transfusion practice, and management of antiplatelet agents pre-operatively for cardiac surgery patients. Previous studies have shown that platelet transfusions are frequently given despite adequate counts because of concern about platelet dysfunction during and after bypass although there is no evidence that blood loss is reduced (Simon *et al.*, 1984), (Premaratne *et al.*, 2001). The majority (74%) in our study were stated as given for the treatment of active haemorrhage.

This study, and that of Pendry & Davies (2011), can assist demand planning for platelet doses if these data are linked to accurate population-based data on haematological malignancies. The Northern and Yorkshire Cancer Registration and Information Service (NYCRIS) demonstrates that the age-standardised incidence of haematological malignancies has increased by 22% between 2001 and 2008 (NYCRIS, 2013). It has also been demonstrated that haematological cancers increase with advanced age, (Smith *et al.*, 2011) and as treatment improves survival, the prevalence of conditions requiring platelet transfusion is likely to increase. Significant survival increases in several malignancies have been seen in the past two decades according to national data (NYCRIS, 2013). In the North East of England and Cumbria, regional data on clinical haematology activity show a sharp rise in haematological

procedures, such as allogeneic transplants, and more intensive chemotherapy regimes for elderly patients with haematological malignancy.

Having established a baseline of platelet usage, we plan to repeat the survey in 4 years, to assess the effects of demographic change, initiatives towards appropriate use, new guidance on the use of platelet transfusions, and the effects of changes in medical and surgical treatments related to marrow failure and bleeding.

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All authors contributed to the initial audit tool design. J. R. designed and operated the electronic data collection tool, and ensured the project ran according to schedule. A. C. and H. T. analysed the data. A. C., H. T. and J. W. wrote the paper. D. W. and A.I. provided critical revision of the results and manuscript.

CONFLICT OF INTEREST

The authors have no competing interests.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Data collection form.

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