Platelets – one bag or two?

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outline of talk

Platelets – some facts

WHO bleeding scale

Summary of National Audit findings

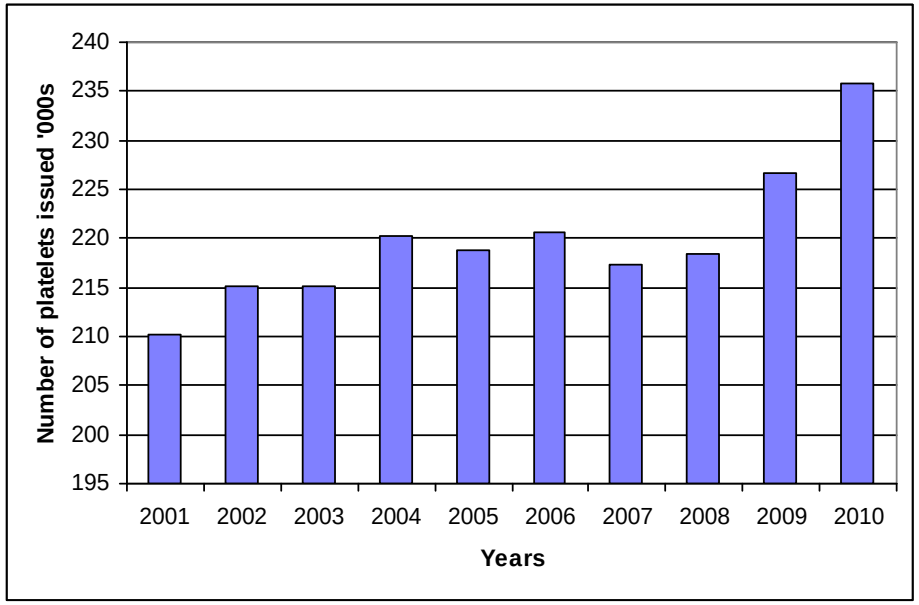
- Prophylactic platelets
- Pre-procedure platelets
- Therapeutic platelets

Conclusions

Getting control of your platelet usage

Platelets – some facts

- one adult dose of platelets costs £208.09



demand for platelets is rising….

the major users are haematology patients (57% of platelets)…

-risk of TRALI (leading cause of death due to transfusion) and platelets now main cause (8 x risk of RBCs)
-risk of allergic reaction (acute transfusion reaction 3rd most common cause of death or major mortality (SHOT)) and more frequent with plasma rich components especially platelets
-risk of bacterial infection (~1 in 1500 components contaminated)

Modified WHO scale for bleeding

Grade 1 Epistaxis/oral bleeding 30 min (total duration in prior 24 h), occult blood in stool, vaginal spotting, petechiae, microscopic hematuria

Grade 2 Epistaxis/oral bleeding 30 min (total duration in prior 24 h), hematoma, melena, hemoptysis, purpura 1-inch diameter, retinal hemorrhage without visual impairment, blood in cerebrospinal fluid after nontraumatic lumbar puncture

Grade 3 Requires RBC transfusion, grossly bloody bodily fluids, bleeding with moderate hemodynamic instability

Grade 4 Bleeding resulting in joint damage, retinal bleeding with visual impairment, bleeding with severe hemodynamic instability, symptomatic CNS bleeding, asymptomatic CNS bleeding evident on imaging only, fatal bleeding

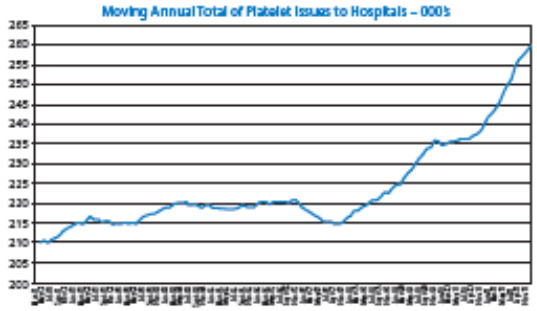
NHS
Blood and Transplant

Platelets

Don't use two...

...when one will do

Chart 1



There are a number of contributing factors for the increase including:

- inappropriate transfusion of platelets, including 'double dosing'
- the ageing population
- new approaches to medical care
- advances in treatments and available options
- the introduction of trauma/major haemorrhage packs.

One unit of platelets/Adult Therapeutic Dose (ATD) contains 2.5 – 3 x 10^{11} platelets[2].

For prophylactic use in a 70kg adult, one adult therapeutic dose (ATD) typically gives an immediate rise in platelet count of

approximately 20 - 40 x 10^9/l[1]

Do not administer double dose platelets for prophylactic transfusions as this practice does not decrease the risk of bleeding[2]

Request and administer one unit/ATD, then reassess your patient.

A platelet increment can be obtained 10 minutes after completion of the transfusion[3]

2010 Re-audit of the Use of Platelets in Haematology

East of England
RTC

John Grant-Casey, Project Manager
Lise Estcourt & Janet Birchall, Clinical Leads

August 2011

Why is this audit important?

NHS Blood and Transplant

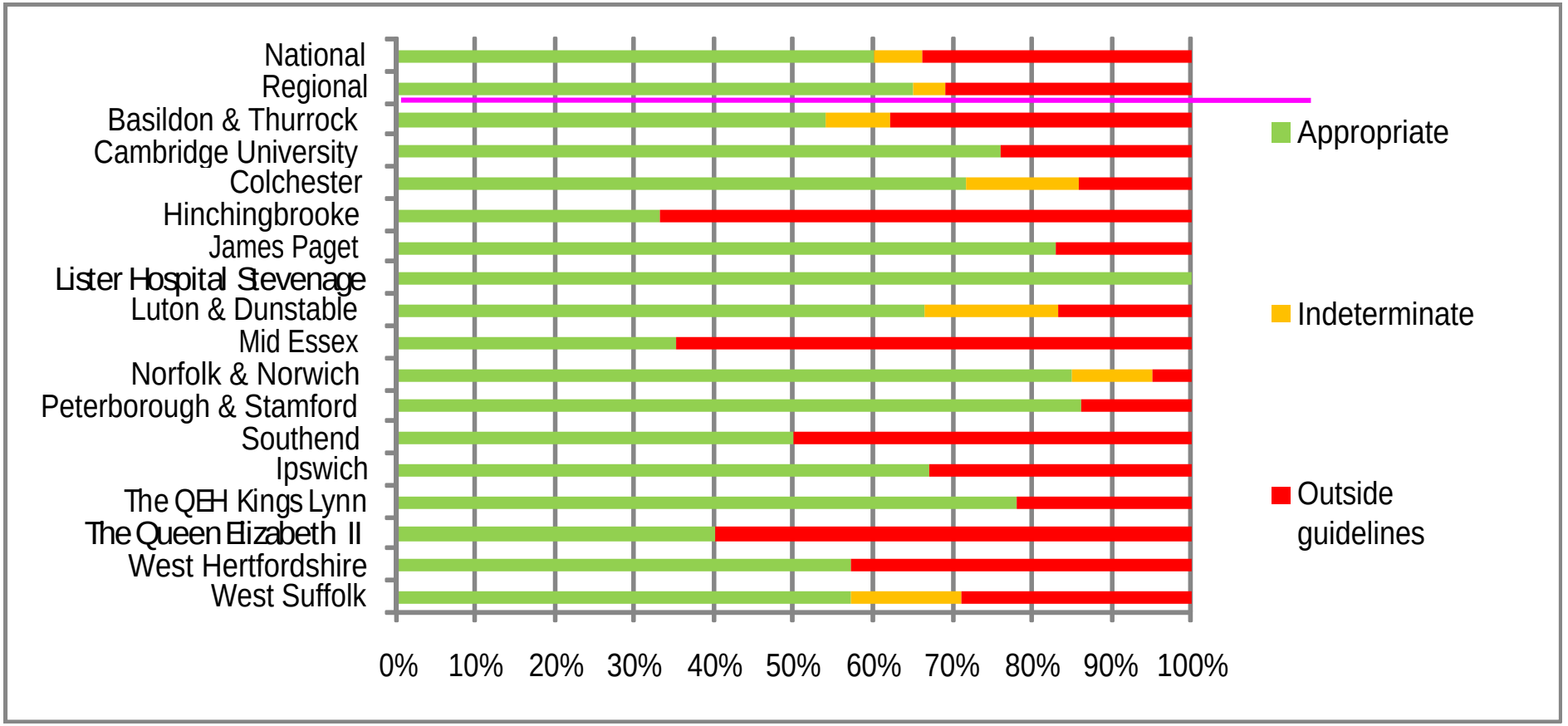
- **28%** of the platelet transfusions audited were considered inappropriate
  - This is despite taking into consideration factors which altered transfusion thresholds – addressing feedback from the previous audit

Audit 2010:
Prophylactic transfusions

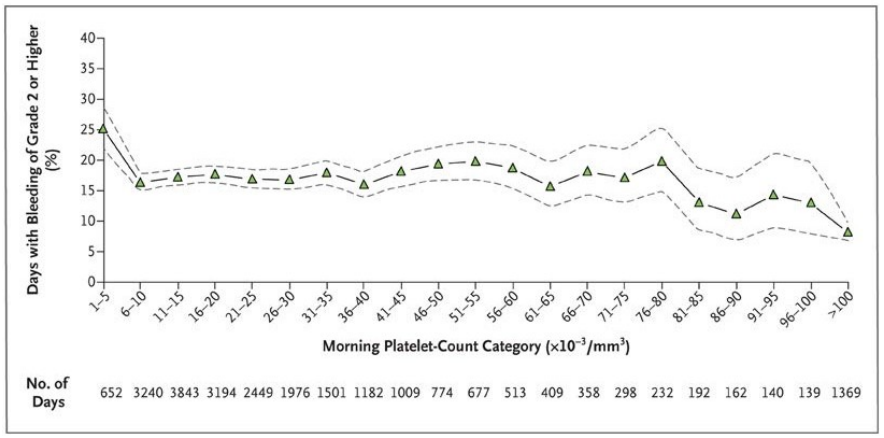
- 69% of all transfusion episodes were prophylactic
- 34% were considered transfusions that fell outside the guidelines and potentially could have been avoided
- 26% were transfused above guideline thresholds
- **10% were double dose** – recent randomised controlled trial has shown no difference in incidence of bleeding between single and double dose transfusions
  (Slichter SJ, Kaufman RM, Assmann SF, et al., 2010)

Appropriateness of prophylactic transfusions

NHS Blood and Transplant



Prophylactic platelets



Prophylactic platelet transfusion for prevention of bleeding in patients with haematological disorders after chemotherapy and stem cell transplantation (Review)

Estcourt L, Stanworth S, Doree C, Hopewell S, Murphy MF, Tinmouth A, Heddle N

THE COCHRANE COLLABORATION®

The NEW ENGLAND JOURNAL of MEDICINE

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A No-Prophylaxis Platelet-Transfusion Strategy for Hematologic Cancers

Simon J. Stanworth, M.D., D.Phil., Lise J. Estcourt, M.B., B.Chir., Gillian Powter, B.A., Brennan C. Kahan, M.Sc., Claire Dyer, B.N., Louise Choo, Ph.D., Lekha Bakrania, B.Sc., Charlotte Llewelyn, Ph.D., Timothy Littlewood, M.B., B.Ch., M.D., Richard Soutar, M.B., Ch.B., M.D., Derek Norfolk, F.R.C.P., F.R.C.Path., Adrian Copplestone, M.B., B.S., Neil Smith, M.B., Ch.B., Paul Kerr, M.B., Ch.B., Ph.D., Gail Jones, M.D., Kavita Raj, M.D., Ph.D., David A. Westerman, M.B., B.S., Jeffrey Szer, M.B., B.S., Nicholas Jackson, M.B., B.S., M.D., Peter G. Bardy, M.B., B.S., Dianne Plews, M.B., Ch.B., Simon Lyons, M.B., Ch.B., Linley Bielby, B.N., M.H.A., Erica M. Wood, M.B., B.S., and Michael F. Murphy, M.B., B.S., M.D., for the TOPPS Investigators*

eprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* ue 5

http://www.thecochranelibrary.com

Original Article

Dose of Prophylactic Platelet Transfusions and Prevention of Hemorrhage

Sherrill J. Slichter, M.D., Richard M. Kaufman, M.D., Susan F. Assmann, Ph.D., Jeffrey McCullough, M.D., Darrell J. Triulzi, M.D., Ronald G. Strauss, M.D., Terry B. Gernsheimer, M.D., Paul M. Ness, M.D., Mark E. Brecher, M.D., Cassandra D. Josephson, M.D., Barbara A. Konkle, M.D., Robert D. Woodson, M.D., Thomas L. Ortel, M.D., Ph.D., Christopher D. Hillyer, M.D., Donna L. Skerrett, M.D., Keith R. McCrae, M.D., Steven R. Sloan, M.D., Ph.D., Lynne Uhl, M.D., James N. George, M.D., Victor M. Aquino, M.D., Catherine S. Manno, M.D., Janice G. McFarland, M.D., John R. Hess, M.D., Cindy Leissinger, M.D., and Suzanne Granger, M.S.

N Engl J Med
Volume 362(7):600-613
February 18, 2010

The NEW ENGLAND JOURNAL of MEDICINE

Study Overview

- The use of platelet transfusions to prevent bleeding in patients with thrombocytopenia due to chemotherapy or other causes of marrow suppression is widespread, but the optimal number (dose) of platelets is unsettled
- In this randomized trial, three doses of platelets were studied: the usual dose, half the usual dose, and twice the usual dose
- No major differences in bleeding complications were found among the three groups, but more transfusions were given in the lowest-dose group to prevent bleeding

Conclusion

- Low doses of platelets administered as a prophylactic transfusion led to a decreased number of platelets transfused per patient but an increased number of transfusions given
- At doses between 1.1×10^{11} and 4.4×10^{11} platelets per square meter, the number of platelets in the prophylactic transfusion had no effect on the incidence of bleeding

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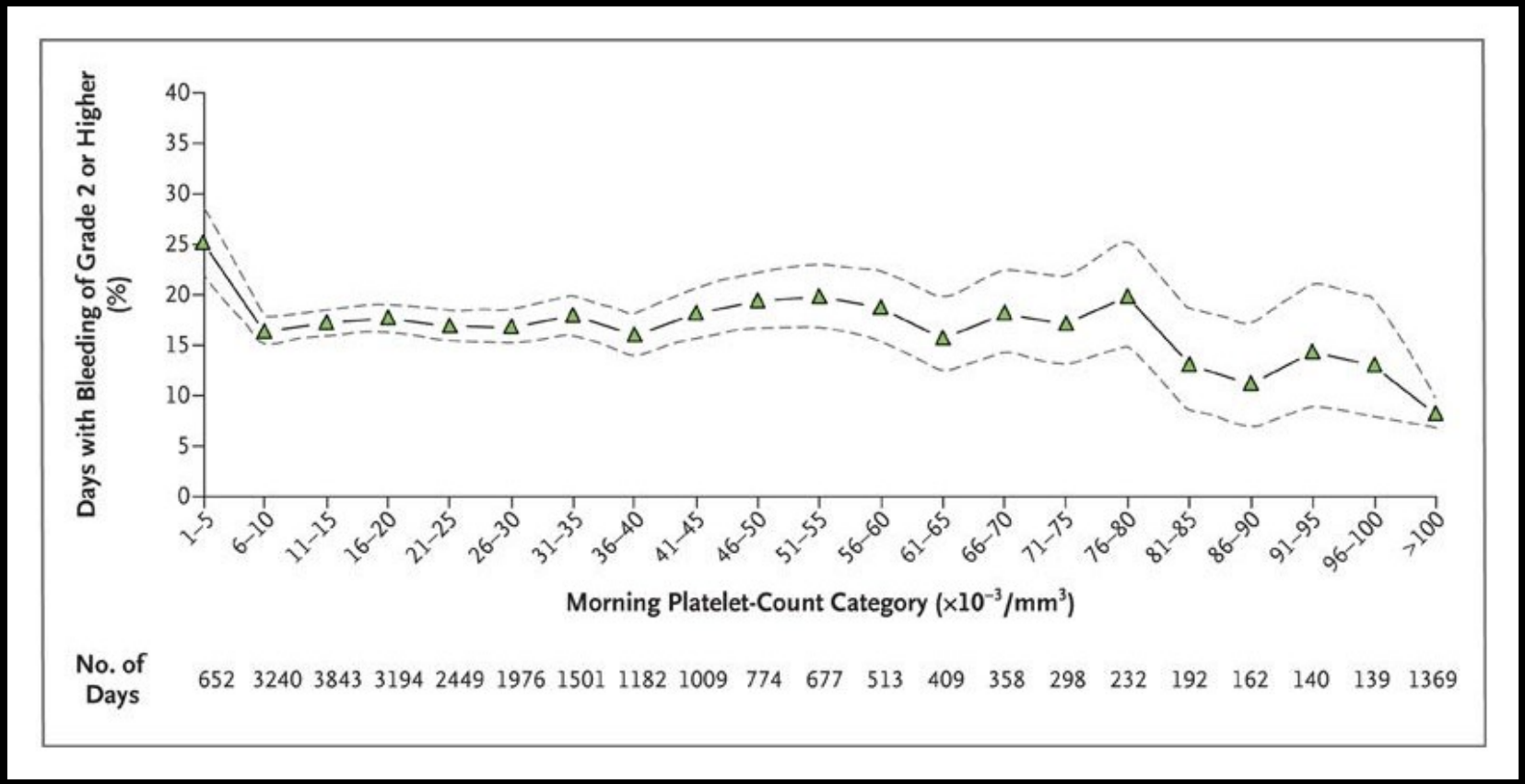
Days with Bleeding of Grade 2 or Higher in All Three Treatment Groups, According to Morning Platelet-Count Categories



Slichter SJ et al. N Engl J Med 2010;362:600-613

Original Article

A No-Prophylaxis Platelet-Transfusion Strategy for Hematologic Cancers

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N Engl J Med
Volume 368(19):1771-1780
May 9, 2013

The NEW ENGLAND JOURNAL of MEDICINE

Study Overview

- Prophylactic platelet transfusions for patients with platelet counts of less than 10,000 per cubic millimeter reduced the rate of WHO grade 2, 3, or 4 bleeding events and the number of days with bleeding, as compared with patients who did not receive transfusions.

Conclusions

- The results of our study support the need for the continued use of prophylaxis with platelet transfusion and show the benefit of such prophylaxis for reducing bleeding, as compared with no prophylaxis.
- A significant number of patients had bleeding despite prophylaxis.

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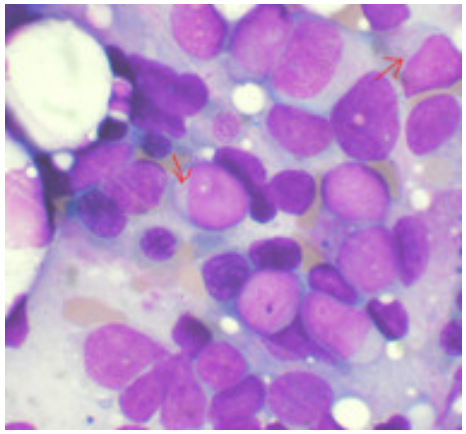
Key Recommendations For Hospitals

NHS Blood and Transplant

- Double dose prophylactic transfusions should not be used routinely

Special circumstances



APML

aplastic anaemia on ATG

platelet refractoriness – more later!

underlying acquired/inherited bleeding tendency

either more frequent single dose platelets to maintain platelet count above target OR exceptionally double-dose platelets

Pre-procedure platelets

Prophylactic use preprocedure except eyes or brain	
- Reversible/chronic bone marrow failure and platelet destruction/consumption if urgent/other therapy failed	
- Bone marrow aspirate or trephine	Not indicated
- Epidural anaesthesia	80 x 10^9/L
- ^All other procedures	50 x 10^9/L
- Abnormal platelet function	
- Bone marrow aspirate and trephine	Not indicated
- all other procedures in selected patients if alternative therapy failed/contraindicated	Not possible to state threshold
Prophylactic use preprocedure involving eyes or brain	
- Reversible/chronic bone marrow failure and platelet destruction/consumption if urgent/other therapy failed	100 x 10^9/L
- Abnormal platelet function in selected patients if alternative therapy failed/contraindicated	Not possible to state threshold
Therapeutic use	
$Massive transfusion, all patient indication categories except platelet function defects where not possible to state threshold	75 x 10^9/L
For patients with multiple trauma or CNS injury	100 x 10^9/L

*BCSH guidelines for Multiple Myeloma recommend a threshold count of 30 with Bortezomib treatment
BCSH guidelines for Aplastic Anaemia recommend a threshold count of 30 during treatment with ATG and a threshold count of 20 if pregnant or fever.
^ American Society for Haematology ITP guidelines recommend a threshold count of 80 for major surgery
$ TTP and HIT platelet transfusion contraindicated unless life-threatening haemorrhage

Prophylactic use for children in the presence of risk factors	
- Additional risk factors include severe mucositis, local tumour infiltration, platelet count likely to fall to <10 x 10^9/l before next evaluation, anticoagulation therapy.	20 x 10^9/L
- Severe hyperleucocytosis or DIC with induction therapy for leukaemia	40 x 10^9/L
- DIC	20 x 10^9/L
Prophylactic preprocedure	
- ECMO	100 x 10^9/L
- Lumbar puncture or indwelling line insertion in children	40 x 10^9/L

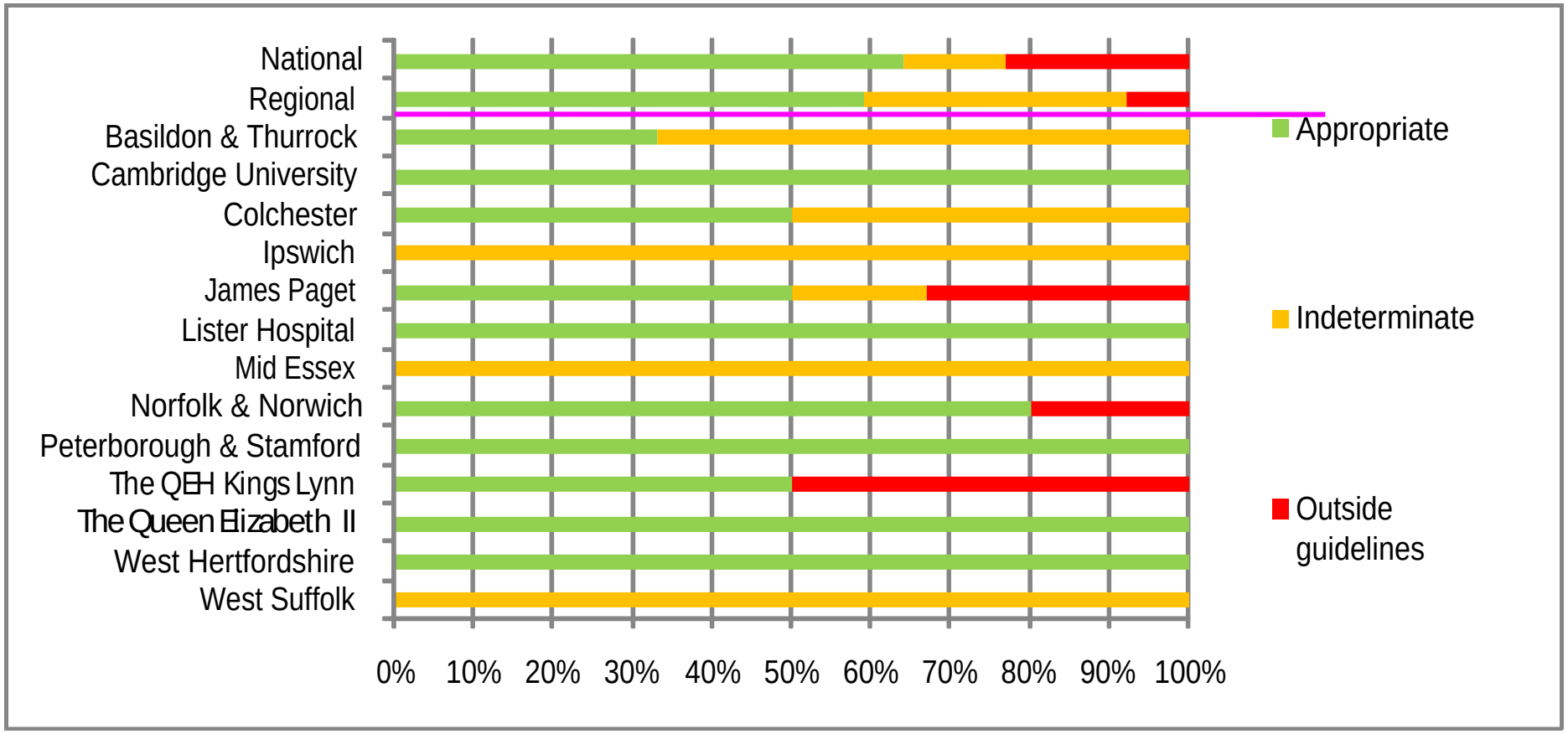
Clinical audit - Pre-procedure Transfusions

NHS Blood and Transplant

- 15% of all transfusion episodes
- 23% were considered inappropriate
  - 14% Transfused above algorithm thresholds
  - 9% Transfused prior to bone marrow aspirate/trephine (not recommended by BCSH guideline)
- Only 30% of cases had a post transfusion platelet count prior to the procedure

Appropriateness of pre-procedure transfusions

NHS Blood and Transplant



How practical is a pre-procedure platelet count?

- a line insertion at 10am at the NNUH
- pre-procedure platelet count 22 x 10^9/l
  - platelets only arrive at 11am and 4pm
  - platelets take over 1h to arrive by emergency delivery
- do we order 2 ATD the day before, give one, check platelet count and give the next one if not high enough ?(total time to do this at least 1h plus the planning ahead)

How practical is a pre-procedure platelet count?

No!

- do we order 2 ATD the day before, give both before the procedure to be sure of increment and not check the count?

No!

- we order 1 ATD the day before, give immediately pre-procedure and ALMOST NEVER check a post-transfusion count (even for LPs)

How practical is a pre-procedure platelet count?

- eye, brain and spinal procedures may need a more cautious approach
- all other haemostatic functions maximised ie correct clotting, avoid anti-platelet agents, omit anticoagulants and consider tranexamic acid
- a second ATD will be available but not given routinely
- double dose platelets never given

Therapeutic platelets in haematology/oncology

- definition of significant bleeding is difficult
- WHO scale has been used in the most recent trials
- cessation of bleeding would be desired outcome and more than 1 ATD may be required (but not necessarily at the same time) ie 2 spaced doses

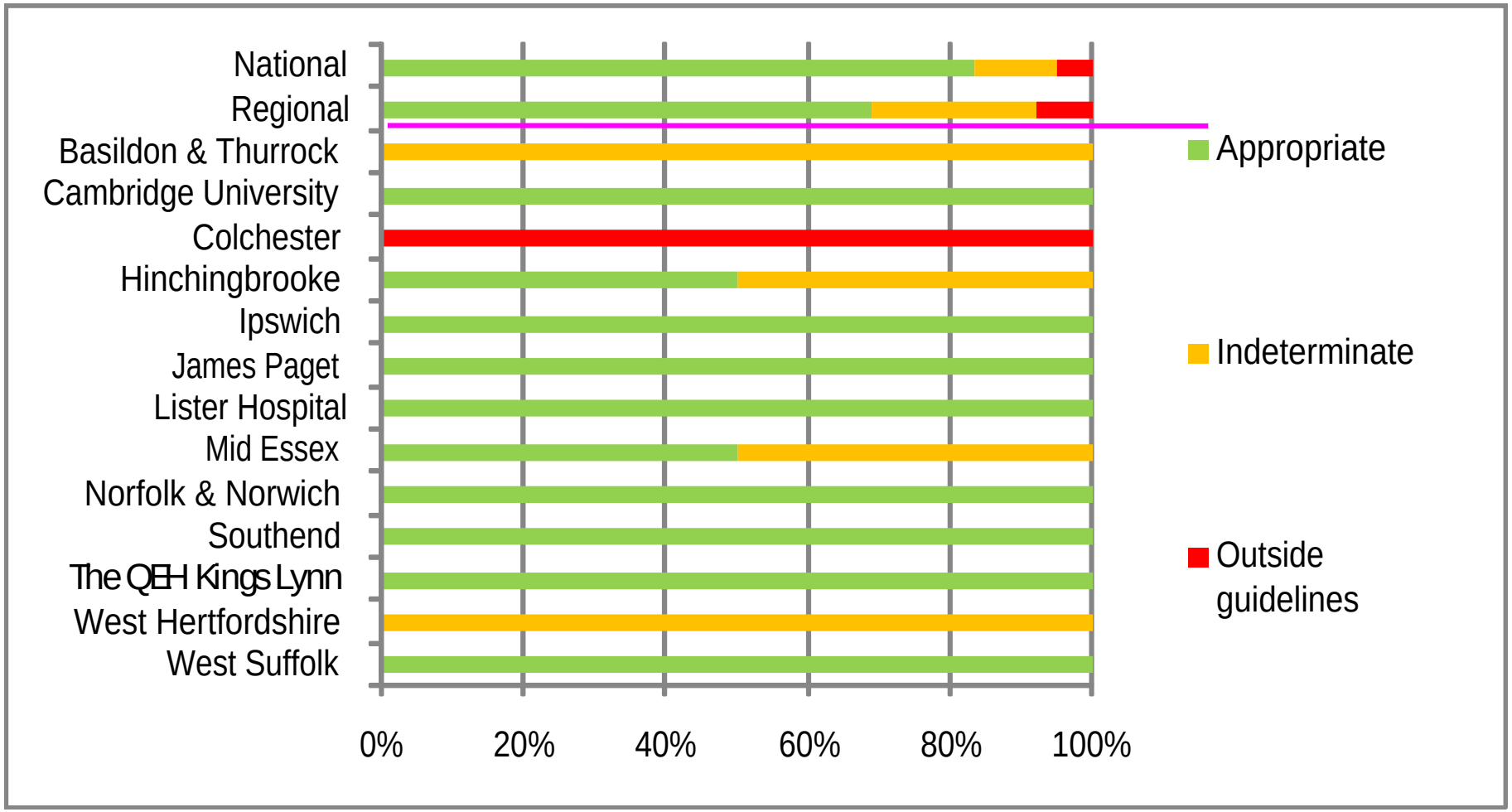
NHS Blood and Transplant

Clinical audit - Therapeutic Transfusions

- Only 13% of all transfusion episodes
- Fewer than 5% (19 transfusions) were considered inappropriate
- 12% of transfusions were indeterminate
  - WHO Grade 1 bleeding in the absence of ITP or TTP

Appropriateness of therapeutic transfusions

NHS Blood and Transplant



Conclusions

- prophylactic platelets – one ATD
- pre-procedure platelets – one ATD, check count if practical and give another ATD if required
- therapeutic platelets – determine grade of bleeding and whether platelets required; assess clinical response before further dose
- special circumstances where double dose may be required include APML, AA, refractoriness, other bleeding disorder and eye/brain therapeutic/prophylaxis

How to control platelet usage

- write clear guidelines (advice on usage is overwhelming)
- ensure your haematology medical staff and laboratory staff know and adhere to these guidelines
- define bleeding – consider the WHO scale
- do not allow double dose requesting – refer to someone (consultant haematologist at the NNUH) to discuss further – 24/7 referral
- let your laboratory users know that all platelet requesting will be reviewed – we don’t allow electronic requesting for example – it is all done by telephone
- feedback to your users on how well they are doing - the NHS BT figures are very useful

Acknowledgements

- NHS BT
- NHS BT National Audit
- Cochrane Reviews
- clinical and laboratory staff, NNUH

Sources of information

- http://hospital.blood.co.uk/safe_use/platelet_education_resources
- National Comparative Audit, NHS Blood and Transplant (2011), Re-audit of the use of platelets in Haematology, http://hospital.blood.co.uk/library/
- McClelland DBL (Ed) (2006) Handbook of Transfusion Medicine 4th Edition, the Stationary Office.