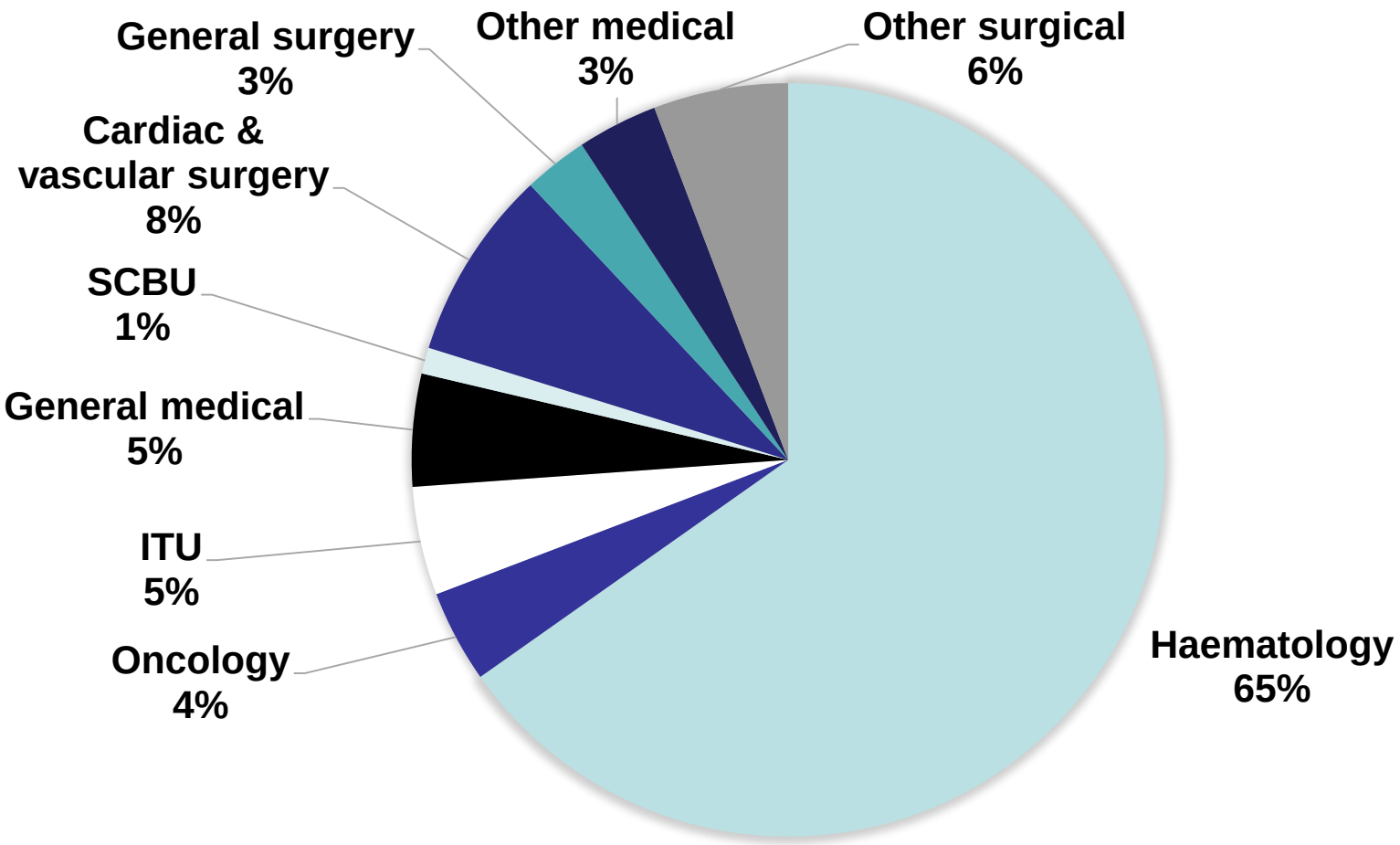
National Comparative Audit
of Blood Transfusion

NHS
Blood and Transplant

2017 Audit of Red Cell & Platelet Transfusion in Adult Haematology Patients

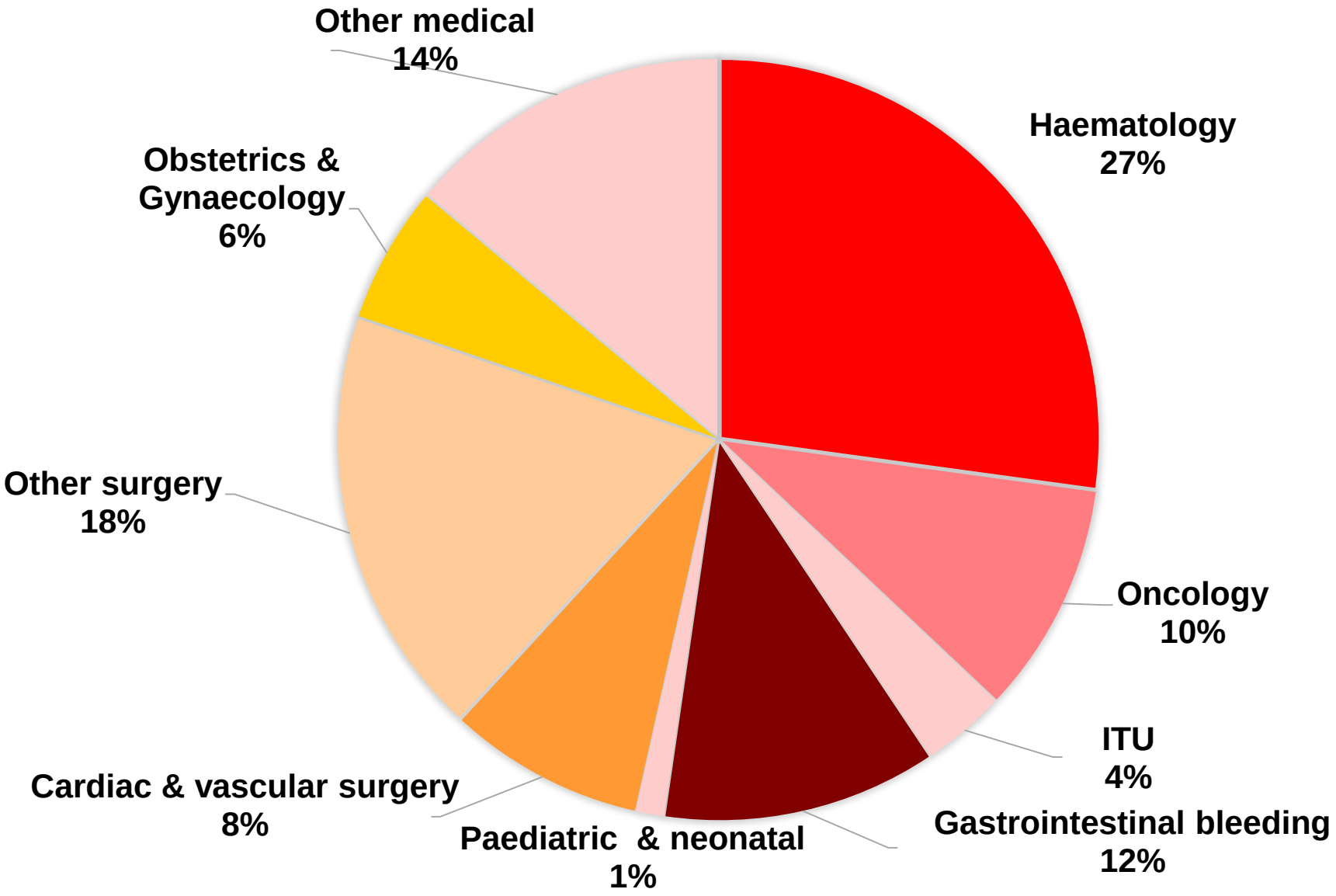
Caring Expert Quality

Haematology patients use the majority of platelet transfusions



A survey of where and why platelets are used in hospitals in the South West region of England. Jones et al 2013. Transfusion Medicine 23(S2):P034

Haematology patients biggest users of red cell transfusions



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The Audit

Two parts

- Organisational audit to assess local guidelines

- Clinical audit to assess practice

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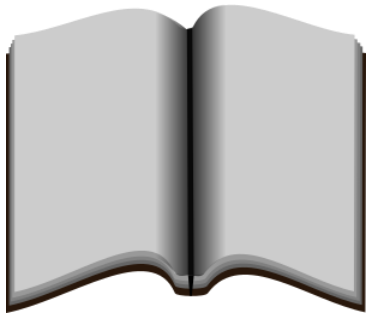
Organisational Audit

11% of hospitals did not have written transfusion guidelines (**Organisational standard 1**).

Hospital guidelines did not always agree with national guidelines.

Approximately **29%** used a higher haemoglobin threshold for patients without additional risk factors.

Only **28%** stated that prophylactic platelet transfusions were not required in chronic bone marrow failure.



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Clinical Audit : Who did we audit?

- Any adult with a known haematological malignancy or myeloid failure syndrome
- Transfused with red cells or platelets in July 2017
- Patients could be audited for both red cell and platelet transfusions

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Facts and Figures

This is the largest re-audit of haematology patients ever reported – 4098 patients from 153 sites

A red cell transfusion was audited on average every

11 minutes for 1 month, a total of 3,830

A platelet transfusion was audited on average every

28 minutes for 1 month, a total of 1,553

Key Finding

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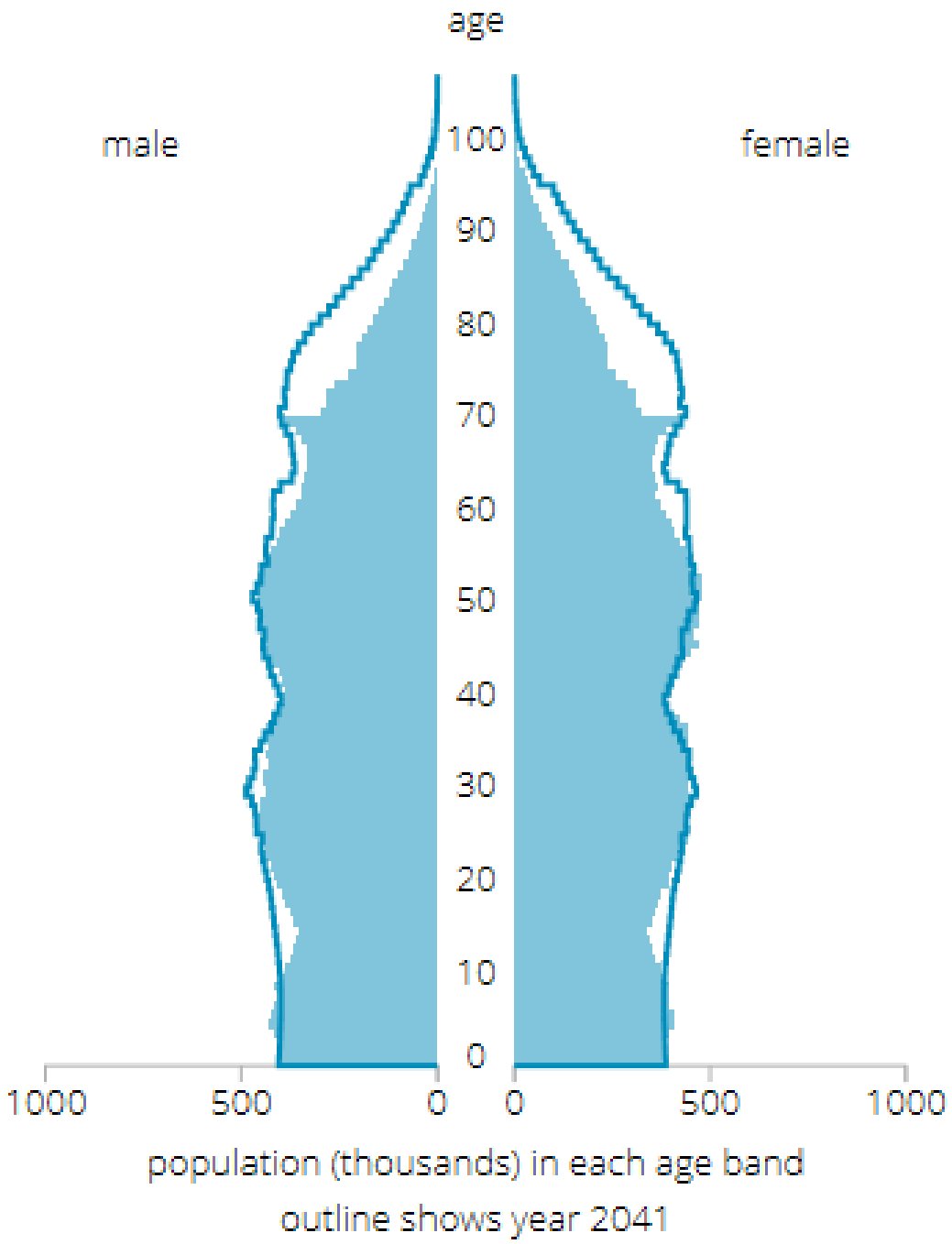
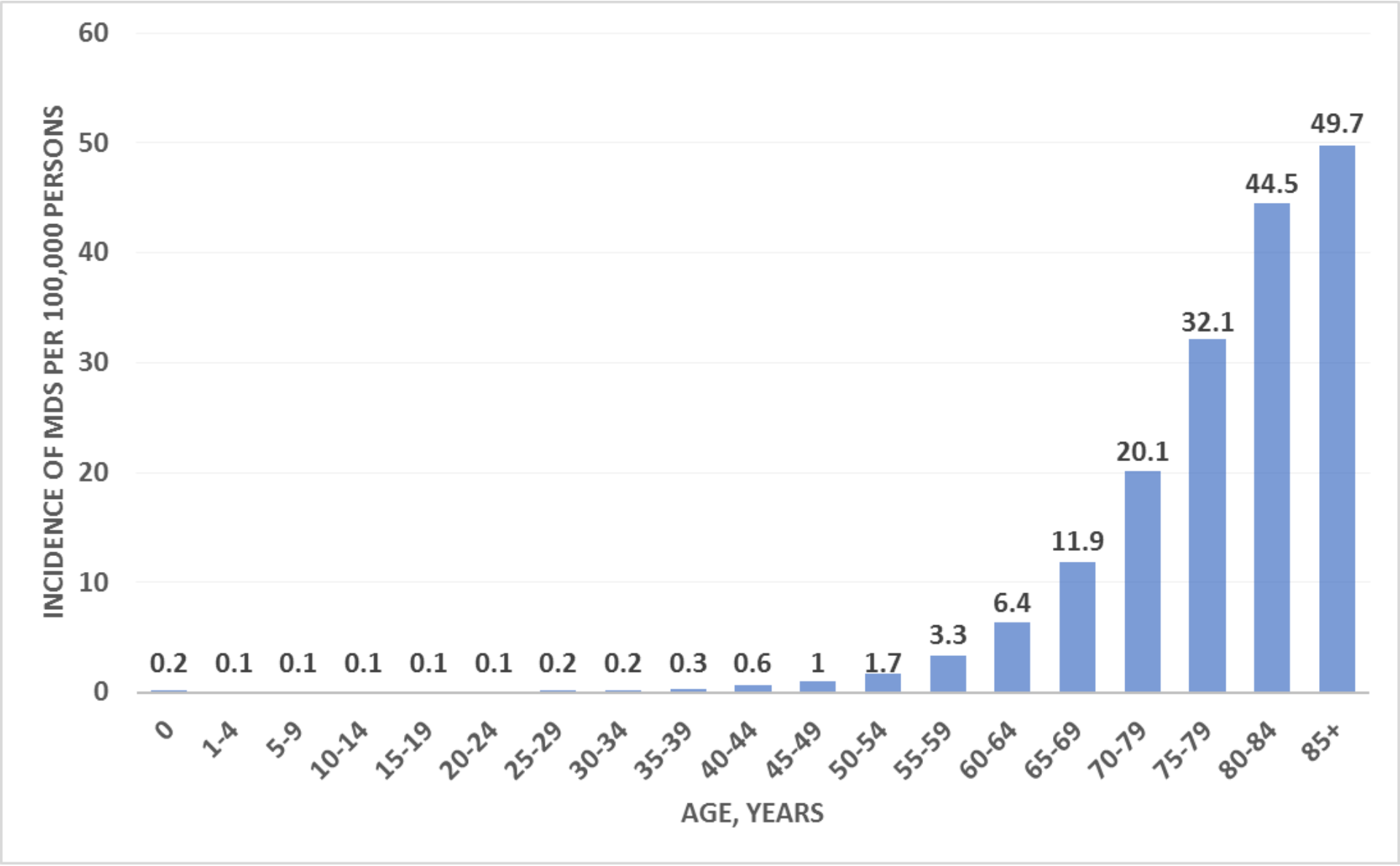
Most transfusions were given to patients with chronic bone marrow failure. **58%** of red cell transfusions and **51%** of prophylactic platelet transfusions.



Age structure of the UK population, mid-2016 and mid-2041

Incidence of MDS



Ma et al, 2012 Am J Med;125(7 Suppl):S2–S5

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Red Cell Transfusions

58% (2187/3780) of red cell transfusions were for chronic anaemia, similar to 2016 (59%)

76% (2924/3830) of red cell transfusions were considered appropriate, 75% in 2016

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Pre-transfusion Haemoglobin

94% (3606/3829) of cases had an Hb measured within 24 hours if the patient was an inpatient or within 72 hours if the patient was an outpatient **(Red cell standard 1).** Same as 2016

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Red Cell Transfusion Thresholds

24% (195/815) of patients with reversible bone marrow failure and no additional risk factors were transfused when their Hb was 70g/L or lower
(Red cell standard 2). 17% (163/955) in 2016.

44% (32/72) of patients who were anaemic and had cardiovascular disease were transfused when their Hb was 80g/L or lower
(Red cell standard 3). 30% (18/60) in 2016.

What is the evidence?

Cochrane Library

Cochrane Database of Systematic Reviews

Completed trials of red cell transfusion in chronic bone marrow failure

Study	No. of participants	Thresholds
Temple 2004 RCT	8	Restrictive Hb < 72 g/L
	5	Liberal Hb < 96 g/L

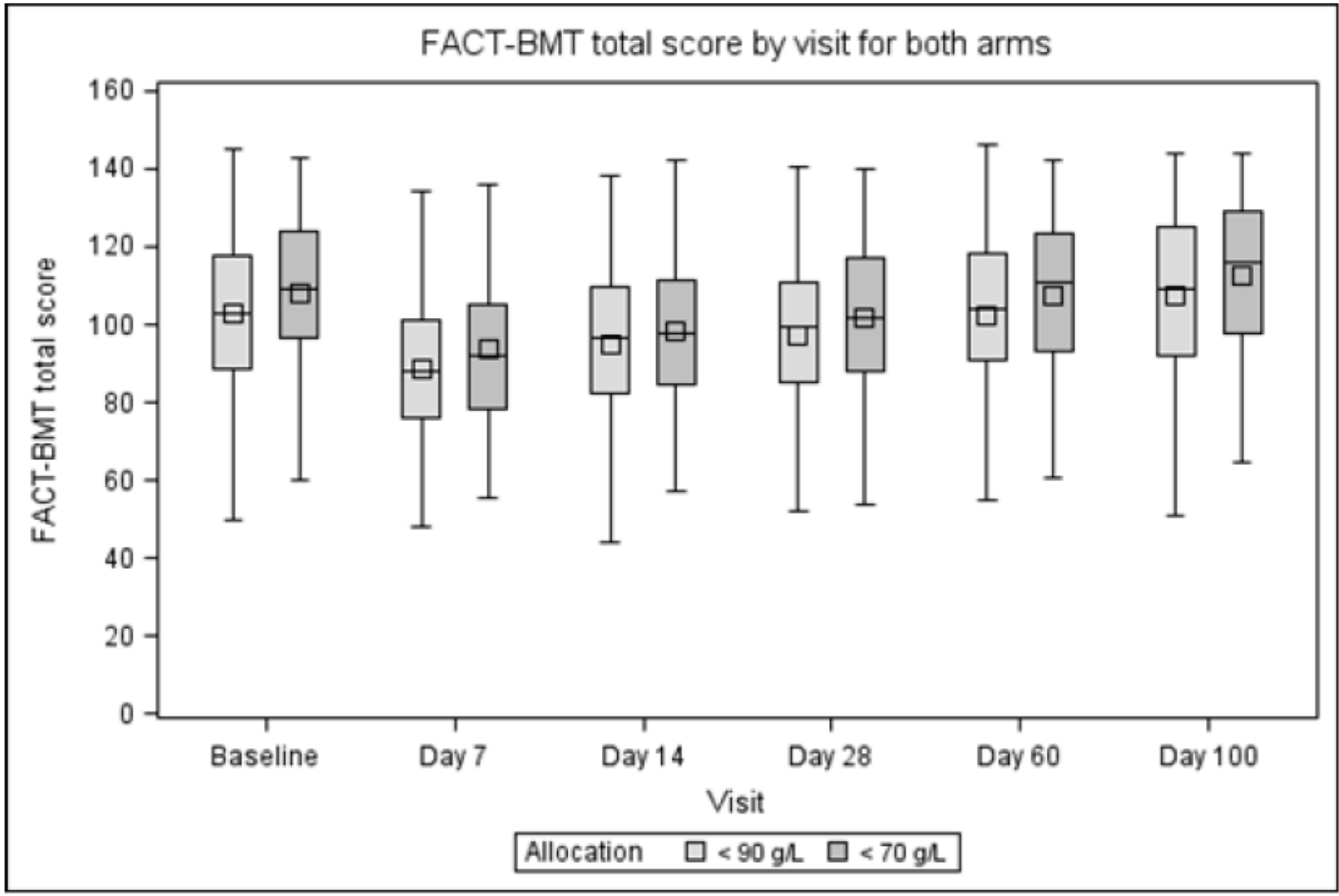
Gu Y, Estcourt LJ, Doree C, Hopewell S, Vyas P

Ongoing trials in chronic bone marrow failure

Study	No. of participants	Thresholds
ISRCTN26088319 (REDDS)	38	Restrictive: maintain Hb 85 to 100 g/L Liberal: maintain Hb > 100 g/L
NCT02099669 (EnhanceRBC)	30	Restrictive: maintain Hb 85 to 100 g/L Liberal: maintain Hb 110 to 120 g/L

Completed trials of red cell transfusion in reversible bone marrow failure

Study	No. of participants	Thresholds
De Zern 2016 **RCT**	89 adults	Restrictive Hb < 70 g/L Liberal Hb < 80 g/L
Robitaille 2013 **RCT**	Stopped after 6 children	Restrictive Hb < 70 g/L Liberal Hb < 120 g/L
Tay 2016 **RCT (abstract)**	300 adults	Restrictive Hb < 70 g/L Liberal Hb < 90 g/L
Webert 2008 **RCT**	60 adults	Restrictive Hb < 80 g/L Liberal Hb < 120 g/L
Jansen 2004 **Non-RCT**	84 adults	Restrictive Hb < 72 g/L if < 25 years; 80 g/L if 25 to 50 years; 88 g/L if > 50. I unit Tx Liberal Hb < 96 g/L, 2 unit Tx


FACT-BMT total score by visit for both arms
FACT-BMT total score
160
140
120
100
80
60
40
20
0
Baseline
Day 7
Day 14
Day 28
Day 60
Day 100
Visit
Allocation
< 90 g/L
< 70 g/L

Ongoing trials in reversible bone marrow failure

Study	No. of participants	Thresholds
NCT02461264 Chantapie 2015	270 adults	Restrictive: Hb < 80 g/L. One unit Liberal: Hb < 80 g/L. Two units
ISRCTN96390716 (REAL)	36 adults	Restrictive: Hb ≤ 70 g/L Liberal: maintain Hb ≤ 90 g/L
RePAST	Children Pilot RCT to start	Restrictive: Hb ≤ 65 g/L Liberal: maintain Hb ≤ 85 g/L

Single Unit Red Cell Transfusions

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43% (527/1217) of inpatients and **24%** (629/2602) of outpatients had single unit transfusions. Compared to **27%** (390/1447) of inpatients and **13%** (383/2859) of outpatients in 2016.

When more than one unit was given **12%** (80/684) of inpatients and **1.3%** (25/1941) of outpatients had an Hb measured between red cell units. Similar to 2016.

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Red Cell Transfusions for Patients weighing less than 50kg

Number of units transfused	Inpatient 2017 (59)	Inpatient 2016 (87)	Day Patient 2017 (87)	Day Patient 2016 (122)
One	27 (46%)	28 (33%)	28 (32%)	27 (22%)
Two	29 (49%)	47 (56%)	54 (62%)	88 (72%)
Three	2 (3%)	6 (7%)	5 (6%)	7 (6%)
Four	1 (2%)	2 (2%)	-	-
Five	-	1 (1%)	-	-

Platelet Transfusions

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79% (1223/1553) were prophylactic and within this group

51% were given to patients with chronic bone marrow failure.

Similar to 2016.

9% (138/1553) were prior to a procedure

9% (145/1553) were therapeutic

3% (47/1553) reason for transfusion was unknown

Prophylactic Platelet Transfusions

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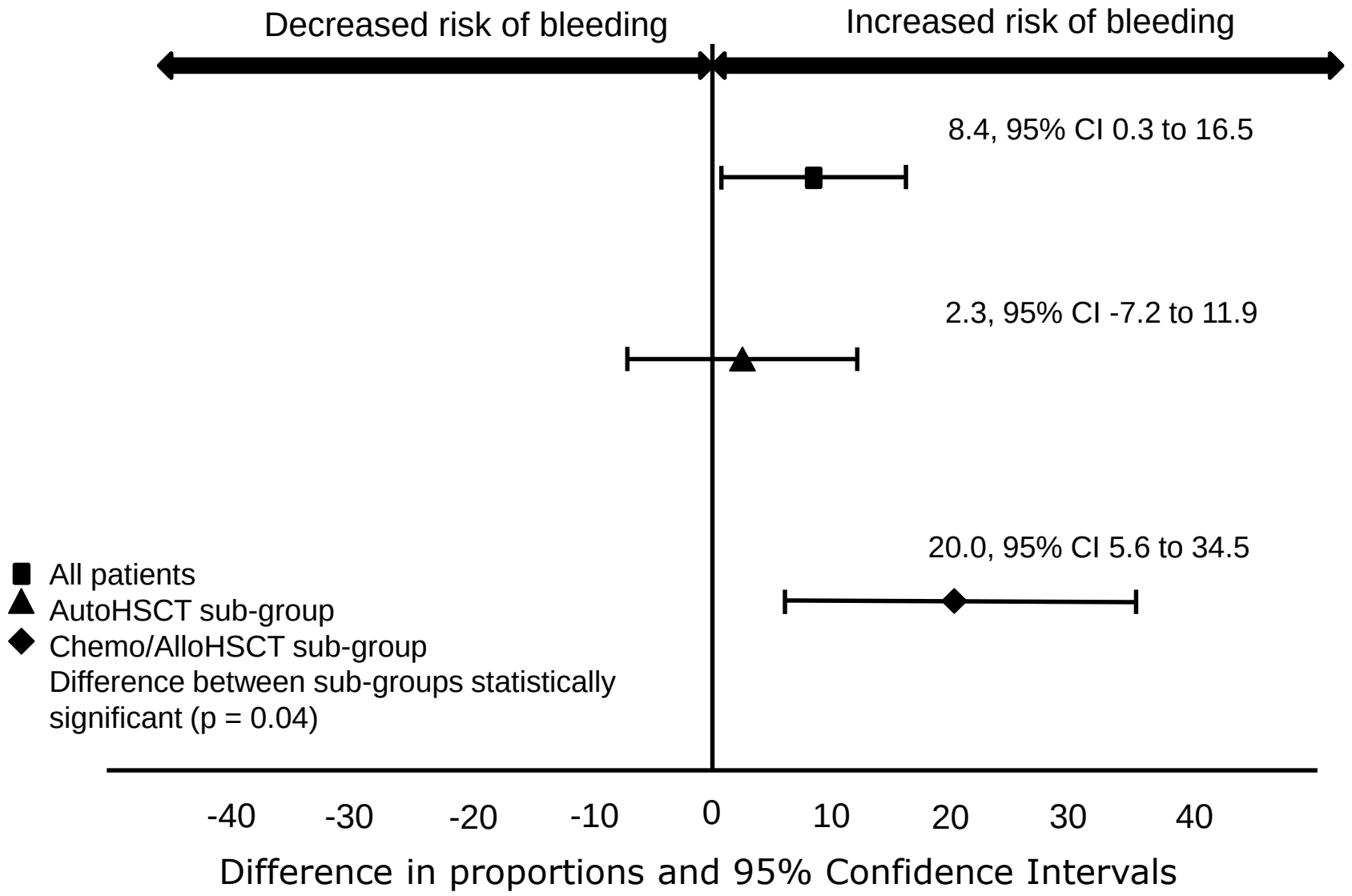
75% (443/590) of prophylactic platelet transfusions were considered appropriate in reversible bone marrow failure. 72% (459/638) in 2016

65% (305/469) of patients received a prophylactic platelet transfusion for reversible bone marrow failure without additional risk factors, when the count was less than or 10 x 10^9/L. **(Platelet standard 1).**

This was **61%** in 2016 & **54%** in 2010 audit.

Only **42%** of prophylactic platelet transfusions were considered appropriate in chronic bone marrow failure. 43% in 2016. **(Platelet standard 3).**

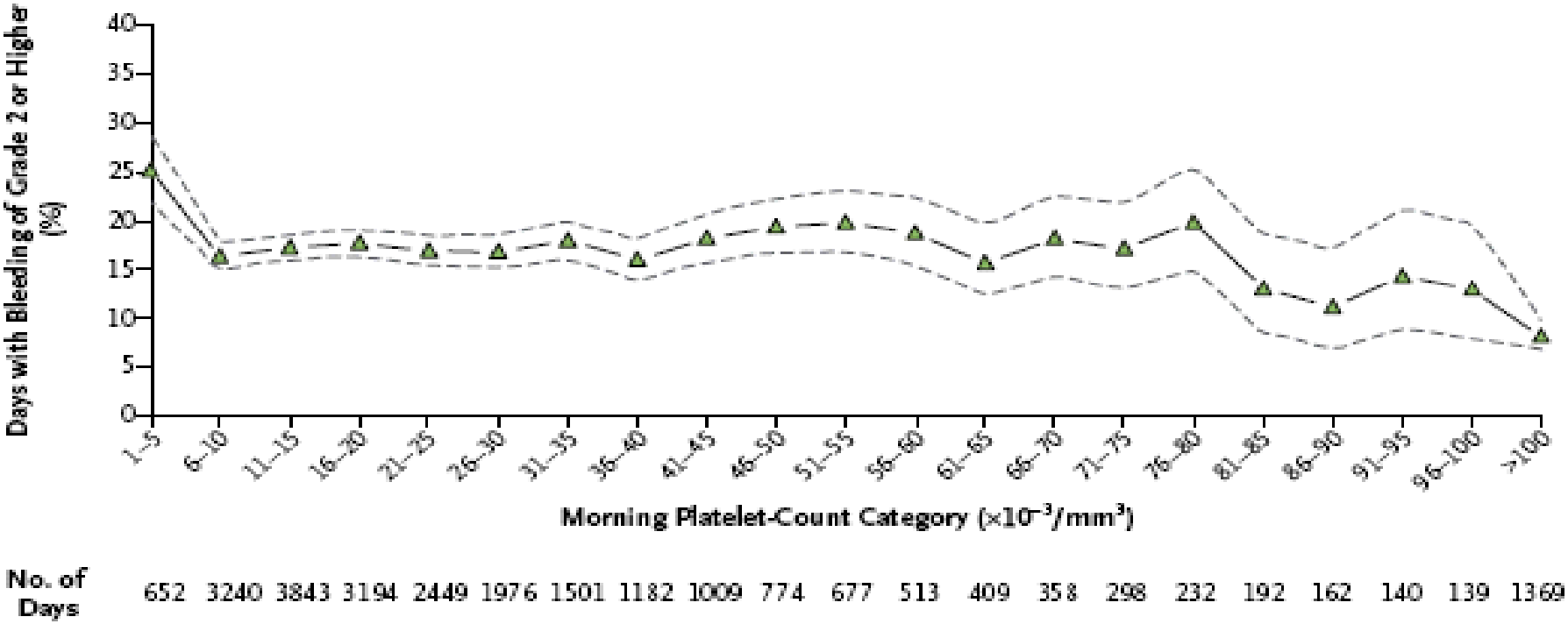
Variability in effectiveness of prophylactic platelet transfusions



	Number of patients needed to be treated with prophylactic platelet transfusions to prevent 1 patient from WHO grade 2 or above bleeding within a 30 day period	
	NNTB	**95% CI**
All patients	12	6 to 333
Autologous HSCT	43	Not estimable
Chemotherapy/ Allogeneic HSCT	5	3 to 18

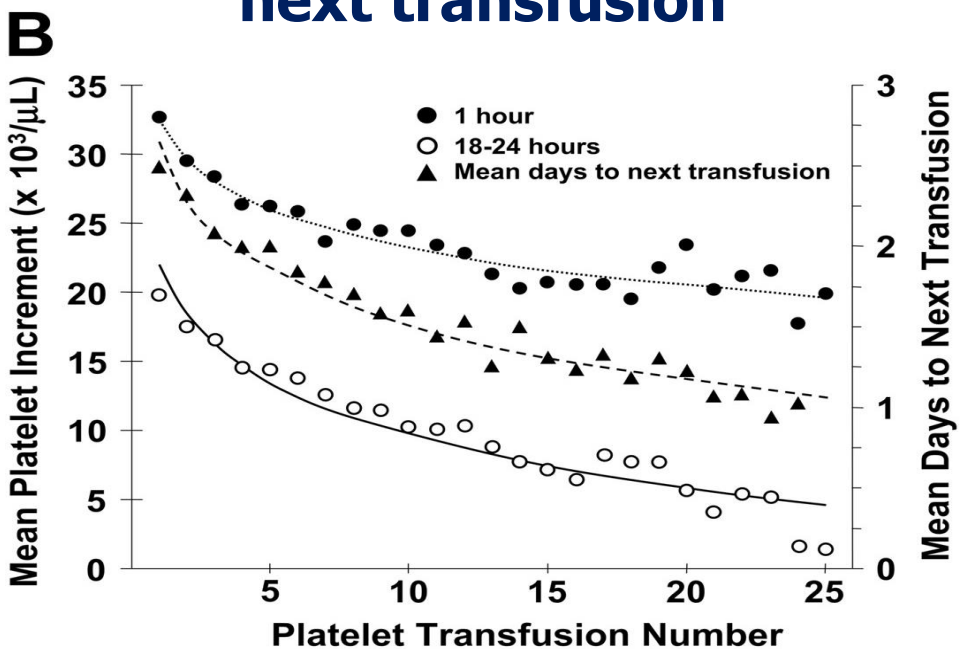
Stanworth et al. A no-prophylaxis platelet transfusion strategy for hematologic malignancies. *NEJM 2013*

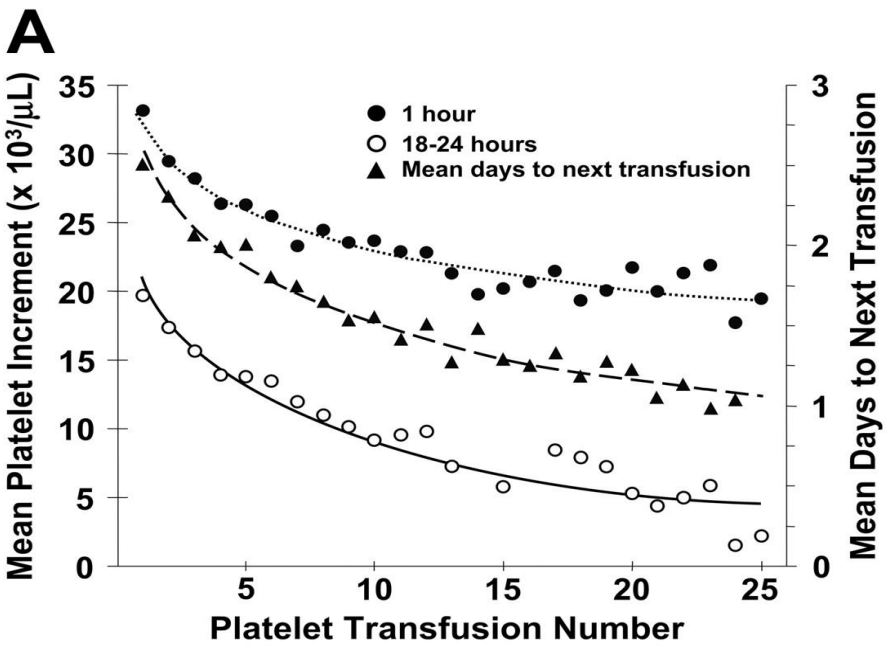
Morning platelet count is a poor predictor of bleeding risk



Dose of prophylactic platelet transfusions and prevention of hemorrhage. Slichter *et al. NEJM* 2010;362:600-613

Relationship between number of platelet transfusions, platelet increments and days to next transfusion





- ● 1-hr increment
- ○ 18-24 hr increment
- ▲ Days to next transfusion

Slichter S J et al. Blood 2005;105:4106-4114

Single Unit Prophylactic Platelet Transfusions

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94% (1144/1218) of prophylactic platelet transfusions were single units **(Platelet standard 2)**

In the previous audits 93% (1277/1379) in 2016

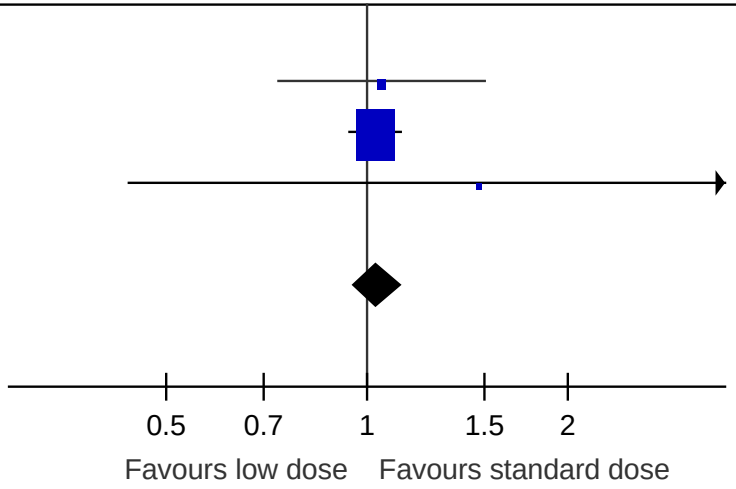
90% (2057/2277) in 2010

39% (20/51) of inpatients who had more than one unit transfused for prophylaxis had a platelet count checked between units

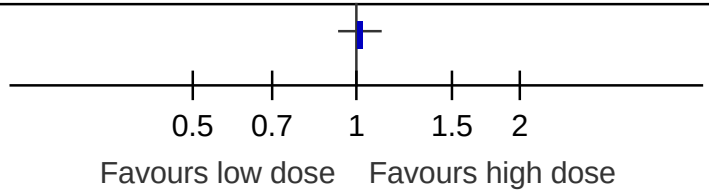
Study or Subgroup	Low dose Events	Total	Standard dose Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Akay 2015	0	48	0	52		Not estimable
Heddle 2009	30	58	30	61	9.0%	1.05 [0.74, 1.50]
Slichter 2010	296	417	292	423	89.7%	1.03 [0.94, 1.12]
Tinmouth 2004	6	56	4	55	1.2%	1.47 [0.44, 4.94]
Total (95% CI)		**579**		**591**	**100.0%**	**1.04 [0.95, 1.13]**
Total events	332		326			

Heterogeneity: Chi² = 0.36, df = 2 (P = 0.84); I² = 0%

Test for overall effect: Z = 0.79 (P = 0.43)



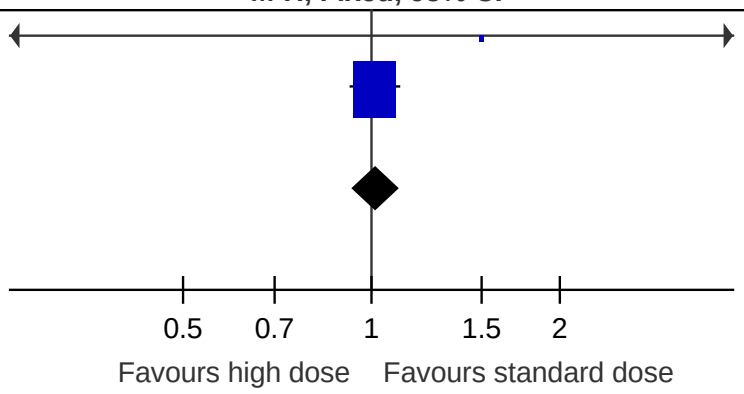
Study or Subgroup	Low dose Events	Total	High dose Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Slichter 2010	296	417	302	432		1.02 [0.93, 1.11]



Study or Subgroup	High dose Events	Total	Standard dose Events	Total	Weight	Risk Ratio M-H, Fixed, 95% CI
Sensebe 2004	3	48	2	48	0.7%	1.50 [0.26, 8.58]
Slichter 2010	302	432	292	423	99.3%	1.01 [0.93, 1.11]
Total (95% CI)		**480**		**471**	**100.0%**	**1.02 [0.93, 1.11]**
Total events	305		294			

Heterogeneity: Chi² = 0.20, df = 1 (P = 0.66); I² = 0%

Test for overall effect: Z = 0.35 (P = 0.73)



Platelet usage

	Number of Platelet Transfusions/patient Median	Number of Platelet Components/patient Median
Low dose	5 (IQR 3 to 9)	3.9 (IQR 2.0 to 7.5)
Intermediate dose	3 (IQR 2 to 6)	4.7 (IQR 2.9 to 9.5)
High dose	3 (IQR 2 to 6)	8.2 (IQR 4.4 to 15.6)

Dose of prophylactic platelet transfusions and prevention of hemorrhage. Slichter *et al. NEJM* 2010;362:600-613

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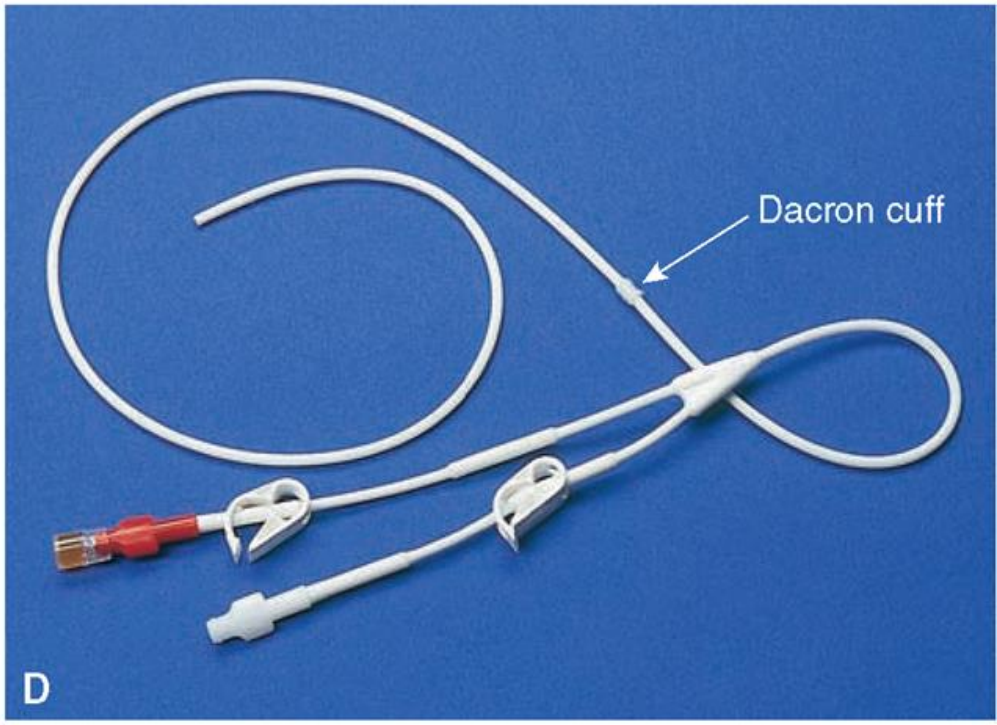
Pre-procedure Platelet Transfusions

51% (29/57) of patients who had a platelet transfusion prior to a procedure (liver biopsy, transbronchial biopsy, laparotomy, etc.) had a platelet count of less than or equal to 50 x 10^9/L **(Platelet standard 4).**

7% (9/138) of patients the only procedure performed was a bone marrow biopsy or trephine **(Platelet standard 6).**

Only **27%** (37/138) of pre-procedure platelet transfusions were considered appropriate.



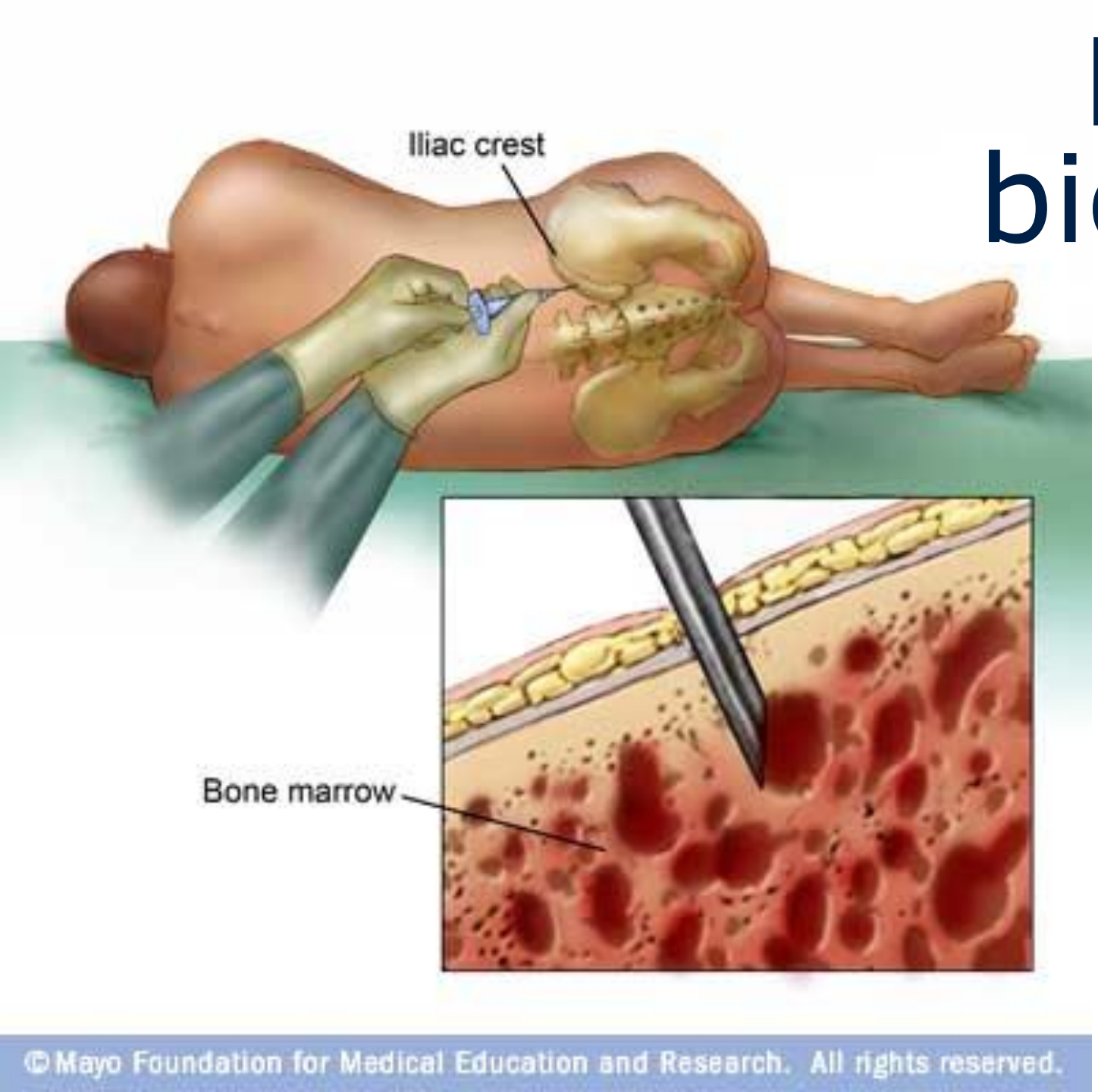
Central lines

	Number of procedures (Platelets < 50)	Number of haemorrhages (Platelets < 50)	Number of major haemorrhages
Haas 2010	344	0	0
Zeidler 2011	173	5	0
Foster 2010	122	0	0
Tomoyose 2013	67	4	0
Napolitano 2013	39	1	0
Hong Pheng Loh 2007	22	0	0
Total	**767**	**10**	**0**

Ongoing Trials

- PACER (Prophylactic Platelet Transfusion Prior to Central Venous Catheter Placement in Patients with Thrombocytopenia) (462 participants)
  - Platelet transfusion versus no platelet transfusion (platelet count < 50)
- POCKET (Point-of-care Versus Standard Coagulation Tests Versus Restrictive Strategy to Guide Transfusion in Chronic Liver Failure Patients Requiring Central Venous Line: Prospective Randomized Trial) (167 participants)
  - Platelet transfusion when EXTEM < 40mm vs platelet count < 25 vs platelet count < 50
- Need 4634 participants to detect an increase in the number of people who had major bleeding from 1 in 100 to 2 in 100 (80% power)

BM biopsy



Year	Number of bone marrows performed	Number of haemorrhages	Number of haemorrhages (plts < 50)	Risk of haemorrhage
2002	13,506	10	3	1 in 1,351
2003	19,259	11	2	1 in 1,751
2004	20,323	9	0	1 in 2,258
2006	15,388	8	1	1 in 1,924
2013	9,295	9	6	1 in 1,033
Total		**47**	**12**	

Bain BJ. Bone marrow biopsy morbidity and mortality: 2002 data. Clin Lab Haem 2004;26:315-8.
Bain BJ. Bone marrow biopsy morbidity: review of 2003. J Clin Pathol 2005;58:406-8.
Bain BJ. Morbidity associated with bone marrow aspiration and trephine biopsy - a review of UK data for 2004. Haematologica 2006;91:1293-4.
Devalia V. Annual British Society for Haematology confidential survey of bone marrow examination associated adverese events 2011. Br J Haematol 2013;161:22-3.

Summary of Appropriateness

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	Audited episodes in each category	Appropriate	Indeterminate	Outside guidelines
Red cell Transfusion	3830	76%	9%	14%
Platelet Transfusion				
Prophylactic	1223	58%	3%	39%
Reversible BMF	590	75%	1%	24%
Chronic BMF*	579	42%	1%	57%
Pre-procedure	138	27%	18%	55%
Therapeutic	145	88%	2%	11%
Unclear	47	0%	100%	0%

* Not receiving intensive treatment

Key Finding

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Most transfusions were given to patients with chronic bone marrow failure. **58%** of red cell transfusions and **51%** of prophylactic platelet transfusions.

Higher number of single unit red cell transfusions in inpatients. **27%** in 2016 to **43%** in 2017.

Improved prophylactic platelet use in reversible bone marrow failure. **54%** in 2010 to **65%** in 2017 were given when the count was 10 x 10^9/L or less.

Key Findings – room for improvement

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Only **49%** have performed a local audit in the last 12 months.

Compliance with restrictive haemoglobin thresholds is **24%** with no risk factors and **44%** with cardiovascular disease.

57% of prophylactic platelet transfusions for chronic bone marrow failure were given to people without additional risk factors

Only **27%** of pre-procedure platelet transfusions were appropriate.

Conclusions

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- Haematological patients are high blood users
- Local hospital guidelines are frequently discrepant with national guidelines and contribute to inappropriate transfusion practice.
- Patients with chronic bone marrow failure receive more transfusions of red cells and platelets than those with reversible bone marrow failure
- Single unit red cell transfusions are more common than in 2016