

**Neonatal transfusion:  
what babies need what?**

# Transfusions



# Cover some international issues?

- Demographics
- Components
- Haemovigilance
- Transfusion triggers – practice & recommendations (platelets & FFP)
- Alternatives to transfusion

# Components? – UK answers

- Should we specify any additional safety measures for blood components?
- What are the irradiation guidelines for neonatal transfusion?
- What pathogen- inactivated types of blood components are used?
- What haematocrit/additives do we recommend for neonatal transfusions?

# Splits – use in practice?



But donor exposure from other components

# Haemovigilance

- Need national or regional guideline for administration of blood that is specific for neonates?
- Do we have a transfusion adverse event reporting system that captures data associated with neonatal (or paediatric) transfusions separately from adults?
- Have other specific measures been taken to reduce errors in patient identification for neonates?

# Epidemiology: Cohort Study 2001-3

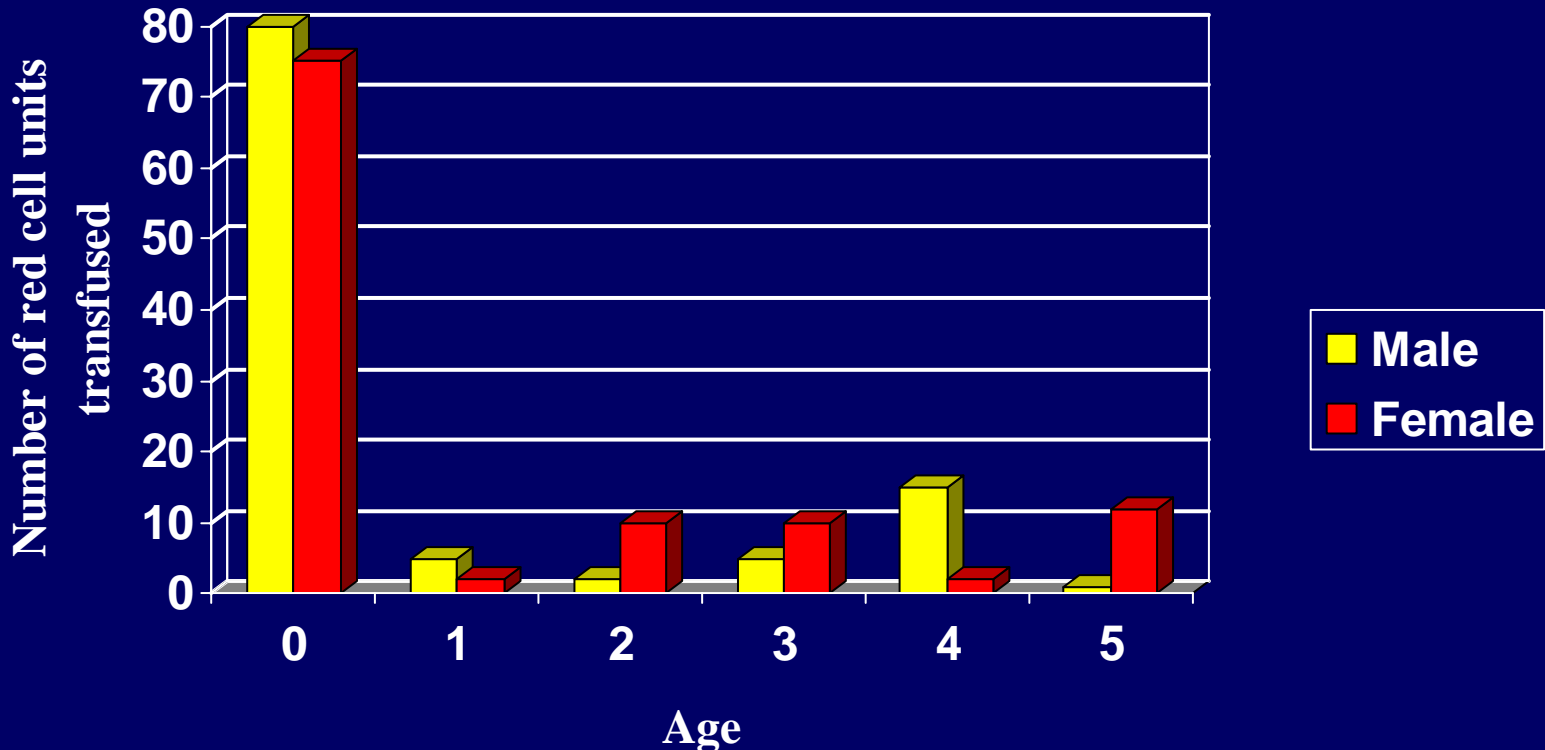
*Slonim et al, Transfusion 2008, 48: 73*

- 4.8% all paediatric patients received transfusions at 35 hospitals
- Varying medical conditions
- 17.5% to neonates
- 10.7 complications/1000 products transfused (c.f. 2.5/1000 adults)
- 69% of children transfused had only one transfusion episode

# Issues: Age distribution;

*Cobain et al, TM, 2007, 17: 1*

*Stainsby et al, Brit J Haem, 2008, 141: 73*

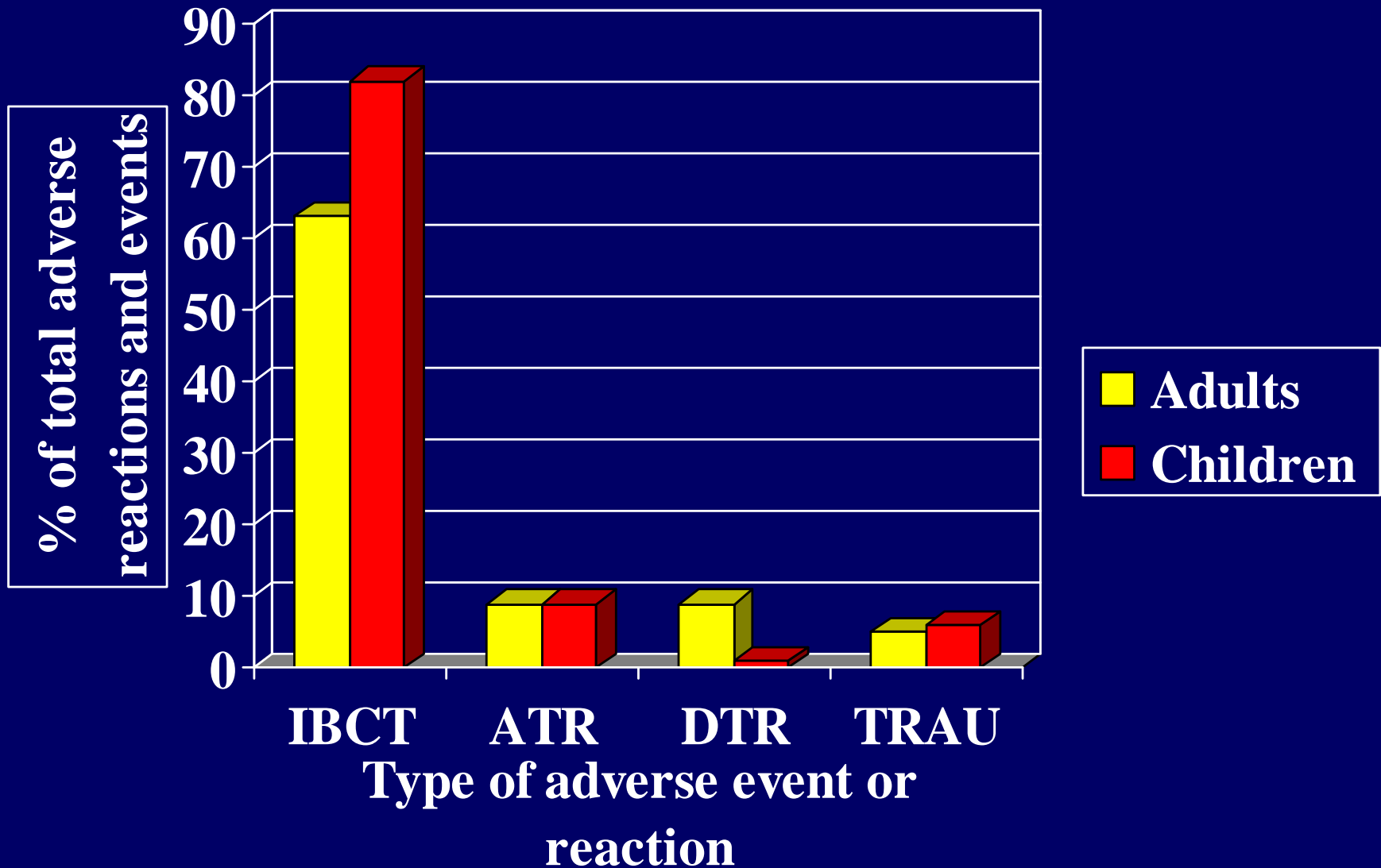


# SHOT reports in children

*Stainsby et al, Brit J Haem, 2008: 141: 73*

- Analysis of cumulative SHOT data 96 – 05
- 321 reports (10%) of total were related to transfusion to children <18 yrs
- 147 reports (4.5%) to infants <12mths
- Interpretation in context of population-based usage rates → incidences adverse events 37:100,000 for infants cf 18:100,000 children, and 13:100,000 for adults

# SHOT: adverse events for children and adults



# Other adverse events

- Maintaining venous access
- ?Febrile & other reactions
- Other reports e.g. association between repeated transfusions in sick neonates and an increase in short bowel syndrome and hepatic dysfunction following NEC

*Kenton et al, 2005, J Perinatol 2005, 25: 173*

# Clinical Use - Transfusion triggers

## The wonder of neonatology

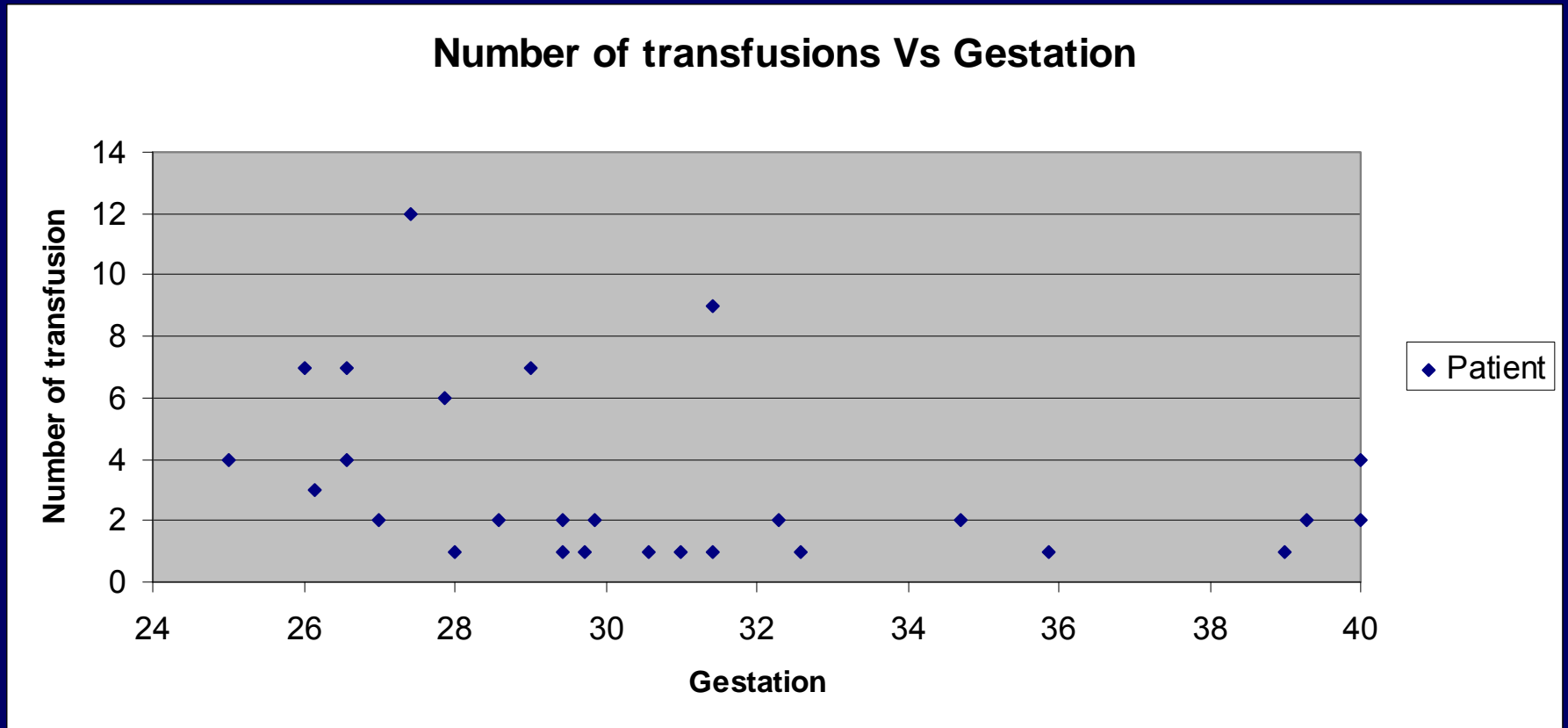
“ask 5 neonatologists a clinical question and you’ll get 10 replies”

# Red cells – evidence base

## Iowa vs PINT studies

	Iowa (n=100)	PINT (n=451)
Hb ranges	7.3-11.3 vs 10-15.3	7.5-11.5 vs 8.5-13.5
Mean Hb g/dl	8.3 vs 11.0	10.1 vs 11.2
No transfusion	10% vs 12%	11% vs 5%
Death/brain injury	16% vs 2%	31% vs 31%

# Current practice - Audit NICU, JR



Other recommendations eg sampling, protocols, supplements/iron

# FFP - Outcomes & RCTs - Systematic review

*Stanworth et al, Brit J of Haem 2004, 126, 139*

- Wide inclusion criteria
- 57 RCTs
- Cover a whole range of clinical settings
- Therapeutic and prophylactic
- Wide range of sample sizes 8 - 261 (per arm)
- Methodological quality - risk of bias & little confidence in the results

# Organisation by focused question

## Neonates

- FFP vs no FFP
  - To evaluate FFP in isolation
- FFP vs colloid/crystalloid
  - Colloids may affect coagulation
- FFP vs another blood product
  - Different aims

# Trials of FFP vs no FFP for therapy

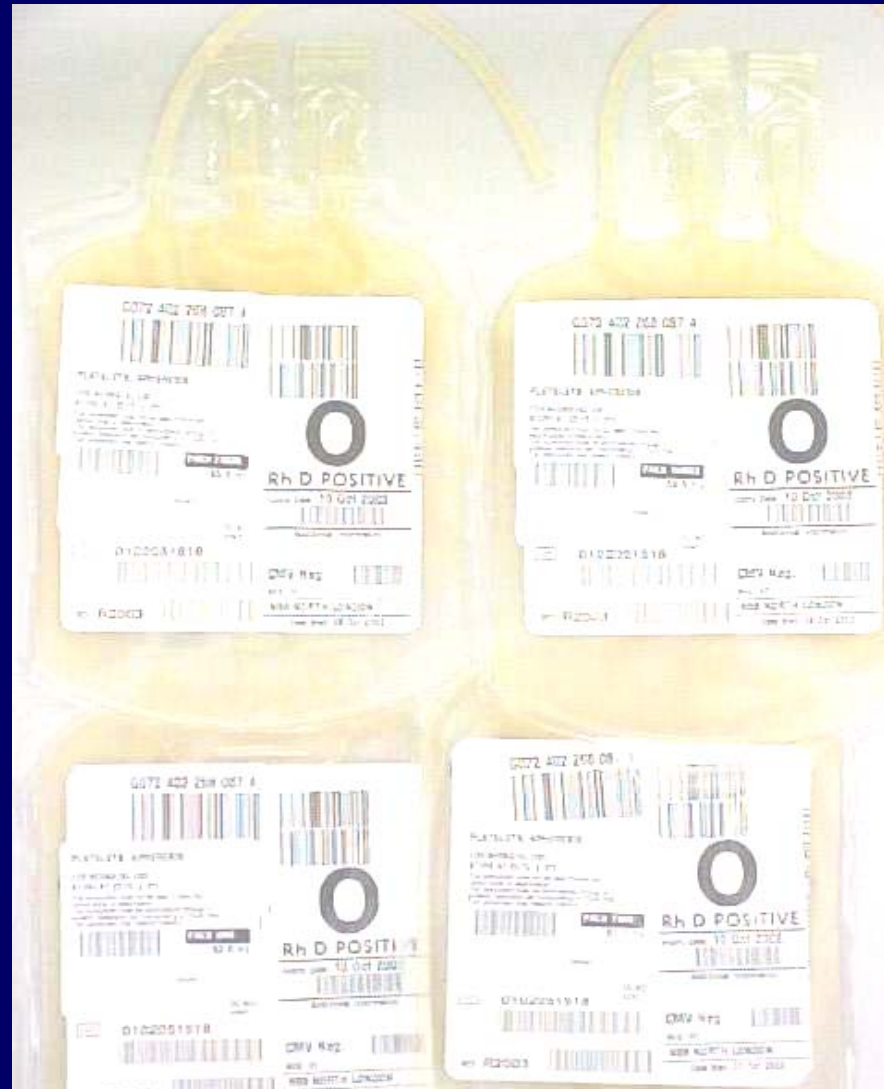
Clinical area	No. RCT	Mean size per arm
Liver	1	10
Cardiovascular	5	18
DIC	1	11
HUS	2	28
Neonatal	7	35
Other	2	8

# Trials of higher quality

*NNNI Trial Group; Lancet 348, 1996*

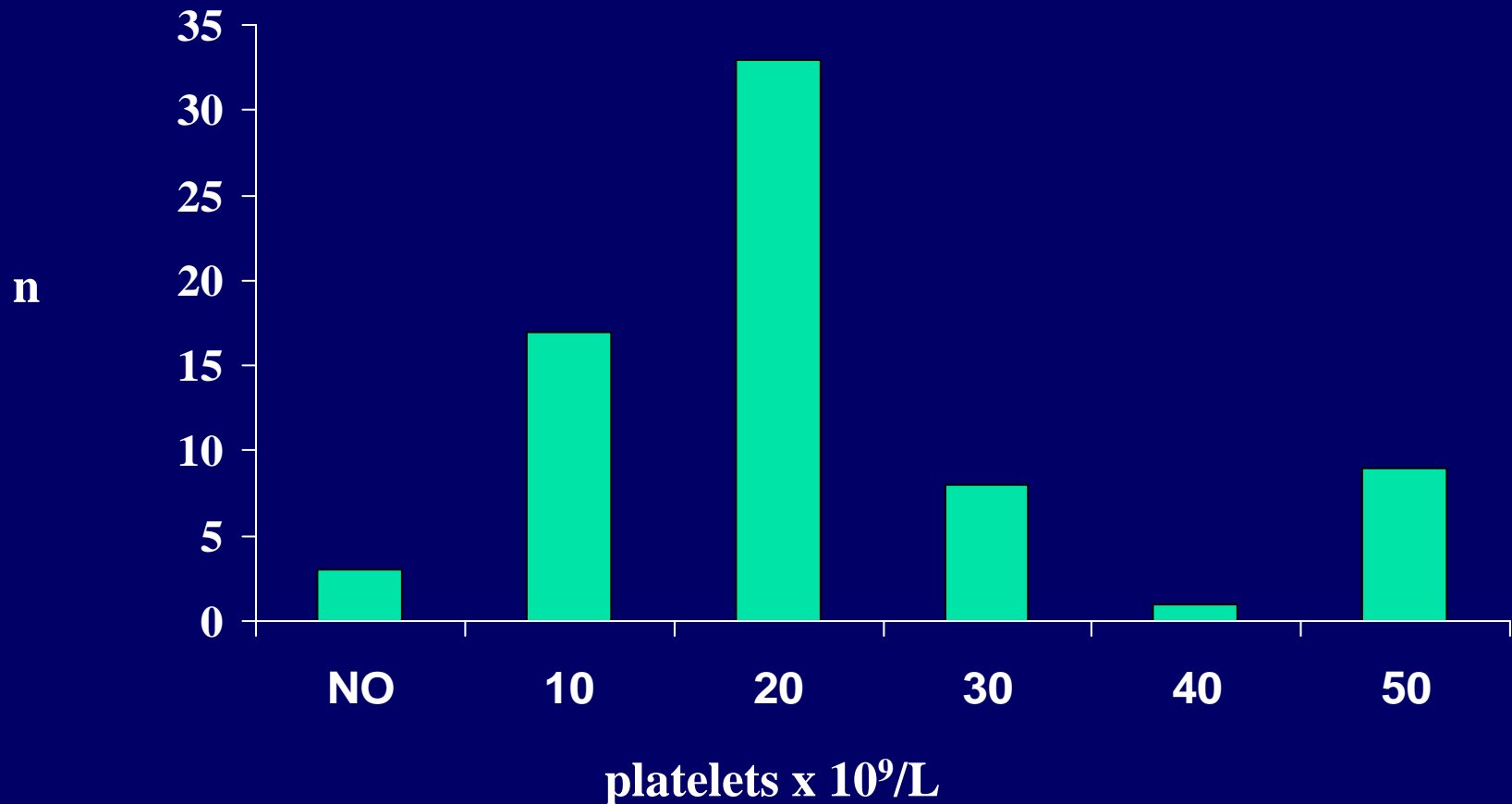
- 776 preterm infants
- Random allocation to prophylactic FFP, or Gelofusin or dextrose-saline
- Short-term (IVH) and developmental outcomes
- No significant differences
- No coagulation data
- Extreme prematurity not included

# Platelets – evidence base



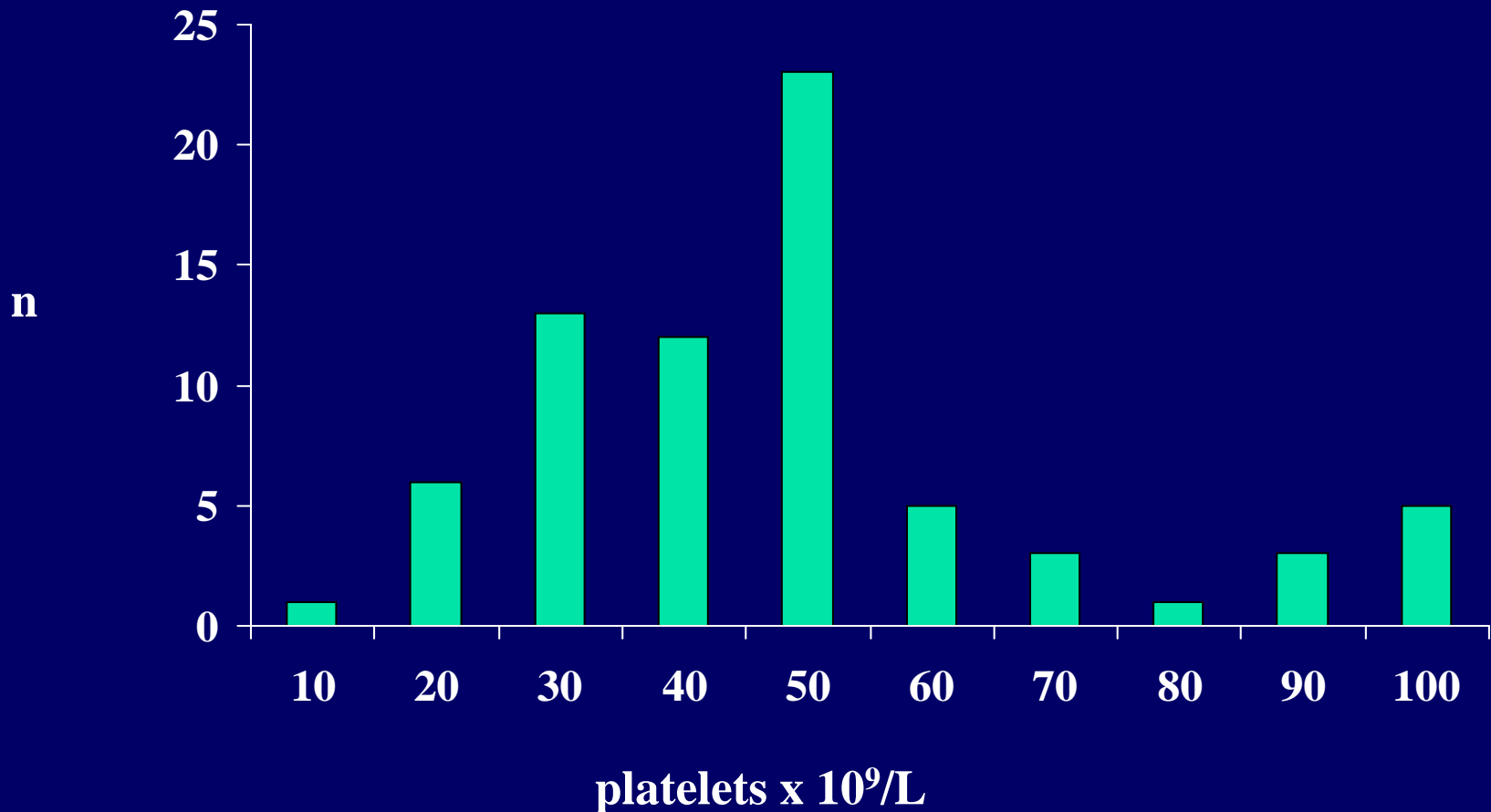
# BAPM transfusion questionnaire – Neil Murray

“Transfuse a non-bleeding neonate”



# BAPM transfusion questionnaire

“Transfuse a bleeding neonate”



# Intraventricular haemorrhage



Aetiology?

# Guidelines - Platelet transfusion in neonatal thrombocytopenia

## Platelets $<50 \times 10^9/l$

- clinical instability
- coagulopathy
- birthweight  $<1000g$  and age  $< 1$  wk
- prev major bleed
- current minor bleeding
- planned surgery or exch transfusion
- plts falling, likely to below 30
- NAIT if prev affected sib with ICH

# Main treatment - platelet transfusions: Common themes

- Around 2-9% neonates admitted NICU receive platelet transfusions, often prophylactically to non-bleeding neonates
- Audits - variable transfusion triggers
- platelet transfusions associated with mortality, although significant haemorrhage rarely major cause of death

# Evidence - RCT neonates

## *Andrew et al, 1993*

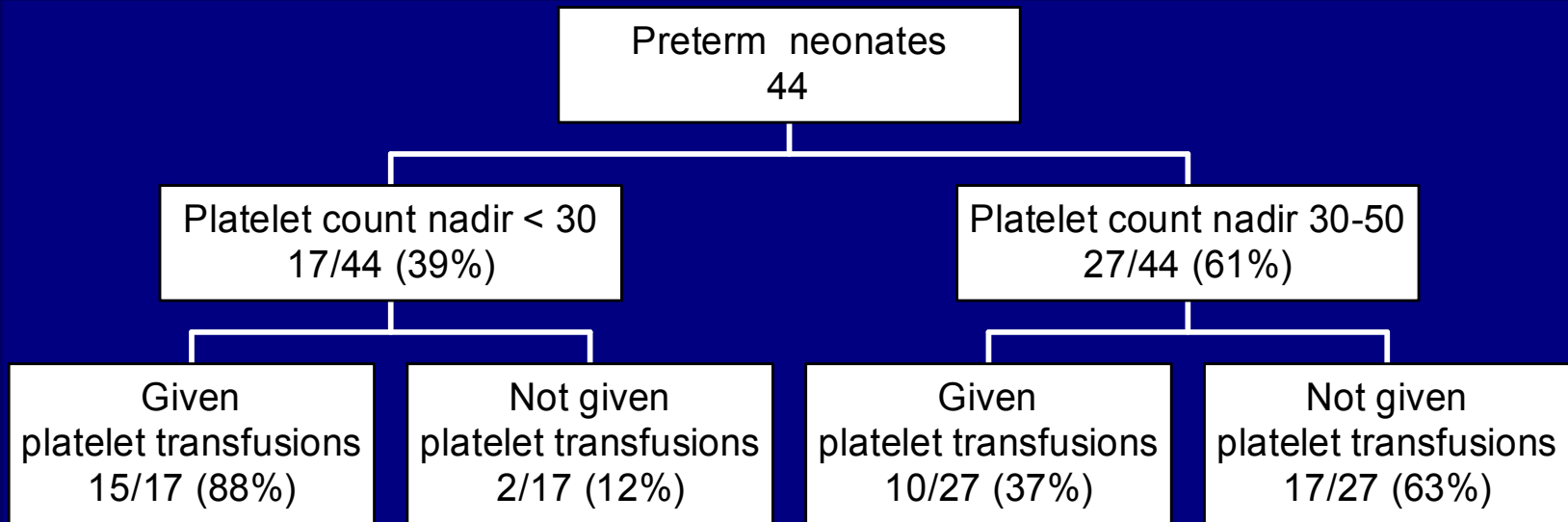
- <1500g; GA < 33weeks; Platelet count 50-150
- Arm 1. Plt Tx to keep plt count >150
- Arm 2. Plt Tx at threshold count 50
- No evidence 'aggressive' prophylaxis influenced incidence or extension of IVH

# Other more recent clinical studies in neonates

- Del Vecchio et al (US), 2001
- Murray et al (UK), 2002
- Garcia et al (Mexico), 2001

Retrospective/historic cohort type of studies to try and characterise platelet transfusion practice in consecutive NICU admissions

# Murray et al. 2002



Uncertain clinical implication of severe thrombocytopenia



# Overview of Results

Neonates admitted during study  
N=3498

Thrombocytopenia- NT60  
N=194

Not enrolled n=25  
Not approached n= 12    Refused n=13

Neonates enrolled to study  
n=169 – 5.5%

**Gestation (wks)**  
27, (25, 32)  
23-41

**Onset of NT60 (days)**  
4 (2, 7)  
1- 118

**Lowest platelet count**  
29 (20, 43)2-59

**Given platelet tx**  
n=115

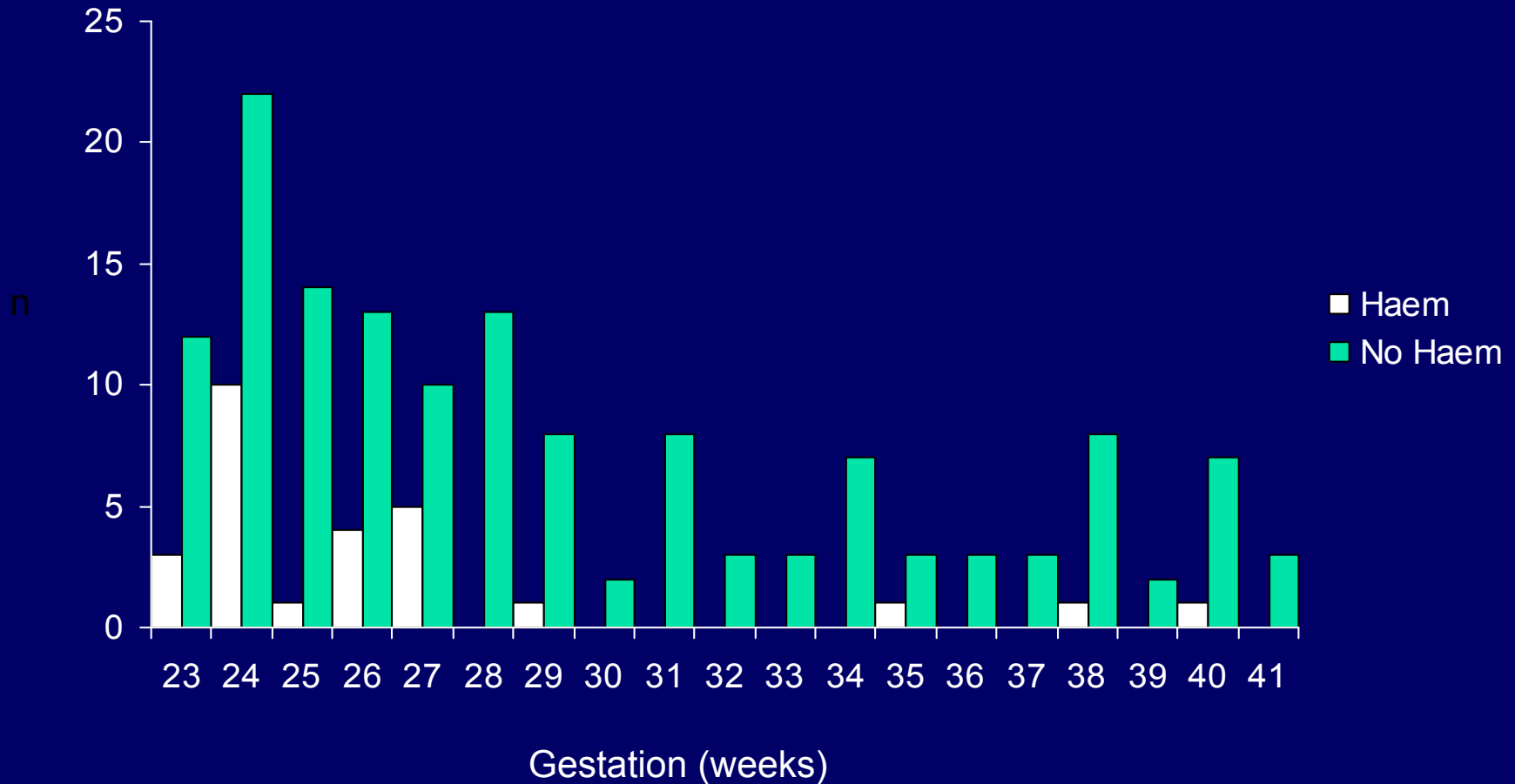
**Outcome**

**Total tx**  
n=414

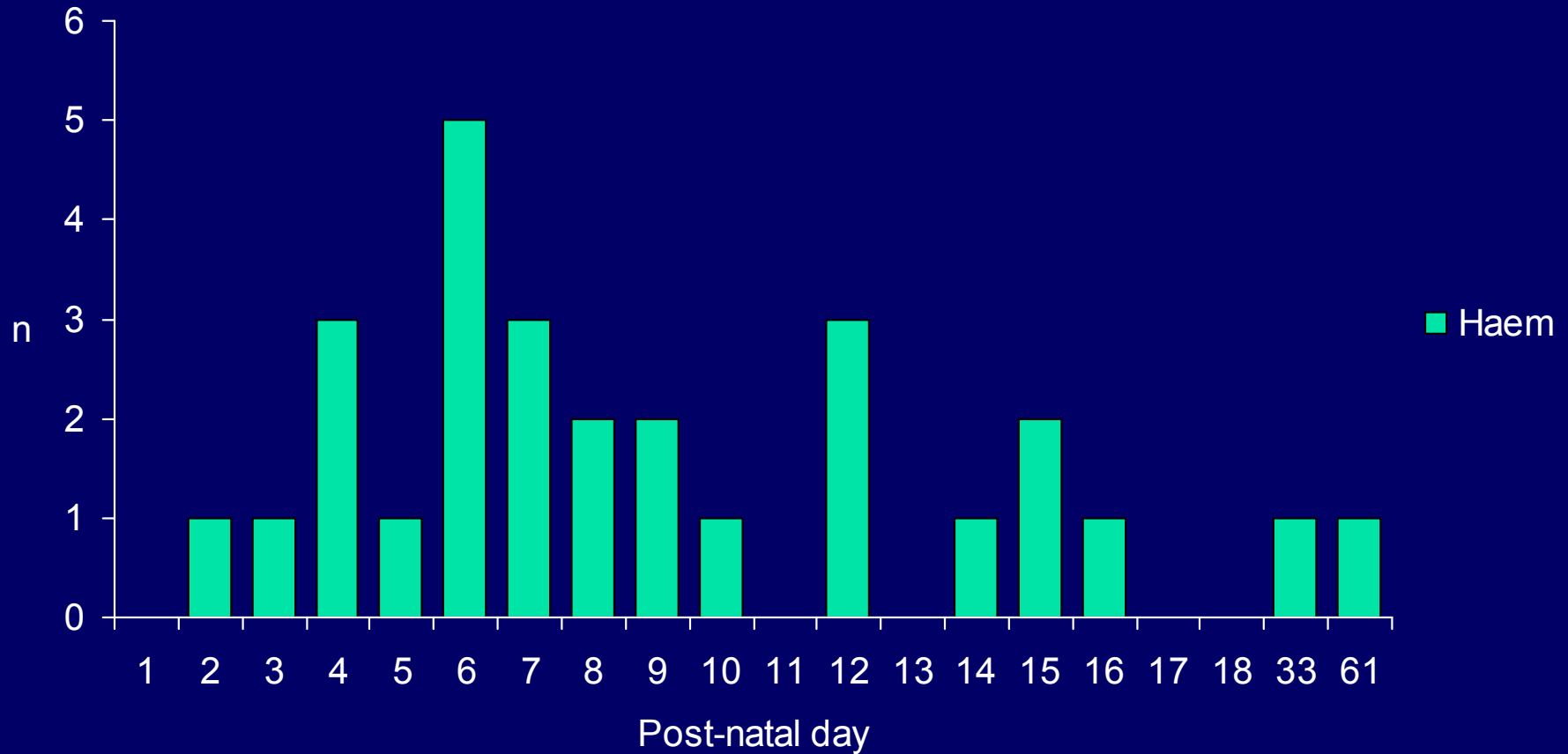
**Major haemorrhage**  
n=45

**Death**  
n=27

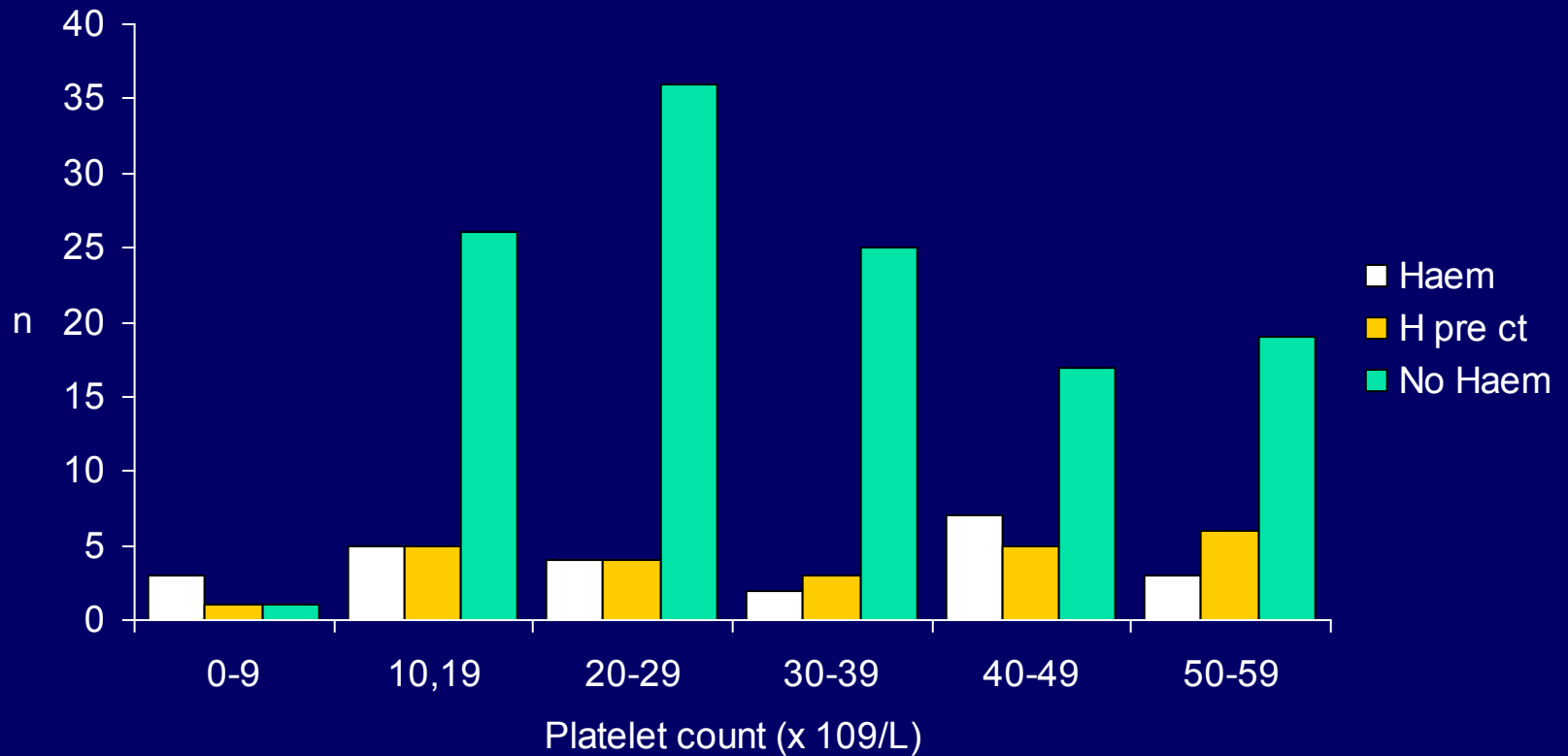
# Different types of Major haemorrhage by gestation



# Major haemorrhage by post-natal day of occurrence



# Major haemorrhage by lowest platelet count



# Reasons for platelet transfusion

Form C Platelet transfusion data

Optimising platelet transfusion in neonates  
**PLANET**

Study Number  
[ ][ ][ ][ ][ ]

Thrombo Epl No [ ][ ]

Transfusion Epl No [ ][ ]

(1) Please answer the following questions about the platelet transfusion

Date transfusion ordered [ ][ ] / [ ][ ] / [ ][ ]

Platelet count at time of decision to transfuse [ ][ ] x10<sup>9</sup>/L

State the volume of platelets that you have prescribed [ ][ ][ ][ ] ml/kg

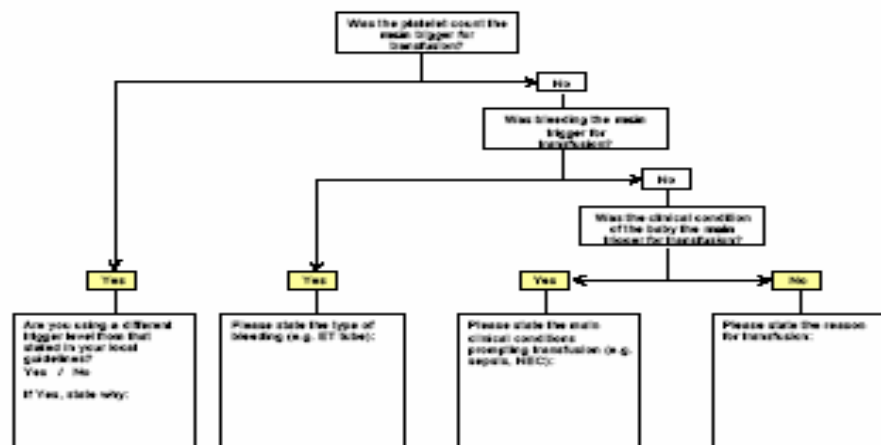
State the start date and time of the transfusion [ ][ ] / [ ][ ] / [ ][ ]  
[ ][ ] : [ ][ ] 24 hour clock

State the end date and time of the transfusion [ ][ ] / [ ][ ] / [ ][ ]  
[ ][ ] : [ ][ ] 24 hour clock

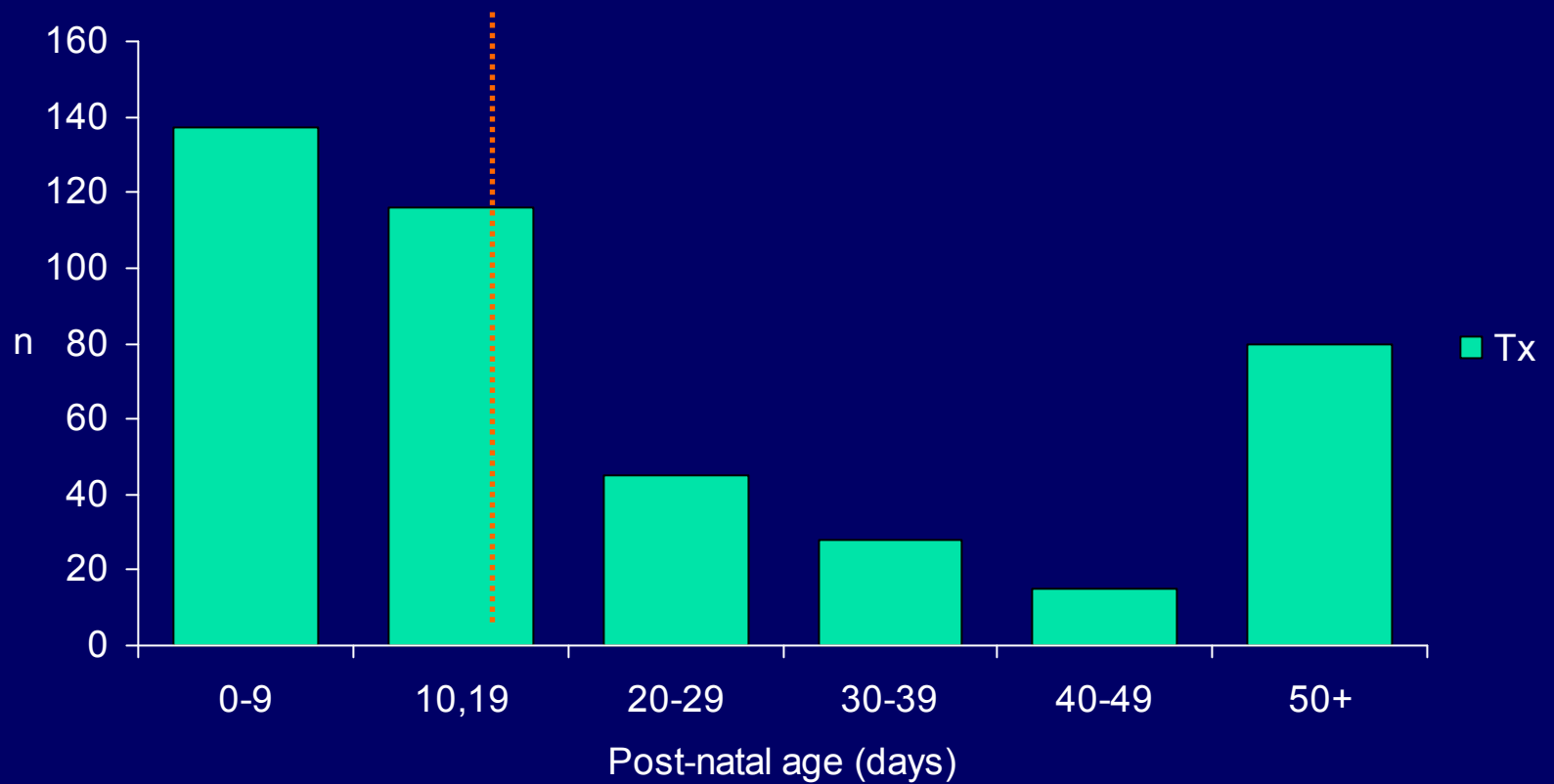
What was the platelet count after transfusion? [ ][ ][ ][ ] x10<sup>9</sup>/L

What was the time and date of the subsequent platelet count? [ ][ ] / [ ][ ] / [ ][ ]  
[ ][ ] : [ ][ ] 24 hour clock

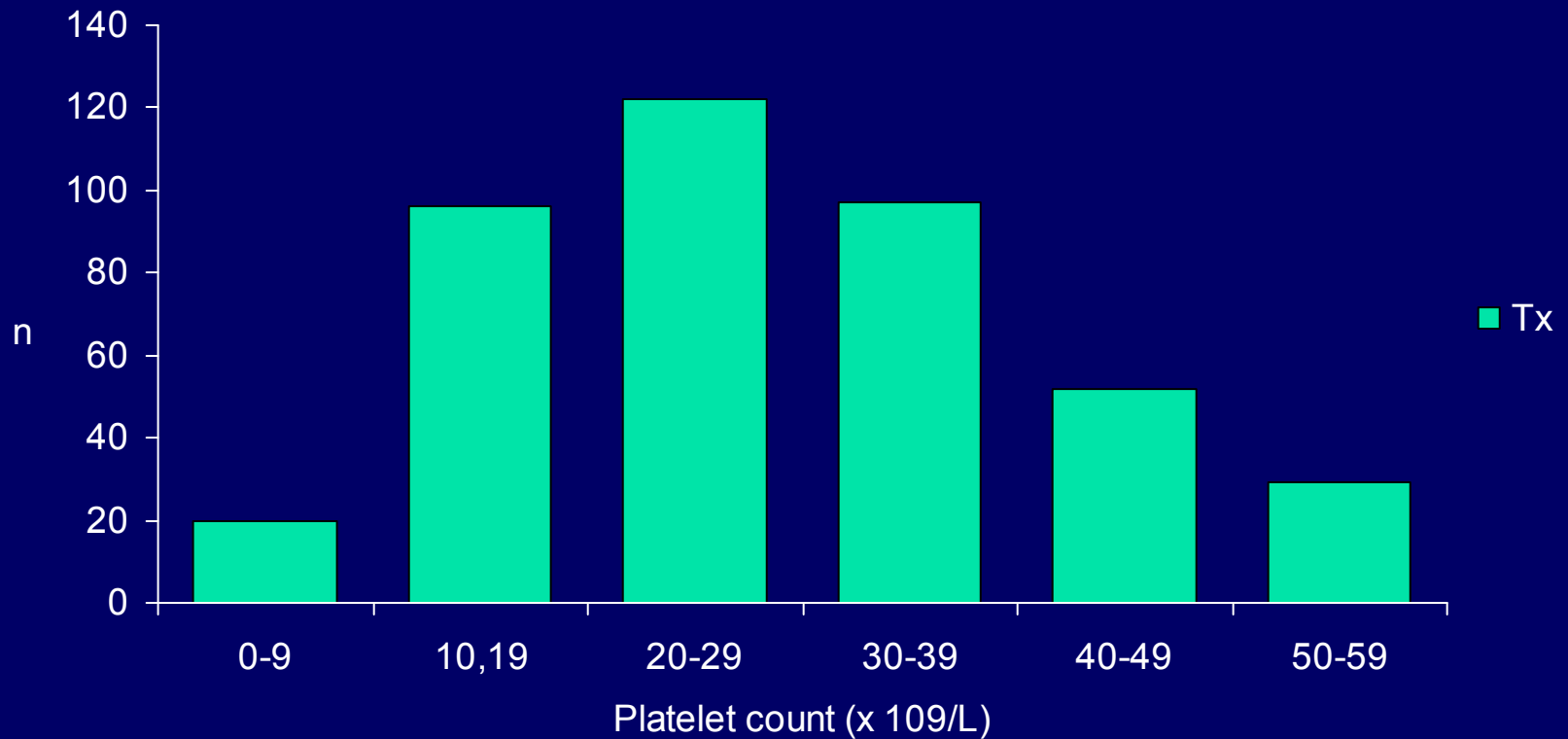
(2) Please study the following flowchart which describes various decision making pathways. Please circle the ONE outcome that most closely matches your decision making process. The four possible outcomes are shaded.



# Total transfusions by post-natal age



# Frequency of platelet Tx by pre-Tx platelet count



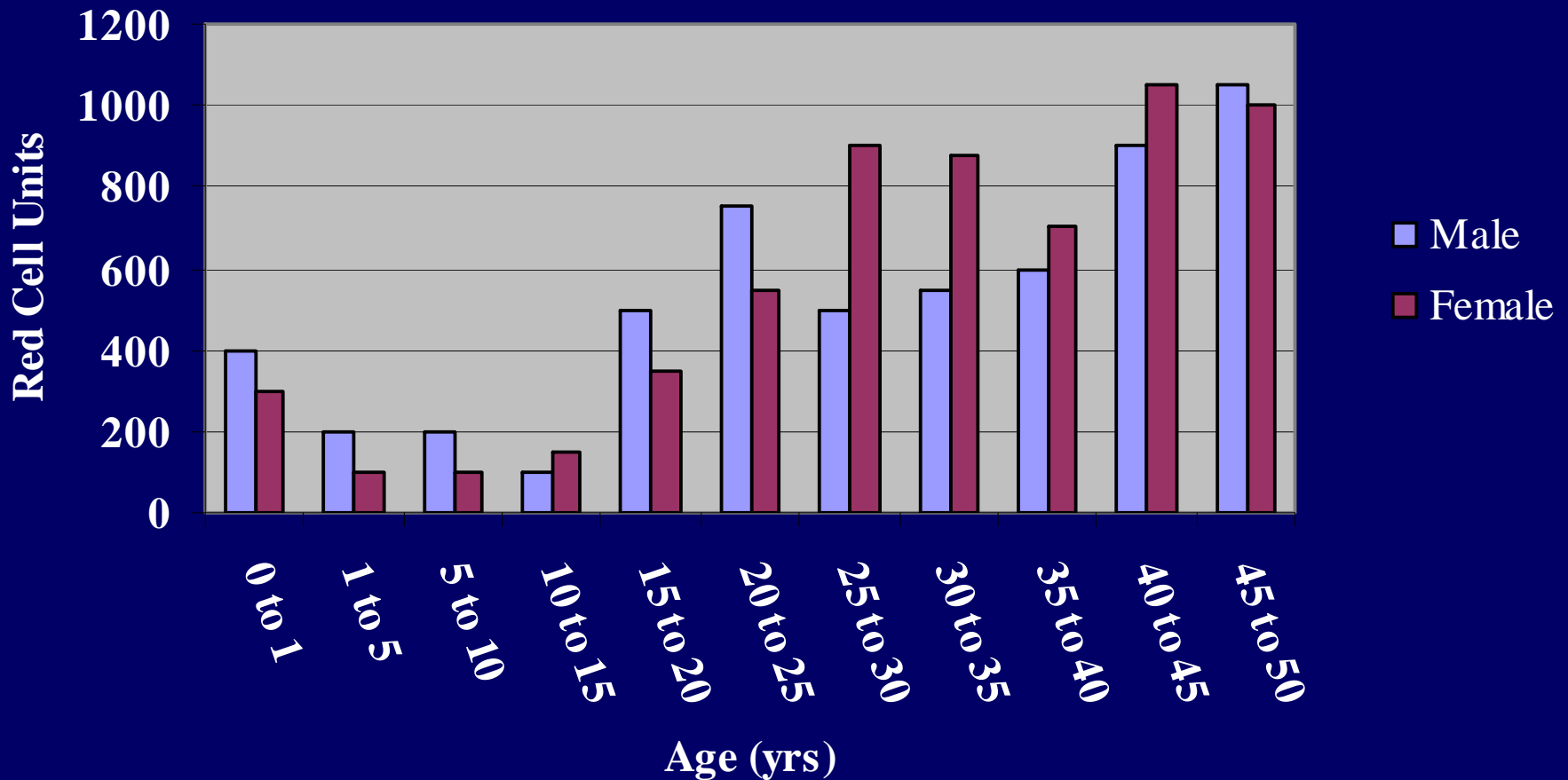
Mean pre-tx platelet count 27 (18, 36), range 2-59

# Summary

- NT60 occurs in 5.5% of NICU admissions
- Mostly early, mostly short-lived, most do well
- Major haemorrhage and mortality are common but relate more to the underlying condition rather than severity of thrombocytopenia
- 2/3 receive platelet Tx with most Tx given as prophylaxis to non-bleeding neonates, often well after “risk period” for haemorrhage has passed

# 4% Use of blood to Obstetrics

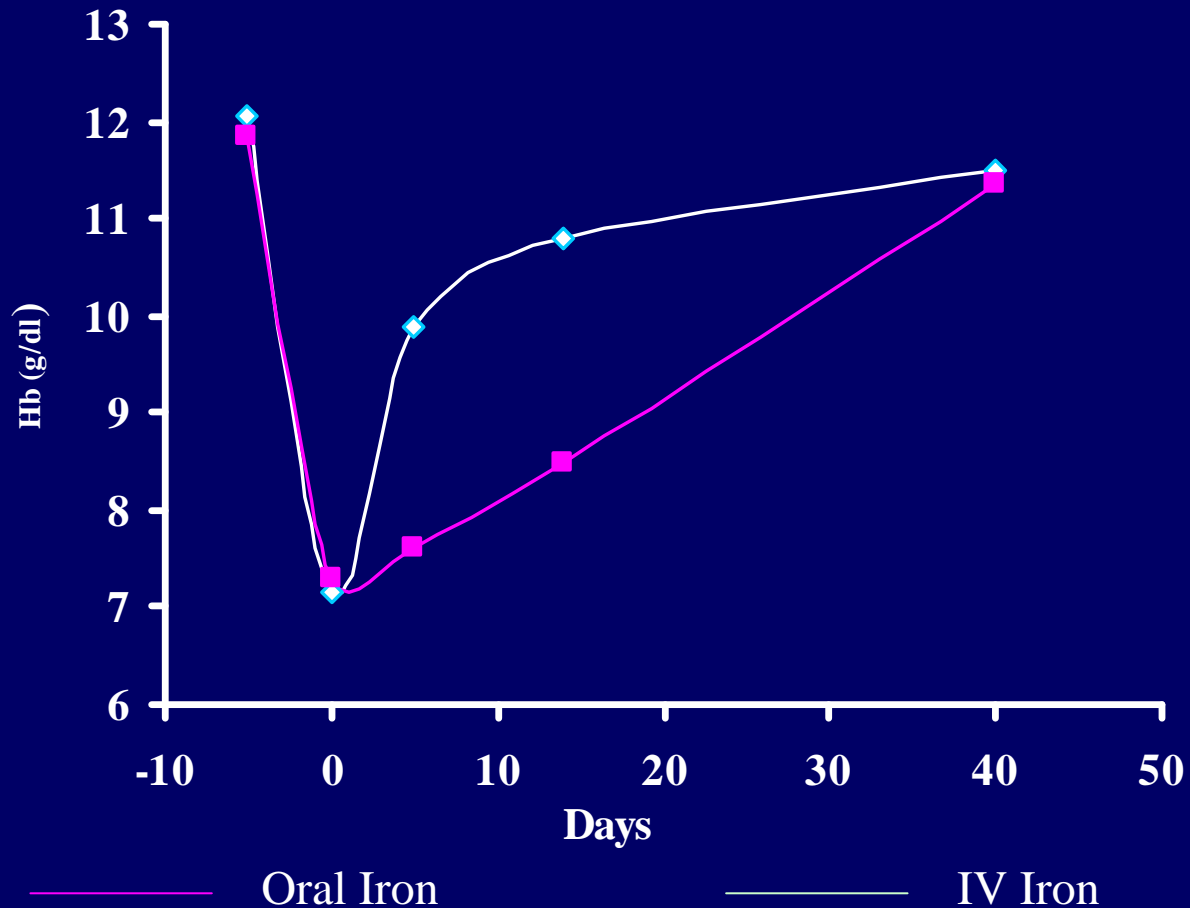
## Transfused RBC: age and sex distribution



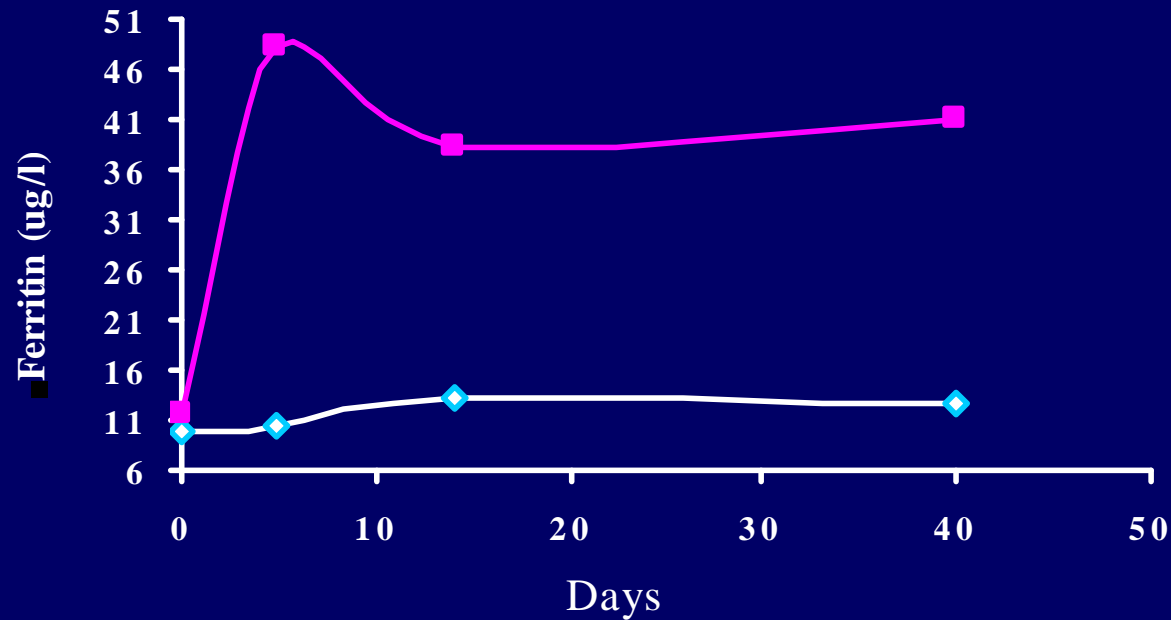
# Use of intravenous iron

- Small single centre RCT
- Comparing iv versus oral iron for post-partum anaemia
- 44 women eligible
- *Bhandel & Russell, BJOG, 2006; 113, 1248*

# Haemoglobin Response to iv and oral Iron



# Response of ferritin to iv and oral iron



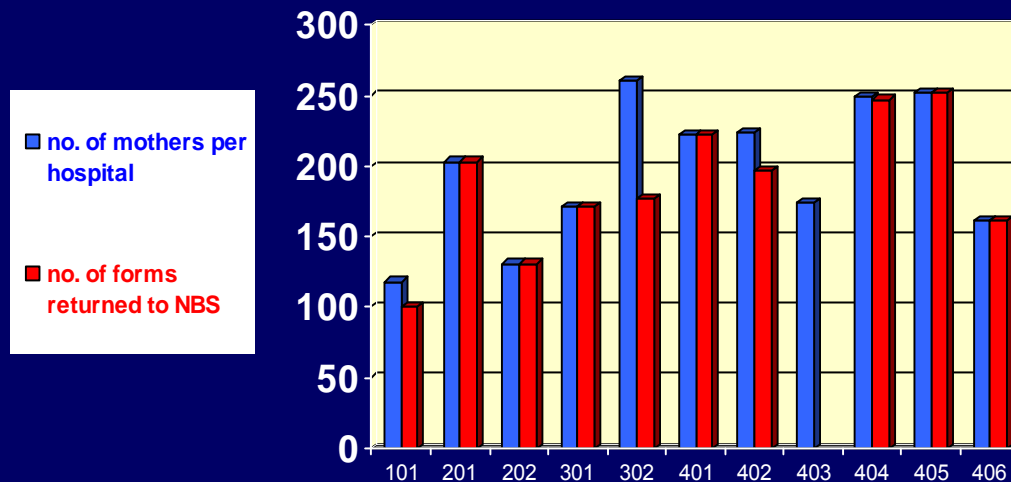
— Oral Iron

— IV Iron

# OTIS - Obstetric Transfusion and Iron Survey

11 delivery units, all deliveries in a 2 week period, aim > 2000 deliveries

OTIS Survey 2008. Patient Recruitment Chart



# Thank you for inviting me!

## Acknowledgements

- NBS CSU/ MRC CTU
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