Fifty ways to fail your patient

Haemolytic transfusion reactions

Nearly

Fifty ways to fail your patient

Haemolytic transfusion reactions

Acute haemolytic transfusion reaction (AHTR): definition

- Fever and other symptoms/signs of haemolysis (either during or within 24 hours of transfusion) confirmed by one or more of the following:
  - Fall in Hb
  - Rise in LDH
  - Positive DAT
  - Positive cross match

Delayed haemolytic transfusion reaction (DHTR): definition

- Fever and other symptoms/signs of haemolysis (occurring after 24 hours of transfusion) confirmed by one or more of the following:
  - Fall in Hb or failure of increment
  - Rise in LDH
  - Incompatible cross match not detectable pre-transfusion

Wrong Component Transfused (WCT) leading to haemolysis

- A patient develops acute haemolysis after being transfused with a blood component of an incorrect blood group, due to
  - Phlebotomy errors
  - Lab procedural or testing errors
  - Collection errors
  - Bedside administration errors

Acute haemolysis due to WCT

- Is always preventable
- Is usually preventable
- Is sometimes preventable
- Is never preventable

AHTR

- Is always preventable
- Is usually preventable
- Is sometimes preventable
- Is never preventable

DHTR

- Is always preventable
- Is usually preventable
- Is sometimes preventable
- Is never preventable

Since the start of SHOT in 1996, how many deaths are attributable, at least in part, to haemolytic transfusion reactions or ABO incompatible WCT?

- Less than 10
- 10-20
- 20-40
- 50-100
- Over 100

Answer

- At least 33
  - ? Plus some cases from 1996-2006 when ATR included acute haemolytic reactions

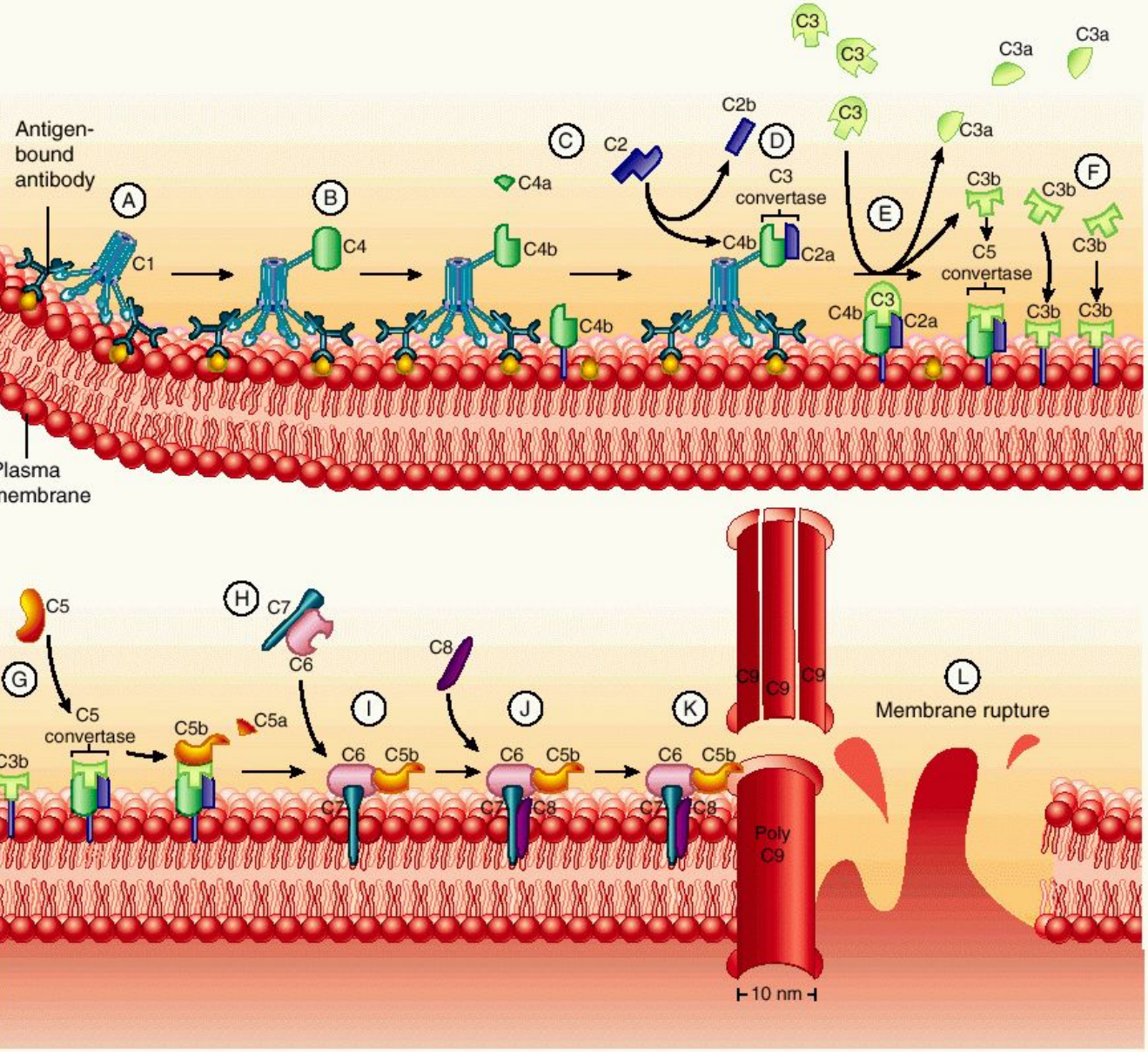
Cumulative data on ABO incompatibility since 1996

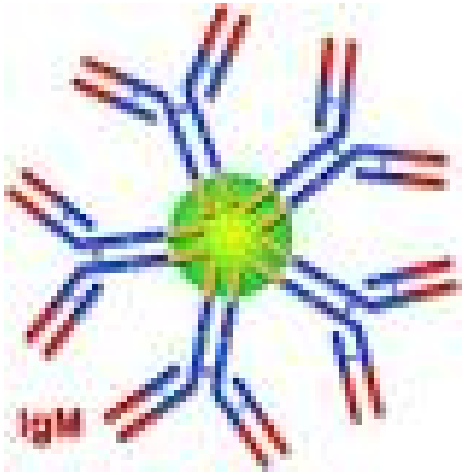
- 282 cases of ABO incompatibility SHOT 1996-2013
  - **19 deaths (7%)**
  - **76 instances of major morbidity (27%)**
- Despite the fact that 64% of cases appear to suffer no morbidity, ABO incompatible transfusion should still be regarded as a never event.
- Incompatibility other than ABO may cause morbidity

Mortality and morbidity with acute and delayed transfusion reactions

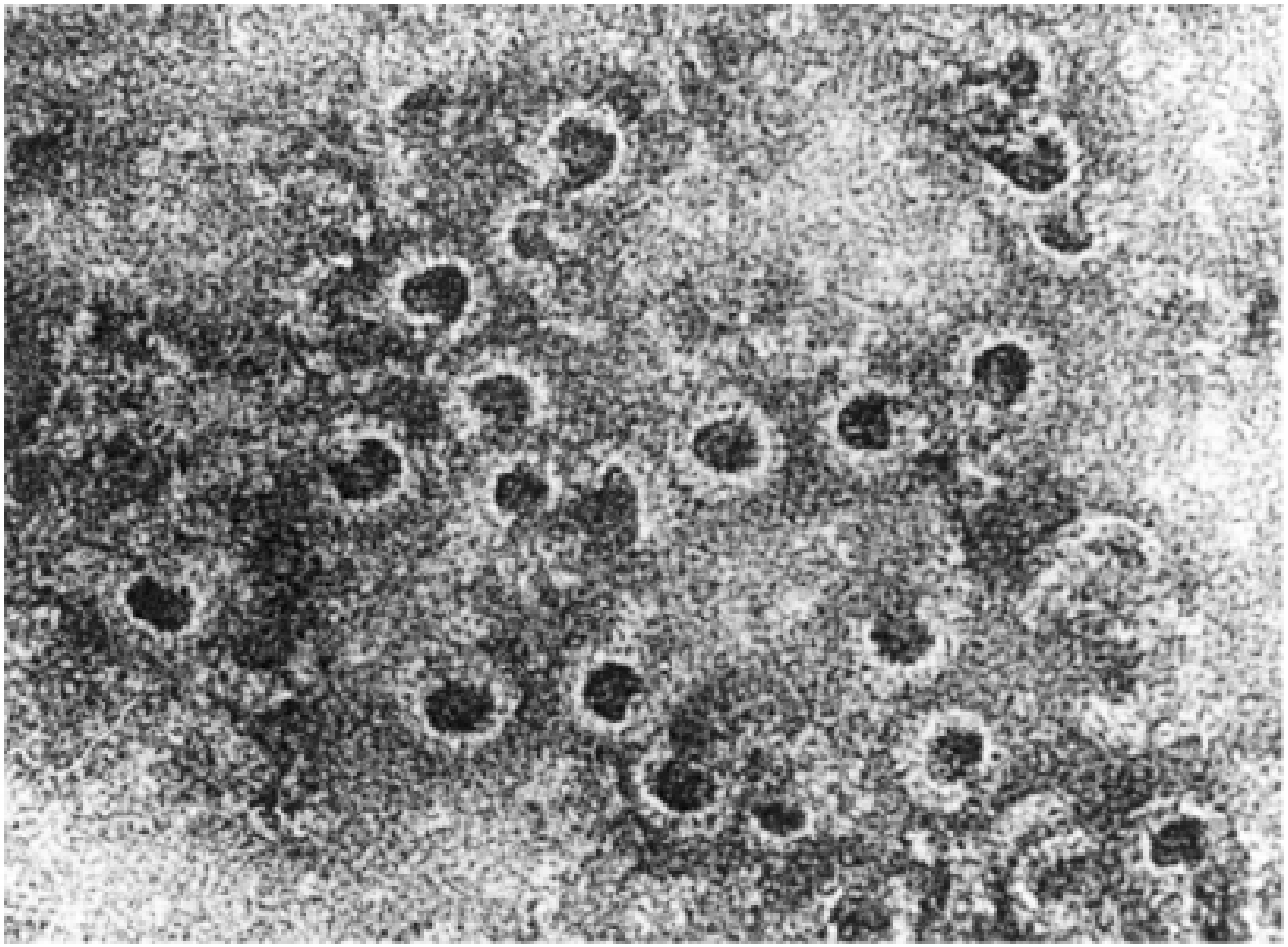
- 1996-2013
  - 607 reports of HTR (AHTR and DHTR)
  - **14 deaths (2.3%)** where HTR was contributory or causal
  - **78 reports of major morbidity (13%)** where HTR was contributory or causal

Acute haemolysis due to WCT

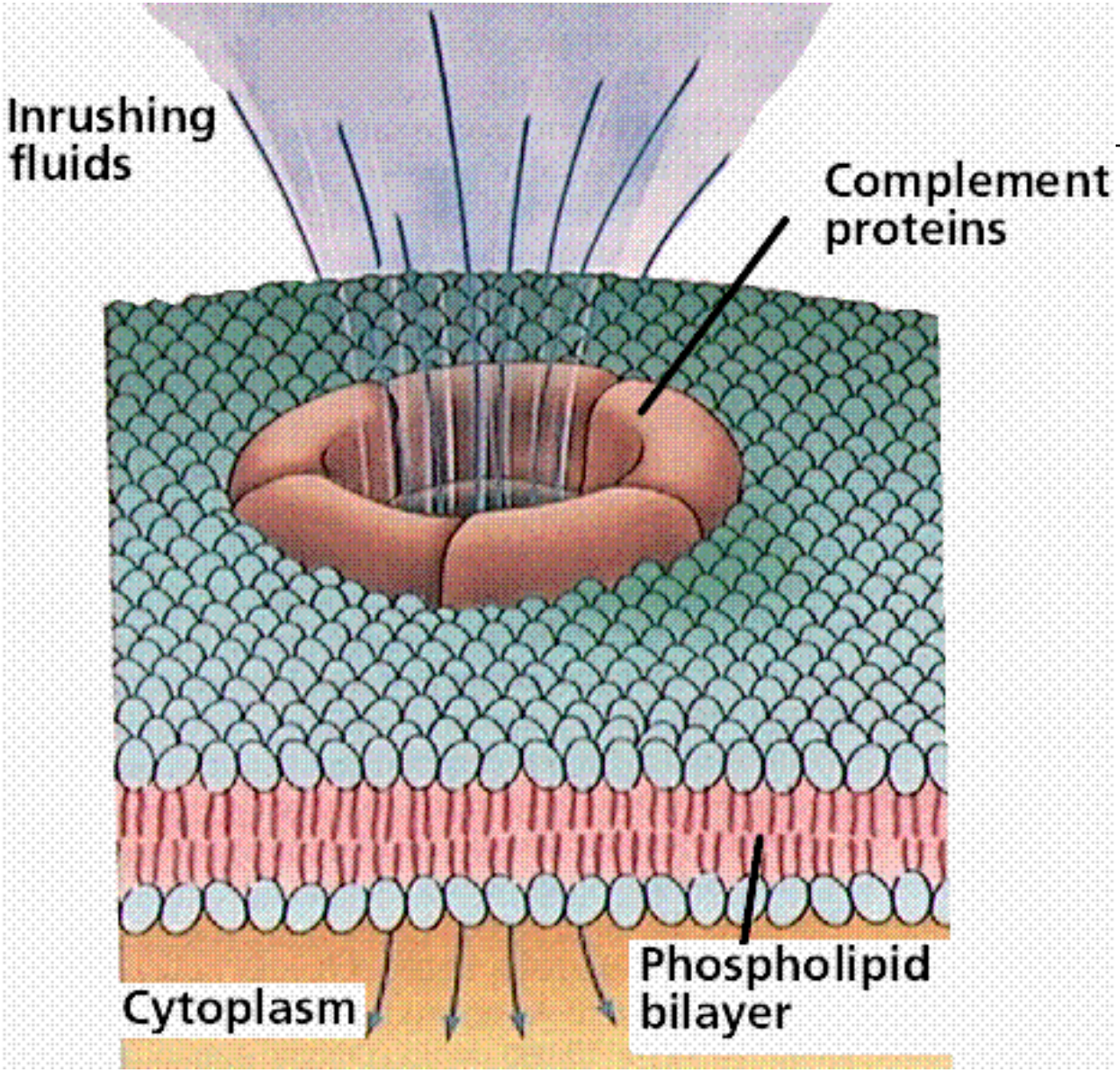




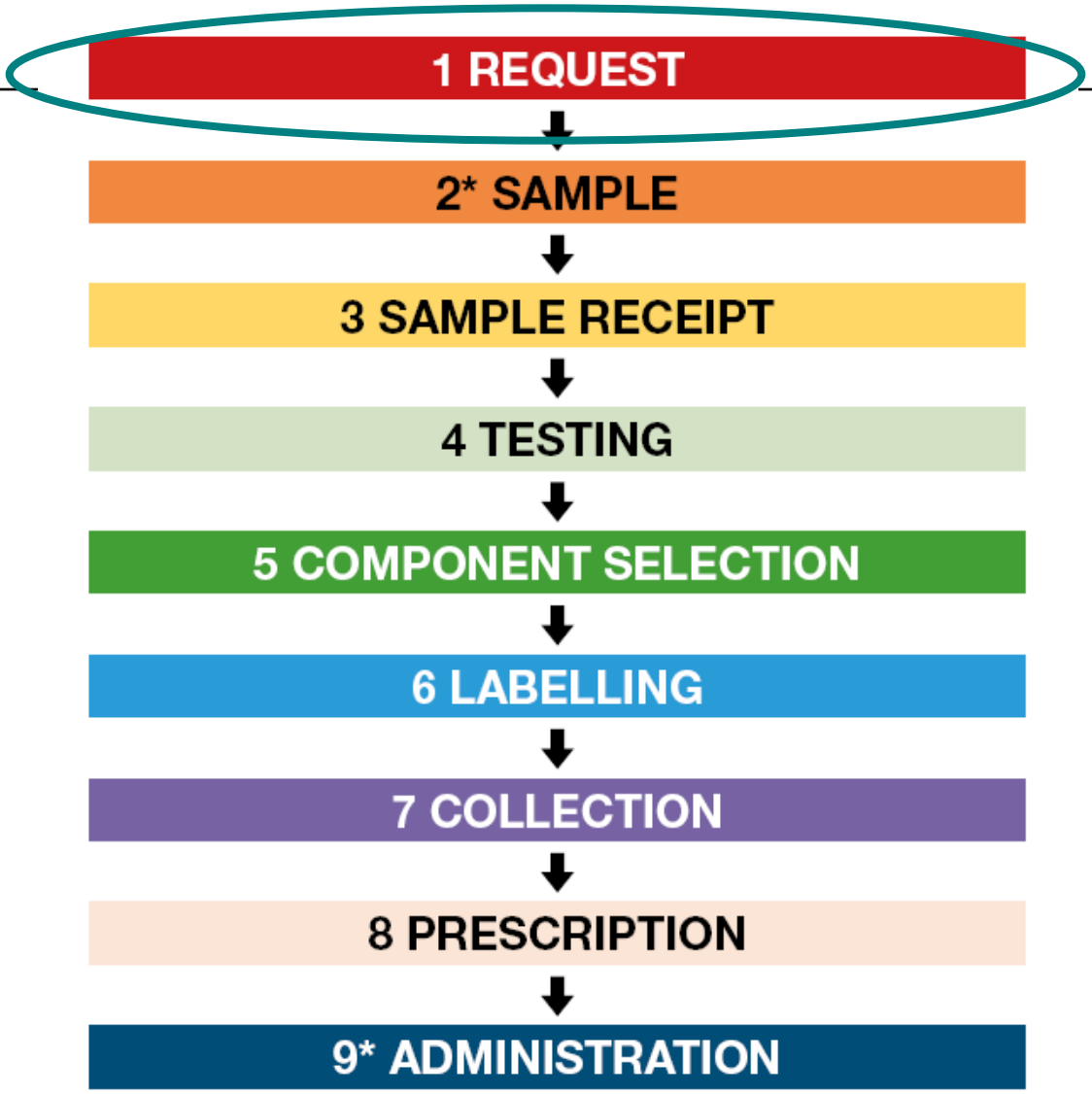
IgM molecule



Membrane attack complexes in
a red blood cell


Inrushing fluids
Complement proteins
Phospholipid bilayer
Cytoplasm

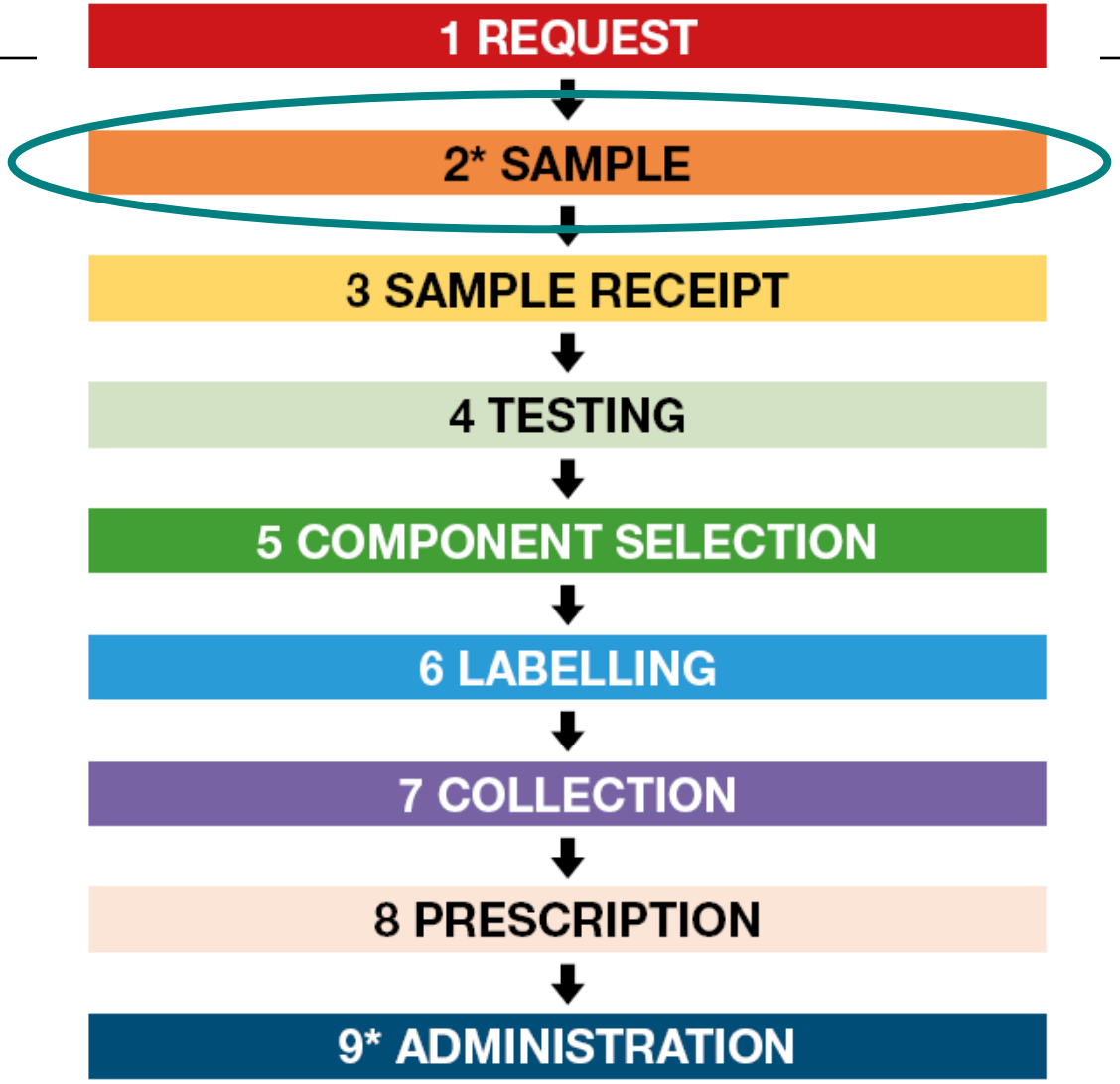
From 2013 SHOT report



Can the requestor reduce transfusion errors?

- Appropriate requesting
- Timing of request: e.g. urgent testing when lab poorly-staffed

From 2013 SHOT report



** Critical points where positive patient identification is essential*

Wrong Blood in Tube

- Blood is taken from the wrong patient and is labelled with the intended patient's details

  Or

- Blood is taken from the intended patient, but labelled with another patient's details

What's the risk?

- Borsetshire General Hospital transfusion lab receives 60,000 samples per year
- On average, how many WBITs will they receive?

Answer?

- Nil
- 1-10
- 10-20
- 20-40
- 40-80

Incidence of WBIT

- Dzik *et al*, 2003 — 1 in 1986
- Murphy *et al* 2004 — 1 in 1303
- N England 2013 — 1 in 2717

All patients having a blood sample taken must be positively identified and the sample labelled at the patient's side.....?

	Yes (%)	No (%)
Was the sample labelled at the patient bedside?	85	15
Was the person taking the sample competency assessed?	74	26
Was the patient identified according to correct procedure?	72	28

Thomas et al, Trans Med 2014

WCT due to WBIT

- A patient with major trauma was grouped at hospital X as group O
- He was transferred to hospital Y where a sample was taken from another patient and labelled with his details
- Grouped as A

Which is potentially a more dangerous cause of ABO incompatibility?

- WBIT
- Bedside administration error
- Both equally dangerous

WCT due to WBIT

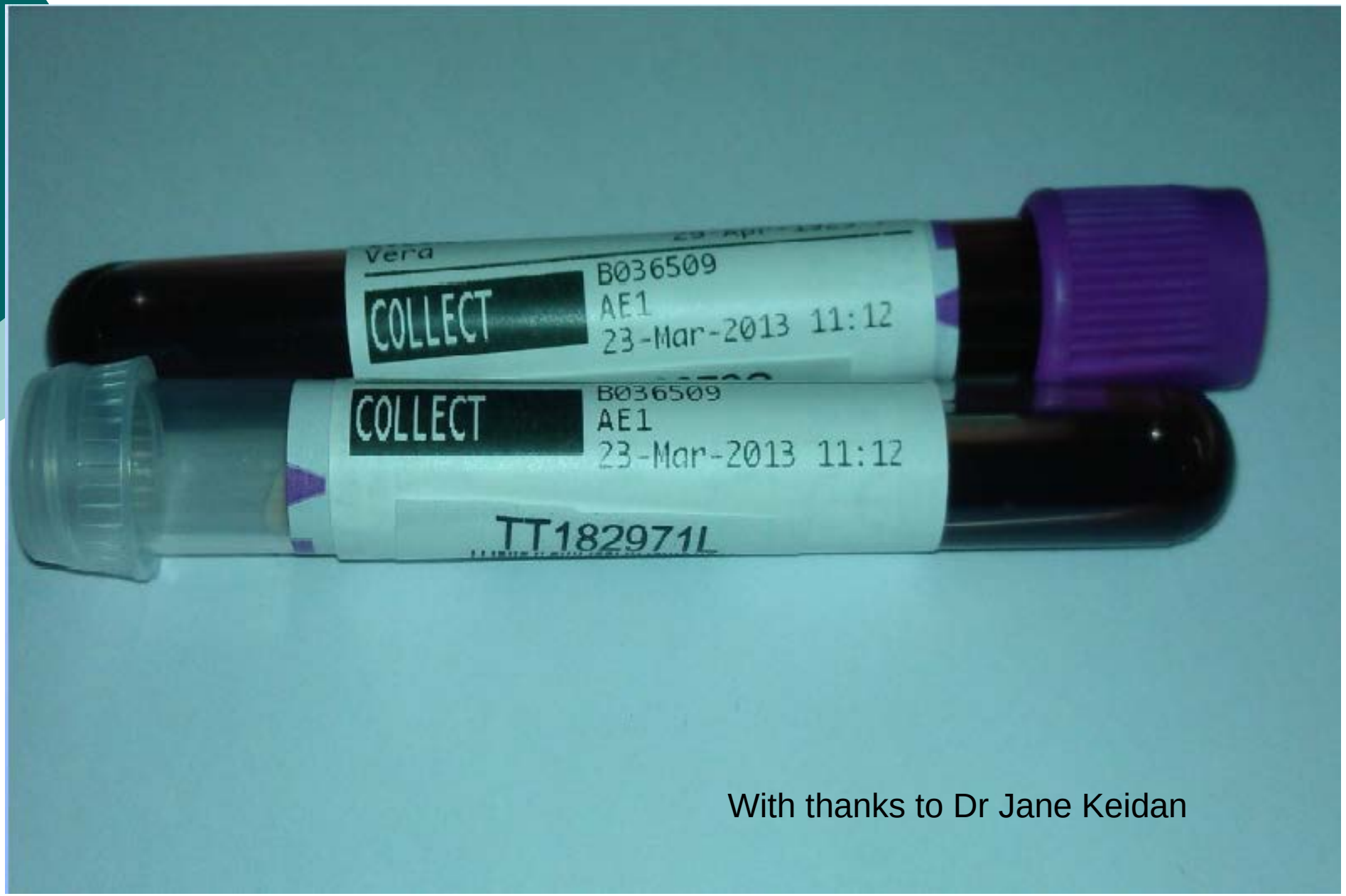
- A patient with major trauma was grouped at hospital X as group O
- He was transferred to hospital Y where a sample was taken from another patient and labelled with his details
- Grouped as A
- Given 4 group O and 24 group A red cells, 5 units of group A platelets and also AB FFP
- He was actually group O

BCSH guidelines: requirement for two samples..... prior to issue of red cells

- Wherever possible a second sample should be obtained
- Urgency should be considered as delays in blood could compromise patient outcome
- In an urgent situation, red cells should not be issued without a second check for ABO incompatibility
  - Second group on the same specimen, preferably using different method/reagents from fresh sampling
  - And/or a serological cross match
  - This needs to be risk assessed

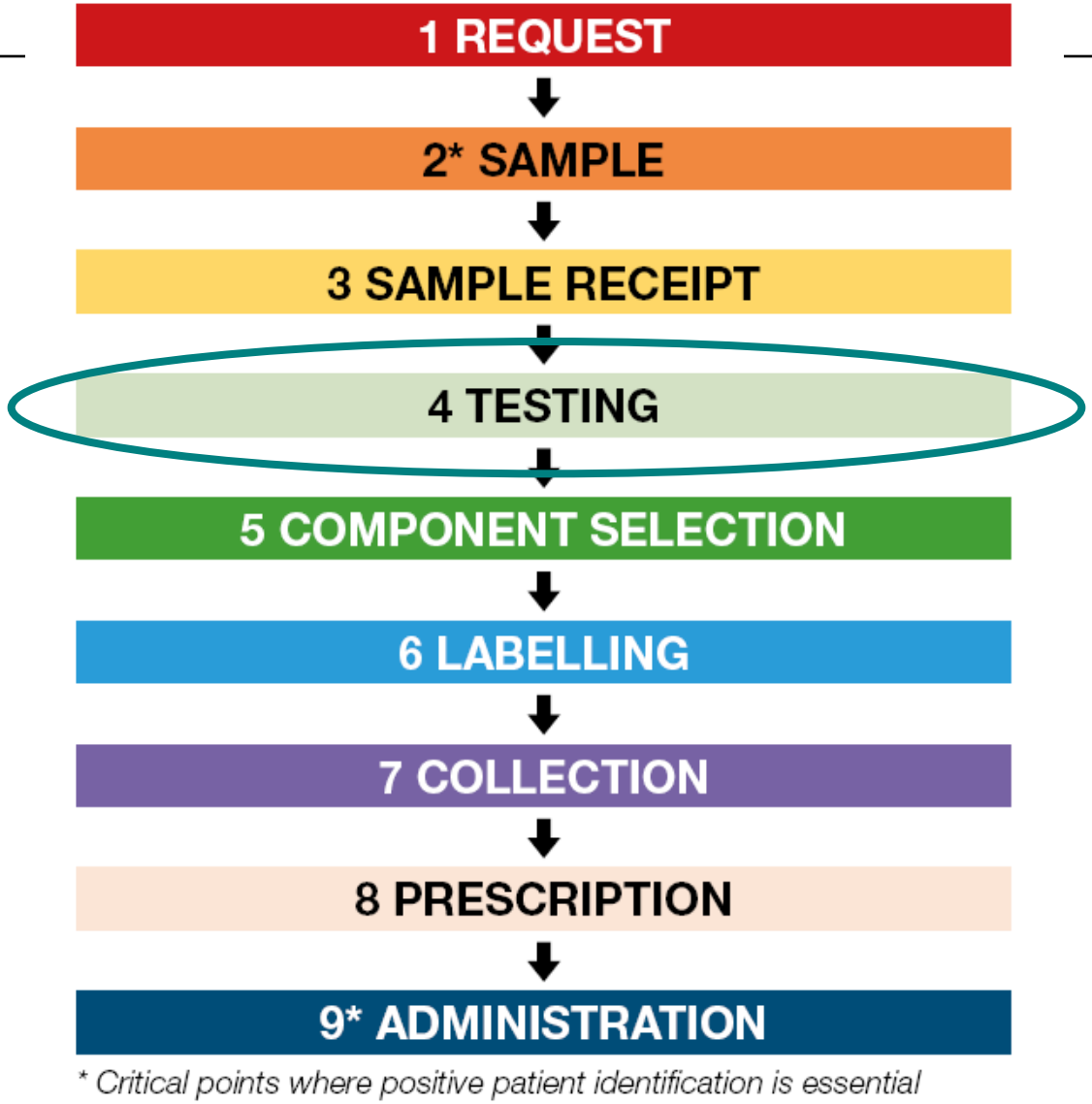
Do you agree a second test on the same specimen +/- a cross match can be done in an emergency?

- Yes
- No



With thanks to Dr Jane Keidan

From 2013 SHOT report



ABO incompatible transfusion due to lab error

- Patient who was group A was transfused 3 units of AB red cells
- RCA performed
- Wrong sample had been selected for testing

Which of these risk factors was most important?

- Testing performed as urgent to enable patient to go home that night
- Lab poorly staffed at that period
- Failure to follow sample checking as per SOP
- Repeated interruptions from staff and phone calls
- Previously tested samples left on bench instead of being stored immediately

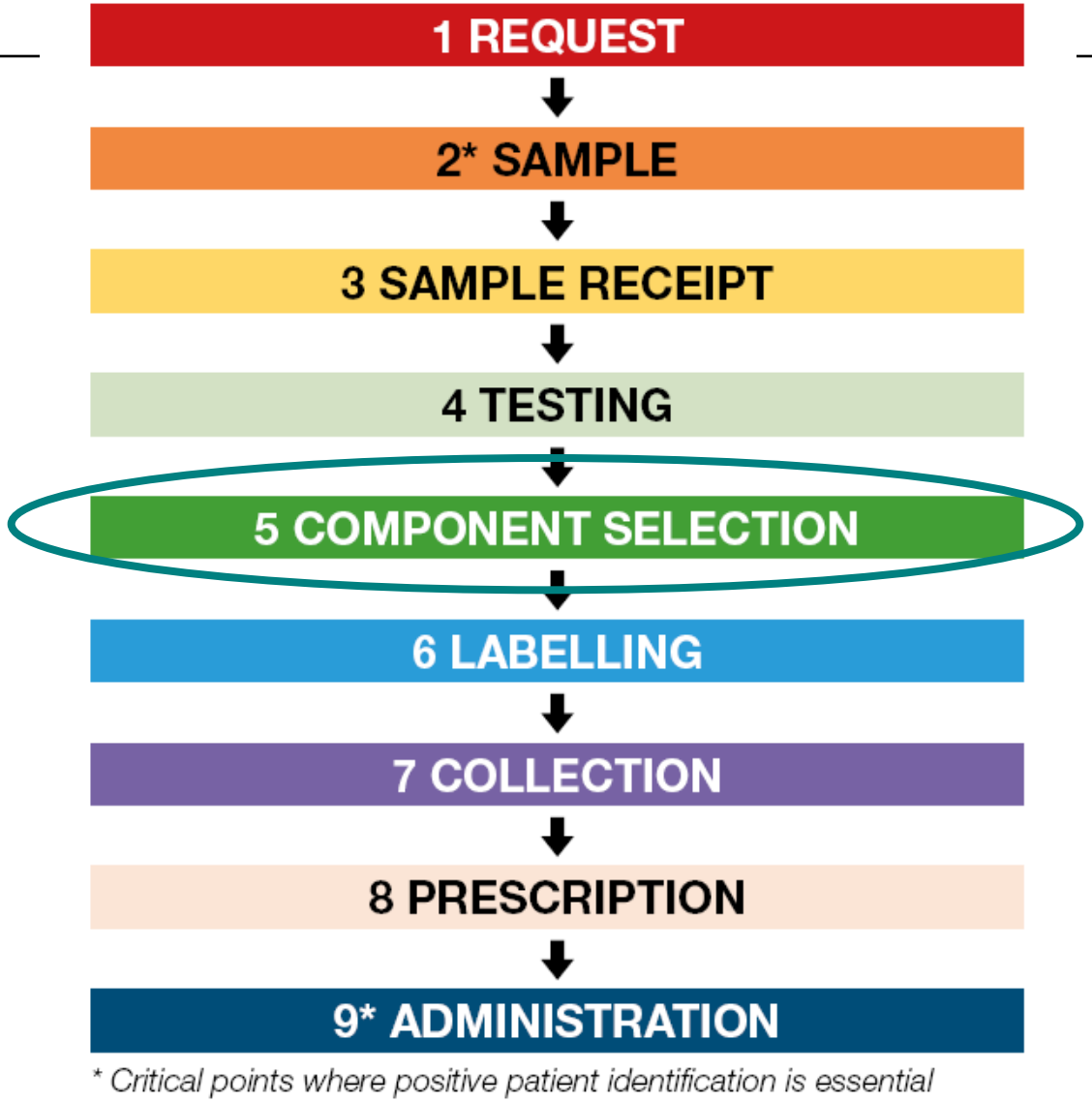
Further testing error

- Group O patient given group A red cells
- Handwritten group given as A on request form
- Misread immediate spin cross match

Comments on minimising testing errors

- Correct and positive patient ID at every step
- Eliminate manual steps
- Communication and handover
- Heed alerts and flags

From 2013 SHOT report



What plasma would you use?

- Patient, group B needs plasma urgently
- You have just used all your group B plasma for a major trauma case, more ordered, should arrive in 1-2 hours

What plasma would you use?

- AB
- A
- O
- Hold on until group B plasma arrives
- I don’t know

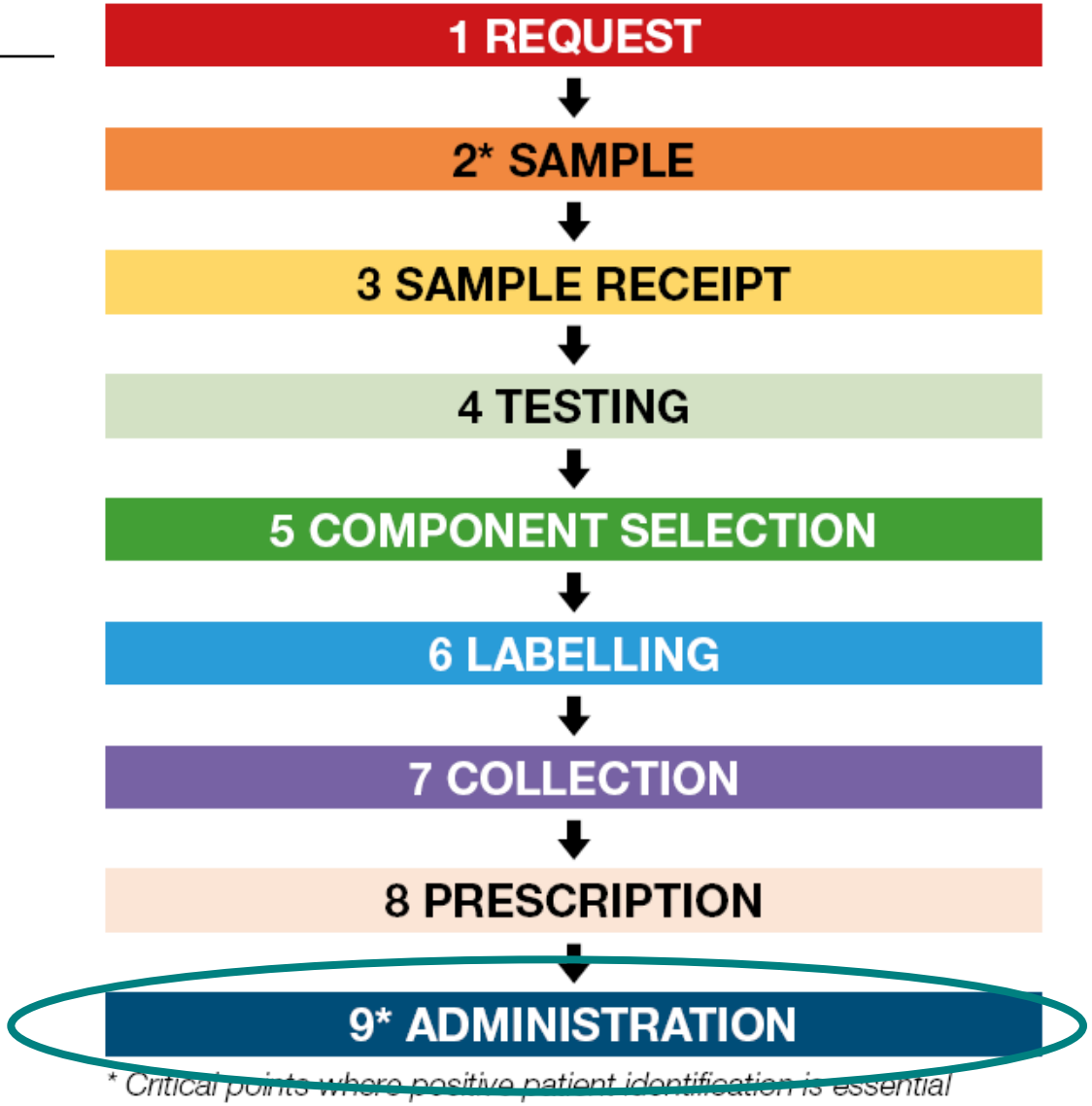
Table. Principles of selection of FFP according to donor and recipient blood group

Recipient group	O	A	B	AB
1st choice	O†	A	B	AB‡
2nd choice	A	AB‡	AB‡	A*
3rd choice	B	B*	A*	B*
4th choice	AB‡	-	-	-

† Group O FFP must only be given to group O recipients
* Tested and negative for high-titre ABO antibodies
‡ AB plasma, though haemolysin free and suitable for patients of any ABO group, is often in short supply.

BCSH, 2005

From 2013 SHOT report



Final check against the patient's wristband

Which statement do you most agree with about this picture?

- Only one person is needed to check
- Two people are needed
- This shows good practice
- Where’s the patient?

Analysis of Acute HTRs reported to SHOT 2009-2013

- 40 cases (17 in 2013)
- 5 described as likely acute and delayed haemolysis in multi-transfused patients
- 3 cases of hyperhaemolysis (1 fatal)
- 3 cold antibodies
- 2 exacerbation of AIHA
- 1 case where fludarabine implicated
- Severe reactions involving anti-Jk^a and -Fy^3
- In several cases, no antibody identified
- In several, antibody identified thought unlikely to be the cause
  - E.g. Knops, Bg
- 7 involved antibodies to low frequency antigens (5 to anti-Wr^a)

Preventable AHTRs

- 5 (or 4) cases from 2009-2013 (I think) may have been preventable
- 2 cases of group O platelets to non-group O patient
- 1 case of transfusion during an episode of hyperhaemolysis
- 1 transfusion during a likely DHTR, where weak anti Jk^a was not identified
- ??1 patient had known anti Co^b, negative units were available but cross match neg units used instead. (but this fits NHSBT policy)

HTR due to antibody to low frequency antigen (TM 2007)

- Patient with myelodysplasia
- Receiving regular transfusions without problems
- Electronic issue
- On this occasion, antibody screen negative
- Patient c/o rigors, dyspnoea, feeling “distant”
- Bilirubin rose within hours from 16 mmol/L (normal) to 110 mmol/L
- Pinkish urine
- Hb fell from 117g/L immediately post-reaction to 95 g/L

Results of investigations

- Both the pre-and post-transfusion samples showed an auto-and pan-agglutinin with enzyme technique only
- Donor was shown to be Wr^a positive
- Patient had the common Wr(a-b+) phenotype
- Patient had anti-Wr^a

Wr^a and anti- Wr^a in the North of England 1996

- 54/ 5098 blood donors shown to have anti- Wr^a (1 in 94)
- 88/1199 patient samples had anti- Wr^a (1 in 13)
- 2/ 5253 blood donor specimens were Wr^a positive (1 in 2626, 95% CI: 1 in 1136 to <1 in 10,000)

What do we learn from this?

- Donors should be screened for Wr^a
- Patients should be screened for anti-Wr^a
- This is a small, but acceptable risk of electronic issue

Delayed haemolytic transfusion reaction: definition

- Fever and other symptoms/signs of haemolysis (occurring more than 24 hours of transfusion) confirmed by one or more of the following:
  - Fall in Hb or failure of increment
  - Rise in LDH
  - Incompatible cross match not detectable pre-transfusion

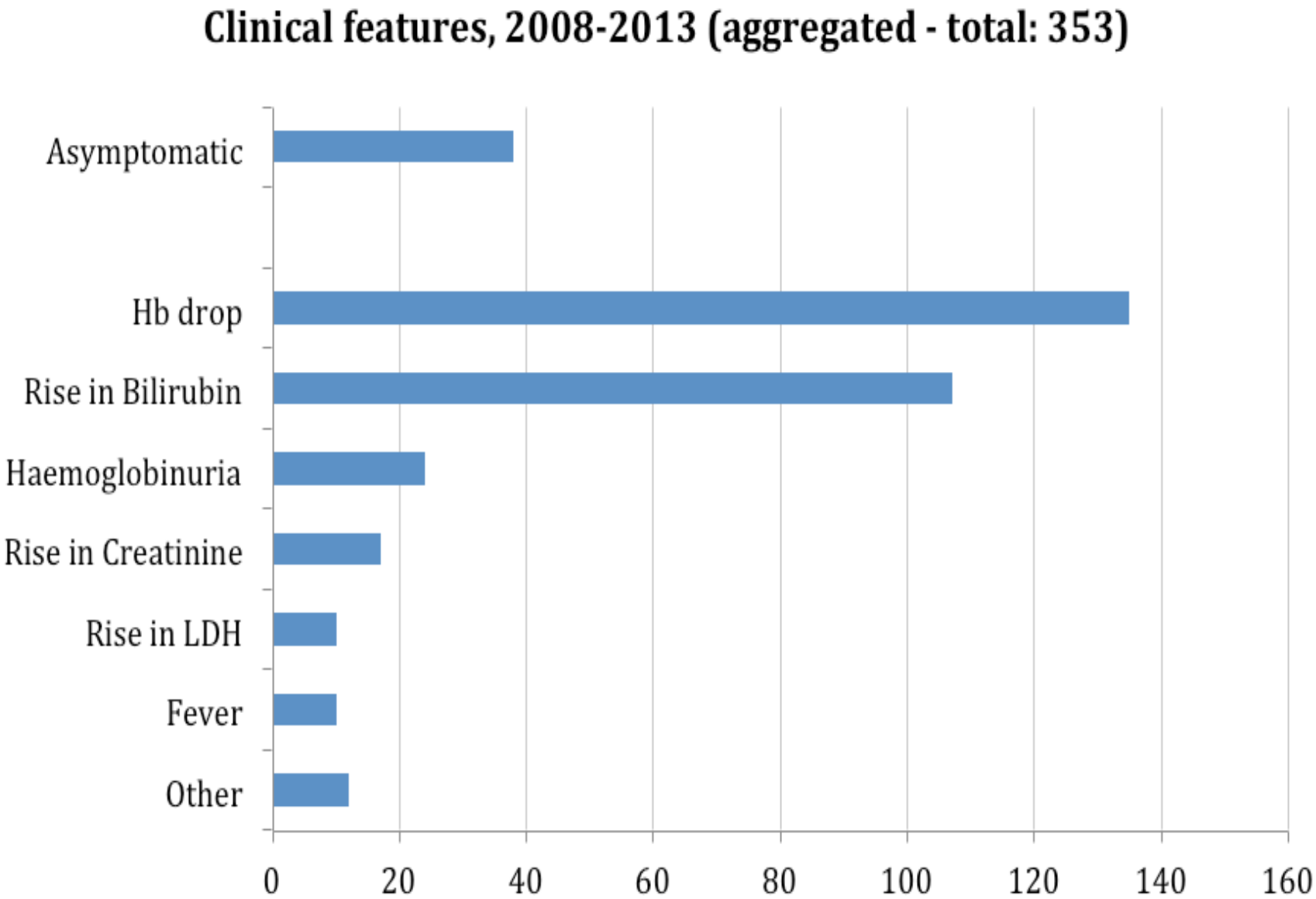
DHTR: Case 1 (SHOT 2011)

- Patent with known anti E and Fy^a was transfused on several occasion over 10 days because of acute blood loss.
- 15 days later, bleeding heavily, was given K-, E-, Fy^b untyped, serologically compatible red cells (E-, Fy^a neg cells were incompatible on this occasion)
- Creatinine and bilirubin rose
- Anti-Jk^a now also identified

DHTR: Case 2

- A patient with sickle cell disease developed fever, rigors and back pain 8 days after a transfusion
- Evidence of haemolysis
- No antibody identified on eluate
- Hyperhaemolysis

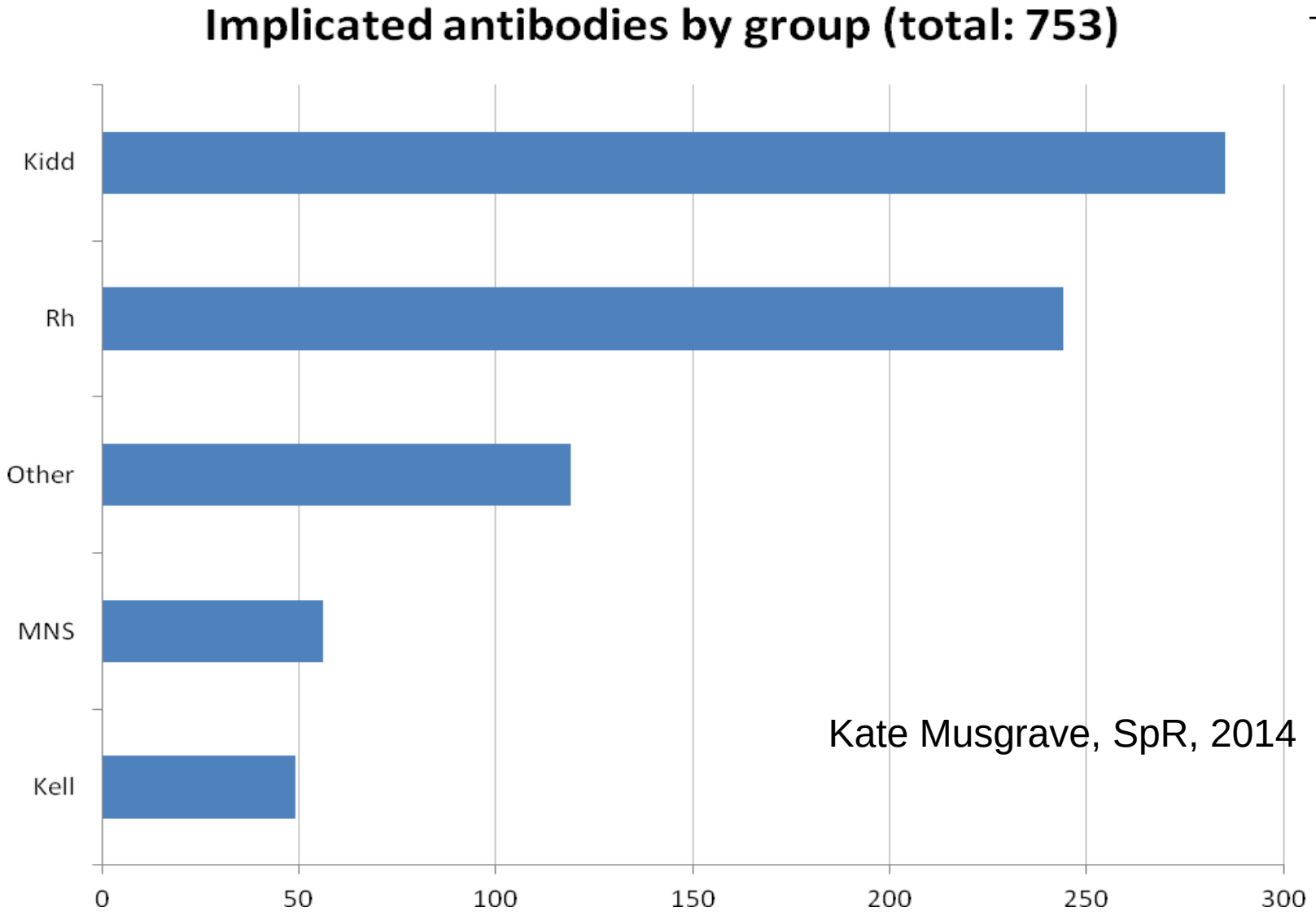
nical Features of DHTRs:from SHOT reports



Which antibodies are most commonly implicated in delayed haemolytic transfusion reactions?

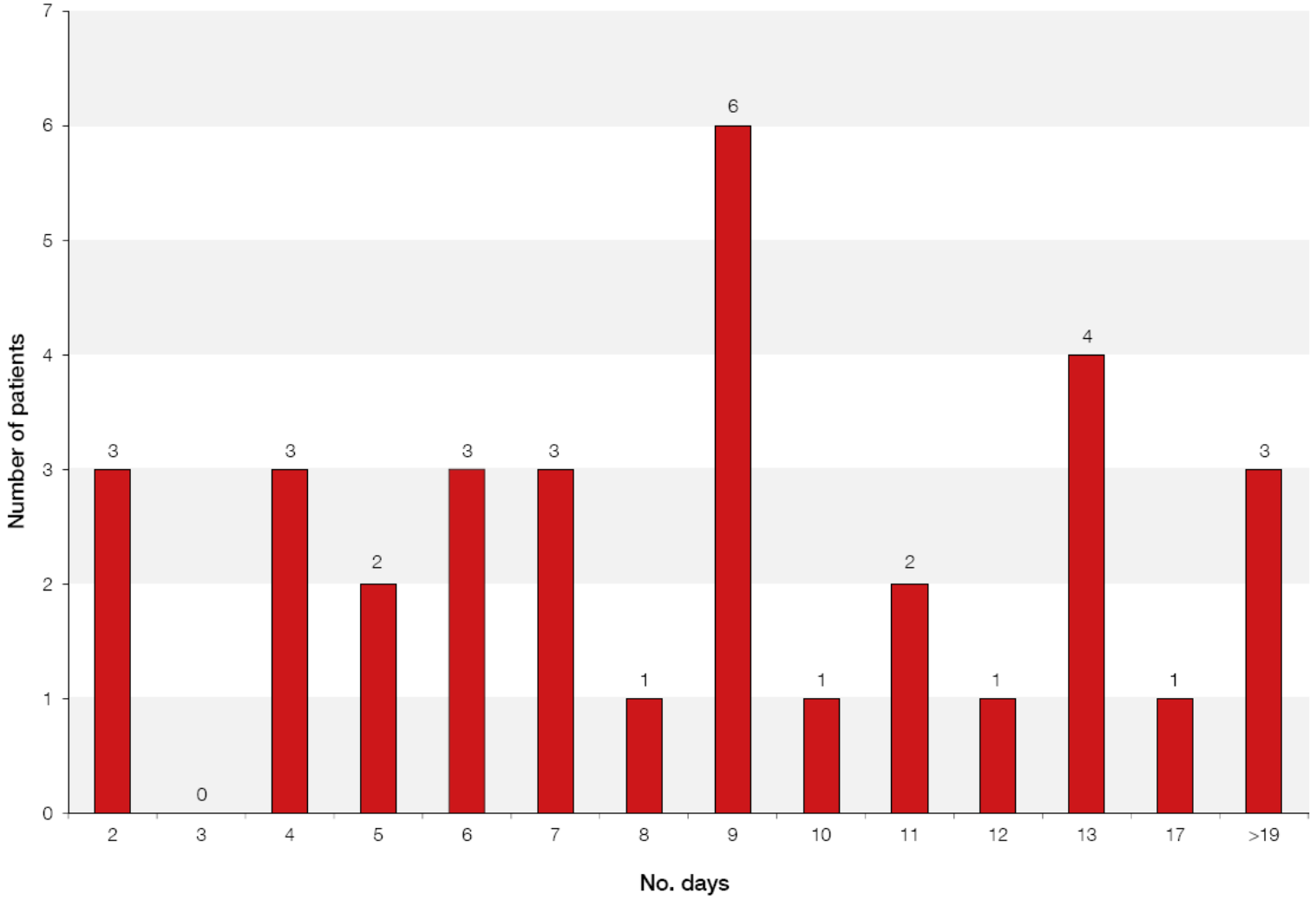
- Low frequency antigens, often not on screening cells
- Rh
- Jk $^{a \text{ and } b}$ (Kidd)
- Fy $^{a \text{ and } b}$ (Duffy)
- K (Kell)

Implicated antibodies in DHTR

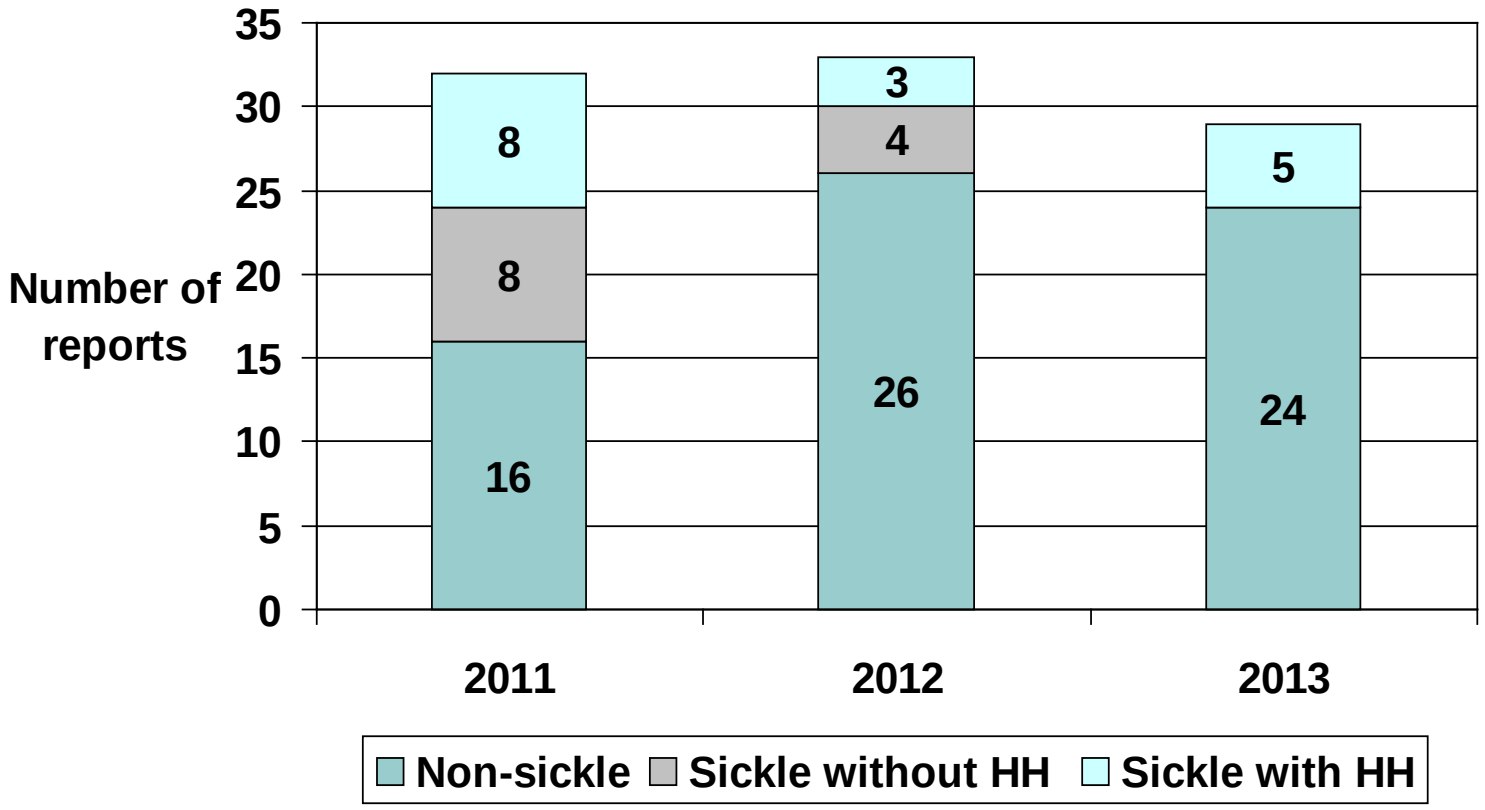


Kate Musgrave, SpR, 2014

Time between transfusion and recognition of delayed HTR



DHTRs reported to SHOT 2011-2013



HH=hyperhaemolysis

Ways to reduce the impact of DHTR

- Appropriate use
- Phenotype matched blood for regular transfusion
- Actively seek transfusion history
- National registry of patients with antibodies
- Primary care teams should recognise signs/symptoms of DHTR and instigate appropriate investigations
- Test eluate when investigating haemolytic transfusion reactions

Learning points re HTRs and DHTRs

- Patients needing regular transfusions should be given Rh and K matched blood
- An eluate should be performed as part of investigation of a haemolytic transfusion reaction
  - May need to involve reference lab
- Request a clotted sample when investigating suspected HTR as Kidd antibodies more easily identified in serum
- Consider hyperhaemolysis or other DHTR in patients with SCD who have crisis-like symptoms within 14 days of a transfusion
- For SCD patients, actively seek prior transfusion history, including contacting NHSBT

Summary

- ALL cases of acute haemolysis due to wrong component transfused are preventable
- Some cases of HTR and DHTR, not primarily due to error, are still preventable
- Cumulative SHOT reports are a vital source of information here

Thank you

- To SHOT, and all who contribute reports, as an excellent source of educational material
- Jane Keidan for the photo
- Kate Musgrave for the DHTR review
- You for your active contributions today!