Headline Data: Deaths, Major Morbidity and ABO-Incompatible Transfusions

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Key SHOT messages

- ABO-incompatible transfusions are the tip of the iceberg and result from failure to identify the patient at the time of blood sampling (wrong blood in tube) or administration to the wrong patient. A bedside checklist will prevent administration errors
- Pulmonary complications, particularly transfusion-associated circulatory overload (TACO), cause the most deaths and major morbidity. Deaths related to TACO n=14, major morbidity n=18
- Delayed transfusions are an important cause of death, 25/115 (21.7%) 2010 to 2016
- Information technology (IT) systems are not always reliable. They must be properly set up and validated. IT suppliers need to work together to standardise their products across the UK
- Many errors in transfusion, some with serious clinical consequences, relate to poor communication between teams, shifts and interfaces. The infrastructure needs improvement to facilitate exchange of results within and between hospitals

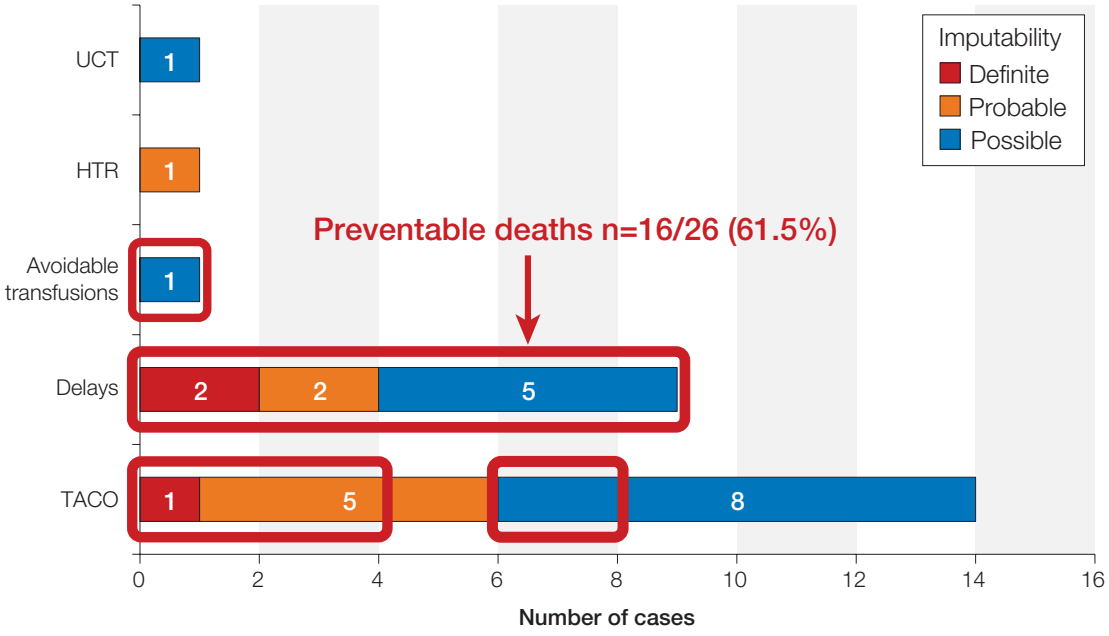


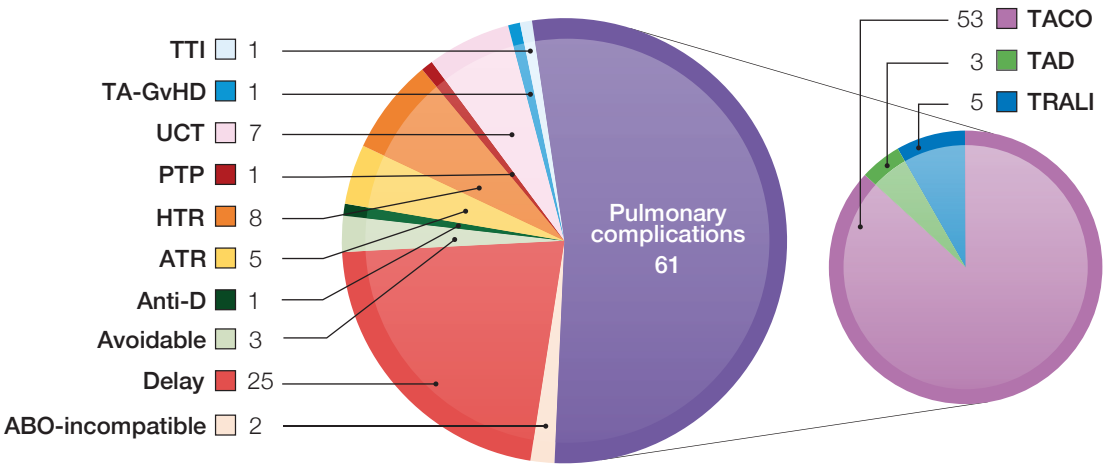
Figure 3.1: Deaths related to transfusion (with imputability) reported in 2016 n=26

TACO=transfusion-associated circulatory overload; UCT=unclassifiable complications of transfusion, this one was related to granulocyte infusion; HTR=haemolytic transfusion reaction

More than half the deaths, 14/26, were related to TACO, compared to 7/26 in 2015. Delays in transfusion contributed to 9 deaths compared to 6 in 2015. Review of these reports shows that 16/26 (61.5%) were potentially preventable.

Review of cumulative data (2010-2016, Figure 3.2) for deaths shows that pulmonary complications are the leading cause of death in 61/115 (53.0%). Delayed transfusions accounted for 25/115 (21.7%).

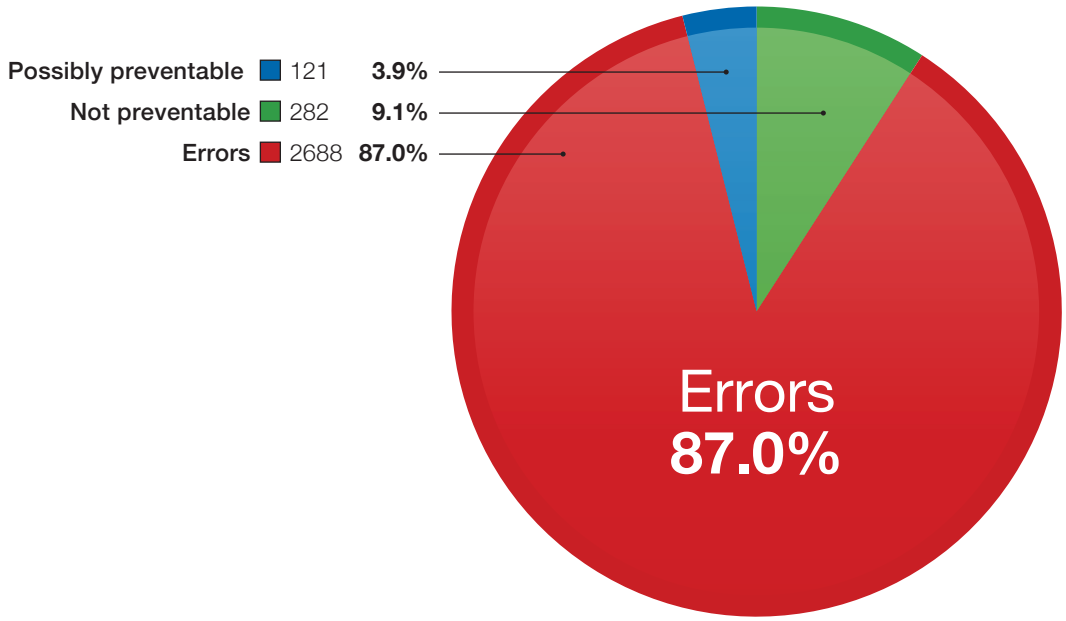
Figure 3.2: Transfusion-related deaths 2010 to 2016 n=115



For key to abbreviations please see Figure 3.4

In keeping with previous years, errors account for the majority of reports, Figure 3.3. These are a larger absolute number and proportion in 2016.

Figure 3.3: Errors account for the majority of reports



Errors with no harm to patients n=1510 (near miss and right blood to right patient reports).

Other errors with actual or potential harm n=1178 (handling and storage errors, avoidable and delayed transfusions, anti-D immunoglobulin errors and incorrect blood components transfused).

Irradiation of cellular components was missed in 95 cases and in 73/95 (76.8%) the clinical areas were responsible. The cumulative number of reports of missed irradiation since 1999 is now 1310.

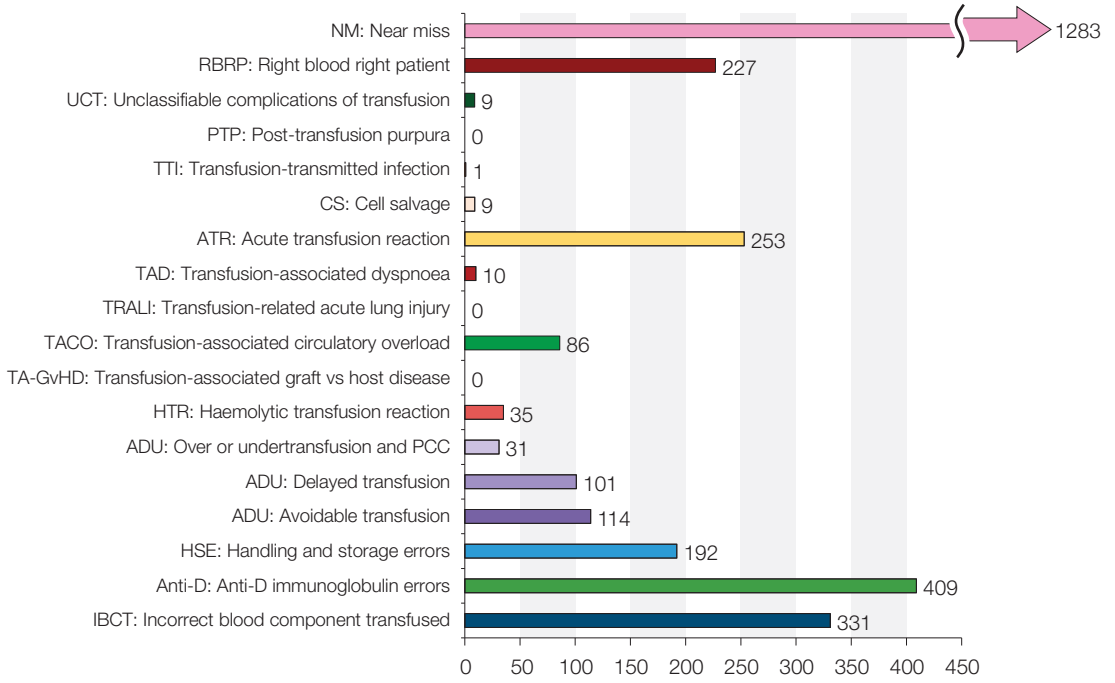


Figure 3.4: Summary data for 2016, all categories n=3091 (including near miss n=1283, and right blood right patient n=227)

PCC=prothrombin complex concentrate

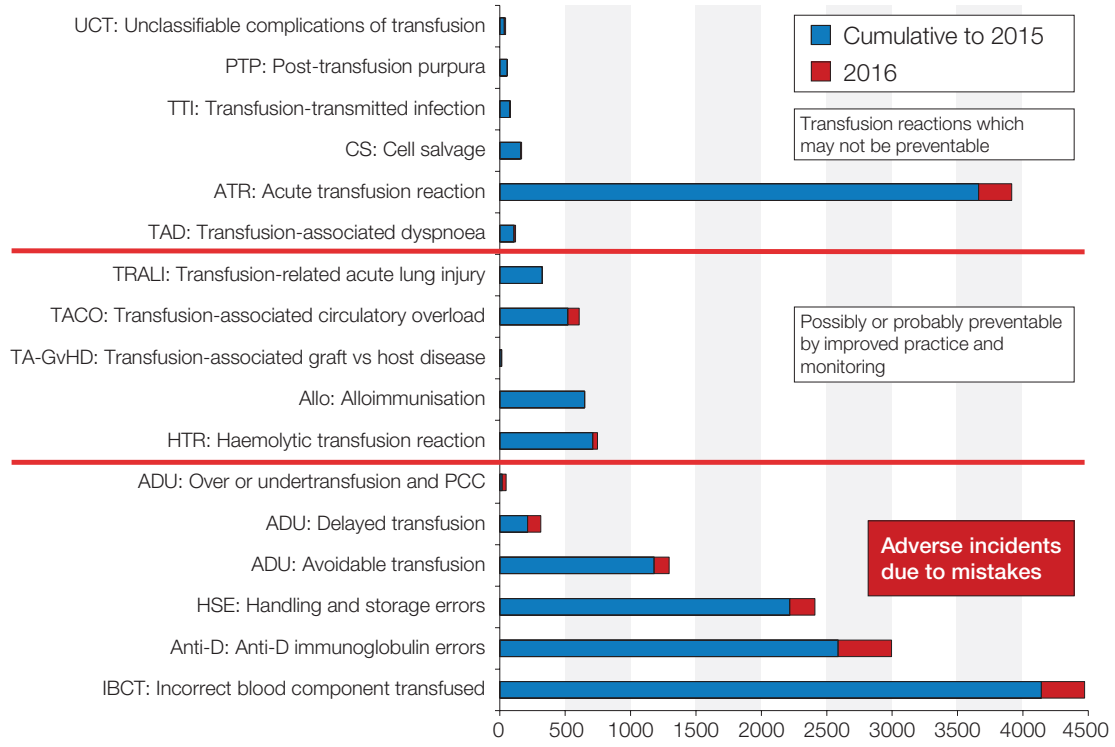
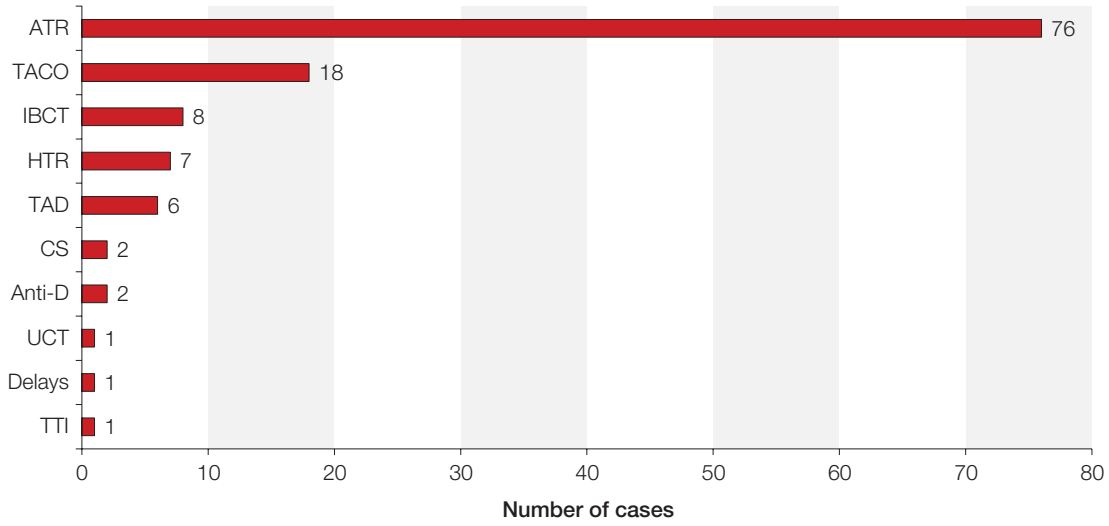


Figure 3.5: Cumulative data for SHOT categories 1996 to 2016 n=18258

Figure 3.6: Ranking of categories to show number of instances of major morbidity in 2016 n=122



For key to abbreviations please see Figure 3.4

Risk of major morbidity and mortality per 100,000 components issued in 2016

Table 3.1: Risks per 100,000 components issued in 2016

Total morbidity	**4.91**
Total mortality	**1.05**

	Mortality	Major morbidity	Total cases
All errors	0.40	0.44	**47.4**
ATR	0.00	3.06	**10.2**
HTR	0.04	0.28	**1.4**
TRALI	0.00	0.00	**0.0**
TACO	0.56	0.72	**3.5**
TAD	0.00	0.24	**0.4**
TA-GvHD	0.00	0.00	**0.0**
PTP	0.00	0.00	**0.0**
CS	0.00	0.08	**0.4**
TTI	0.00	0.04	**0.0**
UCT	0.04	0.04	**0.4**
Paediatrics	0.00	0.72	**5.5**

These numbers translate approximately into a risk of death of 1 in 100,000 components issued, a risk of death from error of 1 in 250,000 and a risk of major morbidity of 1 in 20,400. The international haemovigilance database (ISTARE) reported information collected from 25 countries 2006-2012 (Politis et al. 2016). The incidence of all adverse reactions was 77.5 per 100,000 components issued of which 25% were severe. The total components issued in this period were 132.8 million. The death rate was 0.26 per 100,000 with more than half (58%) due to pulmonary complications (TACO 27%, TRALI 19% and TAD 12%). Trending in 13 countries that reported every year showed a progressive increase in TACO and decrease in TRALI similar to the trend noted in SHOT (Chapter 18, Pulmonary Complications).

ABO-incompatible transfusion was reported in 511 cases with 305 (59.7%) reactions. There were 6333 wrong patient samples reported, 94.6% near misses.

ABO-incompatible transfusions

Three ABO-incompatible red cell transfusions were reported, two of which resulted in major morbidity, but no deaths were reported in 2016. In addition there were 3 ABO-incompatible fresh frozen plasma infusions (now included in England as 'never events'). These are fully described in the chapter on incorrect blood component transfused (Chapter 10, Incorrect Blood Components Transfused (IBCT)). Although there were only 3 ABO-incompatible red cell transfusions, there were 264 potential ABO-incompatible transfusions which were avoided because the near miss incidents were detected (Figure 3.12 below, and Chapter 12, Near Miss Reporting (NM)). This is a reminder that the actual incidents are the tip of a considerable iceberg demonstrating much wider unsafe practice, Figure 3.7.

In addition to very serious clinical outcome (death) the consequences for hospital staff are severe. In December 2016 the nurse who administered an ABO-incompatible transfusion to a patient who then died (in 2014, included in the 2015 data) was convicted of manslaughter. This death would have been avoided if she had performed the final check. A bedside checklist is recommended again by SHOT this year, as in the Annual SHOT Reports for events reported in 2011 and 2015. This should become habit just as all pilots do formal checks before taking off. However, WBIT samples may not be detectable later in the transfusion process as demonstrated by two cases this year, a reminder that correct identification of the patient at the initial step is essential, and a group-check policy would reduce these errors.

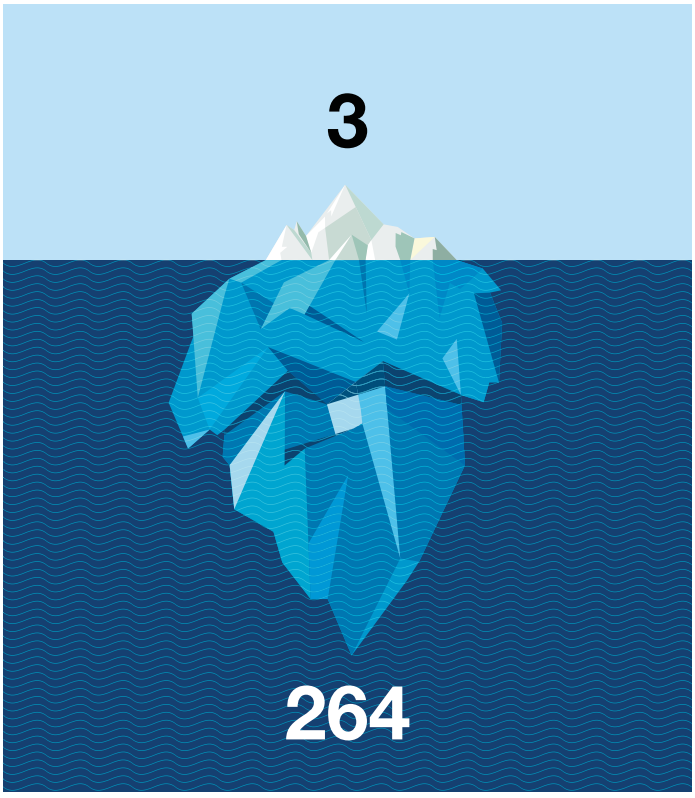
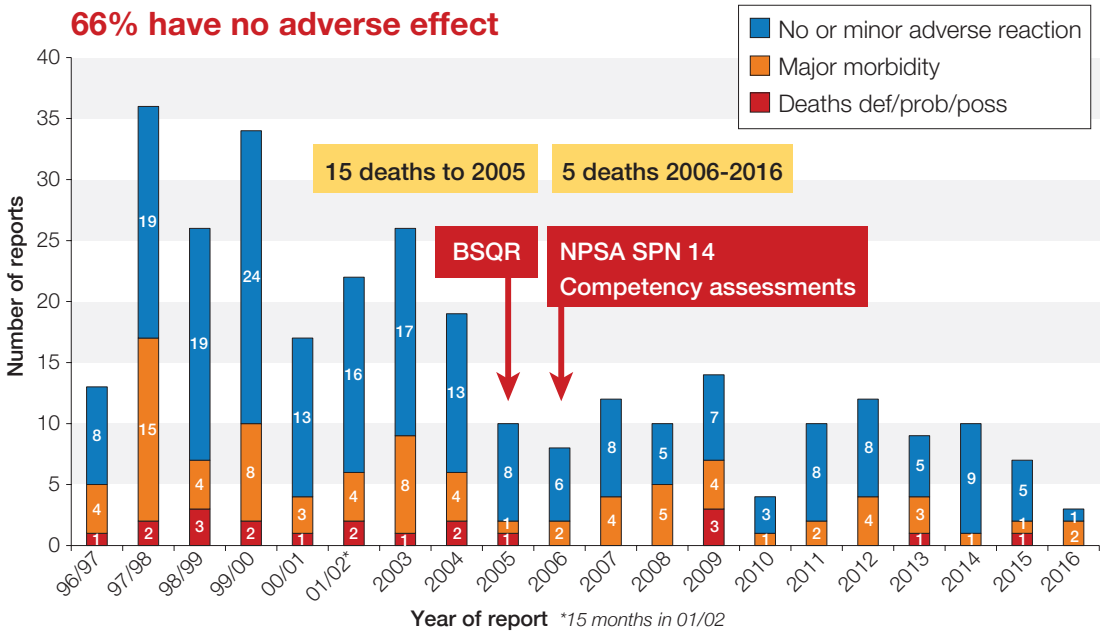


Figure 3.7 ABO-incompatible transfusions: few events (n=3) but many ABO near misses (n=264)

Two of the incompatible red cell transfusions were caused by WBIT incidents in hospitals where there was a two-sample policy that was not followed; the third was a combination of collection and administration errors which could have been detected had the bedside check been performed.

Cumulative data for ABO-incompatible red cell transfusions have shown a decrease over time but each one of these has the potential to cause death. Review of 196 cases where wrong components were transfused 2012-2016 inclusive resulting from errors at administration showed that 141 (71.9%) would have been prevented had the administration checks been done correctly. This includes 26/39 (66.7%) ABO-incompatible red cell transfusions. In 72 cases the bedside check was performed by two people, in 33 cases by one (no details given in 36 cases). It is clear that a bedside checklist has potential to prevent wrong transfusions and death.

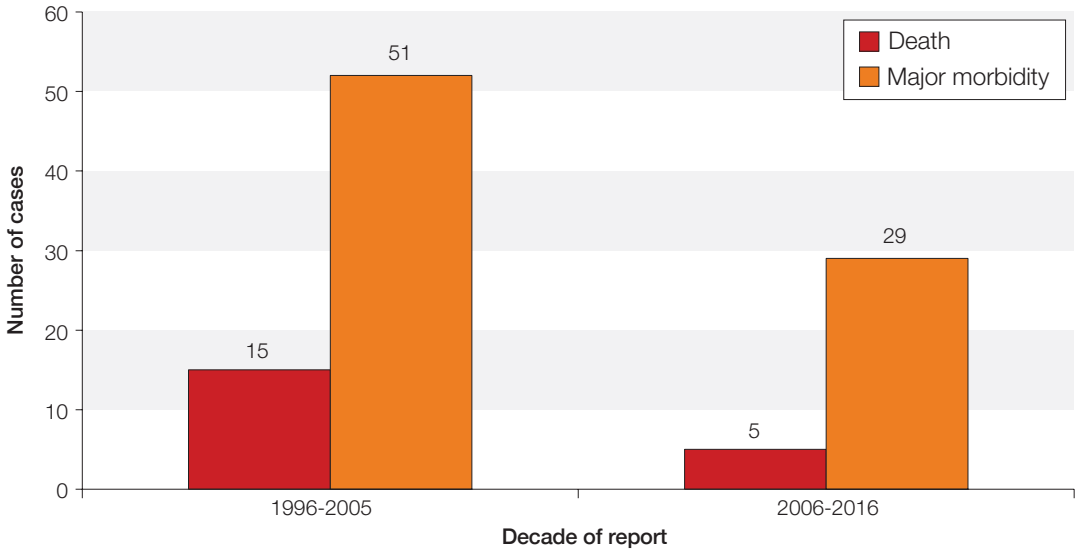
Figure 3.8: Outcome of ABO-incompatible red cell transfusions in 20 years of SHOT reporting



BSQR=Blood Safety and Quality Regulations: NPSA SPN 14=National Patient Safety Agency Safer practice notice 14 'Right patient, right blood (www.nrls.npsa.nhs.uk/EasySiteWeb/GatewayLink.aspx?alId=60046)

In the first decade of SHOT reporting, 1996 to 2005, 15 deaths were reported, but in the next decade, 2006 to 2016 there were 5. The overall reduction in ABO-incompatible red cell transfusions reflects safer practice perhaps as a consequence of the advent of the Blood Safety and Quality Regulations and introduction of mandatory competency-assessments in 2005.

Figure 3.9: Reduction in ABO-incompatible transfusions resulting in death or major morbidity in two decades of SHOT reporting



Review of the ABO-incompatible groups transfused in years 2010 to 2016 shows that the most frequent combination is group A units transfused to patients of group O, as would be expected from the distribution in the population. In 2 cases information on the groups was not available.

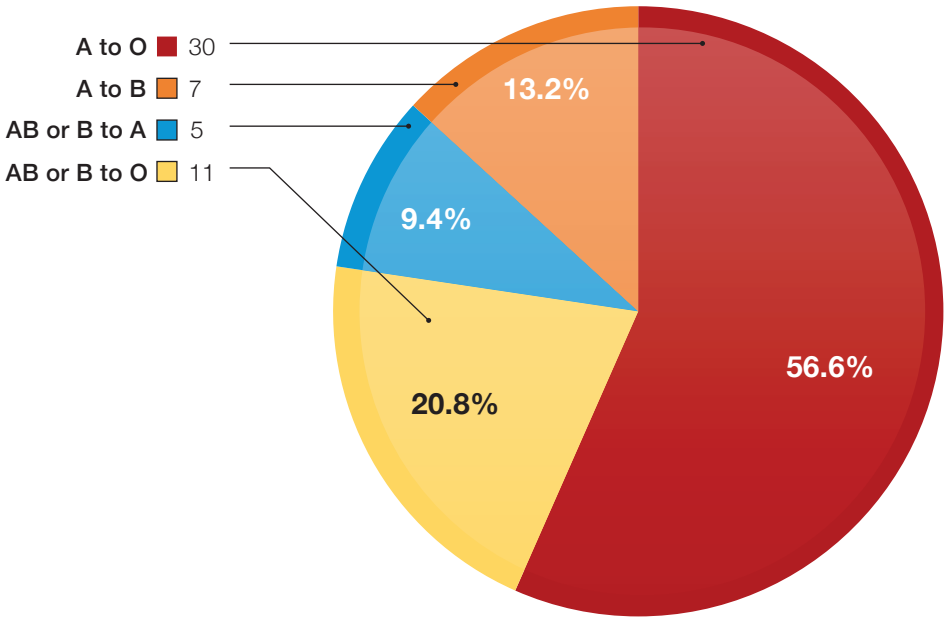


Figure 3.10: Combinations of groups in ABO-incompatible red cell transfusions n=53 (2010 to 2016)

Transfusion of group A red cells to group O patients was associated with the greatest risk of major morbidity (11/30, 36.7%), but both deaths occurred in group O patients receiving group AB red cells (Figure 3.11).

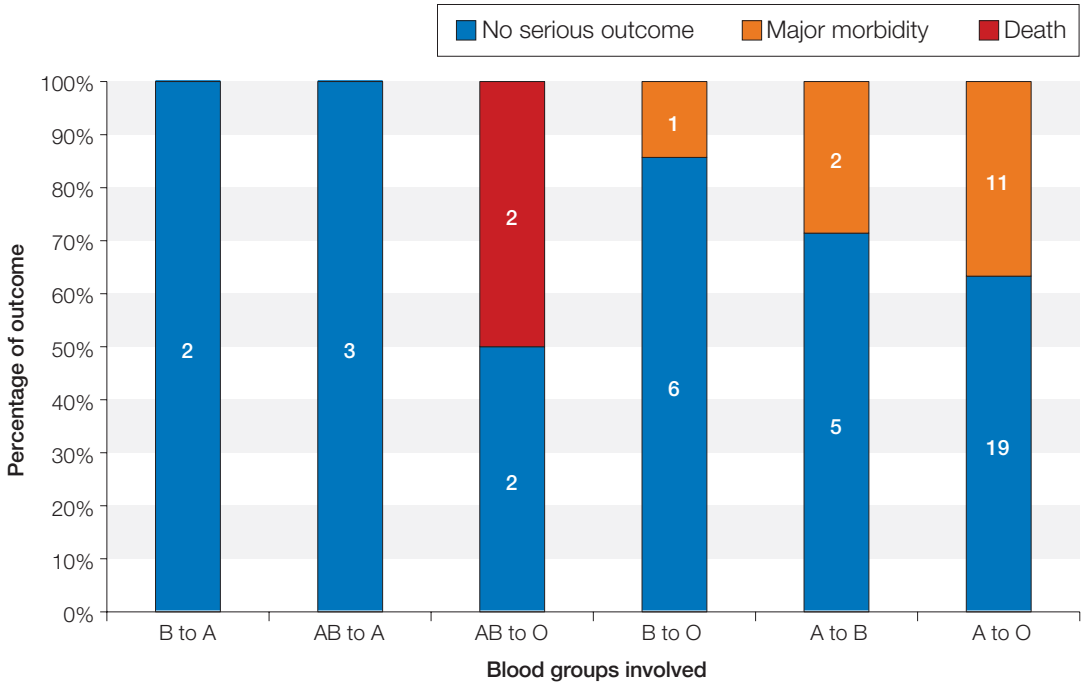
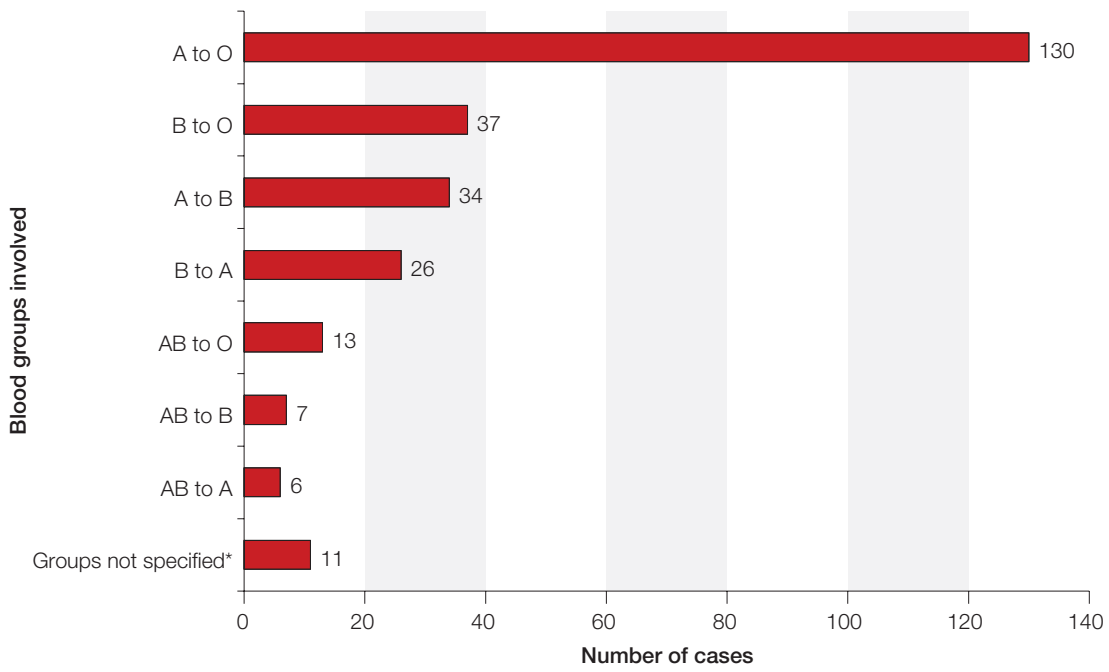


Figure 3.11: ABO-incompatible transfusions by groups (2010-2016) showing outcome n=53

Near miss incidents

Review of near miss incidents in 2016 where WBIT samples were detected and no transfusion took place shows that there were 249/264 incidents where ABO-incompatible transfusions could have resulted had the WBIT not been detected. Other causes are given in Chapter 12, Near Miss Reporting (NM), Table 12.2. More than half of these would have been group A or group AB red cells transfused to group O patients (143/264, 54.2%) which are the most dangerous, Figure 3.11.

Figure 3.12: Possible impact if 264 near miss events (detected) had resulted in red cell transfusions



**Reporters stated the combination would have been incompatible but did not specify the ABO groups*

Reference

Politis C, Wiersum JC et al. (2016) **The international haemovigilance network database for the surveillance of adverse reactions and events in donors and recipients of blood components: technical issues and results.** Vox Sang 111, 409-417