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Emergency Issue Questionnaire
Distributed with exercise 17R8 – September 2017
UK and Republic of Ireland

Introduction

Exercise 17R8 included an additional emergency testing element, with the aim of exploring the testing undertaken within 10 minutes where blood is required in an emergency situation and, for a range of patients with differing demographics, the provision of red cells and components, i.e.:

- The group and specification of red cell units issued within 10 minutes
- The group of further red cell units issued once a second confirmatory sample has been received
- The group and type of FFP issued
- The group of platelets issued (from a limited selection) and further actions based on this issue

Testing scenario provided
You are working alone outside of core hours (or alone within core hours if your laboratory does not operate outside of core hours). You receive a sample and request to provide four units of red cells within 10 minutes (i.e. there is not enough time to complete a routine group and screen) for a patient (Sam Jones, male, aged 47) with multiple injuries following a road traffic accident. You have no historical records for Sam Jones, and a second (group check) sample is not available within 10 minutes. Assume that the request falls within your usual protocols for urgent provision of red cells, but does not trigger your major haemorrhage protocol.

Theoretical scenario provided
The red cells are collected at 10 minutes and a second sample from Sam Jones is delivered at the same time, with a request for a further 6 units of red cells within a further 30 minutes, and also for FFP and platelets as soon as possible. The second sample is adequately labelled with the same details as the first sample, and on testing, gives an identical group and a negative antibody screen. N.B. if a group was not obtained on the first sample within 10 minutes, in order to proceed with the questionnaire, perform/complete this testing now to obtain the first group
In this scenario you have red cells and FFP of all groups in stock, and two pools of platelets (one group O D negative and the other group A D positive), either as stock or awaiting transfusion for other patients the following day.

Material / instructions

One whole blood sample was provided with a matching request card for a patient (Sam Jones aged 47, male) requiring 4 units of red cells within 10 minutes, for multiple injuries. There was an accompanying SurveyMonkey questionnaire requesting details of red cells that would have been provided within 10 minutes, and of further red cells, platelets and FFP to be provided based on the results of the testing within 10 minutes and a (theoretical) second sample confirming these results within 30 minutes. Laboratories unable to complete grouping within ten minutes were asked to complete grouping prior to completing further questions.

The questionnaire also included repeat sets of questions on the provision of red cells and components, with the responses to be based on the same testing results, but for patients with different demographic details, i.e.:

- Female, aged 48, multiple injuries
- Female, aged 20, multiple injuries

Return rate and data analysis

Results were returned by 335/388 (86.3%) laboratories. 14/335 (4.2%) did not perform the exercise; the reasons given were: 3 reference centre, 5 emergency testing never undertaken in clinical practice, 5 other reasons and 1 did not state the reason. 321 sets of results have been analysed for this report.

Decisions surrounding duplicate submissions:

- Complete rather than incomplete submissions have been selected.
- If there was more than one complete set of data then most the most recently submitted has been used.

Edits to data:

- Responses of Yes / No to whether testing was undertaken have been edited according to whether corresponding result sections were completed.
- Information in comment fields has been used to edit responses where relevant.

Data from the following respondents has been included in some sections of the report but not others, as specified in the table headings:

- Four laboratories reporting a grouping result other than A D negative.

Where no group was performed within 10 minutes, participants were asked to complete routine grouping, and it has been assumed that the correct result of A D negative was obtained.

Results

Testing within 10 minutes (expected result A D negative)

Grouping results within 10 minutes

192/321 (59.8%) indicated that they had performed an initial group within 10 minutes. 14/321 (4.4%) indicated they did not undertake blood grouping within 10 minutes. 115/321 (35.8%) indicated that they had undertaken grouping within 10 minutes but did not record a blood group.

188/192 (97.9%) reported the correct result (A D negative), and results from the remaining four are displayed in Table 1.

Table 1: Results for ABO/D typing within 10 minutes for labs not recoding group as A D negative

ABO/D group recorded	Number (technology)
O D negative	1 (BioVue)
ABO UI D negative	1 (Slide/Tile)
A D UI (unable to interpret)	1 (Tube)
A D not recorded	1 (BioRad)

- Of the two laboratories not reporting a D type:
  - 1 would have issued group O D negative red cells at 10 minutes in all three scenarios
  - 1 would have issued O D positive red cells at 10 minutes to the male aged 47, but O D negative for the two female patients aged 48 and 20.
- The laboratory recording UI for the ABO group would have issued O D negative red cells at 10 minutes

Grouping methods used within 10 minutes

Details of testing are shown in Table 2

Table 2: Technology used for initial group (n=192)

Technology	Total Number	Full group	Forward group only	Control	Second group within 10 mins
BioVue	27	22	5	21	13
BioRad (DiaMed)	15	9	6	11	6
Grifols	2	1	1	2	1
Microplate	4	2	2	3	2
Slide / Tile	12	2	10	4	8
Tube	127	61	66	80	43
Two techs[1]	4	0	4	1	4
Not stated	1	1	0	0	1
Total	**192**	**98**	**94**	**122**	**78**

[1]All using tube and a CAT method

Laboratories performing an initial group using microplate or Grifols used the same technology for the second group. Table 3 shows the technologies used for the second group by those laboratories performing an initial group by BioVue, tube or slide/tile.

Table 3: Technology used for second group (where stated)

Technology Initial group	Technology second group					
	BioVue	**BioRad (DiaMed)**	**Microplate**	**Tube**	**Slide/tile**	**Not stated**
BioVue (n=13)	6	0	0	2	0	5
BioRad (DiaMed) (n=9)	0	4	0	0	2	3
Slide / Tile (n=8)	0	1	0	0	3	4
Tube (n=42)	4	4	1	20	0	13

- 78/192 (40.6%) performed a second group within 10 minutes, including 23 that did not provide any details of the second group, and the four stating that two technologies were used for the initial group.
- 45/51 (88.2%) answering the question, tested a new aliquot of cells, but 6/51 (11.8%) stated that they repeated the group on the same aliquot of cells used for the initial group.

Testing within 10 minutes vs. issue of group specific red cells for the first patient (male, aged 47)

- 84/192 (43.8%) performed one group (or a second group on the same aliquot of cells) and did not include an ISXM
    - At 10 minutes
        - 13/84 (15.5%) would have issued group A red cells
        - 71/84 (84.5%) would have issued group O red cells
            - 68/71 (95.8%) converted to issuing group A after receipt of a confirmatory sample at 30 minutes (for the male, aged 47).

- 81/192 (42.2%) stated that they had grouped two different aliquots (+/- an ISXM), or done a single group and an ISXM
    - At 10 minutes:
        - 31/81 (38.3%) would have issued group A red cells
        - 49/81 (60.5%) would have issued group O red cells
            - 47/49 (95.9%) converted to issuing group A after receipt of a confirmatory sample at 30 minutes (for the male, aged 47) .
        - 1/81 (1.2%) did not complete this section

- 23/192 (12.0%) stated that they had performed a second group but did not give full details, and did not perform an ISXM.

Table 4 shows the additional test procedures undertaken within 10 minutes in all laboratories, regardless of whether grouping was undertaken.

Table 4: Additional test procedures within 10 minutes overall (n=321)

Additional test / procedure	Number (%)
'Immediate spin' crossmatch (ISXM)	55[1] (17%)
Sampling units for retrospective crossmatch	174 (54%)
Group check units	28 (9%)

[1] Two did not record a group

Selection of Red Blood Cells (RBC) within 10 minutes

Table 5 shows the selection of RBC within 10 minutes by those laboratories not undertaking a group within 10 minutes.

Table 5: Selection of RBC within 10 minutes where no group was performed

ABO/D group of RBC	Number issuing RBC (%)		
	Age 47 Male	Aged 48 Female	Age 20 Female
O D negative	86 (70.5%)	119 (98.3%)	118 (98.3%)
O D positive	35 (28.7%)	0 (0%)	0 (0%)
A D negative	1[1] (0.8%)	2[1] (1.7%)	2[1] (1.7%)
Total	122 (100%)	121 (100%)	120 (100%)

[1] 1 indicated had done provisional spin group, but no result recorded

Table 6 shows the selection of RBC within 10 minutes by those laboratories reporting a blood group of A D negative completing all 3 scenarios with no contradictory data, e.g. issue of A negative units that are stated to be 'designated group O 'emergency units'.

Table 6: Selection of RBC within 10 minutes by laboratories reporting A negative (n=188)

ABO/D group of RBC	Number issuing RBC (%)		
	Age 47 Male	Age 48 Female	Aged 20 Female
O D negative	114 (60.6%)	126 (67.0%)	123 (65.4%)
O D positive	16 (8.5%)	0 (0%)	0 (0%)
A D negative	55 (29.3%)	57 (30.3%)	60 (31.9%)
A D positive	2 (1.1%)	0 (0%)	0 (0%)
Not completed	1 (0.5%)	5 (2.7%)	5 (2.7%)

Table 7 shows the further specifications of RBC issued within 10 minutes by those laboratories completing all 3 scenarios.

Table 7: Further specification for RBC selected for issue at 10 minutes (n=307)

Additional specifications for RBC	Number selecting RBC with an additional specification (%)		
	Age 47 Male	Aged 48 Female	Age 20 Female
K negative	148 (48.2%)	302 (98.4%)	303 (98.7%)
CDE negative	135 (44.0%)	198 (64.5%)	202 (65.8%)
c negative	3[2] (1.0%)	6[2] (2.0%)	8[3] (2.6%)
Other[1]	21 (6.8%)	16 (5.2%)	16 (5.2%)

[1] including CMV neg, HEV neg, HbS neg, R_1R_1 units and group confirmed units
[2] including two also selecting CDE negative (presumably a data entry error)
[3] including one also selecting CDE negative (presumably a data entry error)

Selection of components following confirmatory group on second sample (at 30 minutes)

For the sake of comparison between the different patient types, the tables in this section only include data from those laboratories returning data for all three scenarios.

Selection of red cell units (RBC)

Table 8 shows the ABO/D group of red cells issued following confirmation of the group on a second sample.

Table 8: Selection of further red cells at 30 minutes (n=308)

ABO/D group of RBC	Number (%)		
	Age 47 Male	Age 48 Female	Aged 20 Female
O D negative	19 (6.2%)[1]	36 (11.7%)[1]	41 (13.3%)[1,2]
O D positive	13 (4.2%)	0 (0%)	0 (0%)
A D negative	267 (86.7%)[2,3]	272 (88.3%)[2,3]	266 (86.4%)[3]
A D positive	9 (2.9%)	0 (0%)	1 (0.3%)[4]

[1] includes lab reporting group as UI (ABO) D neg
[2] includes lab reporting group as O neg
[3] includes lab reporting group as A UI (D)
[4] possible data entry error as selected A neg for second scenario

Selection of fresh frozen plasma (FFP)

Table 9 shows details of the type of FFP selected, i.e. standard FFP or pathogen inactivated (pooled solvent detergent treated (SD), or methylene blue (MB) treated), regardless of the level of testing within 10 minutes for those laboratories who completed this section for all three scenarios. Table 10 shows the group of FFP selected by all participants.

Table 9: Type of FFP selected (n=308)

Type of FFP	Number (%)		
	Age 47 Male	Age 48 Female	Aged 20 Female
Standard FFP	255 (82.8%)	254 (82.5%)	39 (12.7%)
SD FFP	51 (16.6%)	52 (16.9%)	127 (41.2%)
MB FFP	2[1] (0.6%)	2[1] (0.6%)	142[2] (46.1%)

[1]One of these labs indicated only MBFFP kept in stock
[2]Includes one lab stating MB FFP or Octaplas could be given

Table 10: ABO group of FFP selected (n=308)

ABO group of FFP	Number (%)		
	Age 47 Male	Age 48 Female	Aged 20 Female[1]
Group AB	27 (8.8%)	31 (10.1%)	36 (11.7%)
Group A	280 (90.9%)	275 (89.3%)	270 (87.9%)
Group O	1[2] (0.3%)	2[2,3] (0.6%)	1[2] (0.3%)

[1]Results out of 307 as one participant did not complete this
[2]Includes 1 that did not report a group for the patient
[3]Includes 1 that reported the patient's group as A negative

Selection of platelet concentrates

Table 11 shows the group of platelets selected, where the choice was restricted to A D positive or O D negative.

Table 11: ABO group of platelets selected (n=308)

ABO/D group of platelets	Number (%)		
	Age 47 Male	Age 48 Female	Aged 20 Female
A D positive	261 (84.7%)	140 (45.5%)	134 (43.5%)
O D negative	47 (15.3%)	168 (54.5%)	174 (56.5%)

Table 12 shows further actions (where any were noted) by the laboratories following issue of D positive platelets in each of the three scenarios.

Table 12: Actions following issue of D positive platelets

ABO/D group of platelets	Number		
	Age 47 Male	Age 48 Female	Aged 20 Female
Number issuing D positive platelets	261	140	134
Stating any action(s) (including anti-D Ig related actions specified below)	61 (23.4%)	118 (84.3%)	122 (91.0%)
Issue or suggest anti-D Ig	8 (3.1%)	82 (58.6%)	97 (72.4%)
Seek medical advice on anti-D Ig or consider anti-D Ig	15 (5.7%)	22 (15.7%)	10 (7.5%)

Other actions (not related to anti-D prophylaxis) include: consideration of HT status of platelets, giving apheresis platelets, routine haematology follow-up tests, replacing platelet stock, seeking advice / authorisation from Consultant Haematologist, and informing the ward of the group mismatch.

Discussion and conclusions

Testing undertaken within 10 minutes

60% of laboratories performed ABO/D typing within 10 minutes (*cf*. 72% in 2015), with 41% of these undertaking a second cell group within the same timeframe; however, 12% (*cf*. 13% in 2015, and 12% in 2013 and 2010) of these performed the second test on the same aliquot of cells as the first group, which would perpetuate any error in selection of the correct specimen. The BSH criteria[1] for issue of group specific red cells is that following the initial group, a further test to detect ABO incompatibility should be performed, i.e. a second group on a new aliquot of the primary sample, or an ISXM. In 81 (42%) laboratories performing a group within 10 minutes these criteria were met, whilst 84/192 (44%) did not include a second test to detect ABO incompatibility. A further 23 (12%) performed no ISXM, and whilst undertaking a second group, did not state whether a new aliquot of cells was used. Two laboratories recorded an ABO group but no D type.

Issue of group specific and group O blood within 10 minutes

At least 13/192 (7%) laboratories undertaking testing within 10 minutes issued group specific blood for Sam Jones (A D negative) based on grouping a single aliquot of cells and with no ISXM. *(cf. 6% 2015 and 16% 2013)*. Conversely, 50/84 (60%) of those undertaking testing to meet BSH criteria[1] for issue of group specific red cells, issued group O at 10 minutes (*cf.* 64% 2015). Selection of group O blood in this circumstance is a local policy decision based on a risk assessment of emergency testing, with factors including, second sample 'group check' policy, the frequency with which emergency testing is undertaken, differences in methodology between routine and emergency testing, level of blood stocks, skill mix and case mix.

Issue of red cells where grouping was not completed within 10 minutes

129/321 (40% *cf.* 28% in 2015) did not complete a group prior to issue of red cells at ten minutes; more than 99% indicated selection of group O blood. One of the two laboratories that did not record a D type selected O D negative red cells for all three scenarios and the other selected O D positive for the 47 year old male patient and O D negative for the two female patients.

Selection of K- and C-, E- red cells at 10 minutes

In line with BSH guidance[1], 303/307 (99%) would have provided K- units for the 20 year old female and 302/307 (98%) for the 48 year old female. It would seem that in some laboratories K- blood is also selected for other patients, with 48% specifying K- units for the 47 year old male; this may reflect a policy to issue K negative red cells as part of designated 'emergency stock.' Provision of K- for other patient groups will depend on local policy, but there is no BSH guidance that this is necessary, unless the patients are transfusion dependent. Consideration should be given to conserving group O D negative K- units for situations where K- is a requirement.

It is interesting to note that only 202/307 (66%) would have selected C-, E- red cell units for the 20 year old female and 198/307 (64%) for the 48 year old female. There is no BSH guidance on this, although it may be considered good practice (where time permits) for a female with child bearing potential, as it could prevent the stimulation of anti-C and anti-E, and also rarely anti-G which, if misidentified as anti-D+C, can cause problems with decision making around the use of anti-D prophylaxis, risking sensitisation to D.

Selection of FFP

BSH guidelines for transfusion of neonates and older children (2016)[2] and guidelines for the use of FFP cryoprecipitate and cryosupernatant (2004)[3] (addendum 2005[4]) state that Group O FFP should not be issued for non-group O patients, due to the risk of potentially transfusing large volumes of anti-A, anti-B or anti-A,B, even where testing for HT haemolysins has been undertaken[4]. Two laboratories (one that had obtained a group of A D negative within 10 minutes) would have issued group O FFP in one or more of the three patient scenarios, where the instructions stated that the choice of groups available was not restricted.

As a risk reduction measure for variant Creutzfeldt-Jacob disease (vCJD), the UK Departments of Health (DH) in 2005 recommended the use of fresh-frozen plasma (FFP) sourced from countries with low bovine spongiform encephalopathy prevalence, for individuals born on or after 1 January 1996. Due to the potential for a higher prevalence of viral markers in some countries providing this plasma, it is subjected to pathogen inactivation using methylene blue (MB) or solvent detergent (SD) treatment. In line with SaBTO guidance[5], 269/308 (87%) indicated they would use either methylene blue treated or solvent detergent treated FFP for 20 year old female patient. Whilst this recommendation initially referred only to children, the '1996' cohort has now reached the age of 22 and the recommendation will increasingly apply to young adults.

A number of expert committees are currently reviewing the provision of plasma components in the UK - whilst this review is in progress, the 2004 guideline[3] (plus 2005[4], 2007 and 2016 addendum remain current BSH guidance.

Selection of platelet concentrates

In this exercise scenario participants were asked to choose between the two units of platelets available (one O D negative and one A D positive) for an A D negative patient. 261/308 (85%) selected the A D positive platelets for the 47 year old male patient *cf.* 140/308 (45%) and 134/308 (44%) for the 48 year old female and 20 year old female respectively. Although there is a small risk that ABO antibodies from the plasma in which the platelets are suspended can cause red cell haemolysis, e.g. where group O platelets are transfused to a group A patient, more than 50% of laboratories opted to give ABO incompatible D negative platelets to D negative women of child bearing potential rather than give ABO compatible D positive platelets.

BSH guidelines for use of platelet transfusions[6], reference those for compatibility testing[1] in recommending that for D negative patients D negative red cells should be given to women of childbearing potential, patients under 18 years, those who already have anti-D and transfusion-dependant adults. BSH guidelines on the use of platelet transfusions also state that 'It is acceptable to use ABO incompatible platelets to reduce wastage. Units tested and negative for high titre haemagglutinins and non-group O platelets are associated with a lower risk of haemolysis. Pooled platelets suspended in PAS would also be expected to reduce this risk'.

The exercise scenario gave no indication as to whether the platelets had been tested for high titre ABO haemagglutinins (HT), and some laboratories commented on the consideration of HT status when

selecting the platelets. In an emergency situation, lack of HT testing would not necessarily preclude use of platelets of a different group for adult patients.

Following transfusion of D positive platelets various relevant actions were suggested, including informing medical staff of ABO/D mismatch, contacting the consultant haematologist for advice, follow-up monitoring for haemolysis and replacing platelet stock.

Whilst group A D negative platelets would be the ideal choice, especially for the two female patients, this was not an option in this scenario. There are pros and cons in selecting either of the two options available (O D negative or A D positive), and neither would be incorrect (especially in an emergency), so long as anti-D Ig prophylaxis was given to the 2 female patients <50 if the D positive platelets were selected.

Anti-D prophylaxis following transfusion of D positive platelets

Following the transfusion of D positive platelets, BSH guidance[7] is to offer anti-D Ig prophylaxis to D negative female patients with child bearing potential, such as the 20 year old and 48 year old females in this exercise. Whether or not this was instigated was deliberately not asked as a direct question, but examination of the actions following issue of the platelets showed that of those selecting the D positive platelets, 107/134 (80%) would either issue, suggest or seek medical advice on the issue of anti-D Ig for the 20 year old female and 104/140 (74%) for the 48 year old female. This leaves 20% and 26% respectively where it appears that anti-D prophylaxis would not have been offered, putting these patient at risk of producing anti-D with the potential to affect future pregnancies. Following issue of D positive platelets to the 47 year old male, a small proportion (3%) of laboratories would have issued (as opposed to considered) anti-D Ig, which would not ordinarily be necessary but could be considered if he were transfusion dependent.

References

1. BSH (2012) guidelines for pre-transfusion compatibility procedures in blood transfusion laboratories. Transfusion Medicine, 2013, 23, 3–35, and https://www.b-s-h.org.uk/guidelines/guidelines (accessed 05/03/2018)

2. BSH (2016) Guidelines on transfusion for fetuses, neonates and older children. British Journal of Haematology, 2016, 175, 784–828 and at https://www.b-s-h.org.uk/guidelines/guidelines (accessed 05/03/2018)

3. BSH (2004) Guidelines for the use of fresh frozen plasma, cryoprecipitate and cryosupernatant British Journal of Haematology Volume 126, Issue 1, pages 11–28, July 2004 and www.bcshguidelines.com (accessed 05/03/2018)

4. BSH (2005) amendment to the guidelines for the use of fresh frozen plasma, cryoprecipitate and cryosupernatant (selection according to ABO and RhD grouping) and www.bcshguidelines.com (accessed 05/03/2018)

5. SaBTO (2015): Measures currently in place in the UK to reduce the potential risk of transmitting vCJD via blood https://www.gov.uk/government/publications/current-measures-to-reduce-the-risk-of-vcjd-transmission-by-blood (accessed 13/3/18)

6. BSH (2016): Guidelines for the use of platelet transfusions. British Journal of Haematology, 2017, 176, 365–394 www.bcshguidelines.com (accessed 13/03/2018)

7. BSH (2014) guideline for the use of anti-D immunoglobulin for the prevention of haemolytic disease of the fetus and newborn Transfusion Medicine Volume 24, Issue 1 pages 8-20 and www.bcshguidelines.com (accessed 05/03/2018)