



BLOOD STOCKS MANAGEMENT SCHEME



Ad Hoc Exercises Summer 2001 - *Preliminary Report*

This is a preliminary report of the results produced by the BSMS Summer 2001 ad hoc exercise (data collected in November 2001). Its purpose is to present the exercise participants with a prompt summary of the data collected, some general discussion, and an in-sight into the extensive analysis that will be produced later on this year. The report does not contain any individual participant analysis and all data is anonymised.

The report is split into six sections (details below) in a similar layout to the questionnaires. Each section will contain an outline of the individual exercise, the results of the exercise, and a brief discussion of any patterns identified. No methodology or cross-analysis with other exercise results or other known factors, e.g. blood usage, hospital type etc. is contained in this report. Further analysis and discussion, along with the methodologies, will be presented in later reports.

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1 BREAKDOWN OF PARTICIPATION

Exercise Title	Number of Participants*	Number of Respondants
<i>Red Cell Ordering Practice & Laboratory Staffing Questionnaire (herein called OP&S Questionnaire)</i>	76	76 (100%)
<i>Maximum Blood Order Schedule</i>	65	65 (100%)
<i>Allocated Stock</i>	61	38 (62%)

*number of BSMS participants who responded positively to the invitation to take part in the exercises (July 2001)

83 out of 132 invitations to take part in the ad hoc exercises were returned expressing interest. This is an encouraging number for the first round of ad hoc exercises. Those exercises requiring the return of completed questionnaires and supplementary information had a 100% return rate. The allocated stock exercise, which required daily input of allocated stock figures between 12 November and 7 December 2001, achieved a 62% final return rate.

2 RESERVED STOCK (Section A, OP&S Questionnaire)

AIM To ascertain to what degree the amount of red blood cell (RBC) units held at cross-match status was a factor in the amount of RBC units ordered.

- Two questions about 'Reserved Stock' were included in the OP&S Questionnaire.
- Information was collected on how often cross-matched blood was returned from the major blood issue fridges, and for how long red cell units were cross-matched.

2.1 Results

Fig. 1. Bar chart showing the reservation time period for cross-matched RBC units.

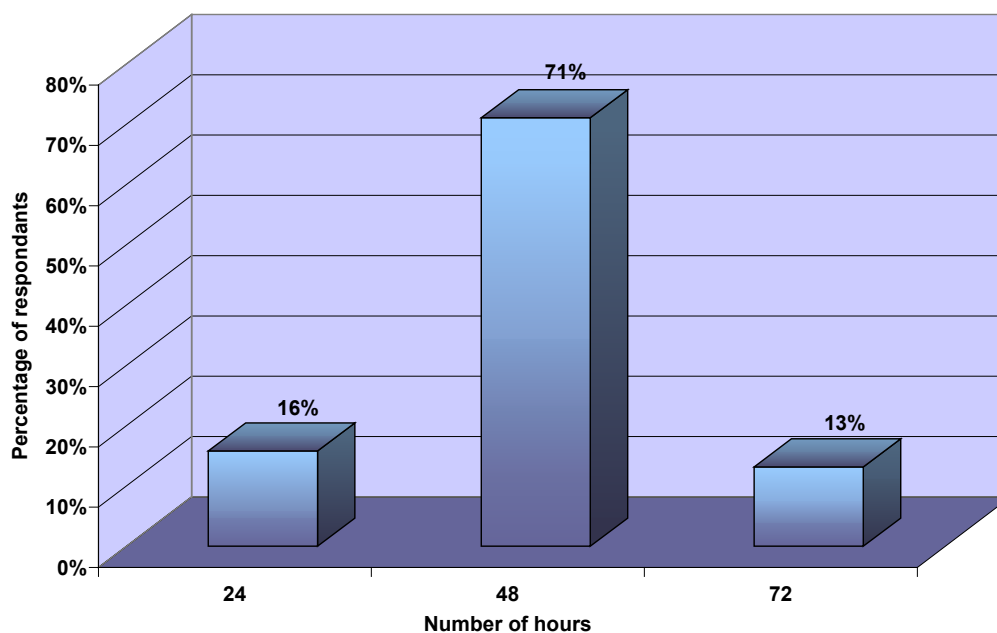


Fig. 2. Histogram showing at what time of day stock is returned from the issue fridges.

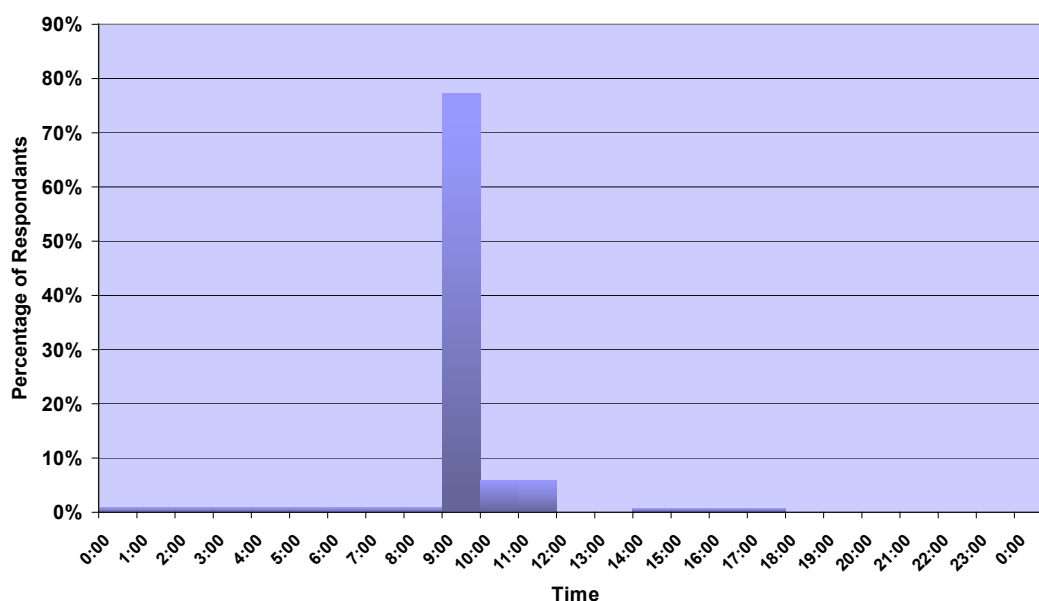


Fig. 3. Bar chart showing if the amount of blood returned to stock is taken into account when ordering RBC units.

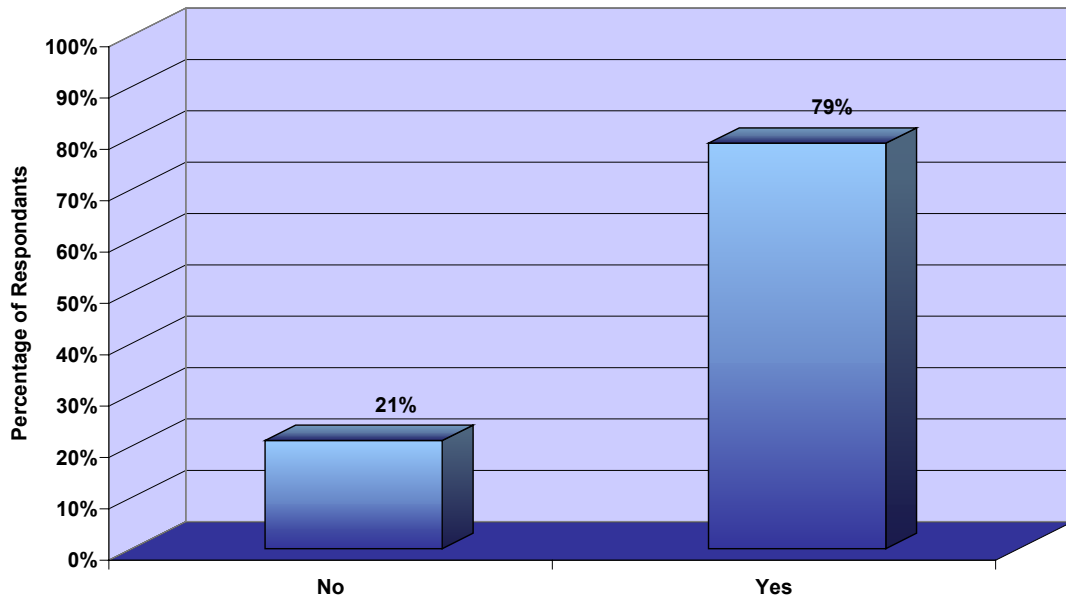


Fig. 4. Table showing breakdown of comments submitted in response to question about how the amount of blood returned is taken into account when ordering RBC units.

28% of respondents (21 out of 76) answering question 2b included a comment. These are summarised below:

Comment keyword*	Frequency	As percentage of returns with comments	As percentage of total returns
'Also factor in next days stock return and outstanding requests'	2	10%	3%
'Electronic crossmatching'	2	10%	3%
'Based on experience'	2	10%	3%
'Influences next days order'	3	14%	4%
'Is part of an ordering algorithm'	4	19%	5%
'Returns done after blood is ordered'	3	14%	4%
'Unable to factor in'	1	5%	1%
'Only when limited supply'	4	19%	5%

**see appendix 1 for full comments.*

2.2 Discussion

The reservation time period for RBC units varies between 24 and 72 hours (Fig. 1). The majority (71%) of respondents reserve blood for a maximum of 48 hours. A significant percentage (13%) holds blood for 72 hours, meaning that RBC units are taken out of general issue, and therefore potential usage, for an extended period. Conversely, 16% of respondents use a 24 hour reservation period, meaning that RBC units are not out of potential issue for an adversely long period.

All respondents perform one stock return (returning crossmatched blood from the major blood issue fridges to stock) per day except for one hospital, which performs two. Almost all stock return is done in the morning between 09.00 and 12.00 with the vast majority (78%) returned between 09:00 and 10:00 (Fig. 2). Less than 1% perform a stock return between 00:00 and 09:00 and any stock return between 14:00 and 18:00 is a second return.

79% of respondents take into account the amount of blood returned when ordering RBC units (Fig. 3). However, the remaining 21%, approximately 1 in 5, respondents do not take into account how much blood is returned when ordering, which may potentially result on over ordering. 28% of respondents commented on the extent to which they factor in returned blood; Fig. 4 summarises these comments into key phrases. Significantly, 4% of respondents commented that “returns are done after blood is ordered” but another 4% of respondents said that they “take into account the returns in the next days order”. Details of the full comments submitted are available in appendix 1.

2.3 Future analysis/research

- Are those reserving blood for 72 hours taking into account stock return when ordering?
- Is the reservation time and/or whether stock return is taken into account when ordering linked to the number of satellite fridges and the distance of these fridges from the lab?
- Given that the vast majority perform stock returns once between 09:00 and 10:00, what are the reasons, benefits, and disadvantages of doing this?

3 RED CELL ORDERING FOR ROUTINE DELIVERIES (Section B, OP&S Questionnaire)

AIM To gain some idea of when, and how regularly, red cell orders are placed; and how much regulation and standardisation there is on those orders.

- Four questions about 'Red Cell Ordering for Routine Deliveries' were included in the OP&S questionnaire.
- Information was collected on who places the orders, what procedures are followed and details of the hospital routine delivery schedule.

3.1 'Who' places red cell orders?

3.1.1 Results

Fig. 5. Bar chart showing if it is broadly the responsibility of one person/position to assess the number of red cells required each time *routine* orders are placed with the NBS.

Fig. 6. Pie chart showing the grade of the person who is responsible for ordering red cells.

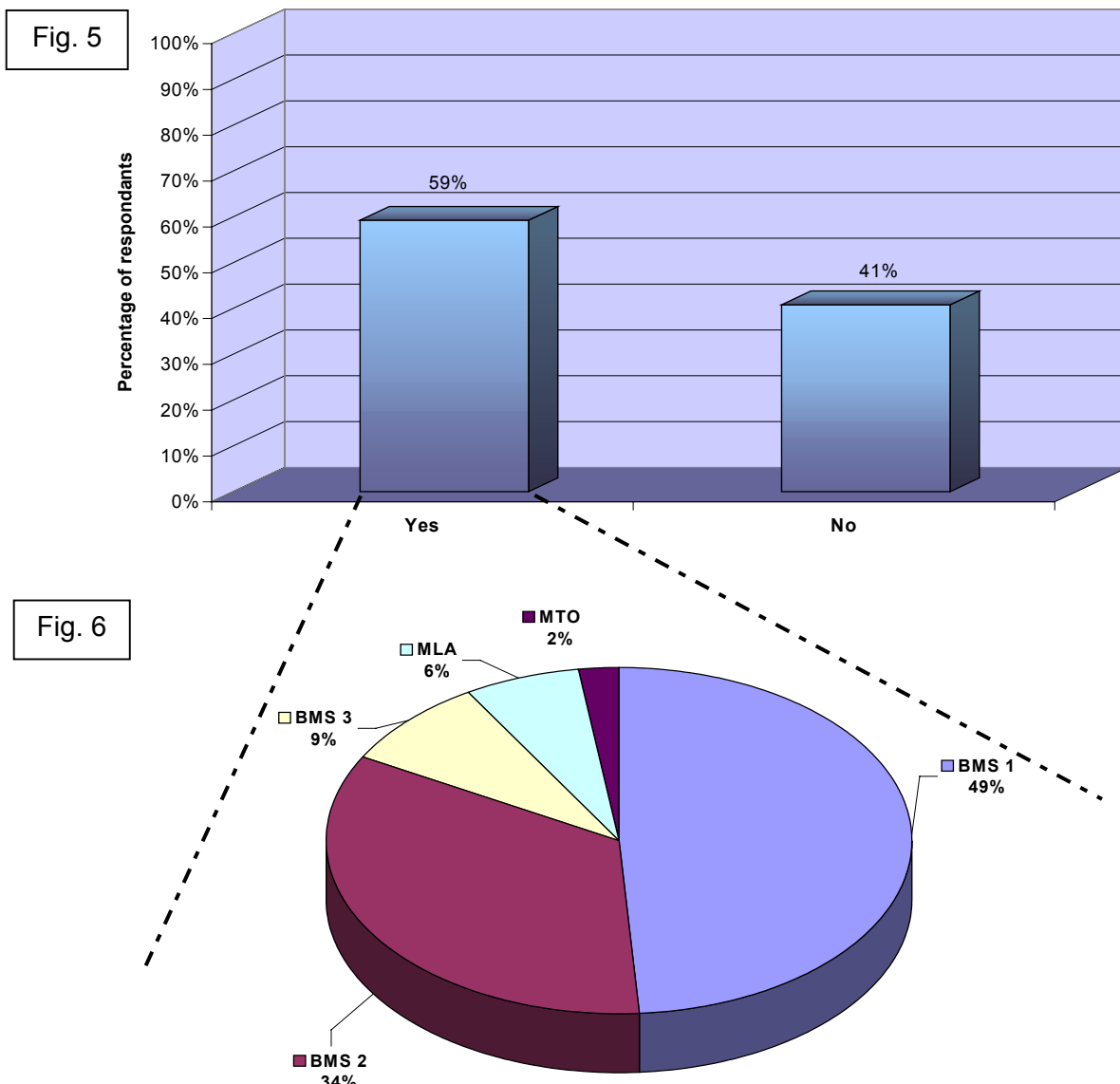


Fig. 7. Bar chart showing if there is a documented Standard Operating Procedure for red cell ordering.

Fig. 8. Pie chart showing how often the SOP is updated.

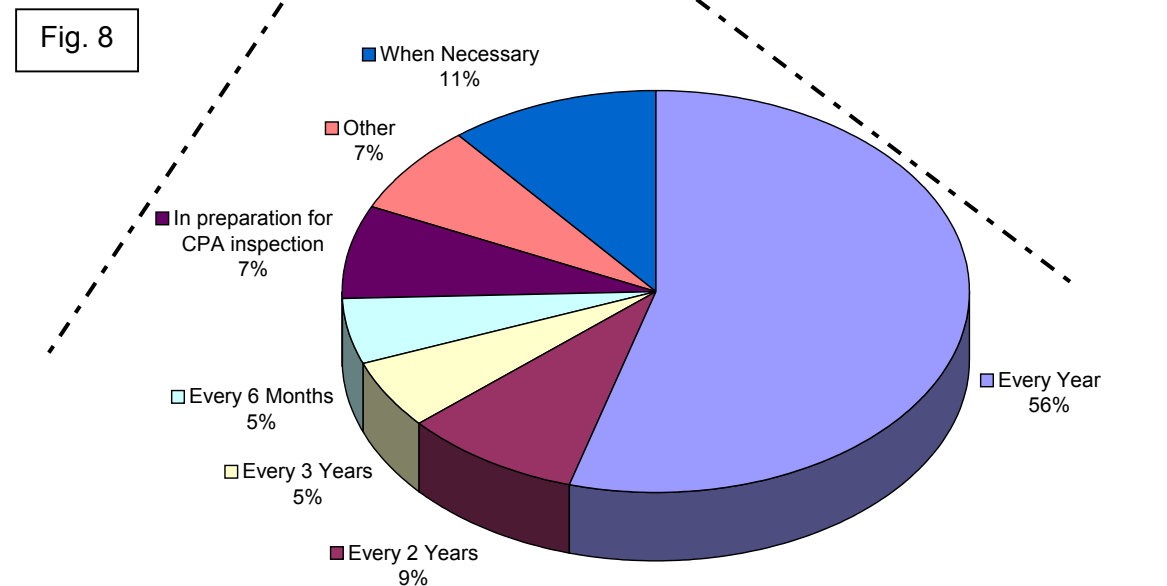
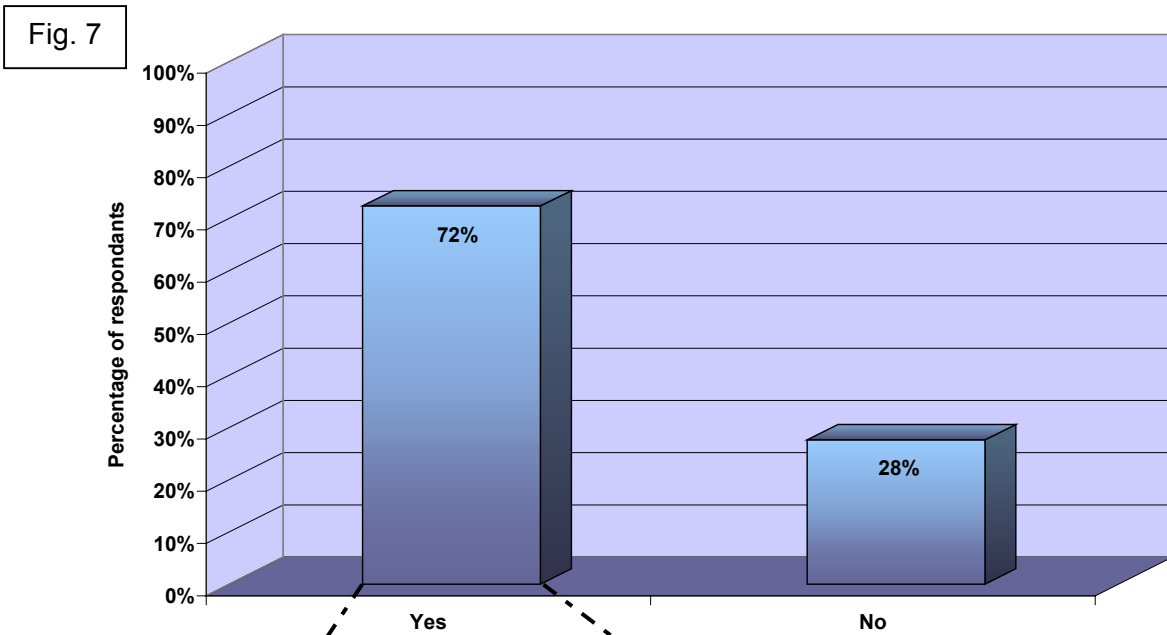
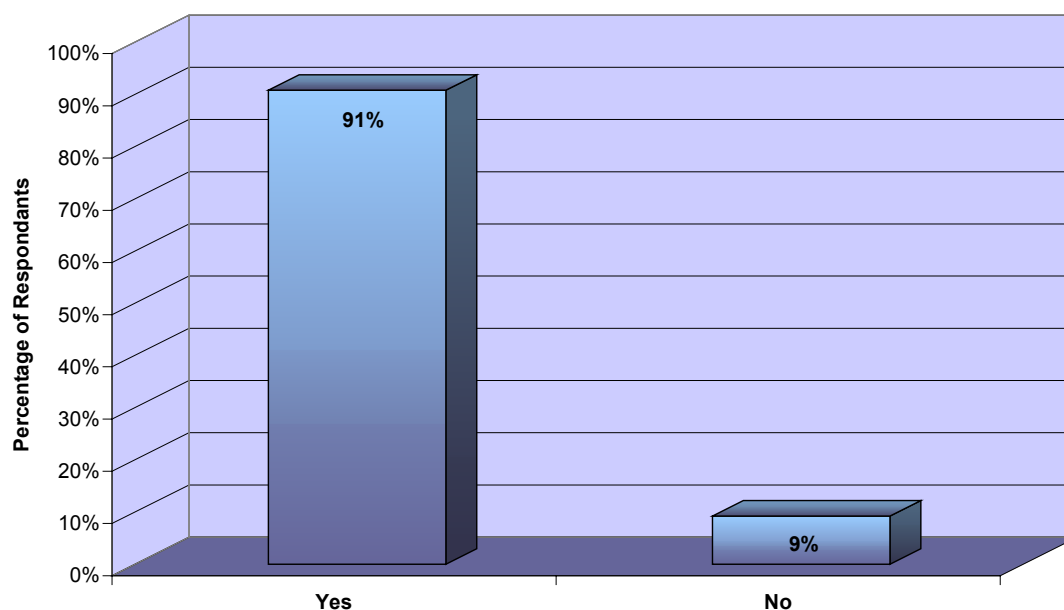


Fig. 9. Bar chart showing if there is a benchmark stock level for each blood group.



3.1.2 Discussion

A modest majority of respondents (59%) allocate the responsibility of assessing the number of RBC units required each time *routine* orders are placed with the NBS to one 'person' or 'position' (Fig. 5). However, it is worth noting that a significant proportion (41%) does not allocate responsibility. Of the 59% who do allocate responsibility, this is mostly (57%) to the junior grades (MLA, MTO, and BMS 1) (Fig. 5). Although, significantly, 9% of respondents allocate responsibility to the BMS 3, and 34% to the BMS 2.

72% of respondents have a document Standard Operating Procedure (SOP) for red cell ordering (Fig. 7). Again, whilst this is a substantial majority, 28%, more than 1 in 4, do not have an SOP for blood ordering. Of those that do have an SOP, 61% regularly (anything up to 1 year) review and update the SOP (Fig. 8). Of the remaining 49%, 21% review the SOP only every 2 – 3 years and 11% have no defined review period.

Over 90% of respondents have a benchmark stock level for each blood group (Fig 9)

3.1.3 Future analysis/research

- How do the factors discussed in § 3.1.2 (responsibility, SOP's, benchmarks) relate to variation in issuable stock index?
- How are benchmarks calculated; how are they reviewed; how much do they vary?

3.2 Red cell ordering/delivery schedules

3.2.1 Results

Fig. 10. Bar chart showing the proportion of weekly to daily delivery schedules.

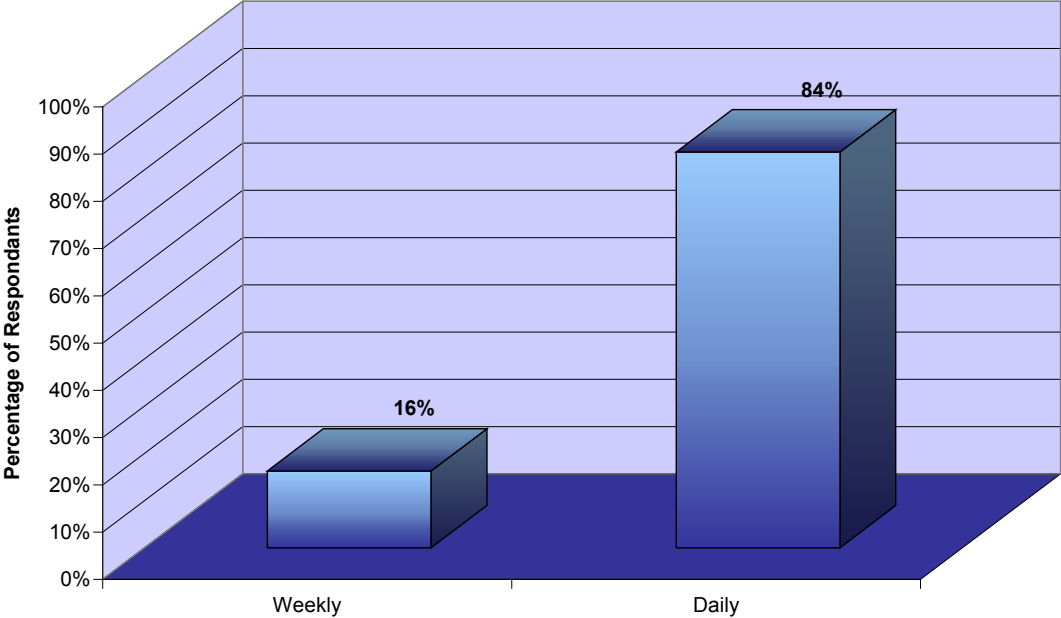


Fig. 11. Bar chart showing on what days orders are placed (weekly delivery schedule).

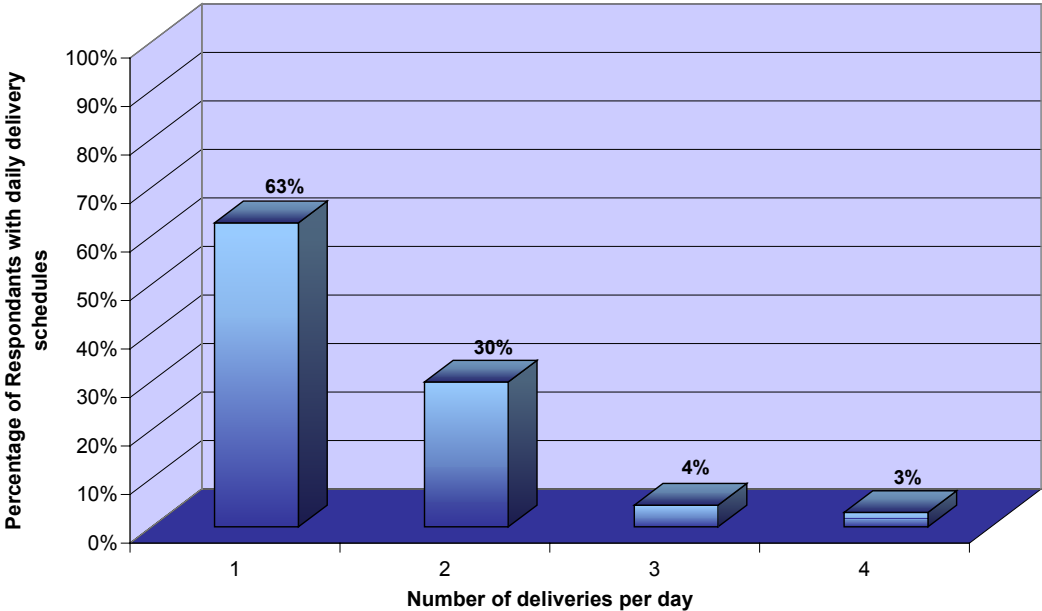


Fig. 12. Bar chart showing how many orders are placed per week (weekly delivery schedule).

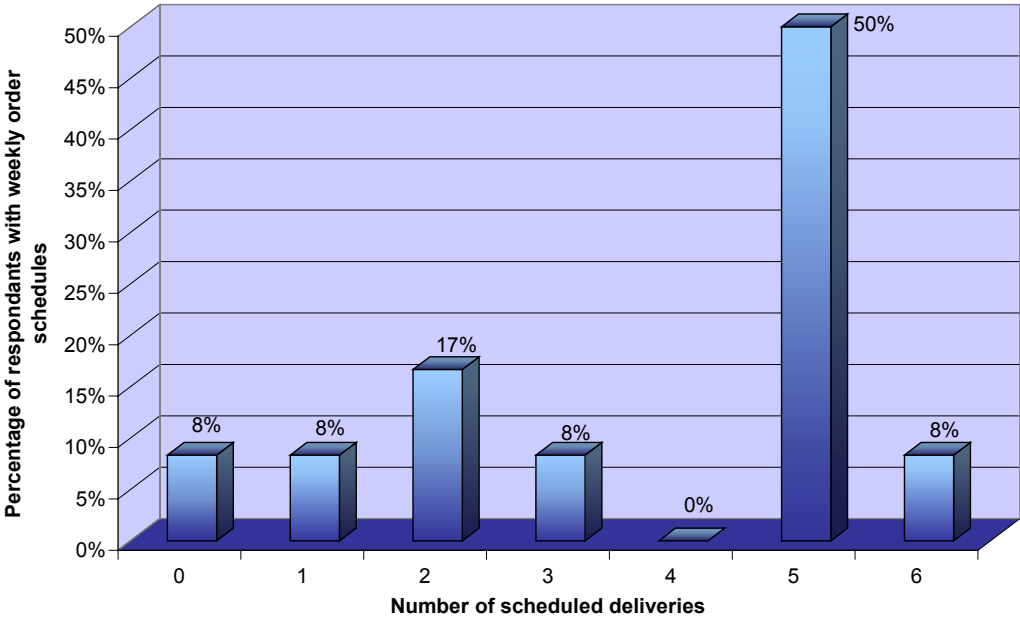


Fig. 13. Bar chart showing how many orders are placed per day.

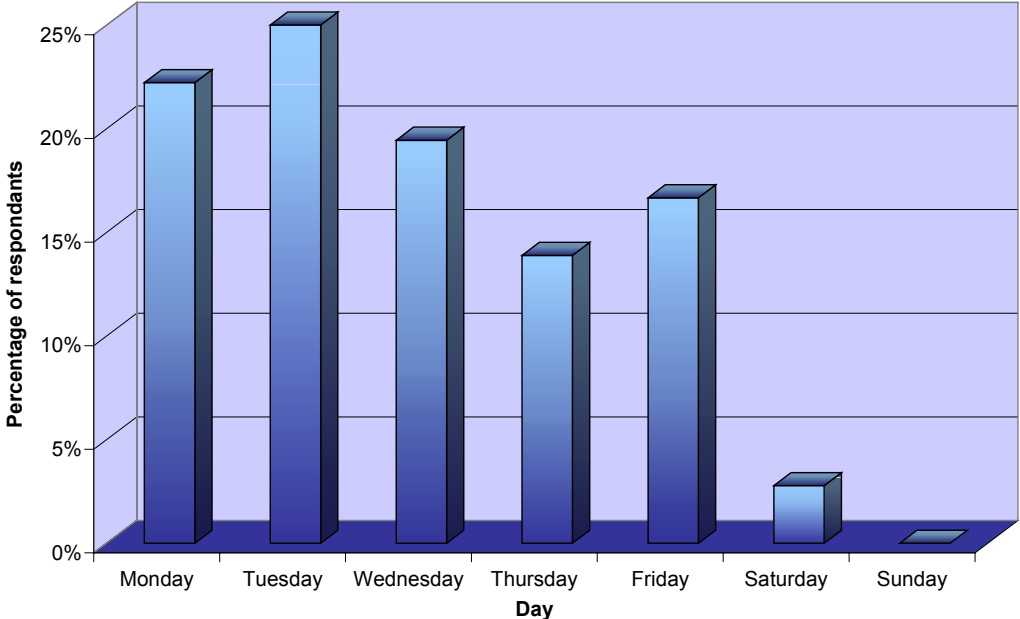


Fig. 14. Bar chart showing whether red cell orders are placed for same day or next day delivery.

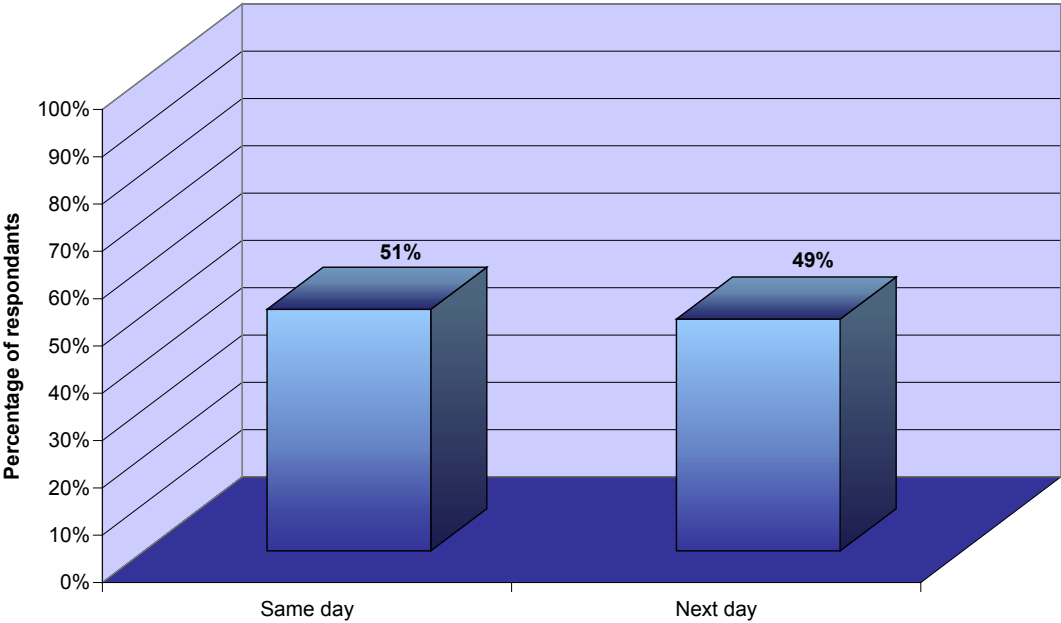


Fig. 15. Histogram showing when orders are placed if for SAME day delivery

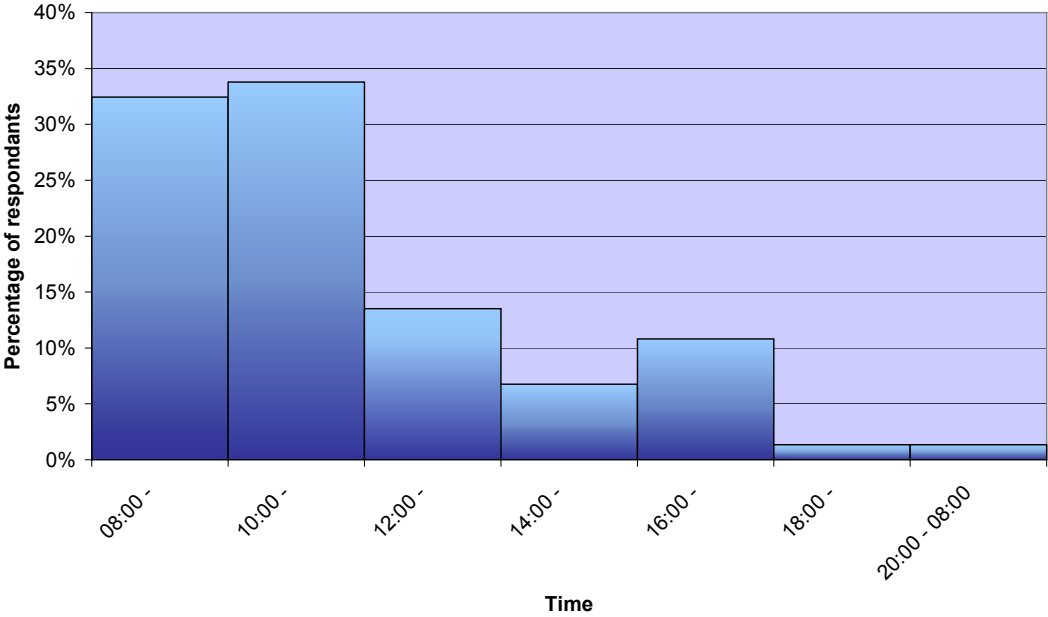


Fig. 16. Histogram showing when orders are placed if for NEXT day delivery.

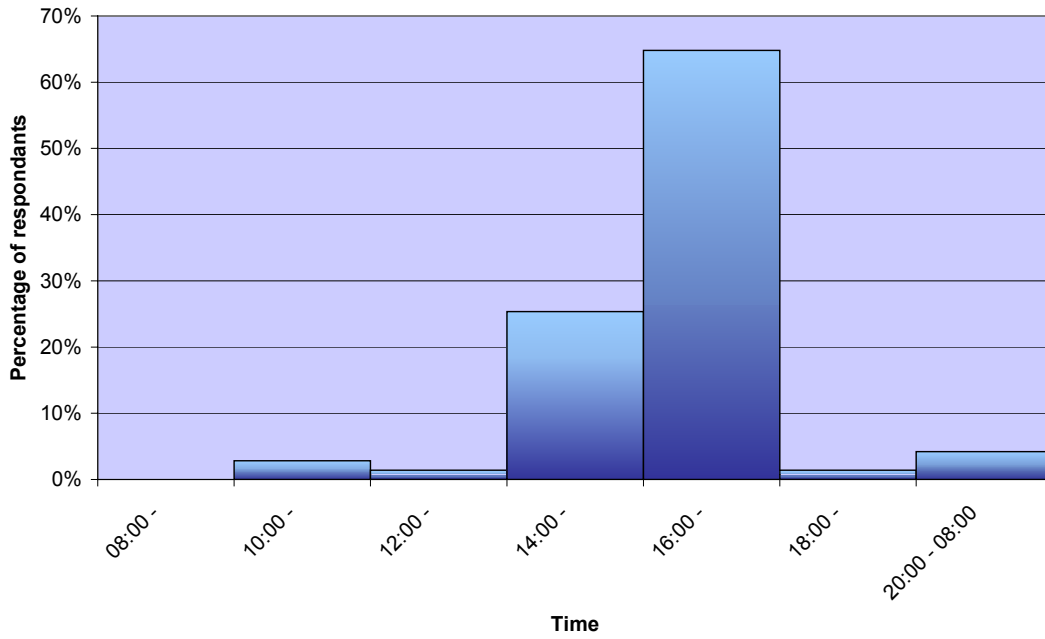


Fig. 17. Line chart comparing at what time orders are received.

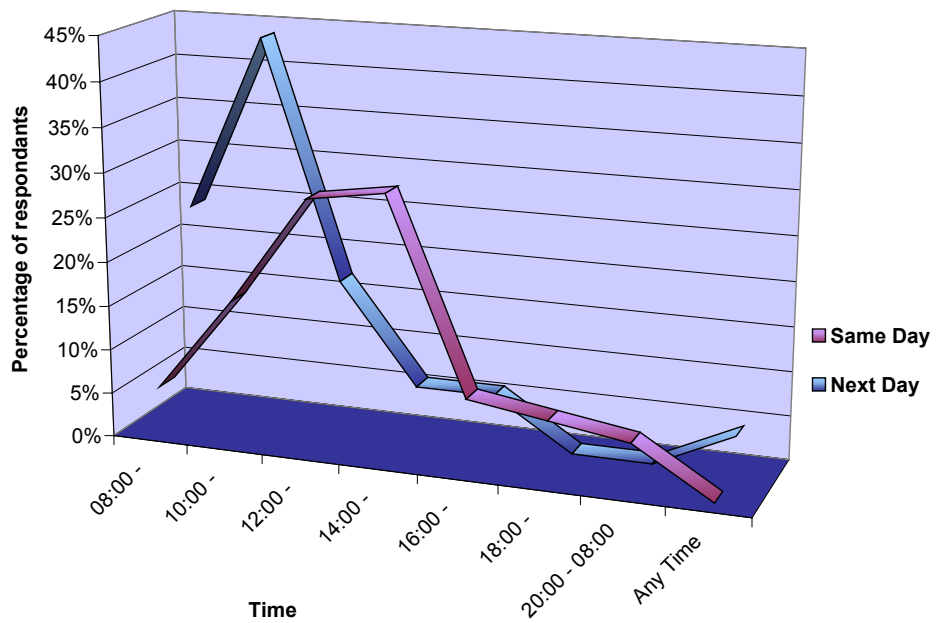


Fig. 18. Bar chart showing what percentage of all orders are calculated by each method.

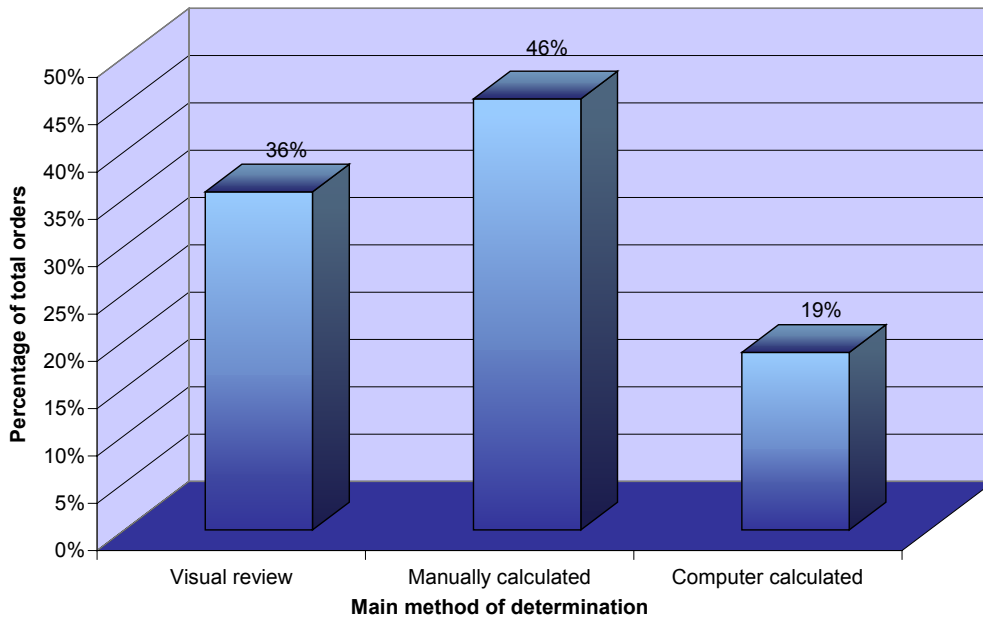
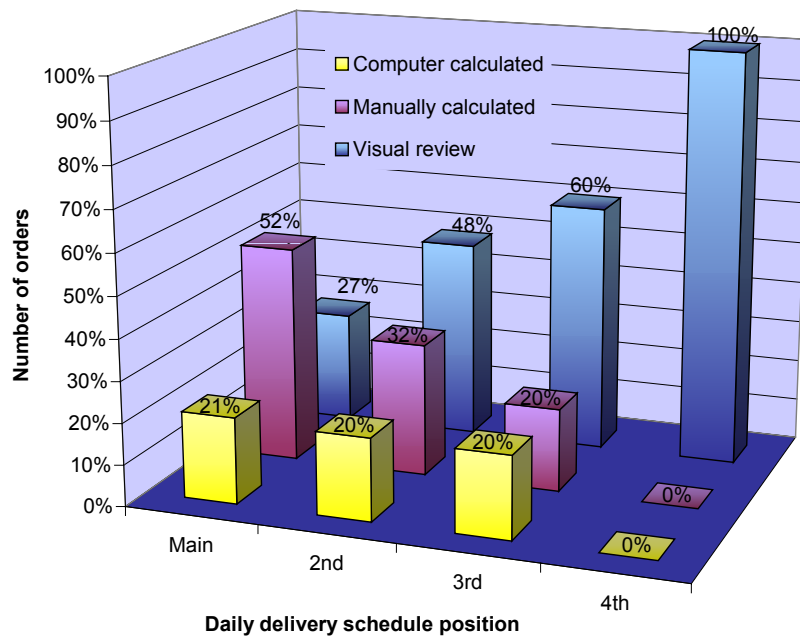


Fig. 19. Bar chart showing how orders are calculated depending on daily delivery schedule position.



3.2.2 Discussion

The majority of respondents (84%) have a daily delivery schedule (DDS)(Fig. 10). However, of the 16% who gave details of a weekly delivery schedule (WDS), 50% have 5 orders per week (Fig. 12). It is therefore likely that, for those respondents who have 5 deliveries per week, there is some overlap between those who nominated this as a DDS (one main order per day) and those who nominated it as a WDS (one main order *specific* to day). The extent of this overlap cannot be defined. Some of those respondents with 5 or 6 deliveries per week (58%) also identified a WDS with multiple deliveries on one day (generally mid week). Of the respondents who identified a DDS, 63% have only one delivery scheduled per day,

30% have 2, and 7% have 3 or 4 deliveries per day (Fig. 11). Combining the WDS and DDS figures, approximately 53% of total respondents have 1 delivery per day.

Fig. 13 shows that there is little pattern in on what day deliveries are made; although only 3% of respondents have a delivery specifically at the weekend and 47% of orders are placed on Monday and Tuesday.

Half of all deliveries are placed for same day (SD) delivery and half for next working day (ND) delivery (Fig. 14). Of the orders for SD delivery, 33% are placed between 08:00 and 10:00 and 34% between 10:00 and 12:00 (Fig 15). A significant proportion (10%) of orders are placed after 16:00. Of the orders for ND delivery, 65% are placed between 16:00 and 18:00 and 90% between 14:00 and 18:00 (Fig. 16). Comparison of Figs. 15 and 16 reveals that orders for ND delivery are placed over a tighter time frame than those for SD delivery. Comparison of the arrival time (Fig. 17) reveals that deliveries arrive earlier if the order is placed the day before: 45% of ND deliveries arrive between 10:00 and 12:00. Again, ND deliveries arrive in a tighter time frame than SD deliveries: 68% of ND deliveries between 08:00 and 12:00 compared with 49% of SD deliveries over the same time period.

The preferred method of calculating how many RBC units to order is 'manual calculation' with 46% of orders calculated this way (Fig. 18). 36% of orders are calculated by visual review and 19%, almost 1 in 5, are using computer calculation to determine orders. A similar pattern can be seen in the main orders placed by those with DDS (Fig. 19). However, the pattern changes for the 2nd, 3rd, and 4th daily orders in that 48%, 60%, and 100% of orders, respectively, are calculated by visual review. This upward trend in visual review is counter balanced by a corresponding decline in manual calculation from 52% of the main, to 32%, 20% and 0% of the 2nd, 3rd, and 4th daily orders, respectively. The percentage computer calculated remains at exactly 20% for all orders, except the 4th when no orders are computer calculated.

3.2.3 Future analysis/research

- What is the relationship between the number of deliveries and variation in the issuable stock index?
- What is the relationship between the number of deliveries and wastage levels?
- Extensive analysis of the patterns in delivery schedules: what time and what day is the order for, when do they arrive; how are they calculated.

4 RED CELL ORDERING FOR 'AD HOC' DELIVERIES (Section C, OP&S Questionnaire)

AIM To ascertain how many 'as hoc' orders are being placed and why.

- Two questions on 'ad hoc' red cell orders were included in the OP&S questionnaire.
- Information was collected on the number of ad hoc deliveries requested, and the major reasons for placing these orders.

4.1 Results

Fig. 20. Bar chart showing how many orders, on average, are placed for red cell ad hoc deliveries.

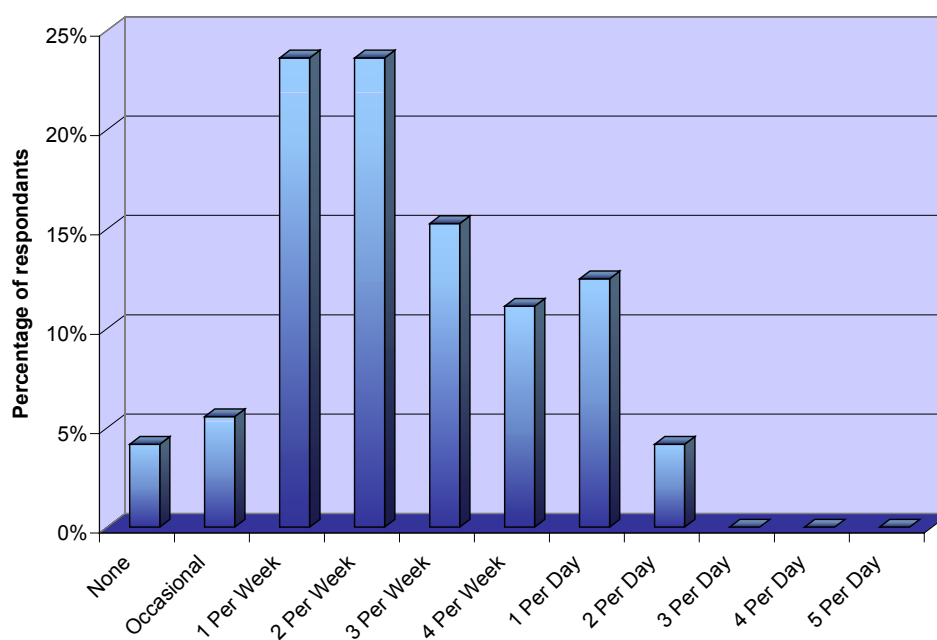
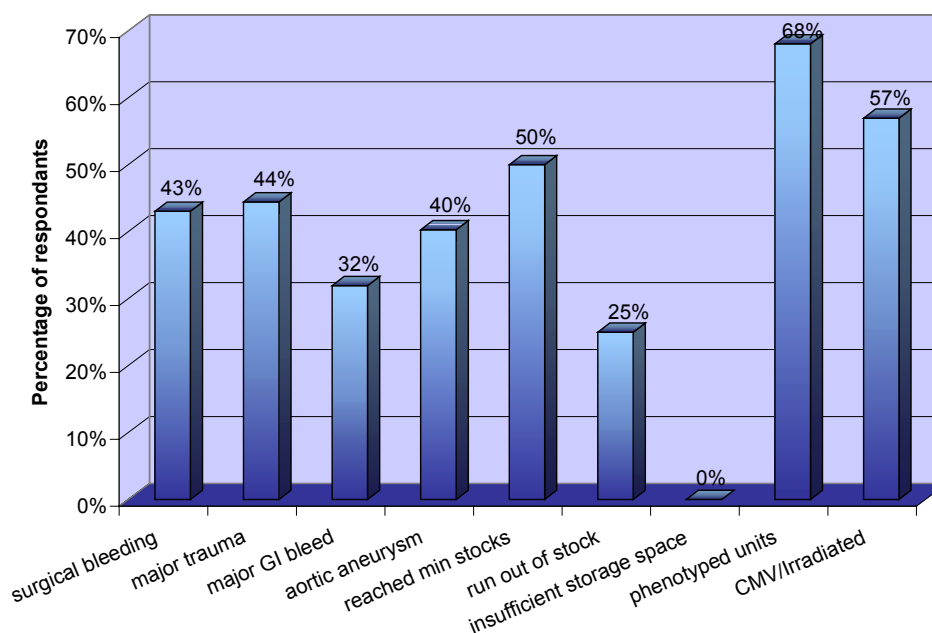


Fig. 21. Bar chart showing what reasons were given for requesting ad hoc deliveries



4.2 Discussion

The majority (48%) of respondents have 1 or 2 ad hoc deliveries per week (Fig. 20). 25% have 3 – 4 deliveries per week and 12% have one per day. 10% have either no ad hoc deliveries or only have the occasional one, and 4% have 2 per day. No respondents have more than 2 deliveries per day. The reasons for placing ad hoc orders (where RBC units are the main requirement) are variable (Fig. 21). 55 – 65% of respondents gave a demand for specialised units (phenotyped and CMV/Irradiated) as a major reason for ad hoc deliveries. Between 32 and 44% gave 'patient emergencies' (surgical bleeding, major trauma, major GI bleed, aortic aneurysm) as major reasons and 59% gave stock levels as a reason.

4.3 Future analysis/research

- Is the number of ad hoc deliveries linked to the delivery schedules and/or ordering practice?
- Are the major reasons for ad hoc deliveries linked to the number requested?

5 STAFFING AND TRAINING (Section D, OP&S Questionnaire)

AIM To gain an initial impression of how much affect staffing and training levels have on blood stocks management.

- Three questions about staffing and training were included in the OP&S questionnaire.
- Information was collected on what training is given to those involved in blood stocks management and whether there are sufficient staff available to the lab to enable efficient blood stocks management.

5.1 Results

Fig. 22. Bar chart showing the response to the statement posed in Question 9 (detailed below)

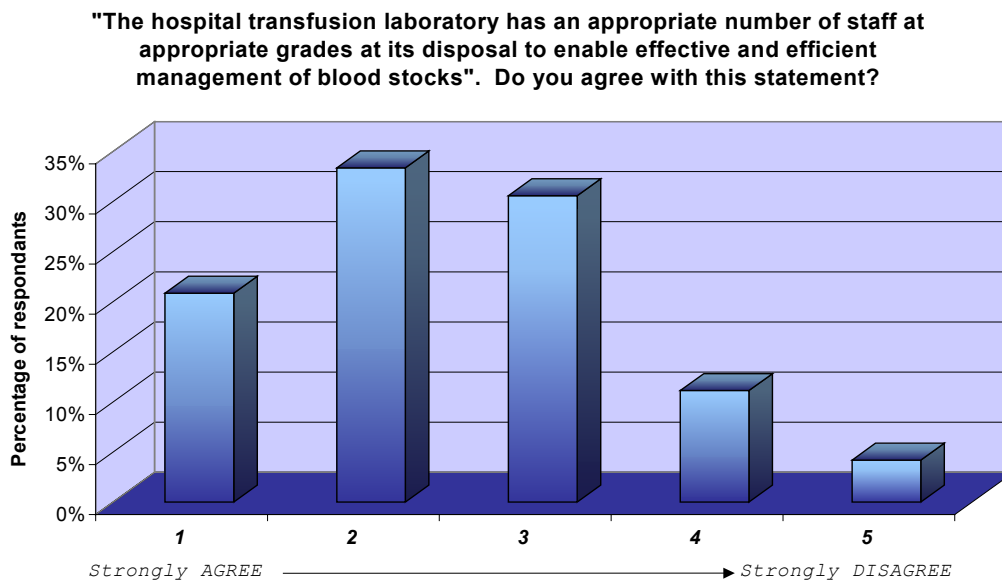


Fig. 23. Bar chart showing who is responsible for training staff who calculate red cell orders.

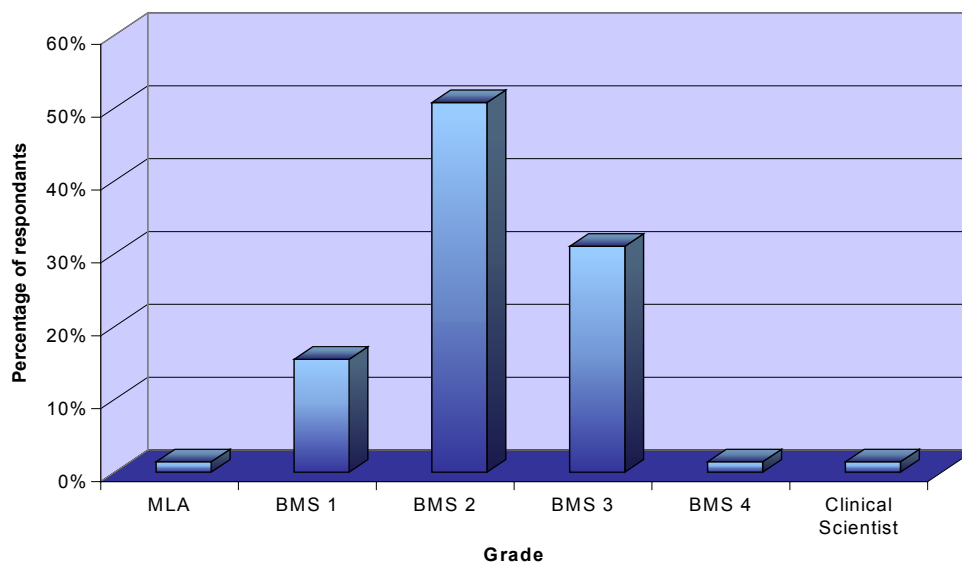
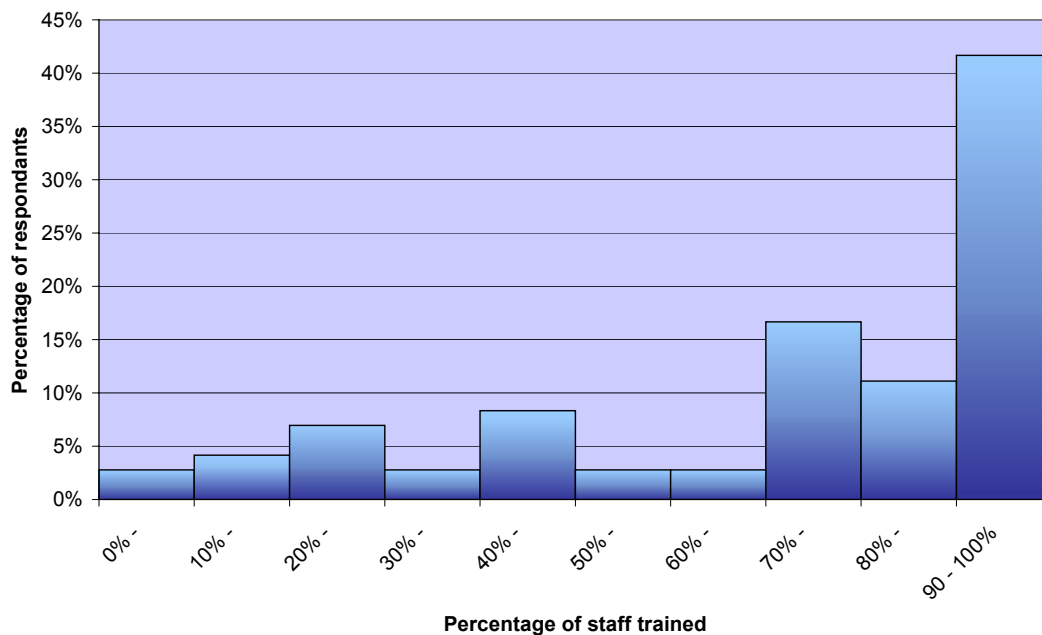


Fig. 24. Histogram showing what percentage of staff in the lab have received training in blood stocks management.



5.2 Discussion

The statement posed in Qu. 9:

“The hospital transfusion laboratory has an appropriate number of staff at appropriate grades at its disposal to enable effective and efficient management of blood stocks”

was met with a positive response by the majority of respondents: 54% entered 1 or 2. Only 15% responded negatively (4 or 5) and consider that there is substantial room for improvement in terms of staffing and experience in the lab. The remaining 31% consider that there is a “workable” level of staff and experience but that there is “room for improvement”.

All respondents offer training of some kind to staff responsible for calculating red cell orders. The majority of training (50%) is given by a BMS 2, although a significant proportion (30%) is given by a BMS 3. 16% are trained by a BMS 1 or MLA and 2% are trained by a BMS 4 or Clinical Scientist.

The majority of respondents (42%) consider that 90-100% of their staff have received operational training in blood stocks management specific to the local transfusion laboratory (Fig 24). In fact, 70% of respondents consider that 70% (3 in 4) of their staff are specifically trained. Conversely, 26% of respondents consider that less than half of their staff have received blood stocks training.

5.3 Future analysis/research

- What affect does the level of staffing and training have on wastage levels and stock levels?
- What ‘staffing systems’ (e.g. rotation, shift, locum etc.) are used in hospitals and to what extent?

6 MAXIMUM BLOOD ORDER SCHEDULES (MSBOS Questionnaire & copy of schedule)

AIM to ascertain the maximum blood order schedules (MSBOS) for selected surgical procedures and how the MSBOS is determined.

- Four questions about the MSBOS were included in the MSBOS questionnaire.
- A copy of the hospital MSBOS was requested for analysis.
- Information was collected on how often the MSBOS is review, by whom, and how the changes are disseminated to the users.

6.1 Results

Fig. 25. Bar chart showing how often the MSBOS is reviewed.

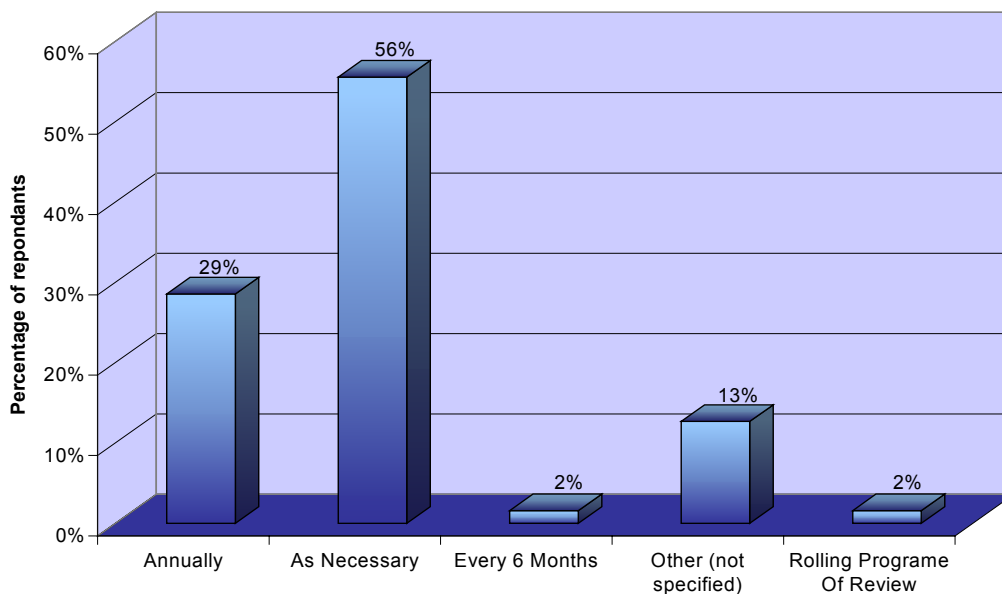


Fig. 26. Bar chart showing what factors and measurements are employed to determine the MSBOS?

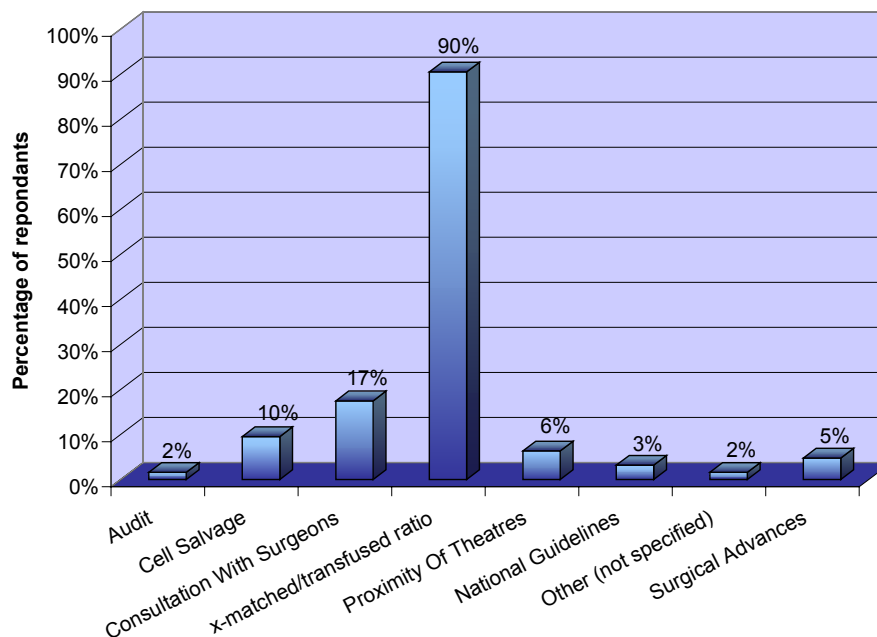


Fig. 27. Bar chart showing who has the responsibility for authorising changes to the MSBOS?

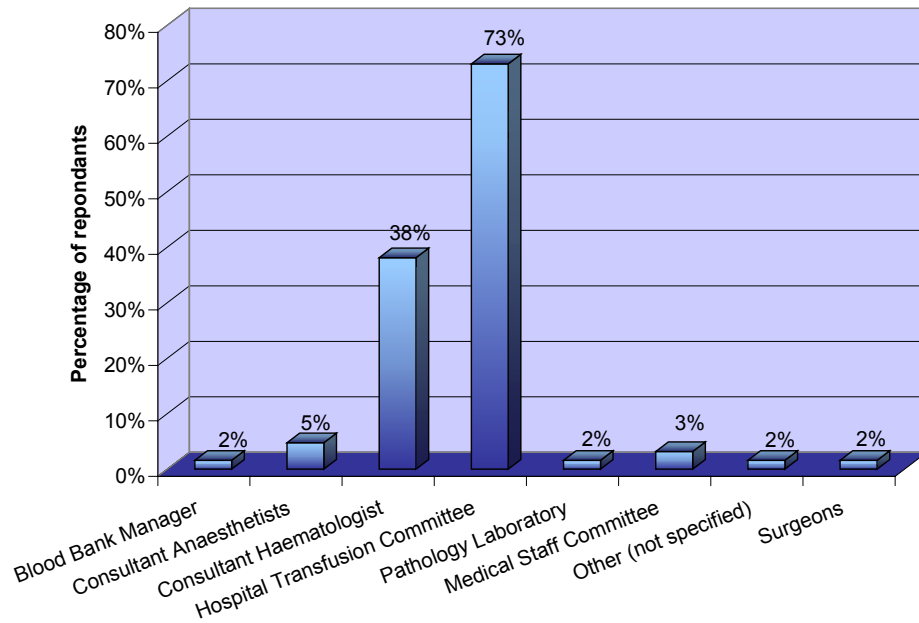


Fig. 28. Bar chart showing how the MSBOS is disseminated to the users.

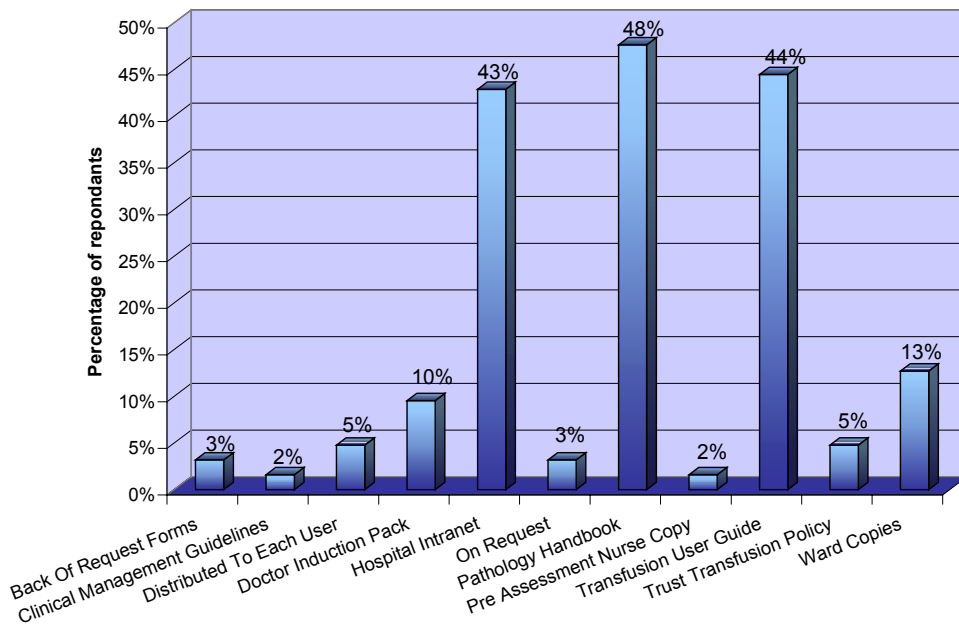
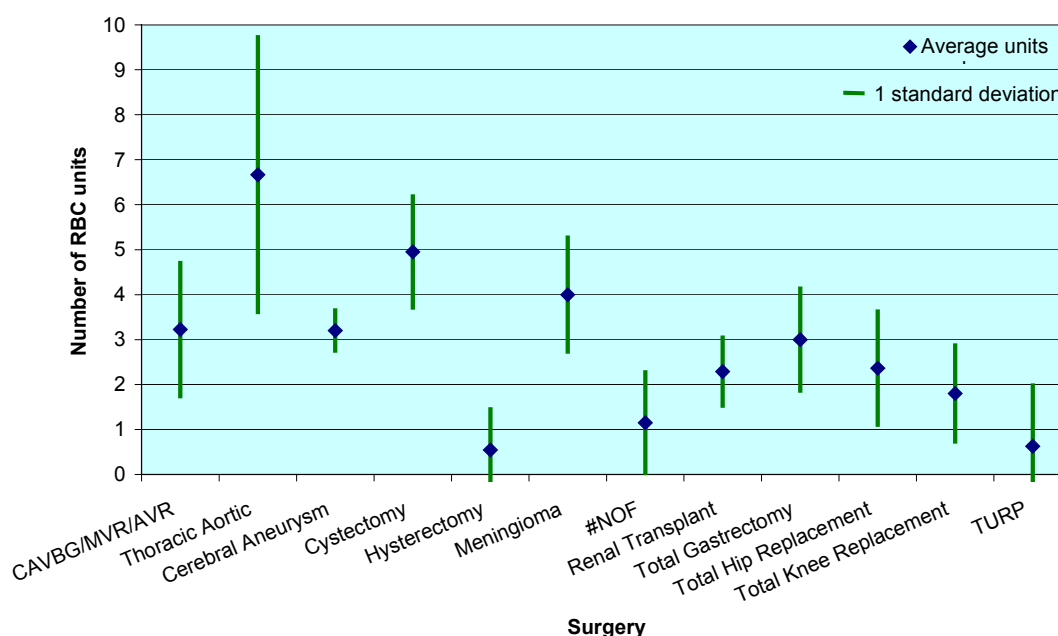


Fig. 29. Table showing number of RBC units used for selected surgical procedures and the percentage of respondents who group & save for those same surgical procedures.

Surgery	Number of red cell units				Group & Save
	Average	S Dev.	Max	Min	
CAVBG/MVR/AVR	3.2	1.5	5	0	
Thoracic Aortic	6.7	3.1	10	4	
Cerebral Aneurysm	3.2	0.4	4	3	
Cystectomy	4.9	1.2	6	2	3%
Hysterectomy	0.5	0.9	2	0	71%
Meningioma	4.0	1.3	6	2	
#NOF	1.2	1.1	4	0	46%
Renal Transplant	2.3	0.8	4	2	
Total Gastrectomy	3.0	1.1	6	0	9%
Total Hip Replacement	2.4	1.3	6	0	11%
Total Knee Replacement	1.8	1.1	4	0	19%
TURP	0.6	1.4	6	0	81%

Fig. 30. Graphical representation of the average number of units used for each surgical procedure.



6.2 Discussion

The majority of respondents (56%) do not have a structured programme for review of the Maximum Blood Order Schedule (MSBOS) and only review 'when necessary' (Fig 25). However, a significant proportion (29%) has an annual review programme and 2% has a rolling programme of review. Only 2% review the MSBOS every 6 months.

The MSBOS is most commonly calculated using the crossmatched/transfused ratio: 90% of respondents (Fig 26). Other significant influences are consultation with surgeons (17%) and cell salvage (10%). Only 3% - 5% use national guidelines and surgical advances as factors and only 2% perform an audit; a higher percentage (6%) use proximity of theatres as a measure. In general, the Hospital Transfusion Committee (HTC) has responsibility for

authorising changes to the MSBOS: indicated by 73% of respondents (Fig 27). A significant proportion also indicate the Consultant Haematologist with responsibility for blood bank as having responsibility for changes. Other 'bodies' also have influences and these are shown in Fig 27.

The major methods of disseminating the MSBOS to users are via the hospital Intranet (43%), in the pathology handbook (48%), and in the transfusion user guide (44%) (Fig 28). Other significant methods are in ward copies (13%) and in the Doctor Induction Pack (10%). Again, other methods were submitted and these can be seen in Fig 28.

A breakdown of the surgical procedures selected from the collated MSBOS' can be seen in Fig 29. Average figures, standard deviations, maximums, and minimums of the number of units used are all shown. Also shown is the percentage of respondents who perform the selected surgical procedure that indicated if they group & save for that particular surgical procedure. Fig. 20 gives a graphical representation of the average number of units used \pm 1 standard deviation for each surgical procedure for ease of comparison.

6.3 *Future analysis/research*

- Collation of more surgical procedures and production of associated statistics for comparison.

7 ALLOCATED STOCK (entered via data management system)

AIM to determine the relationship between allocated stock and issuable stock and compare this relationship between blood groups.

- Daily allocated stock levels were entered into the BSMS data management system between 12 November 2001 and 7 December 2001. No supplementary data was required.

7.1 Results

Fig. 31. Graphical representation of average allocated stock to issuable stock ratios for each blood group.

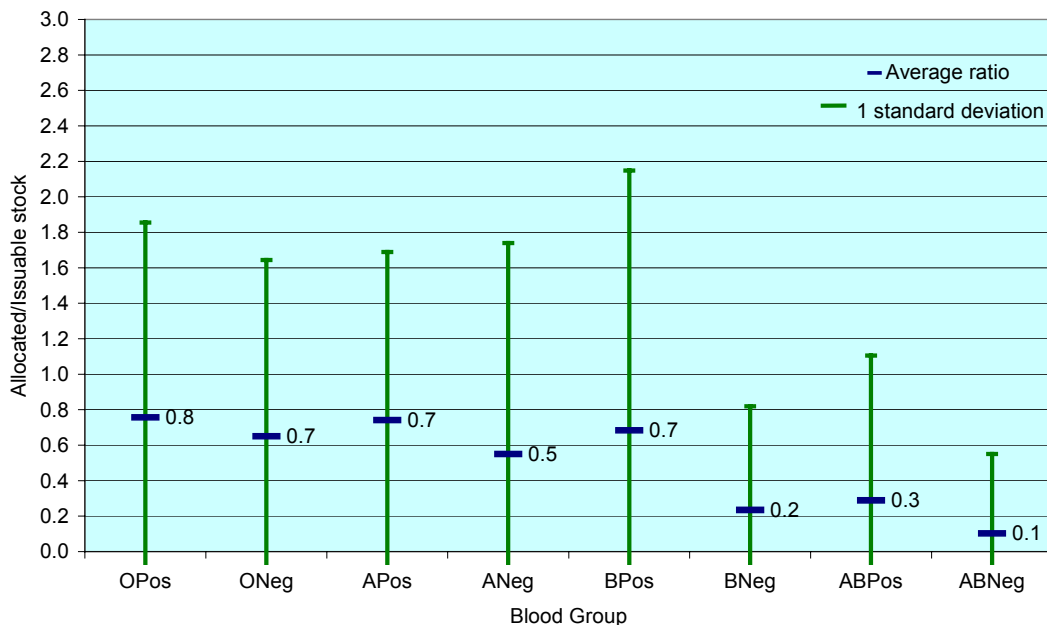


Fig. 32. Line chart showing ratio of O Neg allocated stock to issuable stock.

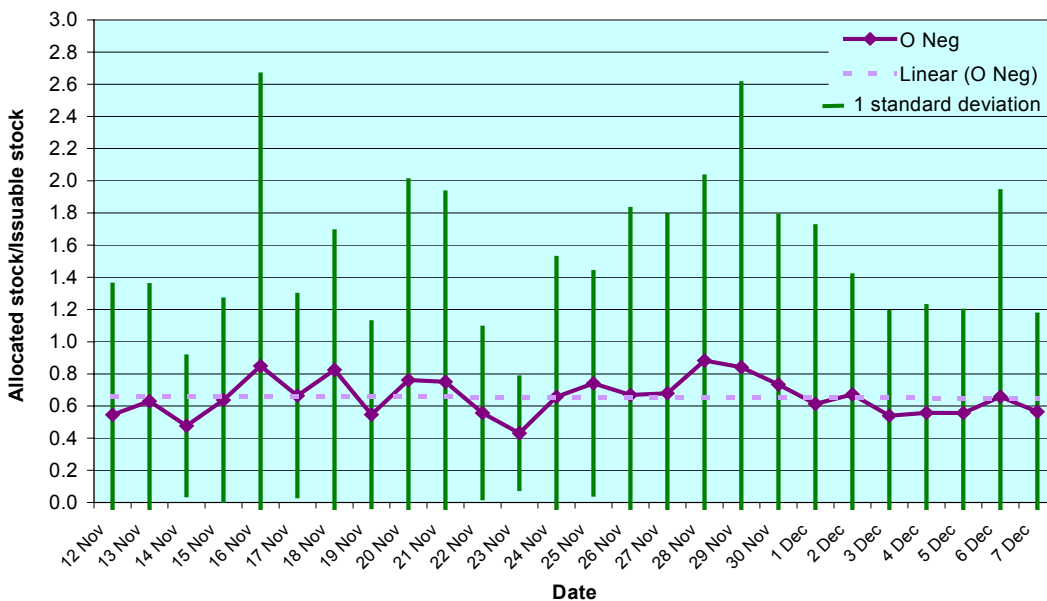


Fig. 33. Table showing average and maximum values of the 'allocated to issuable stock' ratio for each blood group.

Date	OPos		ONeg		APos		ANeg		BPos		BNeg		ABPos		ABNeg	
	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max
12 Nov	0.7	5.4	0.5	4.0	0.6	2.0	0.5	5.7	0.4	1.6	0.4	4.0	0.4	7.0	0.0	1.5
13 Nov	0.7	2.8	0.6	3.4	0.5	2.4	0.7	15.0	0.5	2.0	0.2	4.0	0.3	3.0	0.1	2.0
14 Nov	0.7	3.0	0.5	1.8	0.5	2.1	0.3	1.3	0.7	4.4	0.2	2.0	0.3	3.0	0.1	2.0
15 Nov	1.2	7.2	0.6	3.3	0.7	2.9	0.4	2.7	1.1	8.0	0.2	2.0	0.4	4.0	0.1	1.0
16 Nov	1.0	4.0	0.8	11.0	0.6	2.0	0.5	3.0	0.8	4.5	0.2	2.5	0.2	1.5	0.2	2.0
17 Nov	0.7	1.5	0.7	2.0	1.0	6.0	0.9	6.0	0.9	3.0	0.1	1.0	0.3	1.5	0.2	3.0
18 Nov	0.5	2.3	0.8	2.7	0.9	3.9	0.3	1.3	0.4	3.0	0.0	0.0	0.2	1.5	0.3	3.0
19 Nov	1.3	24.0	0.5	2.5	0.7	4.9	0.5	3.7	0.5	3.2	0.2	1.5	0.2	1.7	0.2	3.0
20 Nov	0.7	2.6	0.8	7.0	0.8	4.0	0.5	2.8	1.1	16.0	0.4	5.0	0.4	10.0	0.1	1.8
21 Nov	0.8	3.0	0.8	7.0	0.6	1.6	0.6	3.0	0.7	3.0	0.2	2.0	0.2	2.0	0.0	0.7
22 Nov	1.0	4.0	0.6	2.4	0.6	1.5	0.4	1.5	0.7	3.1	0.4	3.0	0.2	2.0	0.0	0.7
23 Nov	0.7	2.3	0.4	1.4	1.0	10.0	0.5	2.5	0.8	5.0	0.2	3.0	0.4	4.0	0.0	0.0
24 Nov	0.6	1.9	0.7	3.8	0.9	3.8	0.4	1.7	0.4	1.7	0.1	0.8	0.4	4.0	0.1	1.0
25 Nov	0.6	1.9	0.7	2.5	1.2	6.3	1.3	15.0	0.3	0.8	0.0	0.3	0.2	1.5	0.0	0.0
26 Nov	0.4	1.2	0.7	6.7	0.5	2.1	0.8	6.0	0.5	3.5	0.2	1.3	0.3	2.0	0.0	0.2
27 Nov	0.6	2.6	0.7	6.0	0.7	2.5	0.8	12.7	0.4	2.3	0.2	2.5	0.2	4.0	0.0	1.5
28 Nov	0.8	2.4	0.9	5.3	0.8	1.9	0.7	7.5	1.2	11.0	0.2	1.8	0.1	2.0	0.0	1.0
29 Nov	0.8	3.1	0.8	9.1	0.9	7.3	0.4	1.5	1.3	16.0	0.4	5.0	0.3	2.0	0.1	1.5
30 Nov	0.8	3.9	0.7	5.0	0.7	1.8	0.5	2.5	0.4	2.3	0.3	2.0	0.2	2.0	0.1	1.0
1 Dec	0.7	2.4	0.6	5.5	0.9	1.9	0.6	7.0	0.5	4.0	0.2	1.0	0.5	5.0	0.0	0.5
2 Dec	0.7	2.6	0.7	2.6	1.0	3.5	0.2	1.2	0.5	1.7	0.1	1.0	0.5	5.0	0.0	0.0
3 Dec	0.5	1.7	0.5	2.1	0.8	5.9	0.3	2.3	0.4	1.7	0.1	1.0	0.4	6.7	0.0	0.5
4 Dec	0.6	3.1	0.6	2.7	0.6	3.4	0.6	9.0	0.8	16.5	0.1	1.0	0.3	4.0	0.2	3.0
5 Dec	0.7	3.0	0.6	3.0	1.0	10.0	0.7	6.5	0.5	2.5	0.3	2.0	0.2	4.0	0.2	3.0
6 Dec	0.8	3.8	0.7	6.0	1.1	10.0	0.6	3.3	0.5	4.7	0.4	5.0	0.3	4.0	0.2	7.0
7 Dec	0.7	2.5	0.6	3.0	0.6	2.5	0.5	1.6	0.9	7.0	0.2	1.0	0.1	1.3	0.2	4.0

Maximum values highlighted in red are greater than ten times the maximum average for the associated blood group.

Fig. 34. Line chart showing ratio of A Pos allocated stock to issuable stock.

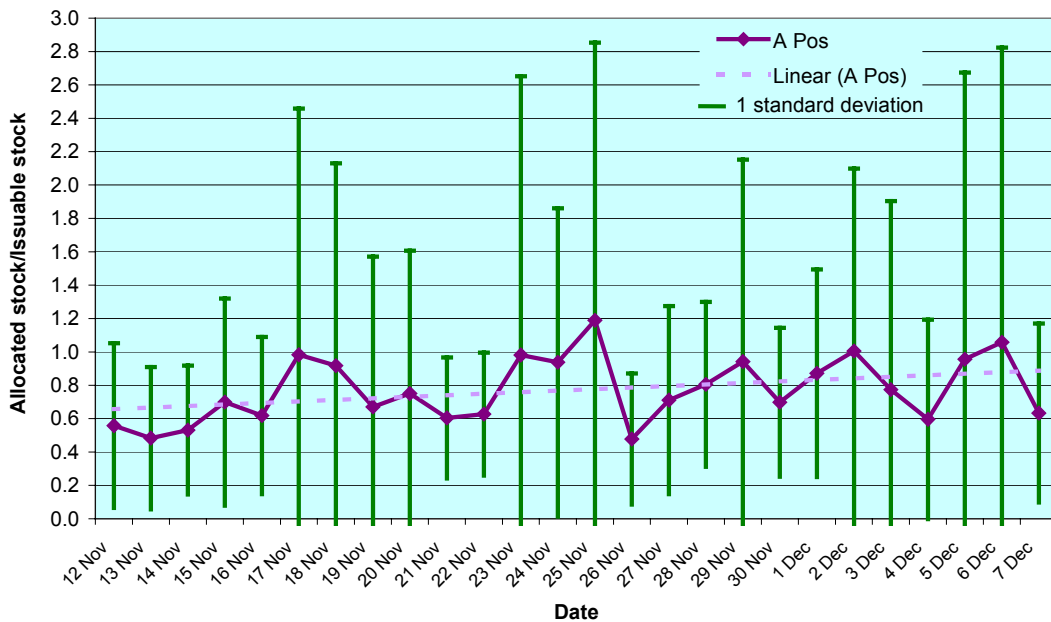
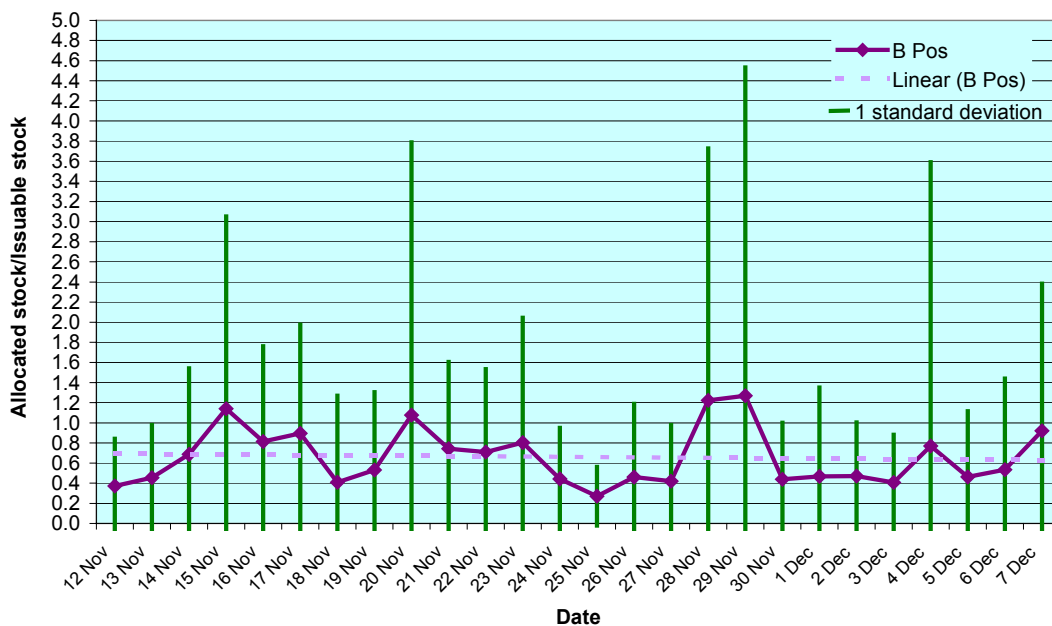


Fig. 35. Line chart showing ratio of B Pos allocated stock to issuable stock.



7.2 Discussion

The allocated stock to issuable stock (AI) ratio is below 0.8 for all blood groups (Fig 31). This means that for every 10 units of blood in the stock fridge there will be less than 8 in the issue fridges. The average AI ratio for O Pos is 0.77 and varies normally up to 1.82; for O Neg the average is 0.65 and varies normally up to 1.65; for A Pos the average is 0.74 and varies normally up to 1.70; and for A Neg the average is 0.55 and varies normally up to 1.75. The average AI ratio for B Pos is 0.70 but has a much higher variance than the other blood groups, up to 2.17. the rarer blood groups have much lower AI ratios: for B Neg the average is 0.22 and varies normally up to 0.8; for AB Pos the average is 0.30 and varies normally up to 1.1; for AB Neg the average is 0.10 and varies normally up to 0.55.

Charts showing the variation in AI ratio over the collection period are shown for selected blood groups: O Neg, A Pos, and B Pos. The average O Neg AI ratio varies between 0.4 and 0.9 and the trend line is static at 0.7 (Fig 32). The standard deviation in the average O Neg AI ratio fluctuates between 0.4 and 1.3, with peaks occurring mid week. This pattern is reflected in all the blood group AI ratios: allocated stocks tend to increase for the first half of the week and then fall off to the weekend.

The average AI ratio for A Pos shows higher variance than O Neg: varying between 0.5 and 1.2, with the standard deviation varying between 0.4 and 1.8 (Fig 34). The average AI ratio for A Pos shows a linear increase but this is unlikely to be a significant trend. All other blood group AI ratios tend to show a similar degree of variance, hence they have not all been included here. Fig 33 shows the average and maximum AI ratios for each blood group on each of the collection days. The values highlighted in red are greater than 10 times the highest average AI ratio for that blood group and gives some indication of the extreme levels of allocated stock, compared to issuable stock, that is held by some respondents.

The average B Pos AI ratio chart has been included because it shows the highest level of variance (Fig 35). The average varies between 0.2 and 1.3 and the standard deviation varies between 0.3 and 3.3. The B Pos AI ratio could therefore reach 4.6, over 4 allocated units to every 1 in issuable stock, under normal variation.

7.3 Future analysis/research

- Continued monitoring of allocated stocks where possible.
- Comparison of allocated stock, issuable stock, and number of units issued per day.

8 Appendix 1 – Comments submitted

Is the amount of blood returned from the fridges taken into account when ordering blood?
Should be but tends to depend on experience of staff member
Affects following days order, because must de-reserve blood not available until 11.00 order faxed at nine.
Unable to estimate number of units returning
It is the sum of xmed and free blood that is used to determine how much blood to order
This will only affect the following days order.
Our run leaves the NBS in the morning before it is possible to allow for returned units
A guess estimate is made of how much on average is returned.
Computer programme identifies No units and blood grps due for return following morning
Depending on those ordering
Not usual to take into account, but larger of a rarer group may sway this
Very few return routinely due to fast and electronic XM i.e. even anaemia's are not issued until definitely required
We also anticipate what may come back the next day as well
Also take into account outstanding requests and age of stock.
As limited supply of some blood groups are kept, we asses the likelihood of blood being used or returned to stocks
Red Cell Order placed after returns done
Routine red cell order 15.00 for 09.00 next day
Orders may be estimated on Friday afternoon to Monday morning , to allow for usage at weekend
Occasionally we examine the issue fridge to see if we can return blood before 48 hours, especially if short.
Blood returned stock list is printed and then blood is requested for p.m.
We use electronic X-match. Most blood crossmatched is used for low bleeders etc blood is not assigned for theatre cases until they come to collect it.
In times of shortage blood returned within 48hrs.

What training is given to the person who decides how many red cell are orders?
The person responsible for 'Compatibility Testing' (BMS 1 or Trainee) is responsible for ordering stock control as part of their training. Although even with SOP's and instruction it takes experience to learn which blood is likely to be transfused and which returned.
1.Optimum stock levels 2. De-reservation 3.Taking into account outstanding orders 4. Special requirements 5. Communication within the NBS
No training recently given due to staff being in post for some time
Ensure BSM 2 staff are all familiar with relevant S.O.P
Staff trained in computer records to show how much stock and what minimum levels etc are shown to note any short dated blood and to try and get it used.
Instructed according to the laboratory protocol as described in the S.O.P
It is part of the state registration training folder in the laboratory. Takes into account current stock, known requirements+CMV+ Irradiated products equal matches on agreed stock level
MLA is told to count everything after reclaiming and also to ask at crossmatch bench to check for extra requirements
Max and min levels explained review of future cms awaiting taken into account prior to ordering .
How to rotate stock appropriately. To ensure blood in satellite fridges is taken into account. To check expiry dates and theatre lists prior to ordering. To be aware of minimum stock levels.
The BMS2 in charge of crossmatching section will train new staff as necessary, and in line with agreed changes
During rotation go through stock control S.O.P,levels etc;
Refer to maximum stock order list generated by computer and reviewing work outstanding. All BMS rotating through BT are given the relevant training.
Experienced BMS staff trained in assessing avaiable stock using computer system and visual checks for measurable demands Requests already received.

We have a standard tariff for stock levels for different days/times. Allowance made for known orders
Staff encouraged to be aware of possible wastage as we are low usage site and not to over order.
Required level of stock in stated SOP . Visual assessment of numbers to achieve this level.
All are state registered BMS
Advice on optimum stock levels given to all basic grade BMS'S
When training staff a discussion and advice is given on making decisions about returns and its effects on stated expected blood stocks
All staff working in transfusion are given guidance by MLSO 2 on appropriate stock levels and when to order
Chief BMS is transfusion Laboratory Training Officer
Explain procedure and reasoning behind quantities kept , observe and monitor BMS for a few times , ask them to seek advice if unsure
Detailed training in the use of blood stock requirements and how to order products and when
Each new member of staff would be briefed on blood stock ordering. A detailed S.O.P is available for them to refer to.
Ordering system explained , demonstrated and then supervised until competent.
All blood bank staff are trained in stock ordering to be able to cope when on duty alone.
Staff continuously rotated through blood transfusion dept to keep up to date with current practices.
Given to all new staff entering the laboratory
Trainee BMS and new staff are given training on stock management . This is part of the daily duties of staff working in the X-match laboratory
Shadowing during training S.O.P and Helpcard for daily duties . Our order sheet has agreed order levels
In house training given using S.O.P's any guidelines etc training is logged
Ensure all staff who order blood are aware of relevant S.O.P
Enumerate the correct stock deduct the known demands on that stock.Order to restore to documented optimum
Generally done as part of induction training . Changes to procedure are notified to staff at staff meetings that are minuted , updates given on ad hoc basis
Stock levels explained and copies of agreed level given training in what and when to restock e.g. any special requirements e.g. paediatric pack, flying squad, all orders are checked by senior staff until happy that ordering levels are correct.
Generally ordered from computer the night before, for next day delivery by anyone available in transfusion.
Computer assess how much blood is required to maintain optimum levels. Optimum levels decided by MLSO3
25-30 years experience in the blood bank
Training involves use of the appropriate computer program
At what level to order volumes depending on stock dates when to order.
Part of overall MLA training
All new members of staff in the laboratory are explained the protocol by a senior member of staff.
Supervision, advice and adherence to stock level protocol
No formal training given to any members of staff, rely on common sense and custom practice.
MLSO responsible for X matching. Performs stock update.
Training covering understanding of S.O.P, person is then covered until satisfied are competent.
Minimum stock levels. Transportation /time from BTS
Blood stock shelves are labelled with recommended stock levels.
Staff required to deputise for MLSO3 are given appropriate training in advance by MLSO3.
Explain minimum stock levels, special needs patients etc:
Part of blood bank training programme
Training is given by the permanent members of staff in transfusion.
Go through the S.O.P and stock levels and try and give them some idea of what crossmatched blood is unlikely to be used. Check the order for them.
Dependent on skill and ability of individuals currently working within dept.
Check stocks against ideal stocks taking off daily requirements.