



BLOOD STOCKS MANAGEMENT SCHEME



Ad hoc Exercises 2001

Further Analysis - Red Cell Ordering

Introduction

The Blood Stocks Management Scheme (BSMS) aims to improve understanding of blood stocks management through the collection, analysis and communication of data. For details of the scheme, please visit www.bloodstocks.co.uk. Ad hoc exercises are distributed annually and gather more specific information on stock management and transfusion laboratory related practice.

Data collection for the BSMS 2001 Ad hoc exercises was conducted during November 2001. A preliminary report of results and initial observations was distributed to participants in February 2002. This report aims to build on those observations and present some more in depth analysis of the influence of red cell ordering practice on stock management; specifically:

- Does a lower reservation time-period relate to lower stock holding?
- Does accounting for units to be returned to stock when placing red cell orders reduce variability of stock holding?
- Does the person responsible for stock ordering influence the normal stock level and the variability of stock levels?
- Do Standard Operating Procedures (SOP) reduce the stock holding level and variability?

Methodology

In November 2001 76 participants completed a questionnaire containing 11 questions in 4 sections. This report will concentrate on sections A and B, which contained 2 questions each; broadly:

Section A - Reserved Stock

1. What is the reservation time-period for cross-matched red cell units?

2. How many times in a 24-hr period do you return cross-matched blood from the major blood issue fridges to stock?

Section B - Red cell ordering for routine deliveries

3. Is it broadly the responsibility of one 'person/position' to assess the number of red cells required each time routine orders are placed with the NBS?
4. Is there a documented Standard Operating Procedure (SOP) for placing red cell orders?

Red cell issue, stock, and wastage data for participating hospitals is collected daily by the scheme via the BSMS website. This data will be analysed in conjunction with the information collected from the Ad Hoc exercise

Data analysis explanations

The p value is the important part of the reported significance test and measures the probability that the relationship occurred by chance. The level of significance used in this report is 0.1, i.e. there is a 90% (1 - 0.1) certainty that the relationships reported as significant did not occur by chance.

The relationships used in the report were verified using Independent T Tests and ANOVA tests. Further confirmatory testing was carried out providing more explanation of the relationship between the experimental groups.

Box plots used in Figs 1,2, 3, 5 and 7 show the median, quartiles, and extreme values for a group.

Results

1. Does a lower reservation period relate to lower stock holding?

Respondents were asked to indicate their reservation period: 24, 48, or 72 hours.

The majority (71.1%) of respondents reported a 48-hour reservation period (Table 1).

Reservation Period	Frequency	Percent
24 hours	12	15.8
48 hours	54	71.1
72 hours	10	13.2

Table 1. Frequency and percentage of each reservation period

The median Issuable Stock Index (ISI) was used as an estimate of average stock holding. The median was used in place of the mean because it removes the spurious influence of extreme stock levels. It was calculated for each hospital over the period 02/04/01 to 31/08/02.

Fig. 1 shows that O DPos has the lowest ISI and the least variation. Therefore, O DPos is used as an indicator of stock level. O DNeg is also used in further analysis because stock patterns are less predictable and therefore of interest.

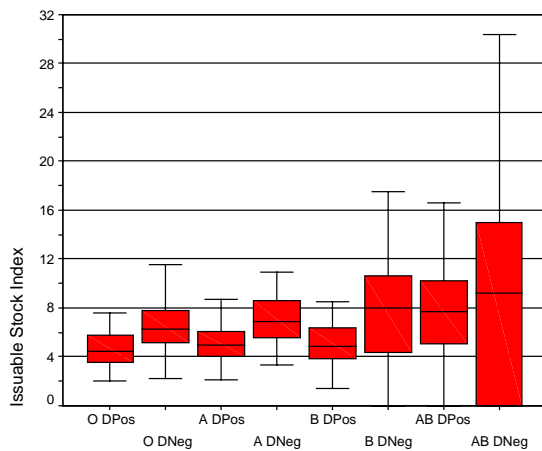


Fig. 1. Box plots of median ISI for all blood groups

A box plot of O DPos ISI for each reservation period (Fig 2) shows a clear increase in the median ISI for successively increasing reservation periods. Analysis suggests there is a weakly significant effect of reservation period on median O DPos ISI ($p < 0.1$). Further analysis indicates a significant linear trend ($p < 0.05$) and suggests a significant difference between a 24-hour period and

longer reservation periods ($p < 0.05$) but no significant difference between 48-hours and 72-hours ($p > 0.3$).

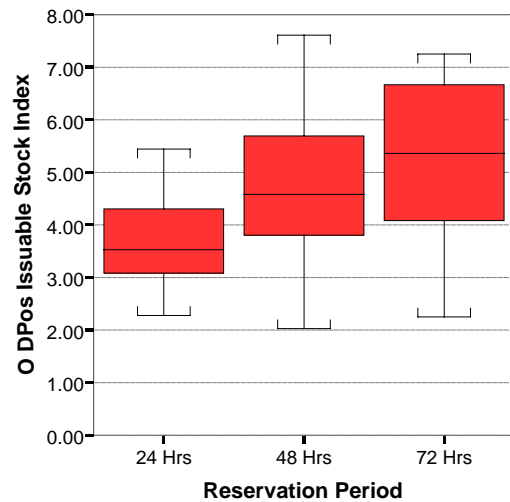


Fig. 2. Box plots of median O DPos ISI for each reservation period

No significant effect of reservation period is found on median O DNeg ISI ($p > 0.7$)

2. Does accounting for units to be returned to stock when placing red cell orders reduce variability of stock holding?

78.7% of respondents take into account stock return units when placing red cell orders.

A measure of the variability in stock levels was determined by calculating the standard deviation of the ISI for each hospital over the period 02/04/01 to 31/08/02. All blood groups were analysed to determine any differences in effect between the blood groups.

Fig. 3 shows that those respondents who do not account for units returning to stock when placing red cell orders appear to have less variance in O DPos stock level. This pattern is reflected for all blood groups.

Further analysis suggests that accounting for units returned to stock:

- has no significant effect on the variability of stock level ($p > 0.1$)
- leads to a lower median stock level (following analysis of median ISI as calculated in section 1)

This may influence the pattern observed in Fig. 3 in that lower stock levels will naturally have less variability.

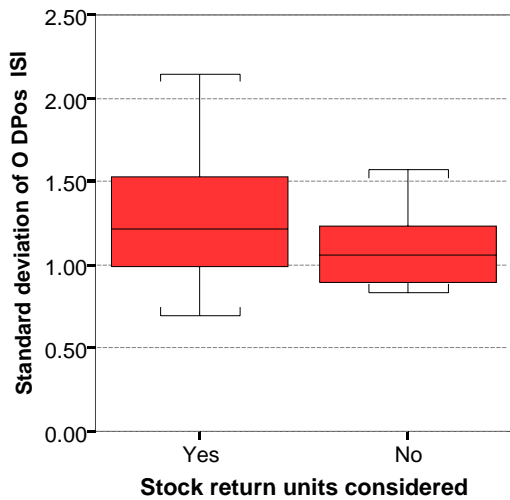


Fig. 3. Box plots of standard deviation of O DPos ISI

3. Does the person responsible for stock ordering influence the normal stock level and the variability of stock levels?

60% of respondents have a nominated individual who is responsible for assessing the number of red cells required each time an order is placed with the NBS. Fig. 4 shows that the majority (51.1%) of those responsible are BMS 1 and 35.6% are BMS 2.

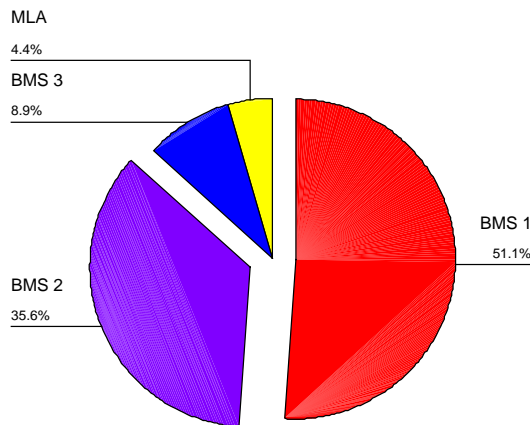


Fig. 4. Breakdown of grade of person responsible for routine blood orders

Analysis of the median ISI of all blood groups (as calculated in section 1) reveals some differences in the effect of responsibility for ordering on individual blood groups (table 2).

There is no strong significant effect for any blood group ($p < 0.05$). However, there is a wide range of significance: from O DNeg, B DNeg and AB DPos, where some indication of a relationship to the presence of an individual responsible for ordering is shown ($p \leq 0.1$), to A DNeg and AB DNeg which strongly indicate no relationship ($p > 0.6$).

Blood Group	Significance
O DPos	$p > 0.4$ not significant
O DNeg	$p = 0.1$ weak significance
A DPos	$p > 0.2$ no significance
A DNeg	$p > 0.8$ no significance
B DPos	$p < 0.1$ weak significance
B DNeg	$p > 0.6$ no significance
AB DPos	$p < 0.1$ weak significance
AB DNeg	$p > 0.7$ no significance

Table 2. Significance values for effect of responsibility for ordering on median ISI

Fig. 5 shows a slightly lower median O DNeg ISI for those respondents having a person responsible for ordering. This relationship is weakly significant ($p = 0.1$).

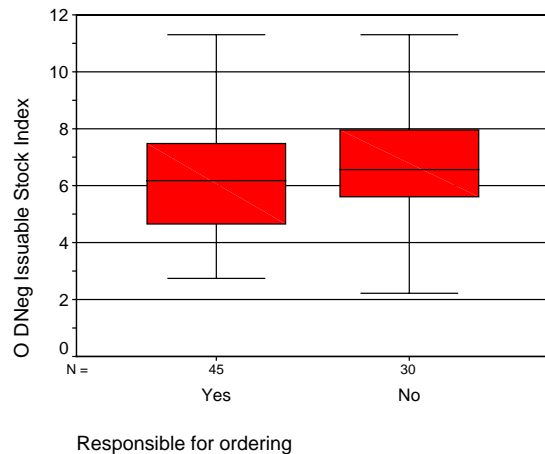


Fig. 5. Box plots of median O DNeg ISI

The relationship between O DNeg ISI and ordering responsibility is substantiated by analysis of the standard deviation of O DNeg ISI (as calculated in section 2) which reveals a significant relationship ($p < 0.05$)

4. Do Standard Operating Procedures (SOPs) reduce the stock holding level and variability?

72% of respondents had a documented SOP for placing red cell orders. Of those respondents that did not have a SOP, 81% had a benchmark stock level for each blood group. 4 respondents had neither a SOP nor a benchmark stock level.

Analysis of the relationship between having a SOP and the median ISI (as calculated in section 1) suggests a lower median ISI for those respondents without a SOP, although no significant relationship ($p < 0.8$) exists for any blood group.

However, analysis of the relationship between having an SOP and the standard deviation in ISI (as calculated in section 2) suggest a lower variability for those having an SOP ($p < 0.1$). This relationship holds for all blood groups except O DNeg, B DPos, and group AB units ($p > 0.2$).

Fig. 6 shows that the majority (61.1%) of SOPs were updated once a year or sooner. However, 25% of SOPs had no scheduled plan for update.

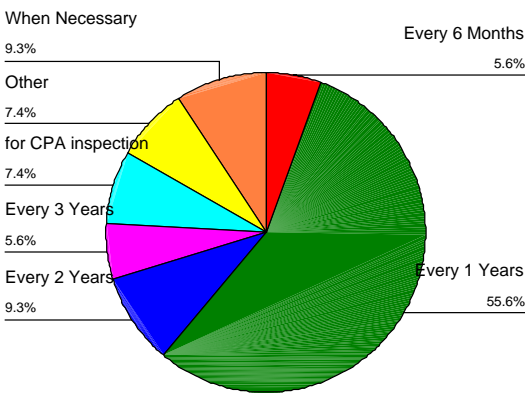


Fig. 6. Breakdown of how often the SOP is updated and reviewed.

Fig. 7 shows a slight increase in variability of O DPos ISI as the length of period review increases although there is no significant relationship between any of the groups. Analysis of the median O DPos ISI shows no relationship to review period.

The lowest variability and median O DPos ISI is for those SOPs that are updated 'when necessary'.

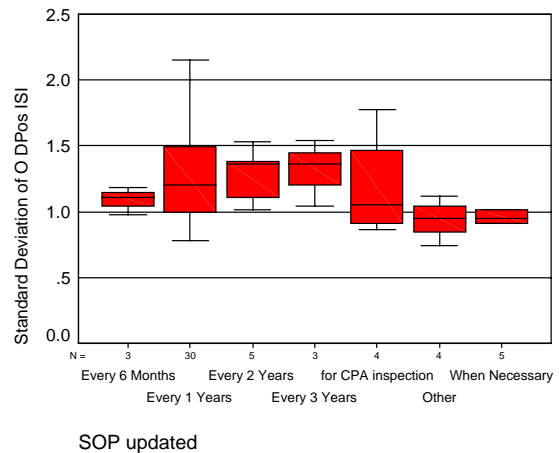


Fig. 7. Box plots of standard deviation of O DPos ISI against review period

Conclusions

1. Reservation period and stock holding

A 24-hour reservation period was associated with lower stock holding levels. It should be recognised however that it might not be possible for every hospital to lower their reservation period; local conditions such as the presence of off site facilities will inevitably influence practice

2. Accounting for units to be returned to stock

For O DPos accounting for units to be returned to stock when calculating the red cell order led to less variance in the stock level but did not have an impact on stock holding levels.

3. Personnel undertaking stock ordering

There was a lower O DNeg stock level for respondents that have a person responsible for ordering. Stock ordering responsibility may be associated with increased awareness of day to day crossmatch request patterns and lead to a more "intuitive feel" for red cell stock management.

4. Use and frequency of updating of SOPs for stock management

The presence of a SOP did not lead to reduced stock levels, but did lead to less variability in stock levels.

Updating the SOP when necessary led to the lowest variability and median ISI for O DPos. Updating the SOP when necessary will ensure that changes in practice in stock management or clinical practice are reflected in the SOP and help to create a dynamic document.