National Blood Strategy Implementation Group

Report to the Minister for Health and Children

Chairperson Dr. Orlaith O'Reilly - 2004

1.0 Introduction

In February 2001 the Board of the Irish Blood Transfusion Service proposed a policy in regard to vCJD in relation to the Irish blood supply. The Board (I.B.T.S.) proposed that donors who had resided in the U.K. for a period of 5 years or more in the years between 1980 and 1996 should be deferred from donating blood. A further deferral of all donors who had spent 1 year or more in the U.K. in those years was being considered. It was estimated that this would result in loss of 12% or more of donors and an accumulative risk exposure reduction of 85%.

In order to counter balance this reduction in blood donation the I.B.T.S. were to launch a campaign to replace lost donors and proposed that the Department of Health and Children establish an interagency group comprising hospital and Health Boards staff; the I.B.T.S and the Department of Health and Children to promote good practice and policy in relation to blood use.

In July 2001 the Minister for Health established the National Blood Strategy Implementation Group (NBSIG) to support the development of best practice with regard to blood utilization in hospitals and in particular to address the following issues;

- The impact of the I.B.T.S. donor deferral policies on blood supply.
- Improvements to blood stock management throughout the health services.
- The implementation of the guideline for transfusion of red blood cells in surgical patients, issued by the National Blood Users Group.
- The implementation of alternatives to allogeneic blood transfusion.
- The implementation of further guidelines to be issued by the National Blood Users Group.

The membership of the Group included a range of Consultant Medical Staff, Laboratory Staff and general management from Hospitals around the Country. The Group also included the Chief Executive of the I.B.T.S. and the National Medical Director of the I.B.T.S. as well as staff from the Blood Policy Division of the Department of Health, the Group was chaired by Dr. Orlaith O'Reilly, the Director of Public Health of the South Eastern Health Board. Details of membership are given in appendix 1.

The Group was formally established and had its first meeting in November 2001. The Group has since met on 9 occasions.

2.0 Structure of the report

This Report of the National Blood Strategy Implementation Group describes the establishment of the Group, presents the findings of the three studies commissioned, identifies the main issues to improve blood transfusion and makes recommendations on how they should be addressed.

3.0 Method of Working

In considering the terms of reference the Group identified that detailed information was required to clarify the current situation in hospitals throughout the Country concerning blood stock management, implementation of the red blood cell guidelines and the use of alternatives to allogeneic blood transfusion. It was also considered important that the barriers to implementing best practice in these areas would be identified. The Committee were conscious that it did not have executive functions, but needed to consider the structures that were needed to ensure ongoing implementation of good practice.

The Group identified three surveys to be carried out; a survey of blood stock management, a survey of blood utilization for 2001 and a national audit of perioperative red blood cell transfusion. Two sub-groups were formed to design the first two of these studies mentioned and Dr. Joan O Riordan of the I.B.T.S. was co-opted onto the Group to design the RBC audit study with the assistance of the Group.

Following the study design it was decided to commission an academic institution to carry out the field work, analysis and survey report write up. The Department of Public Health and Epidemiology at UCD was approached and the Blood Strategy Implementation Group commissioned them to carry out the studies on its behalf, using the I.B.T.S. as a contracting and host body. The study was funded by the Department of Health and Children.

Following the field work and initial data analysis by UCD, the National Blood Strategy Implementation Group met on a series of occasions with UCD to tease out the results, discuss the findings and edit the study report. Following the production of the study report, the N.B.S.I.G. formulated its own recommendations and final report.

3.1 Acknowledgments.

Without the generous co-operation of many busy laboratory staff, haemovigilance officers and haematologists in the seventy-one Irish hospitals this project would have been impossible. It is a tribute to their professionalism and enthusiasm that the fieldwork for these projects was so successful.

The members of the NBSIG would like to thank; Ms. Breda O Connor and Ms. Paula O'Reilly, of the Department of Health and Children and Ms. Janet Nolan of the South Eastern Health Board, for their assistance in compiling this report. We also thank the Project Team for their valuable work in undertaking this commission.

The Project Team would like to acknowledge; the members of the NBSIG, and the staff at IBTS, who were immensely helpful with good advice, helpful comments, critical reading of earlier drafts of this report, and many other valuable contributions. The team would also like to thank the staff at IBTS in Dublin and Cork for their generous assistance with securing blood product dispatch information. The team would particularly like to acknowledge the invaluable contribution of Ms. Geraldine Hayes, who very patiently handled much of the secretarial support for the project within IBTS.

The Project Team was Mr. Juzer Lotya, Department of Public Health Medicine and Epidemiology, UCD, Dr. Joan O Riordan, Irish Blood Transfusion Service and Dr. Anthony Staines, Department of Public Health Medicine and Epidemiology, UCD.

4.0 Report of the 3 Studies

Prepared by Dr. Anthony Staines, Mr. Juzer Lotya and Dr. Joan O'Riordan.

4.1 Introduction and Background

Establishment

The National Blood Strategy Implementation Group (NBSIG) decided that a number of linked studies on aspects of blood transfusion practice in Ireland were necessary. The questionnaire instruments were developed by the Strategy Group, assisted by the staff of the IBTS. The NBSIG then commissioned the Department of Public Health Medicine and Epidemiology at UCD to carry out these studies, with the assistance of the IBTS. The IBTS agreed to contract on behalf of the NBSIG for the service and to host the research staff.

There were three components to the project.

- A survey of Blood Stock Management practices in Irish hospitals, based on a postal questionnaire sent to the appropriate haematologist, senior laboratory technician/technologist or haemovigilance officers
- An audit of blood transfusion related to surgical procedures, carried out by the haemovigilance officers in each hospital
- A survey of blood utilisation for the year 2001 in Irish hospitals, based on a postal questionnaire sent to the appropriate haematologist, senior laboratory technician/technologist or haemovigilance officers.

4.2 Local Hospital Blood Bank Specific Blood Product Stock Management Dataset

Introduction

As part of the work of the NBSIG, it has defined a number of projects to enable it to achieve its goals. A Working Group to identify and facilitate best practices in the country in hospital blood bank blood stock management was been established, comprising:

- Moss McCormack - Chief Technologist, Midland Health Board
- William Murphy - National Blood Centre
- Tony Nolan - Blood Bank, Beaumont Hospital

This group designed the stock management study. The goal of this component of the project was to identify and document existing practices in the Republic of Ireland in blood stock management. This information will be of value both to the NBSIG and to individual centres.

Methods

All hospitals believed to perform transfusion in the Republic of Ireland were contacted. There were 71 of these. In each hospital the appropriate consultant haematologist, haemovigilance officers, and/or senior laboratory staff were contacted.

A significant minority of respondents were unable to complete the form, mainly because of limitations in hospital IT systems. The questions, which posed the greatest difficulty, were the use of blood by specialty, and the blood usage and outdating by blood group. In smaller hospitals it was possible to collate the answers to these questions by hand, but this was obviously out of the question in larger hospitals. Of the responses received for each question, all usable responses have been taken. This means that the number of answers differs from question to question.

Statistical methods

Many of the variables reported here have very skew distributions. For this reason it is usually more appropriate to report the median and inter-quartile range (IQR) (i.e. the 25th to 75th centiles) rather than the more familiar means and standard deviations. Robust linear regression is used for the regression analyses for the same reason. Statistical significance tests are conducted at 5% significance level.

Results

Response rates

Fifty-seven hospitals responded, reporting on 93,816 units of red cells transfused. Those, which did not reply, with one exception, were small hospitals, not expected to have significant transfusion requirements. Many hospitals were unable to complete the questionnaire, for the reasons described above. Throughout this report, analyses are based on those hospitals that were able to complete the respective sections of the questionnaire correctly. After consultation with the hospitals we believe that there are only 69 hospitals carrying out transfusions in Ireland.

Table 1 shows the number of hospitals answering each of the major sections of the questionnaire correctly, and the number of units of RBCs reported on for each section. IBTS dispatch records show that just over 124,000 units of blood were issued in 2001.

Staffing	47	85,289	91%
CT ratio (total)	49	92,739	99%
CT ratio (by specialty)	47	77,418	83%
Stock management	38	69,964	75%
Any part	51	93,816	100%
All parts	35	68,724	73%

Table 1: Response rates to each section of the questionnaire[#].

Classification and Activity

Irish hospitals are very diverse. It makes little sense to compare transfusion practices in, say specialist obstetric hospitals, with those in large general hospitals. For pragmatic reasons we have chosen to divide Irish general hospitals into two groups, based on their overall level of transfusion activity. We have defined large hospitals (10) as those transfusing over 3,000 units of red cells in 2001, and smaller hospitals (28) as those transfusing less than this amount. Private hospitals (12), and specialist hospitals (21), such as obstetric and orthopedic hospitals were classified separately. St. Vincent's Private Hospital and St. Vincent's University hospital provided a common report for this survey and are jointly classified as a 'large' hospital.

One hospital was unable to complete any part of the questionnaire fully.

For our purposes, large hospitals were: - Adelaide & Meath Hospitals inc. NCH, Tallaght; Beaumont Hospital, Dublin; Cork University Hospital, Wilton; Mater Misericordiae Hospital, Dublin; Mercy Hospital, Cork; Limerick Regional Hospital, Dooradoyle; St James's Hospital, Dublin; St Vincent's University/Private Hospitals, Dublin; University College Hospital, Galway; Waterford Regional Hospital, Waterford.

Small hospitals were: - Bantry General Hospital, Bantry; Cavan General Hospital, Lisdarn; Ennis General Hospital, Ennis; James Connolly Memorial Hospital, Blanchardstown; Letterkenny General Hospital, Letterkenny; Louth County Hospital, Dundalk; Mallow General Hospital, Mallow; Mayo General Hospital, Castlebar; Midland Regional Hospital at Mullingar, Mullingar; Midland Regional Hospital at Portlaoise, Portlaoise; Midland Regional Hospital at Tullamore, Tullamore; Monaghan General Hospital, Monaghan Town; Naas General Hospital, Naas; Nenagh General Hospital, Nenagh; Our Lady's Hospital, Cashel; Our Lady Of Lourdes Hospital, Drogheda; Our Lady's Hospital, Navan; Portiuncula Hospital, Ballinasloe; Roscommon County Hospital, Co. Roscommon; Sligo General Hospital, The Mall; South Infirmary / Victoria Hospital, Cork; St Colmcille's Hospital, Loughlinstown; St John's Hospital, Limerick; St Joseph's Hospital, Clonmel; St Luke's General Hospital, Kilkenny; St Michael's Hospital, Dun Laoghaire; Tralee General Hospital, Tralee; Wexford General Hospital, Wexford Town.

Table 2 shows the response rates for each section of the questionnaire for the large and small hospitals respectively

Section	Large hospitals (10)	Small hospitals (28)
Staffing	8	23
C:T ratio (total)	8	23
C:T ratio (by specialty)	6	22
Stock management	6	19
Any part	9	24
All parts	6	17

Table 2: Responses to the sections of the questionnaire by size of unit.

The 6 large centres with full information on stock management transfused 43% of the total units transfused in 2001. The median number of units transfused was 6,849 (IQR 5120 to 8,318). The 17 small centres with full information on stock management transfused 21% of the total units transfused in 2001. The median number of units transfused was 907 (IQR 628 to 1,288).

Staffing

We asked about staffing, covering consultant haematologists, and chief, senior and staff grade medical scientists. Some respondents gave us the total staffing of their laboratory service without distinguishing staff deployed on transfusion related duties. The figures presented here are for the 45 centres where the replies seemed possibly correct, taking into account the number of transfusions recorded.
The median number of staff allocated to transfusion duties (38 centres) was 2 (IQR 1 to 5). These staff worked for a median of 54.5 hours per week on transfusion related work (IQR 1 to 72).

In the large centres, the median number of staff was 7.5 (IQR 6.5 to 8.5) working a median of 74 hours weekly (IQR 4.5 to 75). In the small centres, the median number of staff allocated was 2 (IQR 1 to 2.5) working 11.5 hours weekly (IQR 1 to 70.5).

Consultant staffing varied greatly in the 29 centres with consultant access, with a range from 1 hour a week to 70 hours a week. In total 25 centres reported no access to consultant haematologists. The median number of hours (in the 18 centres that could give consultant staff working hours) was 10.5 hours (IQR 3.5 to 35), while the mean was 18.8 hours. Eight large centres had access to consultant haematologists, but only 5 of 28 smaller general hospitals had consultant grade staffing in their transfusion centres. For the large centres, the median number of hours of consultant staffing was 35 hours (IQR 31.5 to 35).

This part of the questionnaire caused especial problems for many centres as the laboratory staff found it hard to define exactly how many hours many people worked on transfusion related duties. Although considerable efforts have been made to improve the quality of the data presented here, it should be regarded with some caution, and viewed only as a general guide to staffing.

Cross-match to transfusion ratio

This is the number of units of red cells crossmatched divided by the number actually transfused to patients. Crossmatch to transfusion (C:T) ratios reflect both the extent of advance planning of transfusion, and the nature of the services provided. They can be affected by routine blood ordering schedules (The British Committee for Standards in Haematology Blood Transfusion Task Force 1990).

As a rough guide, the C:T ratio should be close to 1 for medical specialties, and between 1.5 and 2 for general and orthopedic surgery (Michiels, Bruining et al. 1985; Juma, Baraka et al. 1990). For obstetrics the C:T ratio would be expected to be higher (Atrah, Galea et al. 1995). Table 3 gives the main results for all of the specialties represented in the survey. Table 4 gives the C:T ratios for the three main specialty groupings, medical, surgical and obstetrics/gynaecology.

Specialty	Units of Red Cells			Mean (Overall)	C:T Ratio by hospital	
	Transfused	Crossmatched	N	C:T Ratio	Median	Weighted Mean
Medicine	15,486	21,369	35	1.4	1.4	1.4
Oncology	4,500	5,551	17	1.2	1.2	1.2
Haematology	6,354	7,761	11	1.2	1.2	1.2
Paediatrics	1,232	1,950	13	1.6	1.4	1.6
Gen Surgery	17,090	35,049	34	2.1	2.1	2.3
Paediatric Surgery	449	697	4	1.6	1.8	2.5
Ortho	8,242	21,251	22	2.6	2.5	2.6
Neurosurgery	503	1,871	2	3.7	2.8	14.4
Cardiac	5,088	11,918	12	2.3	1.5	1.9
ENT	728	1,551	12	2.1	1.9	2.4
Obstetrics	3,112	14,066	18	4.5	4.0	5.7
Gynaecology	1,180	2,817	15	2.4	2.3	2.6
A/E	6,549	12,589	15	1.9	2.0	2.1
Other	5,972	12,247	18	2.1	1.7	2.8
Total (Over all specialties)	**76,485**	**150,687**	**49**	**2.0**		

Table 3: Cross-match to transfusion ratios by specialty (N=49).

Speciality	Units of Red Cells		N	Mean C:T Ratio (Overall)	C:T Ratio by Hospital	
	Transfused	Cross-Matched			Median	Weighted mean
Surgical	39.978	84,929	39	2.1	2.1	2.2
Medical	27,755	36,631	38	1.3	1.3	1.3
Obstetrics /Gynaecology	4,292	16,885	26	3.9	2.7	4.5

Table 4: Cross-match to transfusion ratios by major specialty groups.

There is considerable variation in crossmatch to transfusion ratios between specialties and specialty groups. These results are broadly similar to expectations, although all the C:T ratios are perhaps higher than optimum levels.

Speciality Group	Type of unit	N	Units of Red Cells		Mean (Overall) C:T Ratio	C:T Ratio by Hospital			
			Trans-fused	Cross-matched		Median	25th centile	75th centile	Weighted Mean
Surgical	Large	7	20,533	44,470	2.2	2.4	2.0	2.6	2.7
	Small	22	13,671	28,540	2.1	2.0	1.7	2.2	2.0
Medical	Large	6	14,722	19,539	1.3	1.4	1.3	1.5	1.4
	Small	22	10,098	13,596	1.3	1.3	1.2	1.4	1.3
Total	Large	8	55,529	101,725	1.8	2.0	1.8	2.1	1.9
	Small	23	26,172	53,784	2.1	1.8	1.6	2.2	1.9
Total (over all hospitals)		49	92,739	175,299	1.9	1.9	1.6	2.2	1.9

Table 5: Range of C:T ratios by specialty and size of centre.

When smaller and larger hospitals were considered separately the range of C:T ratios are somewhat narrower, and surgical C:T ratios slightly lower in the smaller centres.

Stock management issues

Describing the stock held in each hospital poses some difficulties. Clearly reporting absolute stock levels provides very little information, and so we have chosen to report stock levels in terms of daily activity units. This is the mean number of units of red cells transfused each day in each centre.

There is a very considerable variation in activity between centres (Figure 1 and Table 6) - with a mean of 5.0 units per day for all Hospitals (N = 38, Total red cells transfused = 69,964), but a median of only 2.3 (IQR 1.5 to 4.7). The weighted ratio of daily red cells transfused in the Large, Small, Private and Specialist hospitals is approximately 16:8:3:1.

Hospital Group	N	Daily transfusion of red cells				
		Total	Mean	Median	25th centile	75th centile
Large	6	111.4	18.6	18.8	14.0	22.8
Small	19	55.5	2.9	2.5	1.7	3.5
Private	7	17.9	2.6	1.4	0.3	4.4
Specialist	6	6.8	1.1	1.3	0	2.0
All Hospitals	38	191.7	5.0	2.3	1.5	4.7

Table 6: Activity data, expressed as units of red cells transfused daily for centres by size.

There is a corresponding variation in the stock held in each hospital when this is expressed as the total number of days of activity for that hospital held (Figure 2, and Table 7). Large hospitals hold fewer days of stock than Small, Private and Specialist hospitals, although, in absolute terms they have far higher blood stocks.

Hospital Group	N	Stock held-days of transfusion activity			
		Mean	Median	25th centile	75th centile
Large	6	9.3	8.4	7.3	10.6
Small	19	17.0	15.1	12.3	22.5
Private	7	23.0	10.1	9.4	34.1
Specialist	3	11.3	10.7	1.5	21.8
All Hospitals	35	16.4	12.7	9.8	20.9

Table 7: Stock held in hospitals, expressed as the number of days of transfusion activity held in each centre, by size.

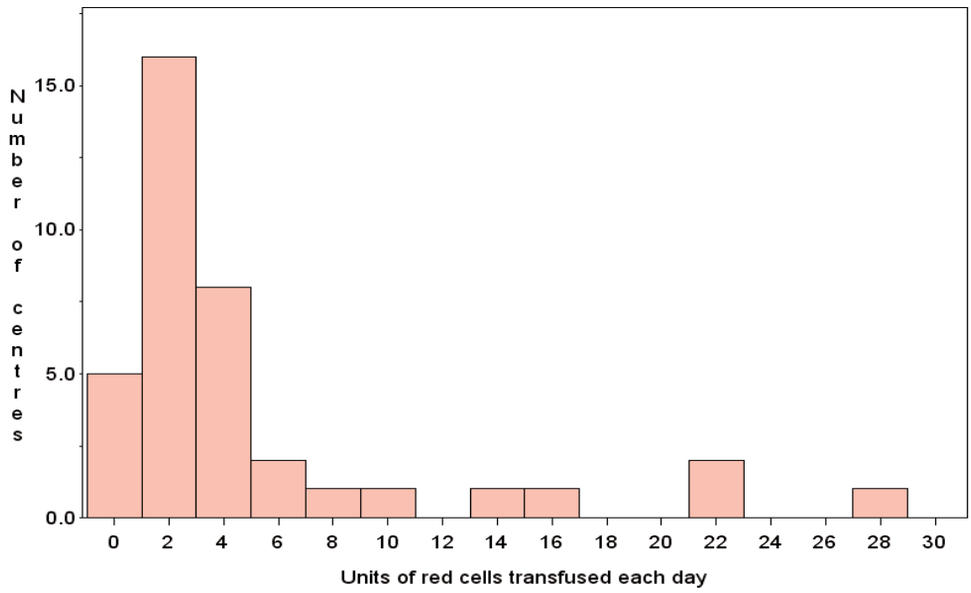


Figure 1: Histogram of daily transfusion level.

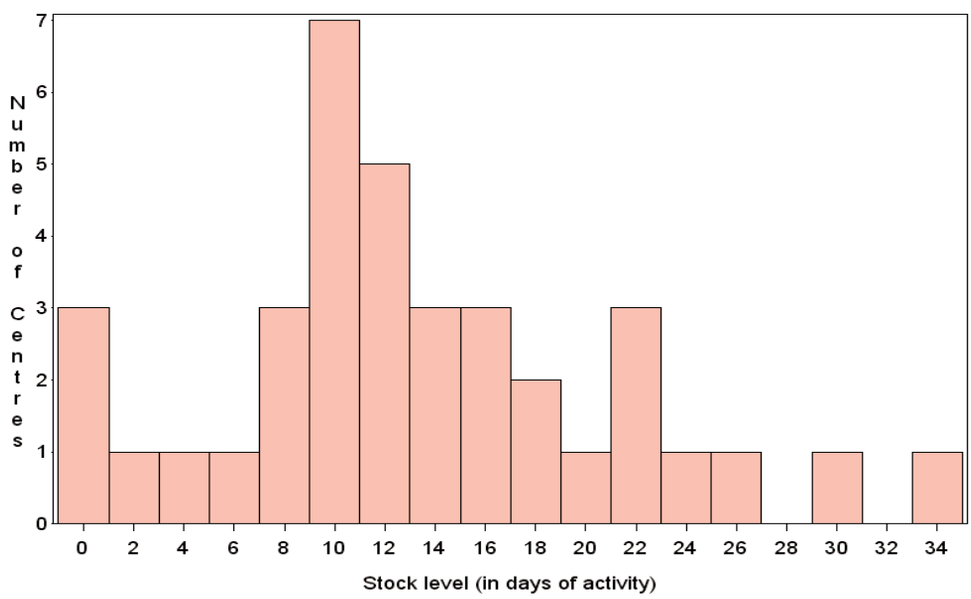


Figure 2: Histogram of stock levels expressed as the number of days of usual transfusion activity held in stock.

Use of O Rh negative blood

O Rhesus negative blood is a valuable resource for two reasons. First, it can be given to any recipient in an emergency, something that can be lifesaving. It is also uncommon, with only 8 % of the Irish population having group O Rh negative blood. These donors are asked to donate regularly, because demand for their blood is greater than demand for other blood types (Figure 3).

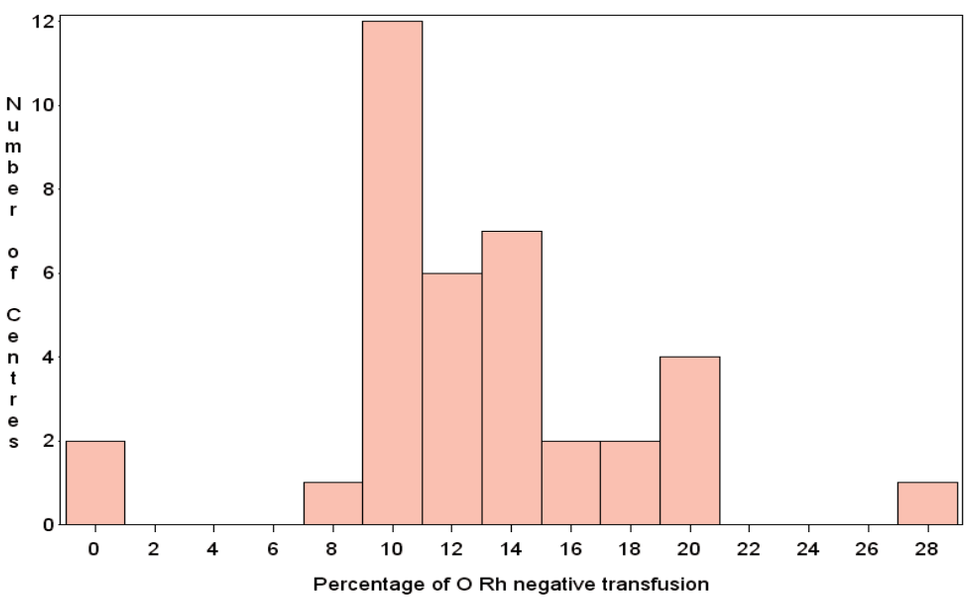


Figure 3: Histogram of the percentage of all transfusions consisting of O Rhesus negative blood.

In most centres, the proportion of O Rhesus negative transfusions is rather higher than the 8% of the population who have O Rhesus negative blood. The median proportion in the Large hospitals is 10.2% (Table 8), while in Small hospitals it is 14.3%. The median proportions in the Private and Specialist hospitals are 12.3% and 11.1% respectively.

There is no (practically or statistically) significant relationship between the percentages of O Rhesus negative blood transfused and distance from a blood centre, whether for all hospitals collectively nor for the individual groups.

There is a strong negative relationship (statistically significant, p=0.0045) between the percentage of O Rhesus negative blood transfused and the number of consultant haematologists present in the hospitals overall.

Hospital Group	N	Percentage of O Rhesus negative blood transfused			
		Mean	Median	25th centile	75th centile
Large	6	10.3	10.2	9.9	11.1
Small	19	14.9	14.3	10.6	17.1
Private	6	13.0	12.2	10.9	14.6
Specialist	4	12.9	11.1	9.4	16.3
All Hospitals	35	13.5	12.4	10.1	16.6

Table 8: The transfusion of O Rhesus negative blood transfused by hospitals, expressed as the median of the total red cells transfused in each centre, by size.

Distance from IBTS Centres

Irish hospitals are widely spread around the country, and Figure 4 shows the distance from each hospital to the nearer of the two IBTS centres in Cork and Dublin, plotted against transfusion activity. Three main groups of hospitals can be identified, a group close to the two centres, that is within twenty miles of one, an intermediate group between forty to ninety miles from the centres, and a remote group, more than 100 miles from the nearest centre.

Figure 5 shows the same data for the general hospitals only, distinguishing between larger and smaller hospitals. The more remote larger hospitals have lower levels of activity than those close to the IBTS centres (-370 units per ten miles of distance, p= 0.014). There is no particular relationship between activity and distance for the smaller general hospitals.

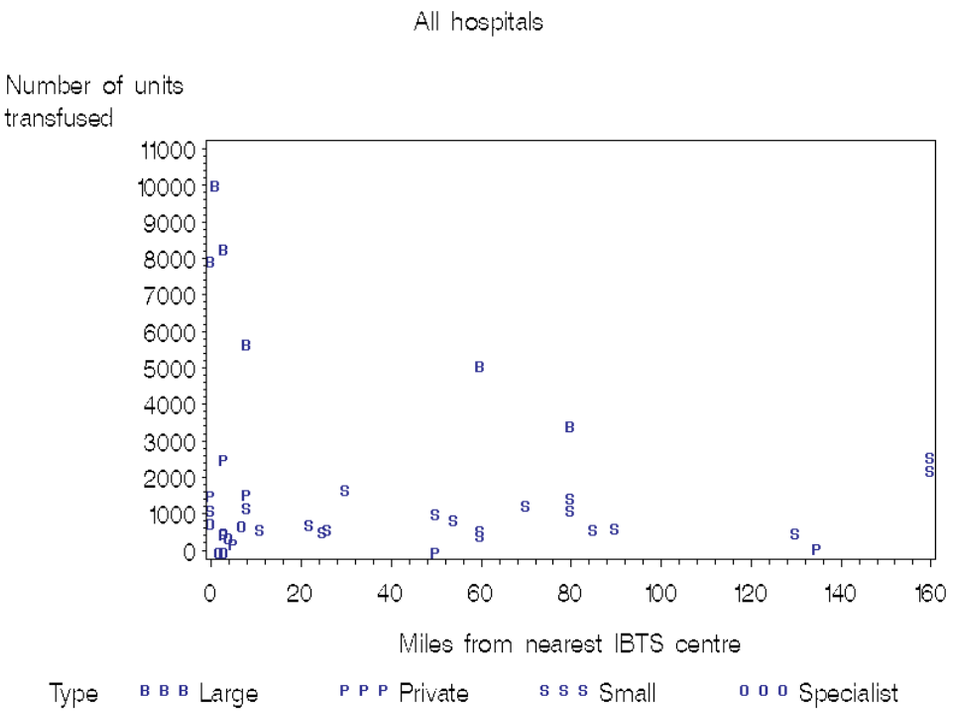


Figure 4: Annual number of units transfused plotted against distance from the nearer of the two IBTS centres for all hospitals.

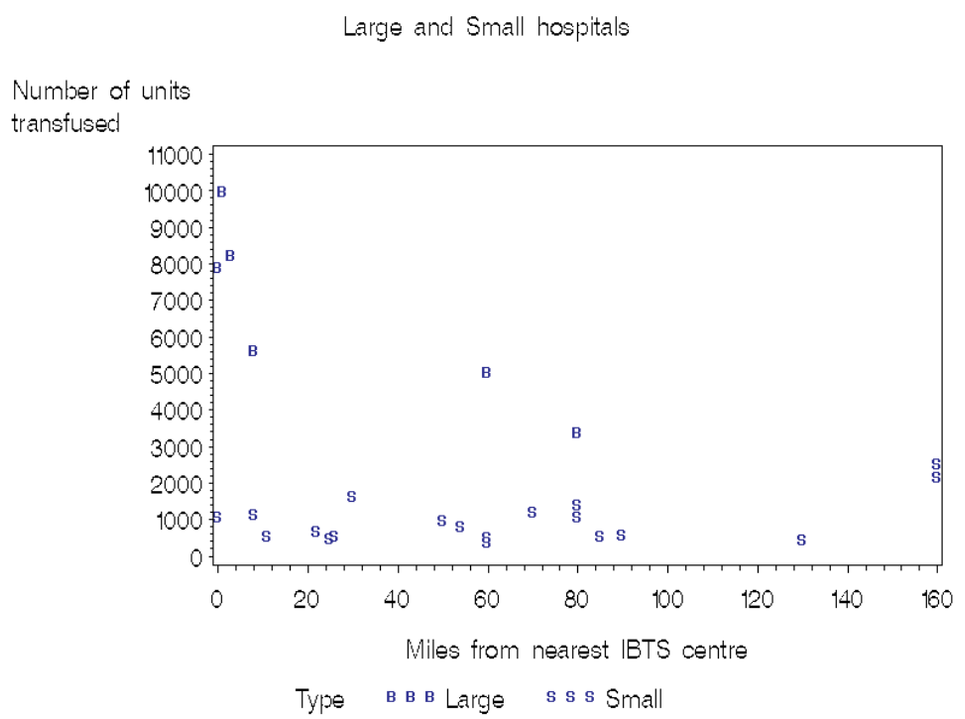


Figure 5: Activity, measured as total number of units of red cells transfused in 2001 plotted against the distance from each of the general hospitals to the nearer of the two IBTS centres in Dublin and Cork.

Stock level variations

Hospitals further from the centres hold higher stocks of red cells. This is true for all types of hospitals. There is a strong positive (at 5% significance level) relationship between the daily stock levels of red cells held in all hospitals and the distance to the nearest IBTS centre[JL1] ($p<0.001$). Further, there is a positive relationship between the daily stock levels of red cells held by Large hospitals and the distance to the nearest IBTS centre[JL2] ($p=0.0331$).

There is a strong negative relationship between the daily stock levels of red cells held in all hospitals and the Large hospitals and the overall level of transfusion activity in these hospitals ($p<0.001$[JL3]) and ($p=0.0376$) respectively, whilst no such (statistically significant) relationship exists for the other hospital groups. (These are based on weighted linear regression analyses, with the total annual number of transfusions in each centre used as weights).

The relationship between the daily stock levels of red cells held in each hospital and the distance to the nearest IBTS and their overall level of transfusion activity is illustrated in Figure 6 to 11. [One centre with very low activity, held over 80 days worth of stock, and is omitted from these graphs for clarity].

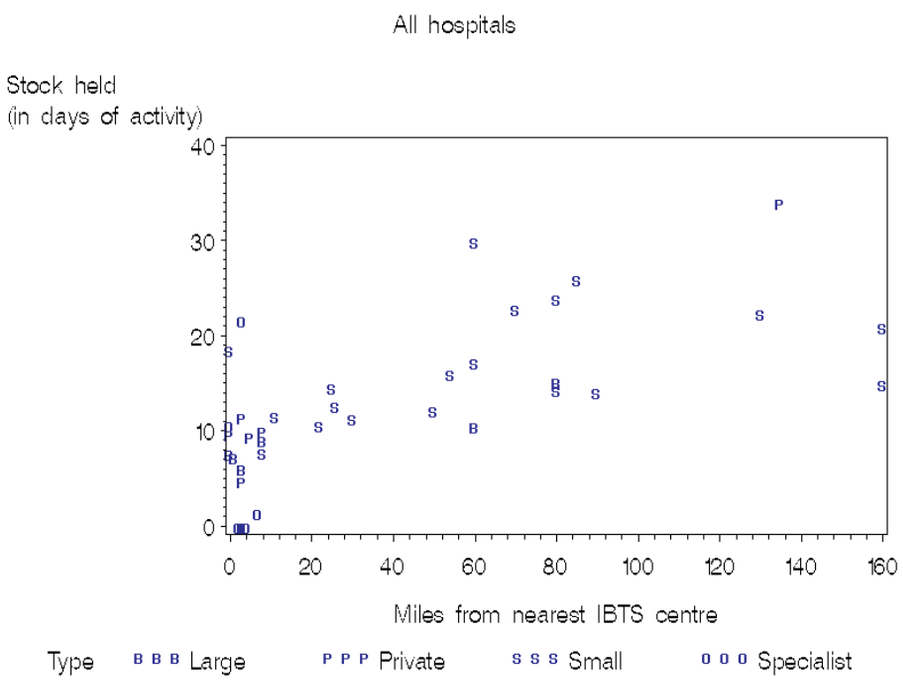


Figure 6: Stock held, in units of daily activity plotted against distance from the nearest IBTS centre for all hospitals.

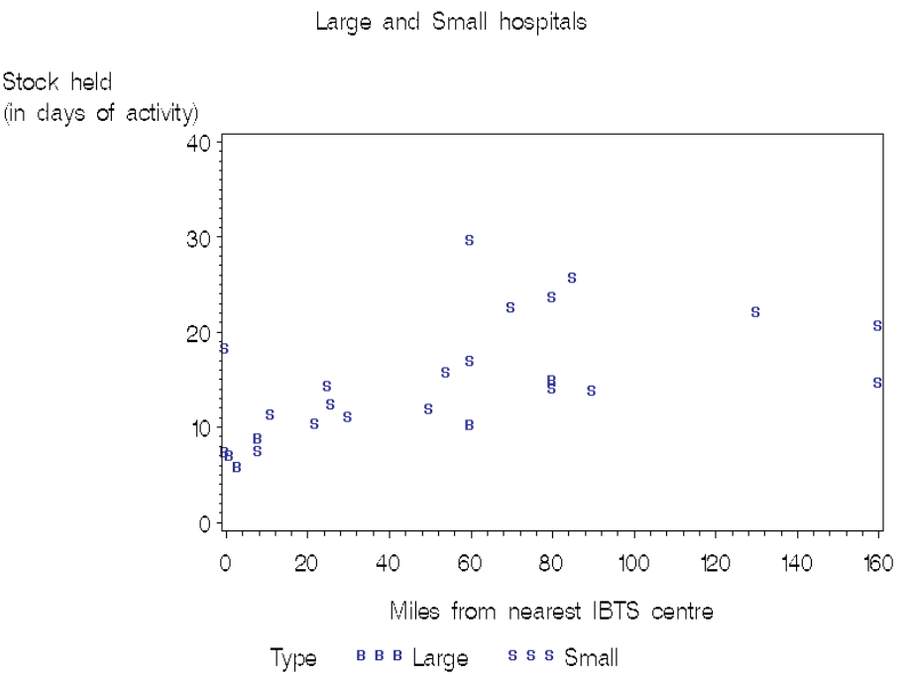


Figure 7: Stock held, in units of daily activity plotted against distance from the nearest IBTS centre for general hospitals only.

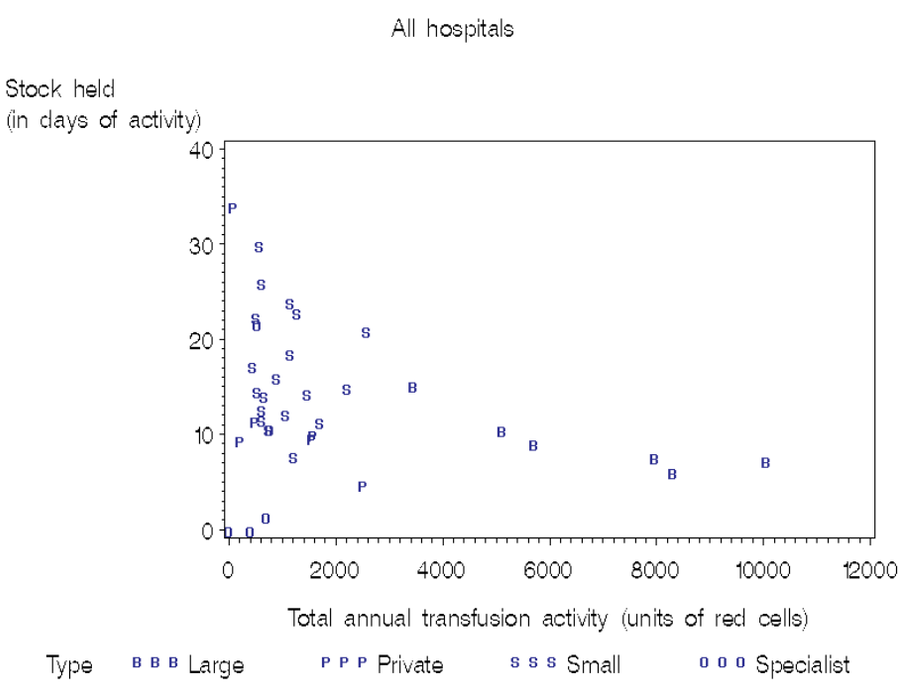


Figure 8: Stock held, in units of daily activity plotted against total number of units of red cells transfused in 2001.

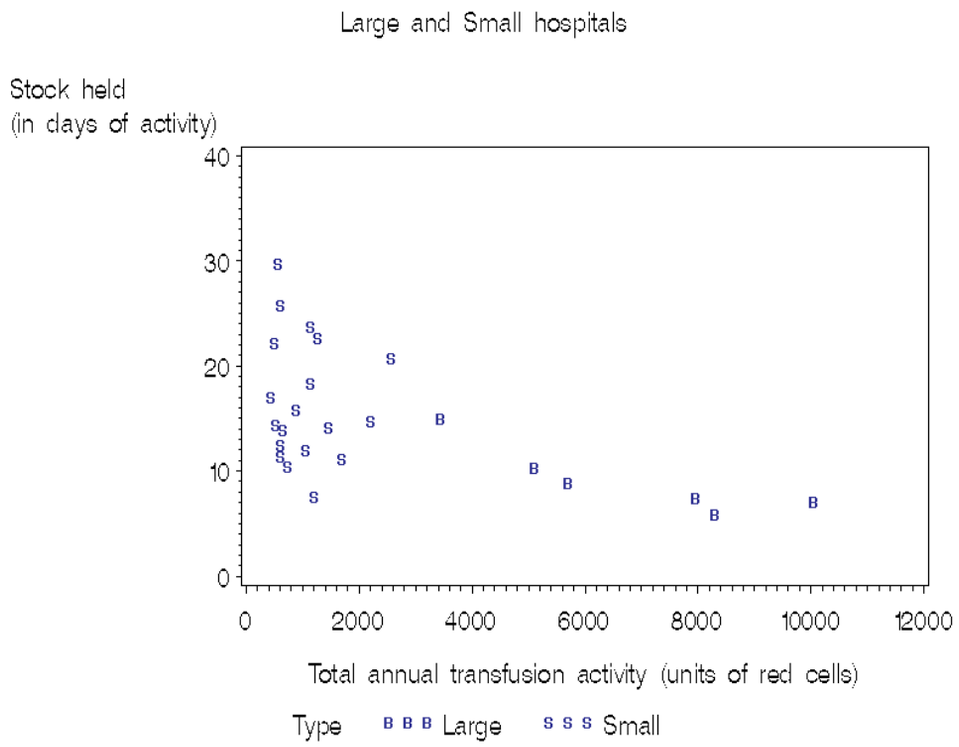


Figure 9: Stock held, in units of daily activity plotted against total number of units of red cells transfused in 2001 for general hospitals.

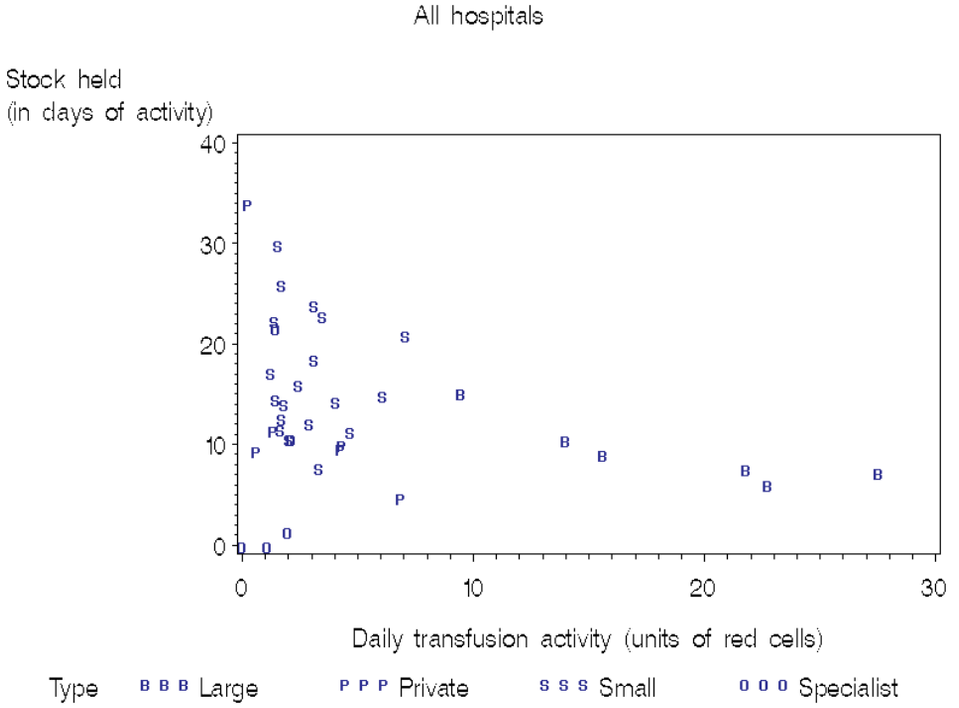


Figure 10: Stock held, in units of daily activity plotted against daily number of units of red cells transfused in 2001 for all hospitals.

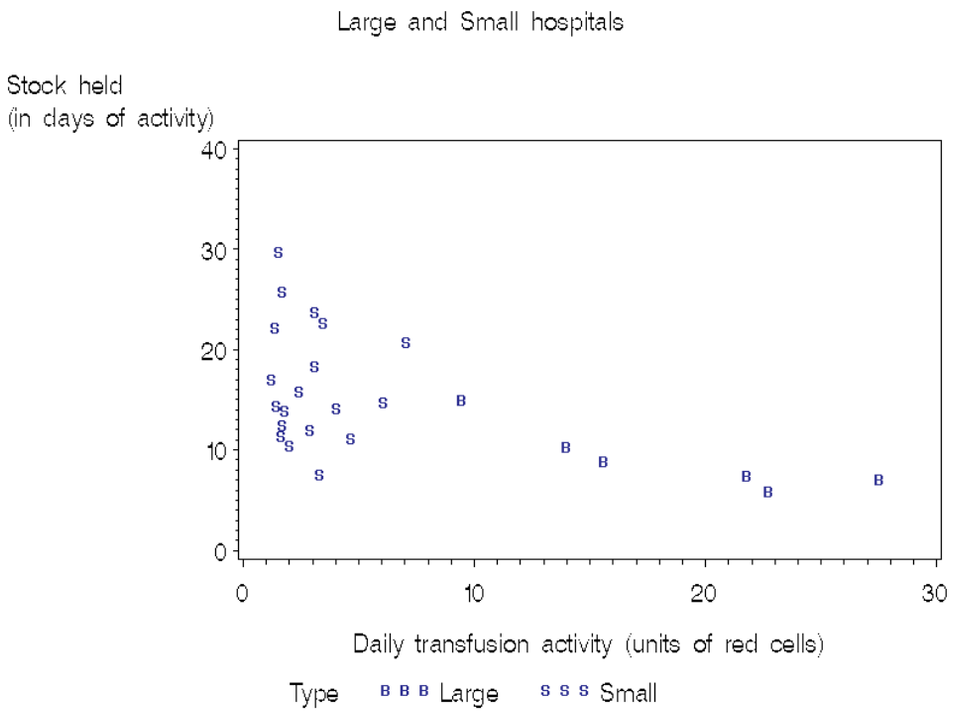


Figure 11: Stock held, in units of daily activity plotted against daily number of units of red cells transfused in 2001 for general hospitals only.

Large hospitals hold an average 7.7 days less stock than smaller centres. However, when distance is taken into account, large centres hold 5.9 days less stock than small centres. Considering centre size, for every 10 miles increased distance from a blood centre, the average stock levels held rise by 0.9 days worth of blood.

Outdate rates

The 'outdate rate' is used here as a measure of blood wastage, for blood dispatched from the two transfusion centres in Dublin and Cork. Hospitals were asked to report units either wasted or outdated.

Outdated units are those, which have not been transfused when their safe storage time was exceeded. This is largely a function of demand for blood, and hospital blood bank stocking procedures (Feng and Ng 1991). Outdating is expected to be higher for the less common blood groups, in smaller hospitals and in hospitals remote from transfusion centres.

Wastage refers to units which have been cross matched and then sent out from the blood bank for a particular patient, and not given to that patient for some reason.

Typical reasons include keeping the unit out of a fridge for too long, mechanical damage to a unit, and various transfusion errors.

The outdate rate is here defined as the number of units wasted or outdated divided by the total number of units transfused plus the number of units wasted or outdated. Outdate rates below 2 % can probably be achieved in most larger hospitals (Novis, Renner et al. 2002)(Murphy W pers. comm.).

There is a wide range of outdate rates observed amongst Irish hospitals, as shown in Table 9. Larger hospitals have a much smaller range of outdate rates than smaller hospitals. Overall 6,544 units were reported as outdated out of 69,730 transfusions from 37 hospitals for which full information was provided, giving an overall national outdate rate of 10.7%.

Hospital Group	N	Percentage Outdate rate			
		Mean	Median	25thcentile	75thcentile
Large	7	9.1	3.6	2.7	8.6
Small	18	14.8	15.4	8.8	22.3
Private	7	20.8	13.7	6.2	21.9
Specialist	4	13.2	11.7	6.3	20.2
All hospitals	36	14.7	13.0	3.6	21.4

Table 9: Outdate rates (percentages) reported by Irish hospital centre size.

There is a positive relationship between the outdate rate of red cell units in each centre and both the level of stock held, and the distance from each hospital to the nearest IBTS centre. Further analyses suggest that the outdate rate is significantly influenced by, the level of stock held and by the distance to the nearest blood centre ($p=0.0009$) for all hospitals and ($p=0.02$) for Large hospitals. The total annual number of transfusions in each centre was used to weight the observations, in regression analyses, as a measure of the size of the hospital.

Within the Small hospitals there is rather weaker evidence ($p=0.07$) of such a relationship, and the very considerable variation in outdate rates amongst this group is not fully explained.

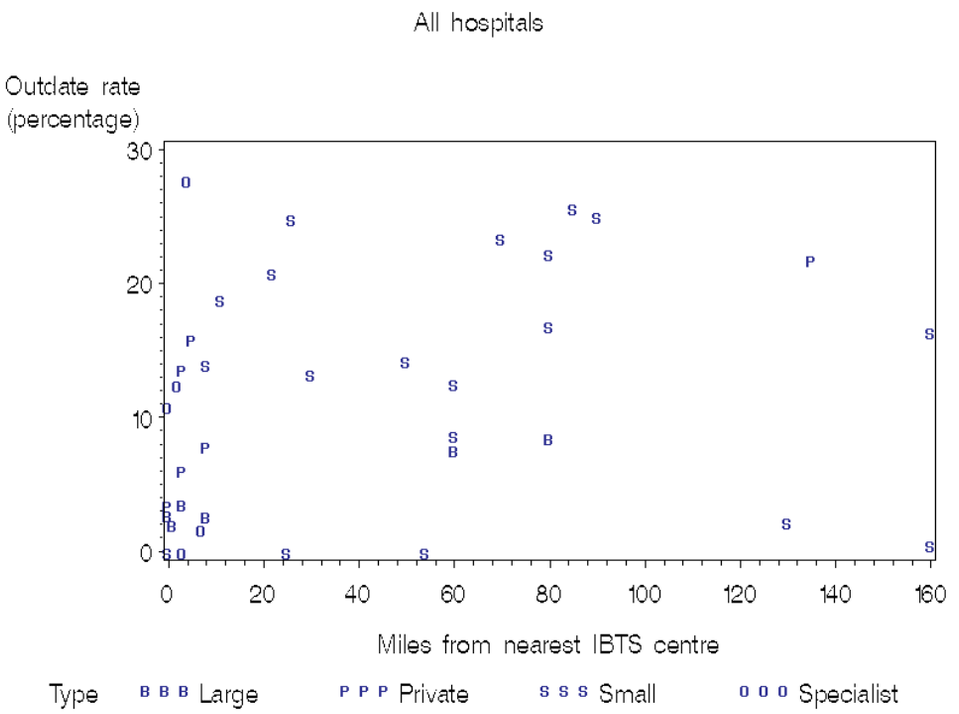


Figure 12: Outdate rate plotted against the distance to the nearest IBTS centre.

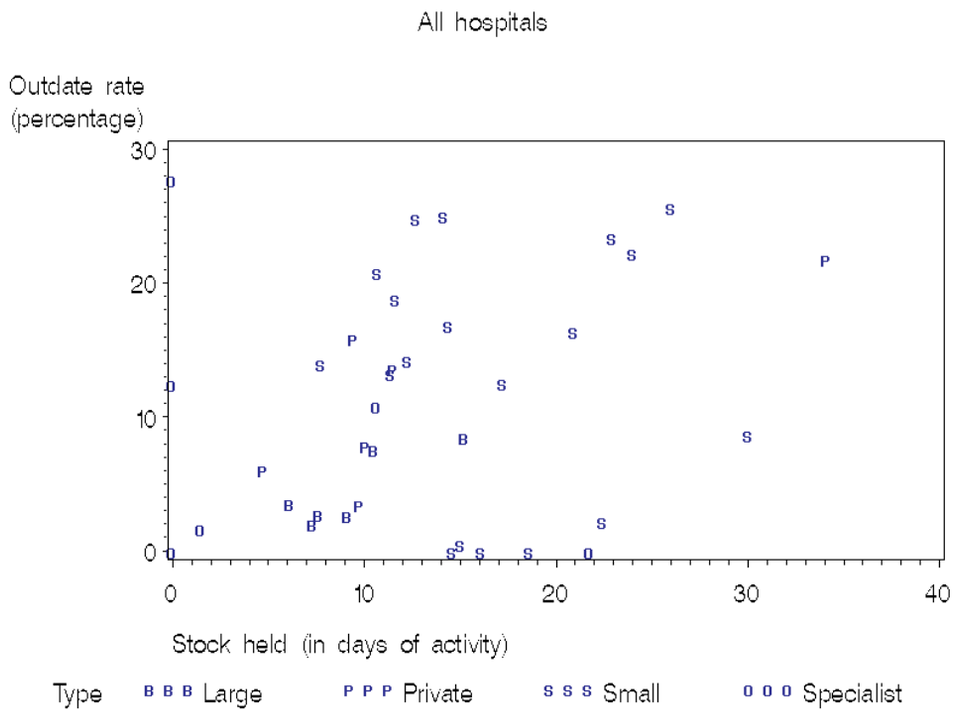


Figure 13: Outdate rate plotted against stock held in each hospital.

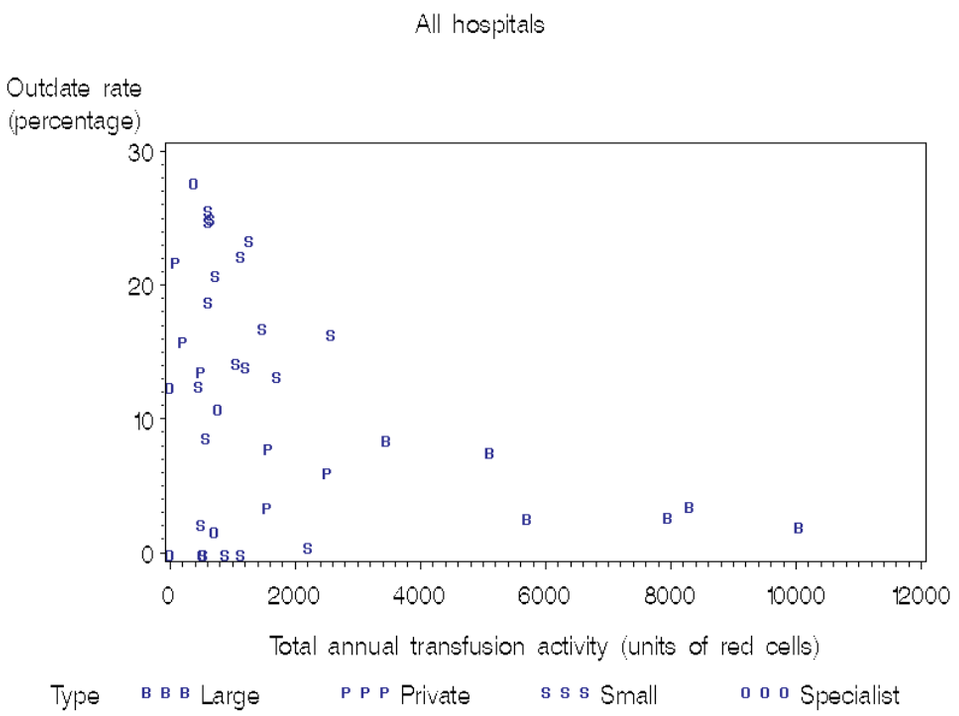


Figure 14: Outdate rate plotted against total transfusion activity

Transfusion data by group

Demand (and supply) for most blood groups are in approximate equilibrium, as the demand arises from the same population, with the same blood group distribution as the supply. As discussed earlier demand for O Rhesus negative blood is higher than that for other types. However, stock management for the less common blood types poses certain challenges, as is clearly shown in Table 9 and 11.

Group	RCC transfused (units)	(% of total transfused)	Stock (units)	(% of total stock)	Stock (days)
O+	34,655	48.1%	1,079	39.1%	11.4
O-	8,273	11.5%	415	15.0%	18.3
A+	17,621	24.4%	682	24.7%	14.1
A-	3,902	5.4%	198	7.2%	18.5
B+	5,256	7.3%	200	7.2%	13.9
B-	1,280	1.8%	83	3.0%	23.7
AB+	848	1.2%	59	2.1%	25.4
AB-	260	0.4%	46	1.7%	64.6
Total	72,095	100.0%	2762	100.0%	14.0

Table 10: Blood transfusion and stock levels for Irish hospitals (N=48) by blood group.

Table 10 shows the relationship between transfusion demand (expressed as units transfused) and stock levels, both as total units held, and as the mean number of days supply of each blood group held by Irish hospitals.

O Rh positive blood, the commonest type, is under-represented in the stock by comparison with its use while O Rh negative is over-represented. This is presumably due to the high turnover of group O positive blood. The rarer blood groups, B -ve and AB (-ve and +ve) are also relatively over-represented in the stock. Again this is related to the difficulty of stock management of rare blood groups

Blood Group	Units RCC Transfused		Units RCC Wasted or Outdated		Outdate rate
	N	%	N	%	
O+	33,109	48.0%	1,409	22.9%	4.1%
O-	7,858	11.4%	876	14.2%	10.0%
A+	16,864	24.4%	1,474	24.0%	8.0%
A-	3,767	5.5%	576	9.4%	13.3%
B+	5,160	7.5%	909	14.8%	15.0%
B-	1,239	1.8%	251	4.1%	16.8%
AB+	830	1.2%	436	7.1%	34.4%
AB-	252	0.4%	217	3.5%	46.3%
Total	69,013	100.0	6,148	100.0%	8.2%

Table 11: Blood transfusion and wastage or outdating for Irish hospitals (N=36) by blood group.

The pattern of wastage or outdating by blood group, shown in Table 11, is also interesting. Wastage at 8.2 percent is high, and the wastage of O positive blood in particular seems unacceptably high. Wastage or outdating of 10 percent of the O negative blood also seems very high. Higher wastage of the rarer blood groups is probably inevitable with any stock management system, but considerably lower levels of outdating are possible overall. Table 12 gives more details of the pattern of wastage/outdate rate -

Group	Category of hospital				All
	Large	Small	Private	Specialist	
O +	1.8%	8.0%	4.1%	8.5%	4.1%
O -	4.6%	16.6%	11.4%	10.8%	10.0%
A +	3.1%	18.4%	6.3%	13.3%	8.0%
A -	6.4%	24.9%	10.9%	9.6%	13.3%
B +	11.0%	20.2%	23.1%	23.4%	15.0%
B -	12.6%	30.2%	9.4%	16.0%	16.8%
AB +	31.2%	41.2%	32.7%	46.6%	34.4%
AB -	45.1%	51.7%	42.9%	22.2%	46.3%
All groups	4.5%	14.9%	7.7%	12.2%	8.2%
(N)	*(7)*	*(18)*	*(7)*	*(4)*	*(36)*

Table 12: Wastage and outdating of red cells by type of facility and blood group, expressed as the percentage of the total supply not transfused.

While the smaller hospitals have much higher outdate rates than the larger facilities, they account for a smaller proportion of the total transfusion activity, but a disproportionate share of the outdating and wastage (Table 13). Just over 55% of all outdating occurs in hospitals giving only 28% of all blood transfused.

Hospital Group	N	Units outdated or wasted	Units transfused	Outdate rate	% of total transfusions	% of total outdating or wastage
Large	7	1,947	41,170	4.5%	59.4%	31.7%
Small	18	3,390	19,639	14.5%	28.3%	55.1%
Private	7	544	6,547	7.7%	9.4%	8.8%
Specialist	4	267	1,927	12.2%	2.8%	4.3%
All hospitals	36	6,148	69,283	8.2%	100.0%	100.0%

Table 13: Activity levels, and outdate rates for the major groups of hospitals.

Conclusions

Cross-match to transfusion ratios across this sample of Irish hospitals are generally around 2.0 which is similar to results found in studies from other countries, although perhaps higher than desirable. Overall outdating at hospital level is 8.2%, which is higher than desirable levels (Novis, Renner et al. 2002).

Outdate rates vary greatly between different hospitals, and with more remote hospitals. This remains true even when the size of the hospitals is considered. That is, there is great variation in outdate rates within the group of large hospitals and the group of small hospitals. There are very high outdate rates in smaller hospitals, and once hospital size is included distance of a hospital from one of the two blood centres has little additional impact.

Only one hospital specified the use of a formal stock management system. The most common response to the question we posed on methods of stock management was either 'experience' or rule of thumb. There is reasonable evidence that stock management techniques, of the kind now commonly used for perishable goods, can significantly improve stock management, and reduce costly wastage.

4.3 National Audit Day of Peri-operative Red Blood Cell (RBC) Transfusion

Introduction

This is the second study commissioned by the NBSIG. The study instrument was mainly designed by Dr. O'Riordan, and it was carried out by UCD, with assistance from IBTS staff. This study was co-ordinated by a committee chaired by Ms. Mary Bedding, TSO, Cavan. The other members of the committee were :-

- Dr. William Murphy, National Medical Director, IBTS,
- Dr. Joan O'Riordan, Consultant Haematologist, IBTS

The National Blood Users Group was established by the Minister for Health & Children in 1999 for the purpose of preparing and disseminating guidelines for the use of blood products in Ireland.

The objective of this study was to determine the level of compliance with the 'Guideline For Transfusion of Red Blood Cells in Surgical Patients' issued by the National Blood Users Group in January 2001(National Blood Users Group 2001). The Guidelines state :-

"Use of red blood cell transfusion in surgical patients must be based on clear expectation of benefit, based on the best available evidence. Transfusing patients with allogeneic blood exposes them to risks such as infection, adverse immunological or other morbid events. The full extent of such risk cannot currently be defined. In particular, the possibility that variant CJD (vCJD) may be spread by transfusion cannot be discounted at present time. In addition, recent and ongoing studies into transfusion in surgical patients indicate an association between transfusion of red cells and adverse immunomodulatory and cardiorespiratory outcomes that requires further investigation. In this current state of knowledge, all orders for transfusion of red cells must be carefully assessed for appropriate indication and dose."

The Summary in the Guideline stated (National Blood Users Group 2001): -

- The only indication for red blood transfusion is to increase the oxygen carrying capacity to improve tissue oxygen delivery.

- No single criterion can be identified as a 'trigger for transfusion' because there is no readily available indicator of critical tissue oxygenation.

- A transfusion is **rarely indicated** for Hb > 9g/dl and is almost **always indicated** for Hb< 6g/dl (particularly when the anaemia is acute).

- Transfusion should be considered on a unit-by-unit basis. **For many patients, a transfusion of a single unit may suffice.**

- The specific reasons for transfusion should be documented in the patient's medical records.

- Transfusions must only be **prescribed by appropriately trained medical practitioners.**

The Sanguis Study, conducted 10 years ago, involving 6 commonly performed elective surgical procedures in 43 teaching hospitals in 10 European countries was the first and only European survey of Perioperative transfusion practice (The Sanguis Study Group 1994). The study showed widespread variation in Perioperative transfusion practice between countries and in different institutions within countries and among different clinicians within institutions.

The discharge haematocrit i.e. that Hct or Hb recorded after all transfusions had been given has become a primary standard against which perioperative transfusion practice may be audited. In the Sanguis Study the discharge Hct, occurring at a median of 5-7 days after surgery, was > 33% in 43-64% of the patients transfused. The reasons for perioperative red cell transfusion were stated in the patient's medical record for only 23% of patients in the Sanguis Study(The Sanguis Study Group 1994).

Methods

Each of the 64 acute hospitals that are supplied with blood by the Irish Blood Transfusion Service (IBTS) was contacted in advance of the audit day. The 58 Haemoviligance Officers in these hospitals were invited to attend a one-day training session prior to the audit.

The hospitals were asked to complete a one-page audit form for each patient transfused within 48 hours (pre or post) of a surgical procedure on the Audit day, Wednesday, June 19th, 2002.

The latest post-operative Hb rather than the discharge Hb was used as an outcome measure of appropriateness of Perioperative transfusion in this study because of delays in discharging patients inherent in the Irish healthcare system. A transfusion episode was defined as a transfusion occurring in a 24-hour period.

Statistical Methods

All data was entered on a Microsoft Access database and statistical analysis performed using SPSS and SAS. The presentation of results is by percentages and frequency as appropriate. The boxplots display the median and interquartile range (IQR) as well as identifying outlying variables. Histograms and density plots (effectively smoothed histograms) are used to show the distributions of some of the key variables.

Results

Sixty-four hospitals were targeted in the audit and the response rate was 100%. Twenty-four hospitals (38%) had transfusions to report. There were 67 transfusion episodes involving 201 units of RBCs transfused to 51 patients.

The mean number of units crossmatched was 4.7 (3.5), median 4 (IQR 2 to 6). The mean number of units transfused was 3.2 (2.7), median 2 (IQR 2 to 4) and the mean crossmatch to transfusion ratio was 1.7 (0.9), median 1.5 (IQR 1 to 2). Figures 15, 16 and 17 show the respective histograms and density plots. Figures 16 and 17 indicate the marked preference for ordering and transfusing even numbers of units of blood.

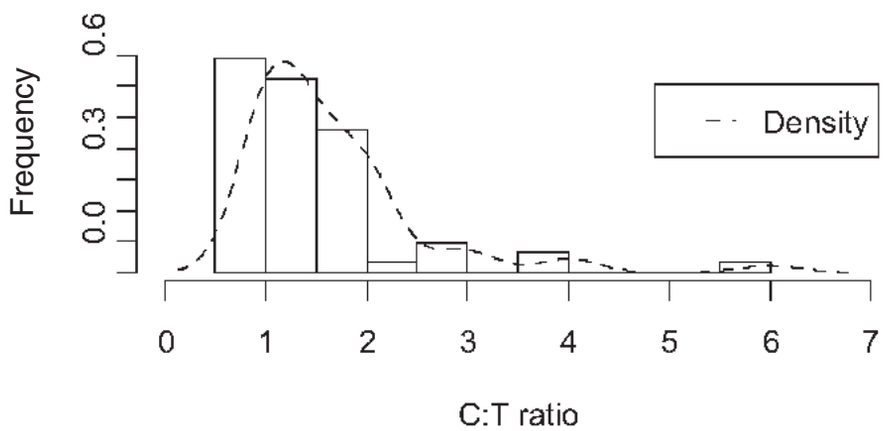


Figure 15: Histogram and superimposed density plot of crossmatch to transfusion ratios for audited transfusion episodes.

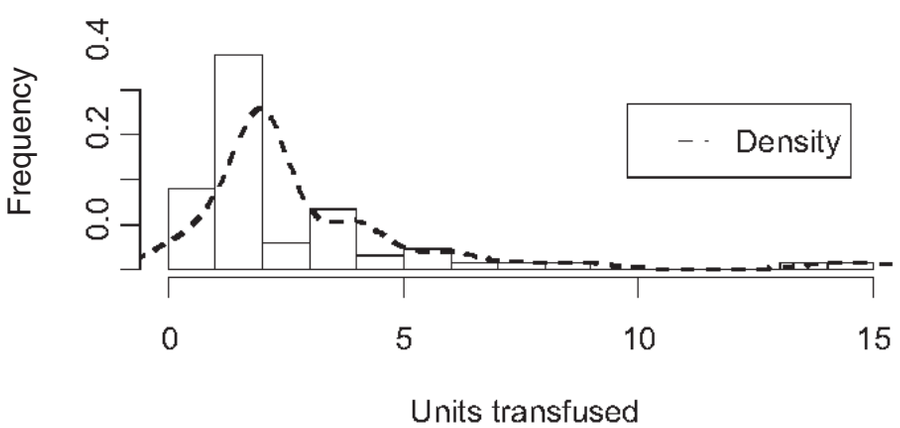


Figure 16: Histogram and superimposed density plot of the number of units of red cells transfused in each episode for audited transfusion episodes.

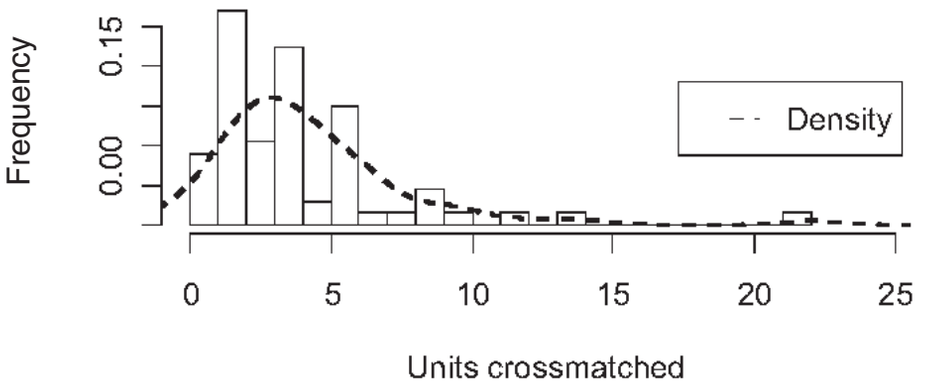


Figure 17: Histogram and superimposed density plot of the number of units of red cells crossmatched in each episode for audited transfusion episodes.

Demographics of recipients

The male to female ratio was 27:23. The median age of all recipients was 68 years (IQR 54 to 77, range 6 days-94 yrs), for male recipients was 61 years (IQR 48 to 71), and for female recipients was 75 years (IQR 61 to 82) (Figure 18 and 19).

The operative procedures involved were; orthopedic surgery (25%), cardiovascular surgery (25%), G I surgery (22%) and other cancer surgery (10%). There were four (8%) gastro-intestinal haemorrhages. Two patients received transplants, one a liver transplant, and one a combined kidney and pancreas transplant. There was one case of major trauma in the audit.

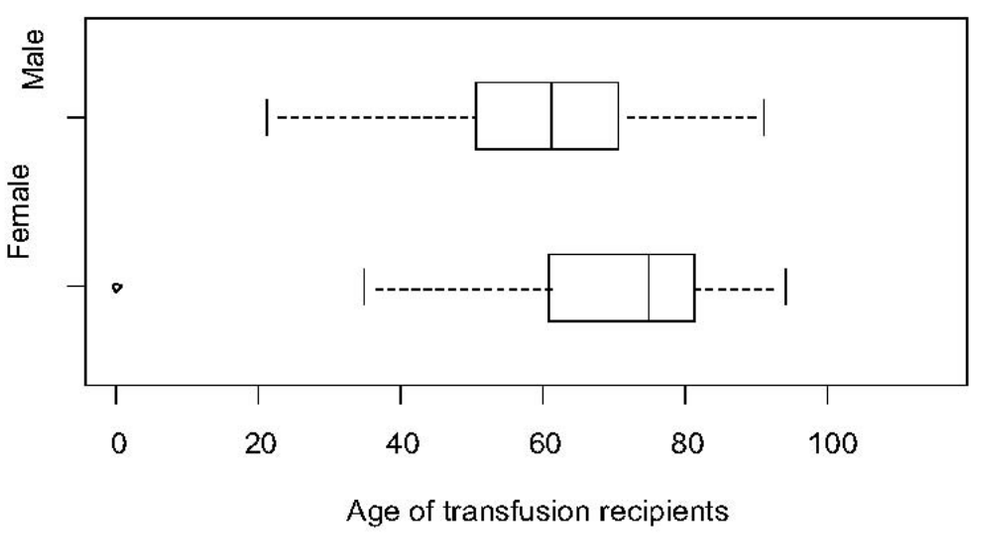


Figure 18: Boxplots showing the distribution of ages of transfusion recipients by gender.

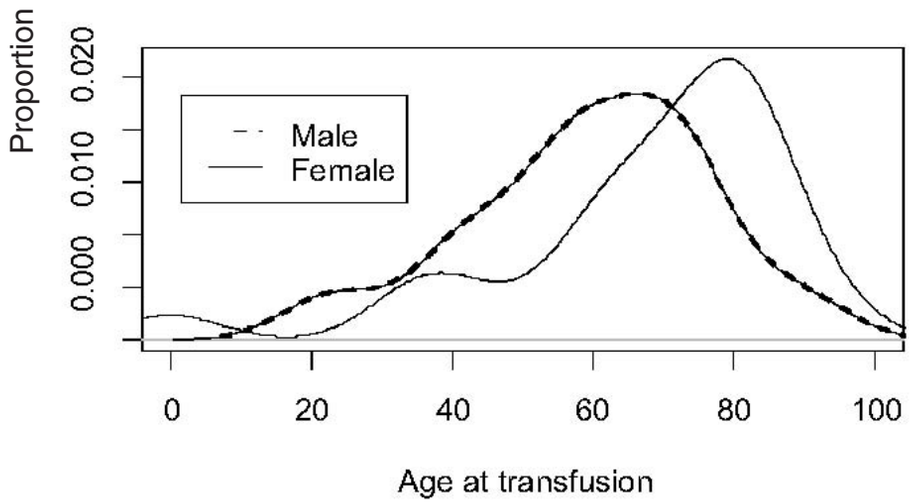
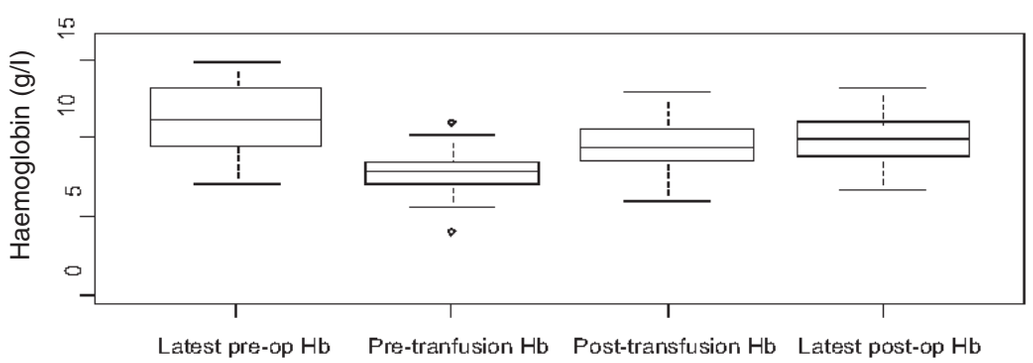


Figure 19: Separate density plots showing the age distribution of male and female transfusion recipients.

Laboratory measurements

The mean (sd) values of haemoglobin across the 67 transfusion episodes for each of the following categories were : - Pre-operative Hb 10.9 (2.4) g/dl; Pre-transfusion Hb 7.6 (1.2) g/dl; Post transfusion (within 48 hrs) 9.4 (1.4) g/dl; Latest post-operative Hb 9.9 (1.4) g/dl. Figure 20 shows boxplots for all transfusions showing the different levels of haemoglobin recorded at these four key times. Figures 21 and 22 show the distribution of pre-transfusion haemoglobins and latest post-operative haemoglobin respectively.

The last recorded post-operative Hb, taken at a median of 6 days (IQR 2-8) after the transfusion episode, was 9.6 g/dl (IQR 8.6 to10.7). It was over 11g/dl for 13 (19%) of the transfusion episodes and the median Hb in these 13 episodes was



11.6g/dl.

Figure 20: Boxplots showing haemoglobin levels at four stages during the transfusion audit for all transfusion episodes.

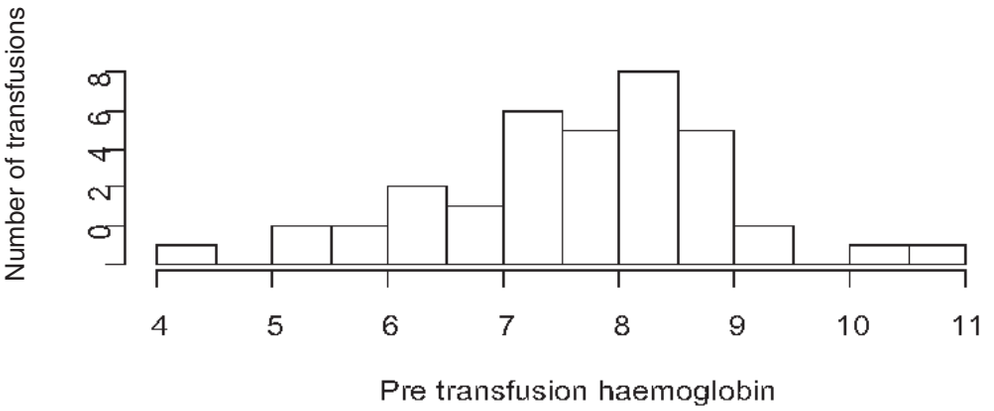


Figure 21: Histogram showing haemoglobin levels before each transfusion episode.

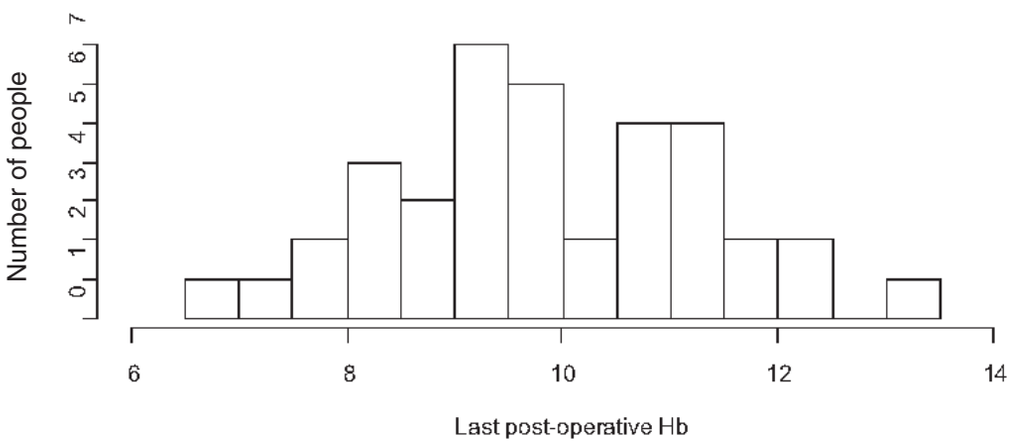


Figure 22: Histogram of final recorded haemoglobin levels for each person.

Urgent vs. non-urgent transfusions

A single unit of RBCs was transfused in only 12 % (n=8) of the transfusion episodes. 31% of the transfusions were classified, as emergency and 61% was deemed non-urgent. There were two massive transfusions; one for trauma and one for a GI haemorrhage involving 14 and 15 units of RBCs respectively.

The pre-transfusion Hb for the 41 non-urgent transfusions was recorded for 26 patients, the mean being 7.7 g/dl (1.1) and the median 7.6 g/dl (IQR 7.1, 8.3). The latest-recorded post-op Hb was recorded for all 41 patients and the mean was 9.7 g/dl (1.3) and the median 9.6 g/dl (IQR 8.6,10.5). The median number of units transfused was 2 (IQR 2,2).

The pre-transfusion Hb for the emergency transfusions was recorded in 19 out of the 21 transfusions; the mean Hb was 7.6 g/dl (1.4), median 8 g/dl (IQR 6.5,8.6). The latest recorded-post-op Hb was recorded for all 21 patients and the mean was 9.7 g/dl (1.7), median 9.5 g/dl (IQR 8.3,11.5). The median number of units transfused this was 4.5 (IQR 2,6).

Where the post-operative Hb was greater than 10 g/dl, the overall mean for the twenty patients was 11.3 (0.8), median 11.3 (IQR 10.6,12.0). For the six emergencies, the mean was 11.6 (0.6), median 11.8 (IQR 11.2, 12.1). For the ten non-emergencies, the mean was 11.2 (0.9), median 11.1 (IQR 10.5, 11.8). Four transfusions were not classified.

Where the pre-transfusion Hb was greater than 9 g/dl and transfusion was done; the overall mean for the four transfusions was 10.0 (0.8), median 9.9 (IQR 9.2, 10.8). The one emergency transfusion had Hb of 10.2 g/dl. The two non-emergencies had Hb of 9.1g/dl and 11.0 g/dl. The one non-classified had Hb of 9.5 g/dl.

Autologous blood was used in 11 of 67 transfusion episodes (16%): pre-operative autologous donation in 2, intra-operative cell salvage in 8, post-op salvage in 1; no allogeneic blood was used in 4 patients.

Clinical decision making and documentation

The decision to transfuse was made by a consultant anaesthetist for 22 (33%) transfusion episodes, by a consultant surgeon/physician in 9 (13%) and by non-consultant hospital doctors in 24 (36%) instances. For 11 (16%) of the transfusion episodes it was unclear who ordered the transfusion. A written order for the transfusion was available for 47 (70%) instances, but in 20 (30%) it was not recorded or not supplied. The reason for the transfusion was documented for 38 transfusions and was implied for a further 10 but was unrecorded or not supplied for 19 (28%).

Conclusions

This snapshot of Perioperative transfusion practice has not identified a large area of inappropriate use of blood in this elderly transfused population, whether judged by the latest post-operative or the immediate pre-transfusion haemoglobin levels. However it is at least questionable if all of the transfusions were really necessary. There is a limited evidence base for blood transfusion, making clinical decisions in

this area more subjective than is perhaps necessary.

Certainly some transfusions take place on questionable grounds. There is little reason for ever electively transfusing someone with a haemoglobin of over 8 g/dl, (See Figure 21) and too many patients had post-transfusion haemoglobins so high as to suggest that there was not an adherence to guidelines. (Figure 22) (Mallett, Peachey et al. 2000; National Blood Users Group 2001; The British Committee for Standards in Haematology Blood Transfusion Task Force 2001). It is particularly striking that most patients get an even number of units of blood, usually 2 units, but sometime 4 or 6 units (Figure 16), this is evidence that guidelines in relation to single unit prescribing are not being followed. (Mallett, Peachey et al. 2000; National Blood Users Group 2001; Regan and Taylor 2002).

The main findings about patients are confirmation that transfusion recipients are an elderly group, with the female participants in the audit significantly older than the males. Many of these patients have multiple cause of illness. While the distribution of surgical procedures is not unexpected, it should be remembered that this reflects surgical activity on one day of the week. Had we chosen another day as the centre of the audit, the pattern of surgical practice might have been very different. The audit has revealed a higher use (12%) of intra-operatively salvaged blood than hitherto thought. This maybe specific to the actual day audited and the particular specialty surgery carried out on that day.

The audit does highlight deficiencies in minimum standards for documentation: where a written order and a documented reason for the transfusion could not be found for 30-28 % of the transfusion episodes respectively.

It should be emphasised that our study is a limited snapshot of Irish transfusion practice. It may serve as a useful resource for people undertaking audit within individual institutions; perhaps helping to put the individual audit results in perspective.

4.4 Blood Utilisation Survey for the Year 2001

Introduction

This is the third of three related surveys commissioned by the National Blood Strategy Implementation Group . The study instrument was designed by a sub-group of the committee comprising :-

- Ms. Mary Bedding, TSO, Cavan
- Dr. Catherine Motherway, Consultant Anaesthetist, Limerick.
- Mr Donal Murphy, Chief Technologist, St. Vincent's University Hospital,
- Dr. Grainne Flannelly, Consultant Obstetrician, National Maternity Hospital
- Dr. Tom Hogan, Consultant Anaesthetist, James Connolly Memorial Hospital
- Dr. Joan O'Riordan, Consultant Haematologist, IBTS

UCD was commissioned to carry out the study with the assistance of IBTS. The primary goal of this study was to document the utilisation of blood products in the Republic of Ireland over a single year.

Methods

All 69 acute hospitals known to perform transfusion in the Republic of Ireland were contacted. In each hospital the questionnaires were sent to, the appropriate consultant haematologist, haemovigilance officers, and/or senior laboratory staff. There were followed up with two written reminders and phone calls.

The questionnaire consisted of six parts. The parts were:

- General activities
- Allogeneic blood components usage
- Autologous transfusion activities
- Neonatal transfusion activities
- Demographics
- Group O Rh negative red blood cell usage

A feedback document that corresponded to the questionnaire, requesting the documentation of respondents' difficulties in completion of the questionnaire, was also sent to all hospitals. The replies received to this have been used to illustrate areas of this report.

Results

Responses were received from 61 (88.4%) hospitals. Those which did not reply, with one exception, were small hospitals, not expected to have significant transfusion requirements.

A significant minority of respondents were unable to complete the form, mainly because of limitations in hospital IT systems. The questions, which posed the greatest difficulty, were the use of blood by specialty, and the blood usage and outdating by blood group. Of the responses received for each question, all usable responses have been taken. This means that the number of answers differs from question to question.

General Activities

Patients Admitted in 2001

The total number of Inpatients admitted in 56 (91.8%) of the hospitals was 558,844 with median (range): 7,906 (293 to 26,000), mean (sd): 9,979 (6,973).

The total number of Day Cases admitted in 52 (85.2%) of the hospitals was 369,095 with median (range): 825 (390 to 43,534), mean (sd): 7,098 (8,097).

Consultants and Bed Capacity by Specialty

Information on the numbers of consultants (whole time equivalents, WTE) and beds over twenty specialties is summarised in Table 14. However, due to overlap of consultants between hospitals, it was not possible to analyses this consistently. Hence, further study is required.

We defined a Surgical group of specialties consisting of Paediatric surgery, General surgery, Orthopaedics, Neurosurgery, Genitourinary surgery, Cardiothoracic surgery, Vascular surgery and Plastic surgery (including burns). Paediatrics includes Paediatric Oncology and Haematology, but excludes Paediatric surgery. Oncology and Haematology excludes Paediatric Oncology and Haematology.

Specialty	Number of Hospitals	Number of Consultants (WTE)	Number of Hospitals	Number of Beds
Surgery	47	489.3	34	2,998
Medicine	40	215.3	29	2,345
Other	28	344.3	24	1,279
Obstetrics & Gynaecology	37	162.5	24	1,164
Paediatrics	26	65.6	20	590
ICU	2	3.0	24	155
ENT	22	64.7	9	151
Oncology	20	36.1	8	103
A & E	18	32.0	4	39
Haematology	19	28.7	3	34
Anaesthetics	42	386.4	4	20
Total		1,827.9		8,878

Table 14: Distribution of Consultants and Beds by Specialty in 2001.

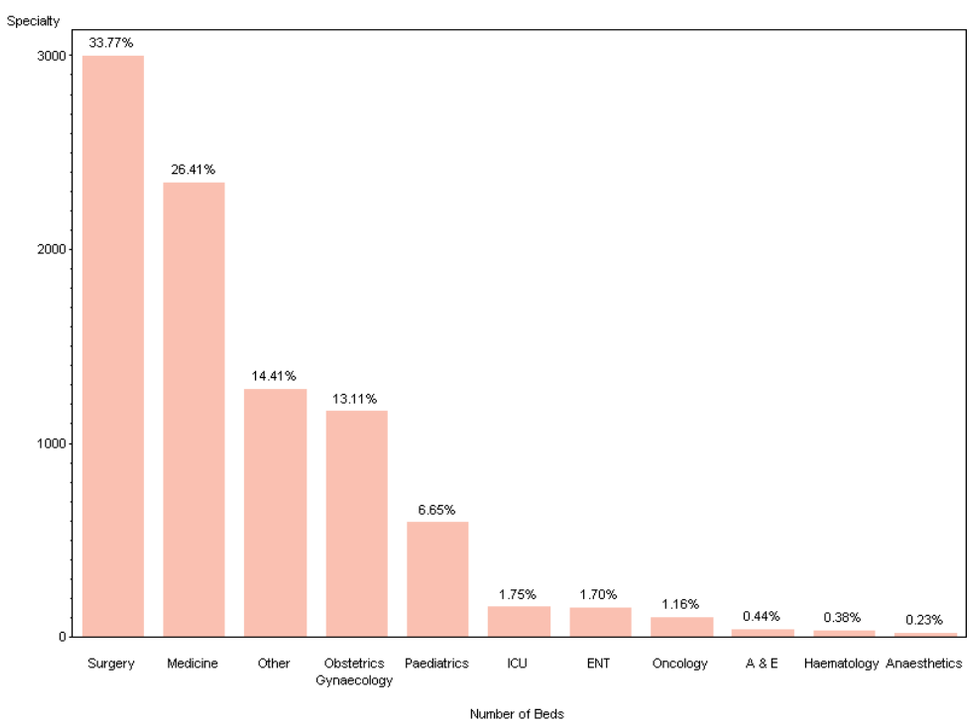


Figure 23: Distribution of beds (number and percentage of total) by specialty in 2001.

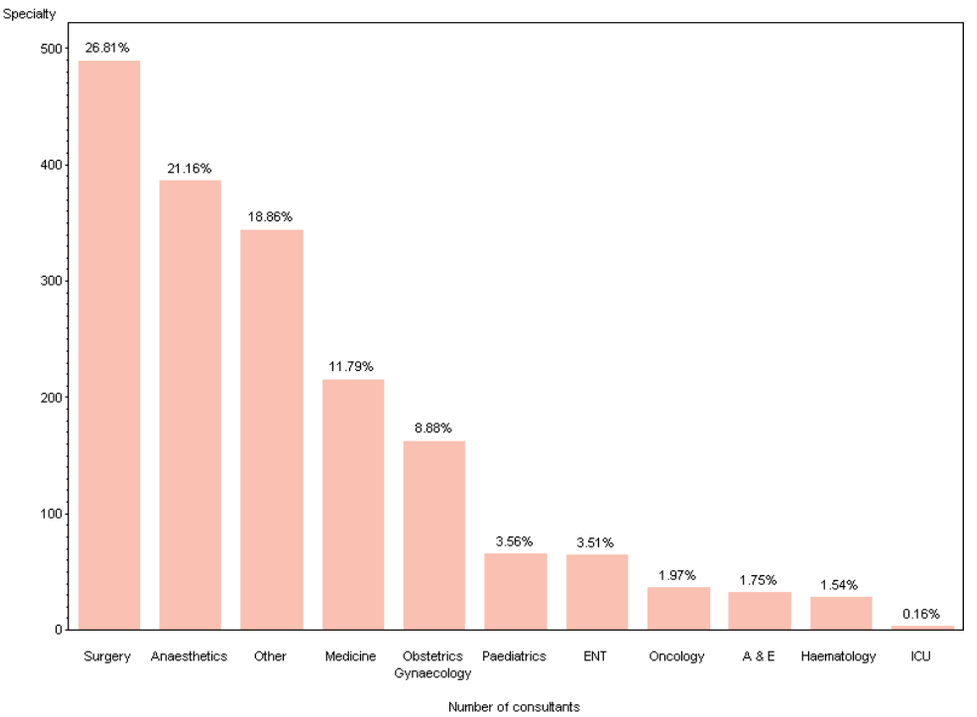


Figure 24: Distribution of Consultants expressed as whole time equivalents, number and percentages by Specialty in 2001.

Transfusion Related Activities

A computer for blood bank/transfusion service activities was used by 51 hospitals (83.6%). In only 23 hospitals (37.7%) were these computers linked to the Hospital Administration System. Crossmatching and compatibility testing was performed by 48 hospitals (78.7%). There was a maximum surgical blood ordering schedule (MSBOS) in 45 hospitals (73.8%). Labelling of blood and components from allogeneic and /or autologous donors was carried out by 50 hospitals (82.0%).

A hospital transfusion service was provided for another hospital by 18 hospitals (29.5%). Further, 10 hospitals, 1 hospital, 2 hospitals, 1 hospital provided the service, respectively to 1, 2, 3 or 4, and 5 other hospital/hospitals.

Therapeutic apheresis services were provided by 17 hospitals (27.9%), however only 3 hospitals (4.9%) prepared components from whole blood or did apheresis collection.

Collection, processing or storage facilities for bone marrow transplantation were provided by 5 hospitals (8.2%). The same facilities for peripheral blood progenitor cells were provided by 9 hospitals (14.8%). Infectious disease testing of donors (bone marrow/autologous) was performed at 5 hospitals (8.2%).

Transfusion Related Management Activities

There were arrangements for moving blood in 35 hospitals (57.4%). There were 28.7 whole time equivalent (WTE) Consultant Haematologists in 19 hospitals (31.1%). There were 52.2 WTE Transfusion Surveillance Officers (TSO) in 55 hospitals (90.2%).

Hospital Transfusion Committees

There were hospital transfusion committees in 48 hospitals (78.7%) and the number of times these met in the year 2001, is given in Table 15

Number of meetings	Number of hospitals
0	12
1	4
2	1
3	5
4	15
5	4
6	4
9	2
11	1

Table 15: Hospital Transfusion Committee meetings in 2001.

There were formal guidelines for the transfusion of RBCs in 49 hospitals (80.3%); for the transfusion of Fresh Frozen Plasma in 48 hospitals (78.7%); for the transfusion of Platelets in 48 hospitals (78.7%). However, 5 (10.4%) of the 48 hospitals that had a Hospital Transfusion Committee did not have any guidelines.

Table 16 gives details of the Chairperson of the Committee in each of the 48 hospitals that had a Hospital Transfusion Committee in the year 2001. Most of the committees were chaired by consultant haematologists or by anaesthetists.

Chairperson of Committee	Number of Hospitals
Consultant Anaesthetist	7
Cardiologist	1
Consultant Haematologist	18
Consultant Pathologist	3
Consultant Obstetrician/ gynaecologist	3
Consultant Orthopaedics	1
Consultant Pathologist	2
Consultant Physician and Medical Director	1
Consultant Radiation Oncologist	1
General Surgeon	1
Haemovigilance Nurse	1
Histopathologist	2
Hospital General manager	3
No chairperson elected	1
Paediatrics	2
Practice Development Coordinator	1

Table 16: The Chairperson of Hospital Transfusion Committees in 2001.

Compliance with National Blood Users Group Guidelines

The National Blood Users Group issued ' A Guideline for Transfusion of Red Blood Cells in Surgical Patients' in January 2001. This guideline had been adopted as policy in 23 hospitals (37.7%), and pre-assessment clinics for surgical patients were in place in 19 hospitals (31.1%). Patients with pre-existing anaemia were identified in 26 hospitals (42.6%) and a follow-up and reassessment of these patients was done in 22 hospitals (36.1%). Group and antibody screens were taken in 20 hospitals (32.8%). Patients were advised on pre-deposit autologous programmes in only 4 hospitals (6.6%) and on alternatives to transfusion in 5 hospitals (8.2%). Written information for patients on transfusion was provided by 24 hospitals (39.3%).

Table 17 below gives details of the number of hospitals that had Hospital Transfusion Committee audit programmes for the usage of various blood products and indications.

Audit Programme	Number of Hospitals
Red Blood Cells (RBCs)	27 (44.3%)
Fresh Frozen Plasma (FFP)	25 (41.0%)
Platelets	18 (29.5%)

Table 17: Hospital Transfusion Committee audit programmes.

Allogeneic Blood Component Usage

Information on the number of units of RBCs, platelets, fresh frozen plasma (FFP) and cryoprecipitate received from the IBTS by the hospitals was collected. Further, data on the numbers of units transfused, units outdated, units wasted and patients transfused was also collected. This information is summarised in Table 18 to 21 (The platelets are adult doses, either pooled or Apheresis units)

Red cells	Received from IBTS	Transfuse Transfused	Outdate Outdated	Waste Wasted	Patients Patients Transfused
Total in 2001	105,543				
Mean	1,885	1,826	116	29	226
Median	908	773	69	6	118
25th centile	298	438	0	0	0
75th centile	1,929	1,929	188	28	254

Table 18: Red cells (overall) information for 2001

Platelets	Received from IBTS	Transfused	Outdated	Wasted	Patients Transfused
Total in 2001	11,430	11,432	841	345	1,553
Mean	233	233	17	7	32
Median	31	30	0	0	3
25th centile	8	10	0	0	0
75th centile	153	153	1	2	15

Table 19:Platelets (overall) information for 2001.

FFP					
	Received from IBTS	Transfused	Outdated	Wasted	Patients Transfused
Total in 2001	18,796	17,743	814	1,450	1,512
Mean	369	348	16	28	30
Median	112	90	0	3	5
25th centile	8	32	0	0	0
75th centile	279	243	12	16	23

Table 20 FFP (overall) information for 2001.

Cryoprecipitate					
	Received from IBTS	Transfused	Outdated	Wasted	Patients Transfused
Total in 2001	1,434	1,051	86	129	96
Mean	57	42	3	5	4
Median	27	7	0	0	0
25th centile	6	0	0	0	0
75th centile	48	34	0	6	2

Table 21: Cryoprecipitate (overall) information for 2001.

National estimates of blood product use

There are a number of potential sources of error in the figures reported here, notably intra-hospital transfers of blood products, and clerical errors in recording transfusions by specialty. After extensive manual checking and resolving of queries wherever possible with either the original hospital, or the issuing transfusion centre, these figures are believed to be sufficiently reliable for use.

Table 22 provides the complete data sets for the number of units received from the IBTS, transfused, outdated, wasted and patients for each of RBCs, platelets, fresh frozen plasma (FFP) and cryoprecipitate respectively.

Allogeneic products	Total in 2001 N	Received from IBTS	Transfused	Outdated	Wasted	Patients Transfused
Red cells	28	52,599	42,979	3,348	1,248	11,082
Platelets	14	4,747	4,378	238	238	1,410
FFP	18	8,693	7,519	330	764	1,343
Cryoprecipitate	3	413	327	4	22	29

Table 22: Allogeneic products complete information for 2001.

While the complete data set is of great value, for many purposes national estimates are required. Ideally units of blood would be traced 'from vein to vein'. Unfortunately this cannot at present be done routinely, although it is feasible as part of specialised haemovigilance exercises. Therefore we must use global figures collected at hospital and transfusion centre level. Given the very poor state of health information systems in Ireland these can only be approximations.

These approximations are based on the assumptions of consistency, of blood products usage, outdating and wastage within the four hospital groups; and, on the assumptions of constancy of distribution and return rates for blood products at the two IBTS centres. These assumptions may be false, but are not testable. Roughly we assume for each hospital with complete data that these are correct. For hospitals with no data, we assume that the IBTS dispatch data were correct, and that these units had the same patterns of wastage, outdating, and blood product dosage as the units in their groups for which complete information was available. For hospitals with incomplete data we use as much as possible of the data that each hospital could provide, and supplement this with the same assumptions

Based on all information available from the Blood Utilisation survey, the Blood Stock Management Survey and the IBTS centres in Dublin and Cork, Table 23 provides national estimates for Red cells and Platelet activity in 2001.

	National total in 2001 (Estimates)				
	Received from IBTS	Transfused	Outdated	Wasted	Patients Transfused
Red cells	124,044	113,033	8,068	2,943	30,104
%	100	91	6.5	2.4	
Platelets	14,095	12,999	1,082	444	1,766
%	100	92	7.7	3.2	

Table 23: Estimated red cells and platelets activity at national level.

Massive Transfusions

Three hospitals were unable to provide separate figures for massive transfusion episodes, and for patients experiencing such episodes. Therefore, it had to be assumed that each episode, in these hospitals, represented one patient.

Using this approximation there were 383 massive transfusion episodes experienced by 377 patients. Twenty-nine obstetric patients received a massive transfusion in 12 hospitals, which between them had 38,997 deliveries representing 70.3% of all deliveries. Therefore, the risk of massive transfusion is 0.052% (i.e. 5.2 per 10,000 deliveries).

Autologous transfusion activities

Autologous transfusion

Pre-operative Autologous donation (PAD) services were used by or available in 15 hospitals (24.6%) in the year 2001. Of those hospitals that did not provide for this service in 2001, there were 32 hospitals (52.5%) that had not done so in previous years. Pre-operative Autologous donation (PAD) services were used for the following procedures: -

- Bone marrow donors
- Orthopedic surgery, especially hip and knee joint replacement, spinal surgery
- Gynaecological surgery, especially hysterectomy and oophorectomy
- Plastic surgery, e.g. breast reduction & reconstruction
- Urology, especially radical prostatectomy

Table 24 summarises the units collected and transfused and the number of patients transfused with autologous blood.

	Units Collected	Units Transfused	Patients Transfused
Total in 2001	917	457	255
% of national activity	0.74%	0.4%	0.85%
Hospitals	15 (25%)	12 (20%)	11 (18%)

Table 24: Autologous Blood Transfusion Activity.

Acute Normovolaemic Haemodilution

Acute Normovolaemic Haemodilution was performed in five hospitals. Three hospitals identified a director for this programme, and in every case, a consultant anaesthetist filled this role.

Intra-Operative Cell-Salvage

Intra-Operative Cell-Salvage was available in 11 hospitals. Of these 11 hospitals, 2 hospitals used it daily, 3 hospitals used it weekly, 4 hospitals used it less frequently and 2 hospitals never used the facility. Only 5 hospitals provided this facility outside normal working hours. The specialty of the persons in charge of the Cell Salvage machine from 10 of the 12 hospitals is given in the Table 25 below.

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Specialty	Number of Hospitals
Consultant anaesthetist	3
Perfusionist	5
Technician / Theatre nurse	2

Table 25: Specialty of person in charge of Cell Salvage Machines.

The hospitals cited the following, as limiting factors in providing Intra-Operative Cell-Salvage services: -

- Availability of trained staff
- Lack of Perfusionist

- Staff knowledge and familiarity with the system
- Funding
- Infrequent use which meant lack of familiarity
- Suitability of patients
- Extremely large blood loss
- Infection/ sepsis

Post-Operative Cell-Salvage

Post-Operative Cell-Salvage was used in only eight hospitals (13.1%).

Transfusions in infants

Neonatal Transfusions

Transfusions of infants less than four months of age were performed by 29 hospitals (47.5%). An obstetrics service was offered, during 2001, by 25 hospitals (41.0%). Full details of the number of deliveries were obtained from 21 hospitals, which delivered 55,489 babies in 2001, as shown in Figure 25 below.

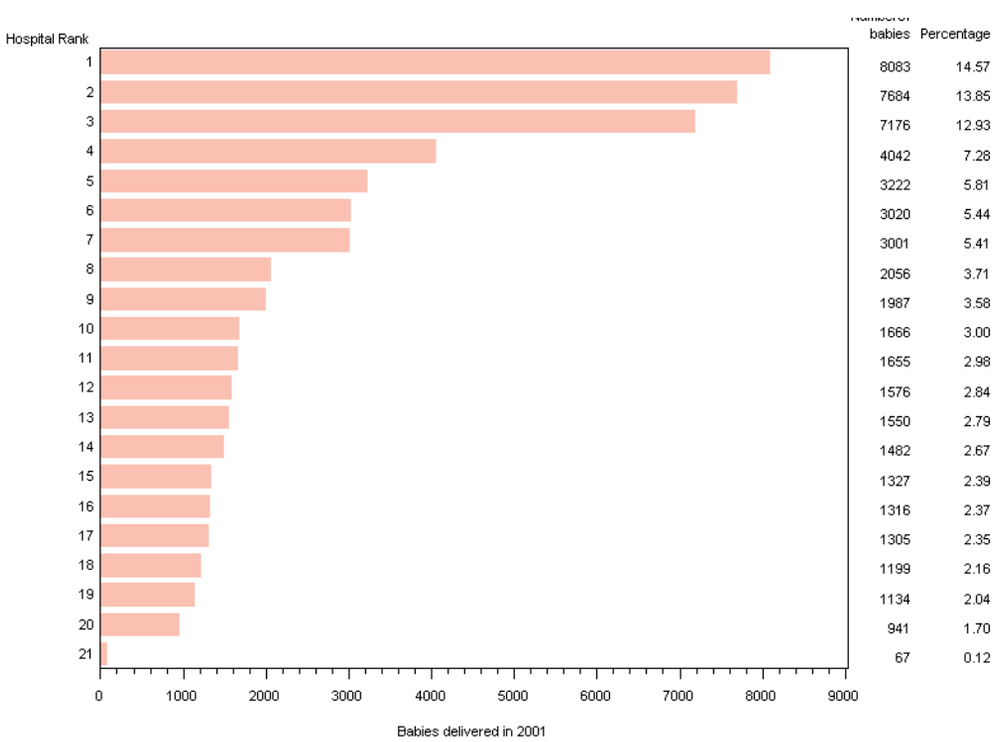

Figure 25: The number of deliveries and the percentage of all deliveries in 2001.

Number of births, birth weights and transfusion practice in infants.

The details about the total number of babies born (live births) at, or transferred to the hospitals in year 2001 is summarised in the Table 26 below. Due to transfers of sick infants between hospitals, approximate percentages are given.

		Number of babies in 2001	Percentage transfused within category	Percentage of total deliveries in 2001
Live births (including transfers)		54,707		
Deliveries		55,422		
RBCs (Pedipacks) transfusions		494		0.89%
Babies born weighing 1000g to < 1500g	Total born	312		0.56%
	Transfused	113	36.2%	
Babies born weighing < 1000g	Total born	276		0.50%
	Transfused	115	41.7%	

Table 26: Total Distribution of Babies born (live births) including transfers.

A complete data set from 11 hospitals where infants were transfused was available. The information from these hospitals, which represents 68.6% of all reported live births (including transfers), is summarised in the table 13 below. In the two categories of low birth weight studied here 45.6% of infants needed transfusions. Of the babies born with weight under 1000g, 49.6% needed transfusion. Of the babies born with weight under 1500g but over (or equal to) 1000g, 42.2% needed transfusion.

Of the total transfusions in infants, 34.7% were on babies with weights over or equal to1500g and 65.3% were on babies with weights under1500g. The overall rate of transfusion of live born infants is 0.9%.

		Number of babies in 2001	Percentage of total deliveries in 2001	Percentage transfused within category
Live births (including transfers)		37,548		
Deliveries		38,370		
RBCs (Pedipacks) transfusions		349	0.91%	
Babies born weighing 1000g to < 1500g	Total born	268	0.70%	
	Transfused	113	0.29%	42.2%
Babies born weighing < 1000g	Total born	232	0.60%	
	Transfused	115	0.30%	49.6%

Table 27: Distribution (complete data set) of Babies born (live births) including transfers.

The details of Donor Exposures for 386 out of the 494 infants transfused with RBCs (Pedipacks) and are summarised in table 28 below. Each Pedipack has 4 to 5 aliquots but constitutes one donor exposure.

	Number of Donor Exposures				
Pedipacks	1	2	3	4	5 or more
Total	248	69	33	21	15
% of transfused	64.3%	17.9%	8.6%	5.4%	3.9%

Table 28: Distribution of Donor exposure of infants transfused with RBCs (Pedipacks).

Transfusion of Platelets to Infants Less Than Four Months of Age

During 2001,122 babies (representing 0.32% of all live births) received 307 platelet transfusions. The details of Donor Exposures for 81 out of the 122 infants transfused with platelets are in table 29. Each Neonatal Apheresis platelet unit has

	Number of Donor Exposures			
Units	1	2	3	4 or more
Total in 2001	45	16	4	16
Percentage of transfused	52.3%	18.6%	4.7%	19.8%

Table 29: Distribution of Donor exposure of infants transfused with Platelets.

Transfusion of Fresh Frozen Plasma (FFP) to Infants Less Than Four Months of Age

During 2001,142 babies (representing 0.26% of all live births) received 295 units of Fresh Frozen Plasma (FFP). The details of donor exposures for 85 out of 139 infants are in table 30. Each FFP Neonatal unit has 4 aliquots but constitutes one donor exposure.

	Number of Donor Exposures		
	1	2	3 or more
Total in 2001	67	10	8
Percentage of transfused	78.8%	11.8%	9.4%

Table 30: Distribution of Donor exposure of infants transfused with FFP

Exchange and Intrauterine Transfusions to Infants Less Than Four Months of Age

Five hospitals gave exchange transfusions to newborn babies during 2001. Two hospitals gave intra-uterine transfusions the details are in Table 31 below.

	Exchange Transfusions		**Intrauterine Transfusions**	
	Number of Transfusions	Number of Infants	Number of Transfusions	Number of Infants
Total in 2001	17	14	12	6

Table 31: Number of exchange and intrauterine transfusions.

Group O Rh negative red blood cell usage

Table 32 below summarises Group O Rh negative red blood cell usage in Irish hospitals during 2001.

	Total units of RBCs used.	Units of O Rh Negative RBCs Used	Units of O Rh Negative RBCs transfused to O Rh Negative Patients	Units of O Rh Negative RBCs transfused to non O Rh Negative Patients
Total (2001)	100364	9972	3565	6407

Table 32: Distribution of Group O Rh Negative Red Blood Cell usage.

Fuller clinical details were available for only 1517 out of 6407 units of O Rh Negative RBCs transfused to non O Rh Negative patients was available. On the assumption that units of O Rh Negative RBCs are transfused to non O Rh Negative patients for similar reasons across all Irish hospitals, Table 33 provides a summary of the reasons.

	Principal Reason (Number of Units)					
	1	**2**	**3**	**4**	**5**	**6**
Total in 2001	1,259	646	519	1195	929	1858
Percentage of transfused	19.6%	10.1%	8.1%	18.7%	14.5%	29.0%

Table 33: Principal reasons for transfusing O Rh Negative RBCs to non O Rh Negative patients.

Principal reasons coded as :-

(1) Emergency, Uncrossmatched
(2) No Rh Negative Group Specific Units Available
(3) Neonatal
(4) Unit Might Otherwise Expire
(5) No Documented Reason
(6) Other Reasons

In 2001 75 patients received 156 units of O Rh Positive blood because of the non-availability of O Rh Negative blood. A significant proportion (1041 of 11,013) of O

Rh negative units expired before transfusion. The outdate rate for O Rh negative blood of 9.5% reported here is close to the 10% outdate rate obtained in the Blood Stock management Survey.

Usage of blood products by specialty

Figure 26 (below) shows the estimated usage of red blood cells by specialty in Ireland. This information, and that in the succeeding figures (26 to 31) is derived from a combination of the data from the stock management survey and the blood utilisation survey. Overall the surgical specialties, at 42% of the total, are the largest single users of red cells with general medicine at 22% and haematology/oncology at 15.5% coming second and third respectively.

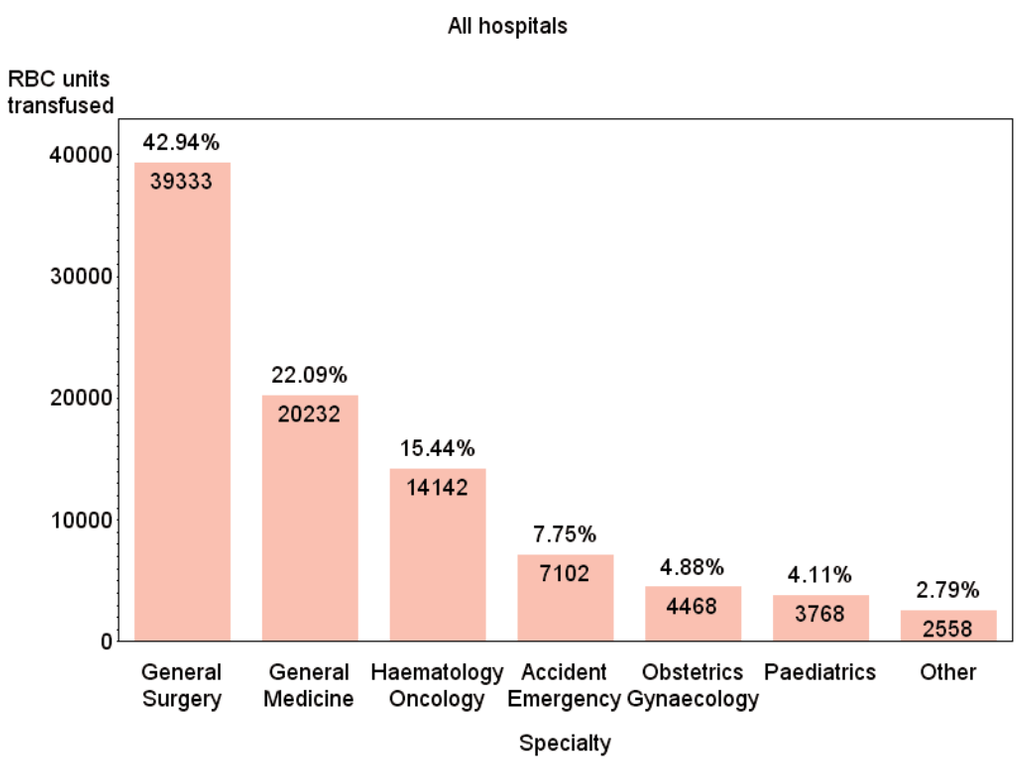

Figure 26: The use of red blood cells in all Irish hospitals by specialty in 2001.

Separating large and small hospitals (figures 27 and 28) a marked difference is evident. Haematology/oncology services are the second most important users of blood in large hospitals, at 22% of the total, while in small hospitals general medicine accounts for 35% of total use, with haematology/oncology being relatively insignificant. In both sets of hospitals surgery uses most of the blood supply.

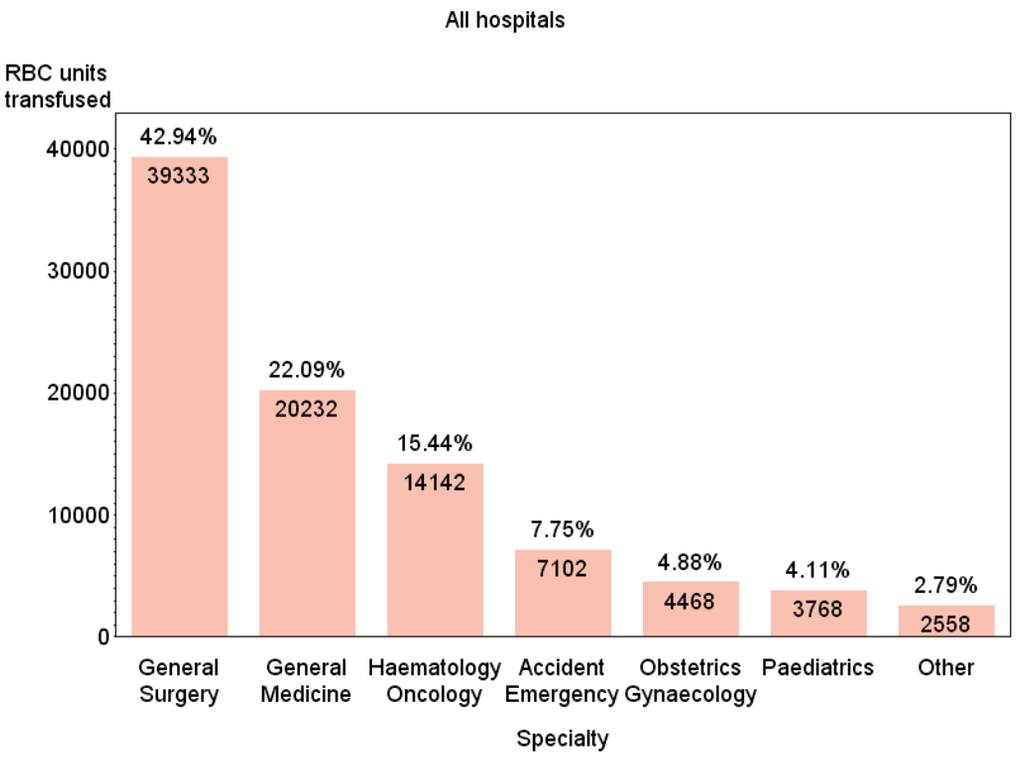

Figure 27: The use of red blood cells in Large (> 3,000 units of RBC per annum) Irish hospitals by specialty in 2001.

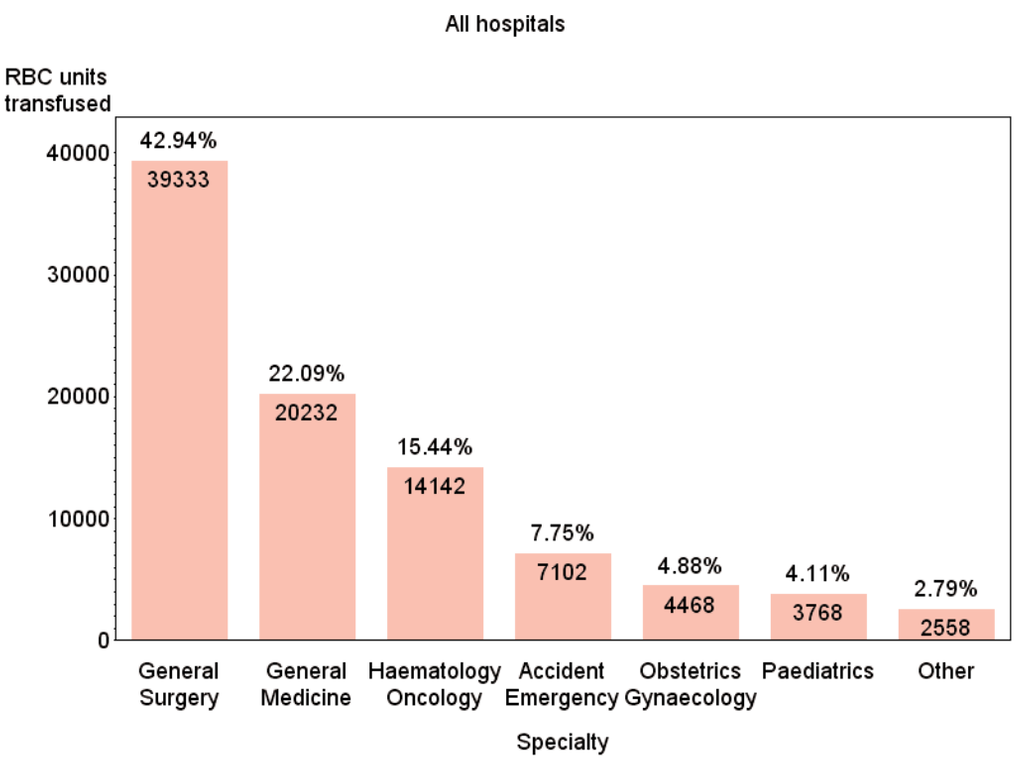

Figure 28: The use of red blood cells in small (< 3,000 units of RBCs used per annum) Irish hospitals by specialty in 2001.

In the specialist hospitals paediatrics is the dominant user of red cells, while in the private hospitals surgical specialties use the vast majority of the red blood cells supplies (over 65%) (Figure 29 and 30). This reflects the two large specialist children's hospitals in Dublin, and the particular bent of most of the larger private hospitals.

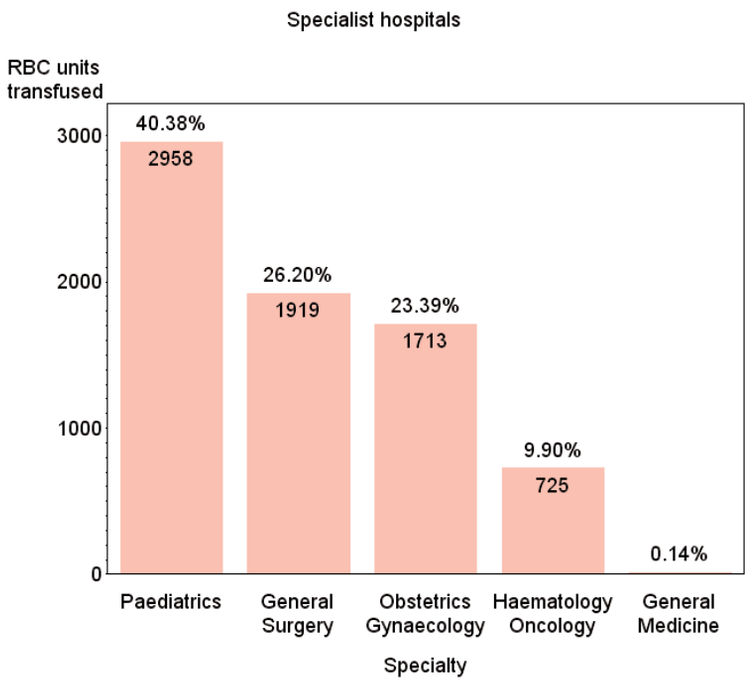

Figure 29: The use of red blood cells in specialist Irish hospitals by specialty in 2001.

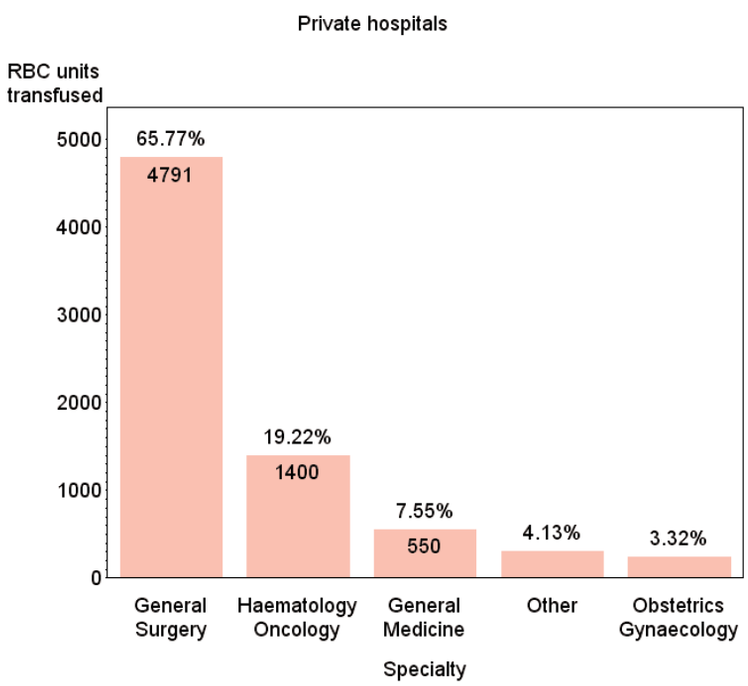

Figure 30: The use of red blood cells in private Irish hospitals by specialty in 2001.

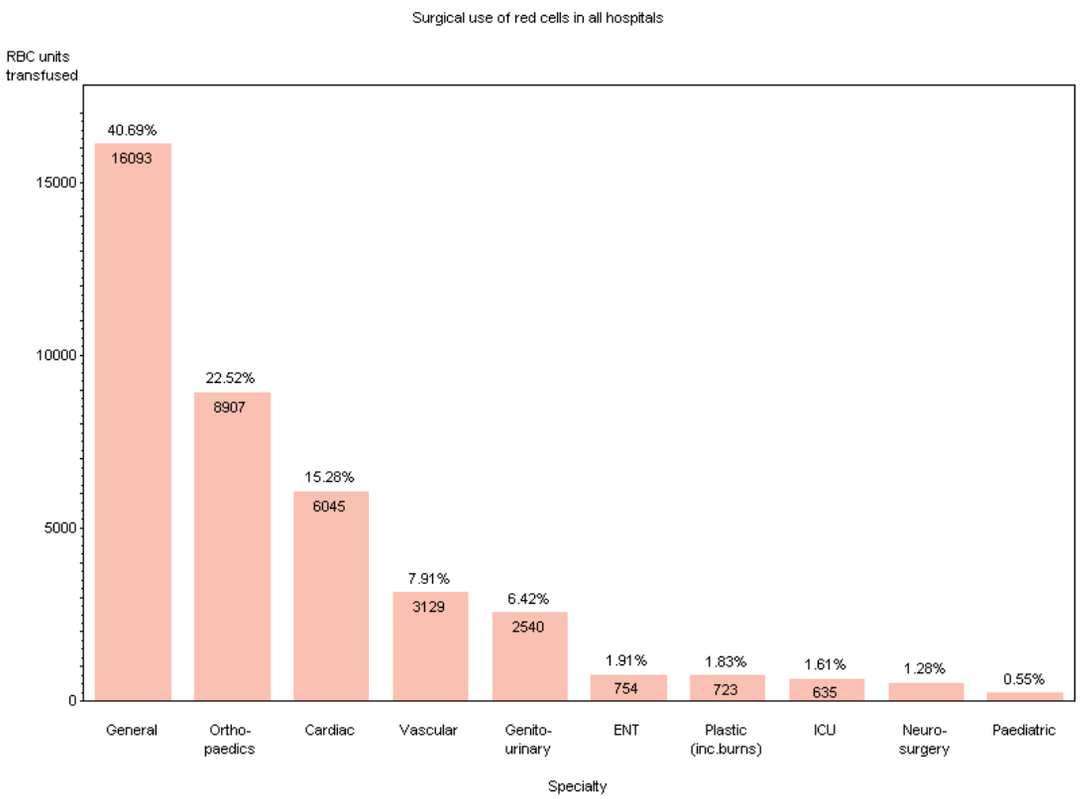

Figure 31: The use of red blood cells in surgical patients by sub-specialty.

Figure 31 shows the use of red blood cells broken down by surgical subspecialty. General surgery is the major user at 41%. Followed by orthopaedics at 23%, cardiac surgery at 15% and vascular surgery at 8%.

Conclusions

Blood utilisation in Irish hospitals is very variable. In particular wastage and outdating rates vary greatly, even when hospitals are divided into groups of reasonably similar types. Usage of autologous transfusion techniques is low, and these could certainly be extended further.

The usage of blood by specialty seems about what would have been expected, confirming the surgical specialties as the main users of blood, followed by general medicine, and especially haematology and oncology (Regan and Taylor 2002).
O Rh negative blood is a precious resource. Usage seems haphazard, with a significant level of wastage, and use in non O Rhesus negative patients for no well documented reason.

The data presented here on neonatal transfusions are the first complete national

data. Thanks to universal use of Pedipacks the number of donor exposures in this very vulnerable group is minimised. The transfusion rates are comparable to those reported from single institution based studies elsewhere (Kirsten, Kirsten et al. 1996; Beeram, Krauss et al. 2001).

4.5 Conclusions

This project is the most exhaustive evaluation of the Irish blood supply and blood utilisation done to date. There is a very large amount of new information about the Irish services presented here. Some general comments are required.

The success of this project was largely due to the very hard work of staff in the hospitals, especially blood bank staff and the Transfusion Surveillance officers. The general response to the audit projects was very favourable. Most people felt that the peri-operative audits were adequately detailed, and not too hard to do.

Many hospitals have extremely inadequate information systems. In several of the smaller hospitals all the data required were collected manually, but this was obviously not possible in the larger hospitals. An ideal system, such as is under development in other countries, would permit the tracking of every unit of blood routinely from the donor to the recipient.

The extent of the problems is reflected, for example, in the differences between the total volume of blood transfused reported to the blood stock management questionnaire and the blood stock utilisation questionnaire. A particular problem is inter-hospital transfers of blood, which were very difficult to count. A very extensive manual checking program was required to produce reasonably credible results.

Furthermore most hospitals have very limited personnel systems, which do not readily permit the allocation of staff hours to particular activities. For example, one of the smaller hospitals initially claimed to have more transfusion staff than the largest of the Dublin teaching hospitals. On further inquiry it became apparent that they had no means of allocating staff activity by area in the laboratory.

Despite these cautions, we believe, after extensive checking, that this report presents a reasonably accurate picture of activity in Irish hospitals. It is also, we believe, of adequate quality to be useful for policy making.

5.0 Main Issues for Blood Transfusion.

Current Context

In May 2004 the IBTS decided to also defer the following donors; those who have received a blood transfusion after 1980, donors who have spent 3 or more years in the U.K. between 1980 and 1996, and donors to the neo natal panel who have spent more than 1 year in the U.K. These deferrals are expected to result in the loss of a further 5% of donors.

The three studies performed by the National Blood Strategy Implementation Group have identified a clear requirement to promote best transfusion practice at hospital level and to reduce unnecessary exposure to allogeneic blood transfusion. In addition more efficient use of the national blood stock is required, both to avoid wastage and to make it more practicable to make deferrals of donors who may pose a risk.

Stock Management

Overall outdating of blood in Irish hospitals is high at 8 to 10%. A 50% reduction in outdate rate is probably a realistic goal, and one that can be achieved with significant savings to hospitals, this would result in a significant sparing of the national blood supply.

Use of O negative blood is excessive at approximately 14%. This varies in large hospitals from 10.2 % to 14.3 % in small hospitals. It probably represents the overall difficulties in maintaining adequate stocks while trying to limit outdating. Eight percent of the Irish population have O negative blood, therefore the excess use of this blood type ranges from 2% to 6% depending on hospital size. A 50% reduction in this excess to 9% and 11% respectively is an achievable target.

A major factor in poor stock management is small hospital size, exacerbated by poor I.T. systems and limited laboratory staffing levels. Stock management in larger hospitals also varies, and in some hospitals needs to be considerably improved, only one hospital used a formal stock management system. Hospitals tend to overstock to meet contingencies and worse case situations. Alternative measures are needed to ensure security of supply in emergencies, to enable hospitals to reduce their minimum stocking levels while retaining the ability to respond to

unusual demands at short notice. Hospital strategies include formal stock rotation among hospitals and satellite stock holding units. These strategies will need to be underpinned with adequate staff and I.T. systems, and resulting stock management figures should be benchmarked among the hospitals themselves.

It is recognised that a national executive structure needs to be established to implement and resource the achievement of targets in stock management.
Cross match to transfusion ratios are higher than optimum with an average of 2.1, it should be possible to reduce this to 1.5 in a tightly managed system.

The results of the surveys raised the question about the time allocated at hospital level for blood stock management, in smaller laboratories in particular. It is recognised that the implementation of many of the recommendations of this report will require a formal consideration of staffing grades and levels in transfusion laboratories and a possible implementation of pilot projects to address benchmarking in respect of staffing or workload ratios.

Clinical Use of Blood

The available information indicates that use of blood in surgical patients is not at variance with practice reported in the international literature (Sanguis 1994).However current guidelines are more restrictive. Many patients are attending for surgery with correctable underlying anaemia undoubtedly leading to some being transfused unnecessarily. The audit day study provides evidence that substantial number of patients are receiving a total number of units over and above guidelines. For example 20 out of 51(39%) patients had a post operative Hb > 10g/dl (many of these had a Hb. > 11g/dl). This suggests that these patients received one unit or more in excess of National Guidelines. This further suggests that significant savings in blood use can be made by tighter adherence to guidelines. It was also found that blood salvage techniques were under utilised

Improvements in clinical use of blood will require robust structures both at local hospital, hospital network and national level. A national standard setting authority should be established under the auspices of an authorative professional institution. Robust local and regional transfusion committees should be required to actively manage and monitor the clinical use of blood and report through an agreed audit to the national authority.

Significant resources will be required to improve the clinical use of blood, these include;

additional referral clinics for the management for anaemia in pre surgery patients, the provision of staff and equipment for cell salvage and adequate staff and information system resources for the active management and audit of blood use.

Adequacy of Blood Supply

The Group was unable to assess the adeqacy of the blood supply. This will require a prospective, long-term information-gathering process.It is advised that the proposed National Task Force should set up a system for monitoring the adequacy of blood supply for both elective and emergency needs at regional and hospital level.It is necessary that the clinical impact of any deficiencies be monitored.This is important for the purpose of making and reviewing balance-of-risk judgements on donor deferrals.It is also important for assessing the adequacy of local and regional stocking and delivery arrangements.

6.0 Recommendations

The Blood Strategy Implementation Group sought to base its recommendations on the findings of the studies carried out, best practice identified in other jurisdictions or through the literature and on its own consideration of the structures, resources and facilities required to support development of best practice with regard to blood utilization in Irish hospitals.

1. It is recommended that a National Task Force be established to improve blood stock management at hospital level with specific targets and time scales.

2. The Task Force should be established at national level and chaired by the I.B.T.S. In the short term it should report to the Department of Health and Children and in due course to the new Health Service Executive.

3. A target for a 50% reduction in blood outdate rates should be achieved by the end of 2005.

4. The Task Force should develop and institute a system for monitoring the adequacy of supplies of blood for both elective and emergency needs at regional and at hospital level. This should include monitoring effects on clinical management of patients where these occur.

5. A 50% reduction in excess O negative use to 9% in large hospitals and 11 % in small hospitals should be achieved by the end of 2005. Protocols for the use of O negative blood should be developed.

6. It is recommended that a standard, integrated I.T. system to support stock management, stock transfers and traceability between hospitals be implemented in each hospital. This system should be linked to the I.B.T.S. systems and be linkable to existing hospital systems. It would be preferable if this blood management system would be procured as part of the national procurement for pathology systems. The information collected in these three surveys should be extractable from the system. In the interim period adequate IT resources should be made available to hospitals to support blood management.

7. It is recommended that via the I.T. system outlined above, that daily stocking levels in each hospital would be reported to the I.B.T.S., and the I.B.T.S. report on the daily blood it has available. In the interim period a daily stock report project should be piloted in a number of hospitals.

8. The stock management system should have the ability to model stock dispersal solutions in response to potential problems.

9. Hospital IT systems should be capable of bar coding reading so to ensure accurate product tracing.

10. A system of regional stock holding units should be established in each of the new hospital networks under the health service reform programme.

11. An additional senior medical scientist should be appointed as a stock manager to each of these networks and based in the hub hospital.

12. Each transfusion laboratory should be adequately staffed and managed by a medical scientist of sufficient seniority and expertise. A defined career structure for transfusion laboratory staff should be established and examined as a pilot study, as part of the implementation of this report.

13. It is recommended that a Maximum Blood Ordering Schedule (MBOS) should be implemented in each hospital, where not already in use.

14. It is recommended that pre-surgical assessment clinics be established on a pilot basis in several hospitals, with careful evaluation of their impact on blood usage in surgical patients and clinical outcomes.

15. It is recommended that a national standard blood ordering form and transfusion record be introduced into all hospitals. This form should record the indication of a transfusion, the person ordering the transfusion and the process and outcome of transfusion. The completion of these forms should form part of the regular audit.

16. Training on optimum blood stock management and system usage would be required for all hospital blood bank staff.

17. Each hospital network should collect figures on the number of occasions, and the number of patients involved, where elective surgery had to be cancelled because of blood shortages, and report on a regular basis to the I.B.T.S. and the Taskforce. Each network should also report incidents of emergency blood shortages.

18. It is recommended that the Department of Health request the Royal Colleges to host a National Transfusion Committee, whose remit it would be to prepare clinical practice guidelines in blood transfusion and monitor the audit results of this practice by local hospital and regional transfusion committees. It is suggested that this body would take over the work of the National Blood Users Group.

19. It is recommended that agreed audit criteria are established, based on national transfusion guidelines. This data should be collected at agreed intervals and returned via the regional network to the National Transfusion Committee.

20. It is recommended that each hospital maintains an active transfusion committee, chaired by the Haematologist, the membership of which should include the Hospital Manager and the Haemovigilance Officer. This committee should report to the Medical Board and the regional network transfusion committee.

21. It is recommended that each hospital network establish a Regional Network Transfusion Committee to monitor the activity of the local hospital committees and report to the National Committee.

22. It is recommended that a Consultant Haematologist in Transfusion Medicine be appointed to each tertiary hospital and each hospital network to specifically implement the recommendations of this report, and chair the Regional Network Transfusion Committee.

23. It is recommended that all hospital transfusion laboratories should be under the active professional direction of a consultant Haematologist, with adequate sessional attachment to discharge this responsibility.

24. It is recommended that an I.T. blood ordering system be developed using

the standard form, which gives prompts to the clinician ordering in accordance with transfusion guidelines.

25. It is recommended that cell salvage programmes be established in each major hospital, with adequate staffing and equipment. The committee consider that this is the most effective alternative to allogeneic blood transfusion to be implemented.

26. It is recommended that guidelines on the non surgical use of blood be finalised and disseminated to hospitals. These then should be the subject of an audit similar to the perioperative audit carried out by the National Blood Strategy Implementation Group.

27. There should be on-going continuing professional development for all clinical staff involved in decision regarding blood usage, this will include doctors, medical students and nursing staff.

Appendix 1 - Membership of the Group

Dr. Orlaith O'Reilly, Director of Public Health, South Eastern Health Board, Lacken Dublin Rd., Kilkenny - Chair.

Mr. Andy Kelly, Acting Chief Executive Officer, National Blood Centre, Irish Blood Transfusion Service, James's St., Dublin 8. (from September 2002).

Ms. Grainne Moran, Pathology Department, Blackrock Clinic, Blackrock, Co. Dublin.

Ms. Mary Bedding, Haemovigilance Officer, North Eastern Health Board, Cavan General Hospital, Cavan.

Dr. William Murphy, National Medical Director, Irish Blood Transfusion Service, James's St., Dublin 8.

Dr. Catherine Motherway, Consultant Anaesthetist, Limerick Regional Hospital, Co. Limerick.

Dr. Margaret Murray, Consultant Haematologist, University College Hospital, Galway. (from July 2003).

Mr. Chris Lyons, General Manager, North Western Health Board, Letterkenny General Hospital, Letterkenny, Co. Donegal.

Ms. Ann McGrane, Blood Policy Division, Department of Health and Children, Hawkins House, Hawkins St., Dublin 2.

Mr. Donal Murphy, Chief Technologist, St. Vincent's University Hospital, Elm Park, Dublin 4.

Mr. Michael Lyons, Chief Executive Officer, Adelaide & Meath Hospital, Dublin Incorporating the National Children's Hospital, Tallaght, Dublin 24.

Mr. Tony Nolan, Chief Technologist, Beaumont Hospital, Beaumont Rd., Dublin 9.

Mr. Moss McCormack, Chief Technologist, Midland Health Board, Longford/ Westmeath General Hospital, Mullingar, Co. Westmeath.

Dr. Tom Hogan, Consultant Anaesthetist, James Connolly Memorial Hospital, Blanchardstown, Dublin 15.

Mr. Stephen McGrath, Chief Technologist, University Hospital, Cork.

Professor Ernest Egan, Consultant Haematologist, University College Hospital Galway. (resigned February 2003).

Mr. Aidan Gleeson, A.&.E., Consultant, Beaumont Hospital, Dublin. (resigned December 2001).

Dr. Gráinne Flannelly, Consultant Obstetrician, National Maternity Hospital, Holles Street, Dublin. (resigned September 2002).

Mr. Martin Hynes, Chief Executive Officer, Irish Blood Transfusion Service.
(resigned September 2002).

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Appendix 3 List of Tables

Appendix 4 List of Figures.