การเตรียม การใช้ การส่งกลับ และการสูญเสียของเลือด :
ภาพรวมในช่วง 4 ปี จากระเบียนสถิติ โรงพยาบาลจุฬาลงกรณ์

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Preparation, Usage, Returning and Expiration of Blood: 4-year Overview from Registry data of King Chulalongkorn Memorial Hospital

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In the present day, blood becomes an important in vivo product for therapy of many patients. Seeking for blood donor has been continuous promoted. However, pattern of blood using by the physician is still another interesting item to be considered. An analysis on registry data about preparation, usage, returning and expiration of blood of King Chulalongkorn Memorial Hospital during the 4-year period, 1996 - 1999 was performed. Average amount of preparation for all division in the hospital was 53,529 unit/ year. Average amount of usage for all division in the hospital was 33,268.5 unit/year. Average amount of returning for all division in the hospital was 22,170.5 unit/year. Average amount of expiration for all division in the hospital was 985.25 unit/year (by both expiration before expired date and expiration by expired date). Further analysis on blood transfusion reaction was also performed and gave average amount equal to 48 case/year (allergy 28 case/year, febrile 20 case/year).

Introduction

In the present day, blood becomes an important in vivo product for therapy of many patients. Seeking for blood donor has been continuous promoted. Quality control of the laboratory tests in blood bank is very important. Safety blood for usage is the main consideration for all blood bank settings[1-2].

However, to reach the concept of quality and efficacy, not only quality control in laboratory process but also other processes, especially for the physicians in request and ordering blood transfusion for their patients. Furthermore, calculation of present and projected blood need is necessary [3].

Pattern of blood using by the physician is still another interesting item to be considered. In this article, we reported a study on registry data of data about preparation, usage, returning and expiration of blood of the largest Thai Red Cross Society Hospital was performed.

Materials and methods

Review of data

This study was designed as a retrospective descriptive study. The setting is at King Chulalongkorn Memorial Hospital. The main objective of this study is analysis on registry data about preparation, usage, returning and expiration of blood of King Chulalongkorn Memorial Hospital during the 4-year period, 1996 - 1999. A historical review was performed on the registry data. The data source was derived from secondary data from Department of Medical Statistics, King Chulalongkorn Memorial Hospital[4-7]. Summarization of the reviewed data in the focused period was done and presented as the average.

Statistical analysis

All recorded data were collected then analyzed.

Descriptive statistical analysis was used where appropriate. The difference between the total number of prepared blood according to the requests and the actual usage in all departments of the hospital was tested by paired T-test[8]. The difference between rates of expiration by expired date and before expired date was tested by proportional Z-test[8]. Statistical significant level equal to 0.05 was used in this study.

Results

A. Review of data

The registry data about preparation, usage, returning and expiration of blood of King Chulalongkorn Memorial Hospital during the 4-year period, 1996 - 1999 were reviewed. The results were shown as the followings:

1. Preparation of blood for each Department of the hospital

During the study period, the blood bank of the hospital prepared several types of blood and blood components (214,116 units) as shown in Table 1. The three first orders of preparation were packed red cell (79,244 units, 37.01 %), platelet concentration (60,298 units, 28.16 %) and fresh frozen plasma (58,568 units, 27.35 %), respectively.

2. Usage and returning of blood

Usage of blood classified by Department of the hospital was shown in Table 2. The three first orders of Department with the high usage of blood were Medicine (36,120 units), Surgery (37,420 units) and Out patient (26924 units), respectively.

Table 2 Usage of blood classified by Department of the hospital (4-year period)

Department	Request (unit)	Use (unit)	Return (unit)
1. Medicine	49,379	36,120 .	13,259
2. Surgery	71,955	37,420	34,535
3. Out patient	37,433	26,924	10,509
4. Pediatrics	12,571	8,220	4,351
5. Obstetrics-Gynecology	24,200	8,951	15,249
6. Radiology	5,461	4,348	1,113
7. Orthopaedicts	8.162	3,323	4,839
8. EENT	4,870	1,758	3,112

Usage of classified by types of blood component was shown in Table 3. The three first orders of Department with the high usage of blood were packed red cell (15,324 cases), fresh frozen plasma (48,356 cases) and whole blood (23,325 cases), respectively.

Concerning the returning of blood, The three first orders of Department with the high returning of blood were Surgery (34,535 units), Obstetrics-Gynecology (15,249 units) and Medicine (13,259 units), respectively. The trend of preparation, usage and returning of blood and blood components in the study period was presented in Figure 1.

3. Blood expiration

During the study period, there were 3,941 units of

Table 1. Preparation of blood component (by Division of Blood Bank, King Chulalongkorn Memorial Hospital)

Blood & blood component	Sum (Unit)	Average (unit/year)
1. Packed red cell	79244	19811.00 ± 1541.41
2. Fresh frozen plasma	58568	14642.00 ± 1621.54
3. Platelet concentration	60298	15074.50 ± 2451.36
4. Leucocyte poor blood	12388	3097.00 ± 256.23
5. Buffy coat	153	38.25 ± 7.12
6. Cryoprecipitate	46183	11545.75 ± 748.25
7. Cryo removed plasma	3677	919.25 ± 48.3
8. Frozen plasma	578	144.50 ± 24.65
9. Aged plasma	2035	508.75 ± 41.24
10. Single donor platelet	137	34.25 ± 7.24
11. Single donor red cell	102	25.50 ± 8.52
12. Pooled platelet	521	130.25 ± 21.47
13. Pooled leucocyte poor platelet concentrate	3361	840.25 ± 45.82

Table 3 Classified by types of blood component (4-year period)

Blood & blood component	Patient (case)	Usage (Unit)
1. Whole blood	15,324	39,211
2. Packed red cell	48,356	80,026
3. Fresh frozen plasma	23,325	55,568
4. Platelet concentration	11,134	60,298
5. Leucocyte poor blood	9,158	12,388
6. Buffy coat	33	153
7. Cryoprecipitate	5,138	46,183
8. Cryo removed plasma	1,056	2,914
9. Frozen plasma	216	578
10. Aged plasma	959	2,057
11. Single donor platelet	730	666
12. Single donor red cell	66	102
13. Pooled platelet	102	494
14. Pooled leucocyte poor platelet concentrate	851	3,507

Figure 1. Change of preparation, use and return of blood and blood components in year 1996 - 1999.
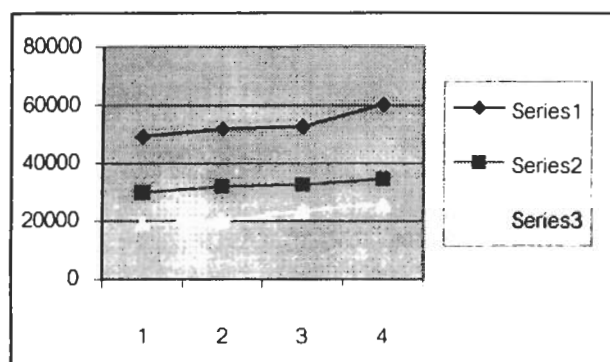
X Axis = Year (1 = 1996, 2 = 1997, 3 = 1998, 4 = 1999)
Y Axis = Amount (unit)
Series 1 = preparation, 2 = use, 3 = return

expired prepared blood (by expired date 3,299 units, 83.71% and before expired date 642 units, 16.29 %)

4. Other information

4.1 Blood transfusion reaction

Further analysis on blood transfusion reaction was also performed. During the 4-year period, there were cases of 192 blood transfusion reactions giving average amount equal to 48 case/year. Concerning these cases, they could be classified as allergy 112 cases (58.33 %) and febrile 80 cases (41.67 %)

4.2 Blood cell separator and other special services During the 4-year period, blood bank of the hospital also provided blood cell separator services. Concerning blood cell separator services (total 435 cases), there were 370 cases (85.06 %)of plasma exchange, 54 cases (12.41 %) of peripheral stem cell collection, 7 cases (1.61 %) of thrombocytapharesis, 3 cases (0.69 %) of leucoctye pheresis, and 1 case (0.23 %) of granulocyte collection. Concerning other special services, there were also 141 cases of phlebotomy.

5. Conclusion

❏ Average amount of preparation for all divisions in the hospital was 53,529 unit/year.

❏ Average amount of usage for all divisions in the hospital was 33,268.5 unit/year.

❏ Average amount of returning for all divisions in the hospital was 22170.5 unit/year.

❏ Average amount of expiration for all divisions in the hospital was 985.25 unit/year.

❏ Average amount on blood transfusion reaction of on blood transfusion reaction equal to 48 case/year (allergy 28 case/year, febrile 20 case/year).

B. Statistical analysis

Significant higher rate of expiration before expired date than by expired date was detected in our study (P < 0.05)

Discussion

Blood transfusion is an important medical procedure. Presently, a number of patients required blood and blood component for treatment. In Thailand, blood donation is still only one method in finding blood. Promotion of blood donation has been continuously performed.

However, not only the topics how to find the donated blood, The quality control of blood transfusion process is also necessary. After collection of donated blood, many steps including to the processes in the laboratory and in the clinical wards should be well controlled. Error in any steps of the whole transfusion process can affect the quality of the system.

Presently, the concept of high quality and high efficacy of the donated blood is promoted. The blood banks play a major role in providing of the safety blood to serve the physicians. On the other hand, the physicians must request and order the transfusion based on the rational usage. Study about the usage of blood in any setting is therefore valuable in strategies planning of the blood transfusion service.

According to this study, many interesting considerations from the pattern of blood and blood component usage by the physicians can be observed. In the setting, the preparation of blood and blood component was sufficient for usage.

Considering the requests for preparation, it can be observed that the total number of prepared blood according to the requests were more than the actual usage in all departments of the hospital. This can reflex the trend of the physician-in-charge in request for reserved blood for their patients. However, some departments displayed a high returning rate comparing to request. This can imply the loss in preparation. Therefore, the proper practical guideline for blood transfusion should be followed. Unnecessary request is considered irrational and can waste the limited resource.

Furthermore, concerning the blood expiration, the rather high rate of expiration before expired date was detected (P < 0.05). Root-cause analysis for this problem should be done. To decrease the rather high rate of expiration before date due to the poor keeping by the laboratory workers or physician before usage, the proper keeping procedure should be available and promoted.

The two main recommendations emerged from this study are 1) physicians should request only necessary

amount of blood and blood product and 2) quality control of blood product keeping. Although the findings and the suggestions from our report is not actually new the similar problems can be detected in every setting. Hence, the repetitive notification on this topic is important. The basic analysis like this study should be done in every setting as a basic data for continuous quality improvement by plan-do-check-act (PDCA) cycle.

Acknowledgement

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