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Analysis of the Blood Consumption for Surgical Programs

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ABSTRACT

Introduction: Transfusion is an activity that assures sufficient supply of blood and blood components to treat the sick and injured. In transfusion departments is necessary to timely provide adequate amounts of blood and blood products for various surgical procedures.

Material and methods: To determine the total amount of preoperative requirements (BT/AB and BT/AB/MT) for blood and blood products in surgical departments of General Hospital "Prim. Dr. Abdulah Nakas" in the period from June 1, 2014 – December 31, 2014 and analyze the requirements for blood in relation to surgical procedures, surgical discipline, period, age and gender of patients. To determine the maximum consumption levels surgeries. **Results:** The total amount of preoperative requirements for blood and blood products in surgical departments amounted to 927. Almost the same number of requests with a slightly higher percentage was in December and October and the lowest in June. The average age of patients was 52.2 ± 20.1 years with the youngest patient aged 9 and the oldest at the age of 97 years. Women were more prevalent with 686 or 74% of the time compared to men. The largest number of requests for surgery elective cesarean section 208 (22.5%) with delivery wards, then for surgery or hip replacement 98 (10.6%). Maximum consumption for surgical operations Hysterectomy totalis abdominals 15 doses of blood. **Conclusion:** The largest number of requests were for elective cesarean section 208 (22.5%) with delivery wards, then for surgery or hip replacement with 98 (10.6%). Maximum consumed doses had gynecology surgery at Hysterectomy totalis abdominals 15 doses of blood, then orthopedics surgery at Primary hip prosthesis 11 doses.

Key words: Requirements (BT/AB and BT/AB/MT) for the operational programs, the maximum consumption levels

1. INTRODUCTION

At the transfusion departments is necessary to timely provide adequate amounts of blood and blood products for surgeries. For various surgical programs are made assessments of the average number of doses of blood needed for surgery. These estimates are provide big savings in levels and supplies, decrease number of additional steps to achieve self-sufficiency in blood and blood derivatives (1-3). For example, in surgeries such as total gastrectomy, total cystectomy, pulmonary resection, assumed blood loss can be recovered with 4 units of blood after surgery. Then, the surgery of the femoral head fractures, partial

cystectomy, radical mastectomy, and nephrectomy require the preparation of 2 units of blood after surgery. Surgery of aortic aneurysm due to the complexity of the surgical procedure requires a larger amount of blood levels of 10-12 doses per surgery (3). The potential revision in the number of transfusions for surgeries programs are every day, estimates carried out are largely beneficial, primarily to determine how effectively the blood is used in elective surgery (1-3). Studies are significant for comparisons and use in transfusion practice, identifying predictors of transfusion in hospitals and developing strategies to optimize practice (1-3).

2. GOALS

The goals of the study were: a) to determine the total amount of preoperative requirements (BT/AB and BT/AB/MT) for blood and blood products in surgical departments of General Hospital "Prim. Dr. Abdulah Nakas" Sarajevo in 2014; b) to determine the number of applications for surgical programs by the surgical departments and the type of surgery; c) to analyze the number of requests of blood and blood products in relation to the time period, age and patient's gender; d) to identify the largest spending of blood products in relation to the type of surgery.

3. MATERIAL AND METHODS

The study was conducted in General Hospital "Prim. Dr. Abdulah Nakas" at the Department of Transfusion Medicine as retrospective study during the period from June 1, 2014 to December 31, 2014. This study investigates the supply and demand of blood in surgical departments through two types of requisitions for blood. This retrospective study determined the total number of requests for BT/AB/MT and BT/AB for blood and blood products for surgical departments, then determined their total consumption for different surgical programs within the surgical wards of the General Hospital "Prim. Dr. Abdulah Nakas" In the above mentioned period. Through descriptive scientific method is collected, processed and analyzed data from conventional samples, then of the final calculation and determination of statistical indicators. With processed and analyzed data is determined the total number of transfusions (TR), in relation to specific surgical disciplines, surgical programs. After that was determined the highest preoperative requirements of individual departments, according to the type of surgery and established their actual consumption.

Conducted is descriptive statistical analysis of the data in this study, which is composed of the collected data are entered in the Microsoft Excel 2013 tables from requests (paperwork) for transfusion with surgical departments. The data were analyzed, calculated and performed is the statistical analysis using the statistical package IBM SPSS Statistics in 21.0 (Chicago, Illinois, USA). Data are presented in the form of tables, using the classical methods of descriptive statistics, and depending on the nature and scale of measurement data. To test differences were used chi-square test, Student's t test and one-way analysis of variance (ANOVA) with significance level of 95% or $p < 0.05$.

4. RESULTS

In the period from June 1, 2014 – December 31, 2014 the total of requests by the surgical wards/departments was 927 requests for BT/AB and BT/AB/MT. Of that 623, or 67.2% of requests for BT/AB and 304 or 32.8% of claims for BT/AB/MT. Almost the same number of requests with a slightly higher percentage was during December and October and the lowest in June. The average age of patients was 52.2 ± 20.1 years with the youngest patient aged 9 and the oldest at the age of 97 years. Women were more prevalent with 686 or 74% compared to men. According department's largest number of requests was from gynecology 273 or 29.5% and the lowest with ENT

3 or 0.3. The largest number of requests was for patients in Intensive Care after surgery Hemicolectomy I. dex laparoscopy, 14 requests. On average, after the surgery were used 3.2 units of blood. Statistical analysis indicates that there is no significant difference in the average number of used blood units ($p > 0.05$). The surgery Resectio colonis sigmoidei cum colostomia sec. Hartman had 11 requests the Department of General Surgery, most of the blood is used for performing the surgery gastrectomy partialis, 3 doses, followed by the Colectomia totalis and anastomosis ileorectalis 2.5, Statistical analysis indicates no significant difference in the average number of used units of blood ($p > 0.05$). The largest number of applications was the primary operation installation hip replacement–98, on average, after the operation was spent 1.6 units, then surgery of disc herniation 72 requests, this operation did not use blood. The largest number of units consumed blood was for surgery amputation of the lower leg, three doses in two cases. Statistical analysis indicates that there is a significant difference in the average number of consumption to the number of surgeries ($p < 0.05$). On average the highest number of blood because of surgery Mastectomia totalis and Hemicolectomia 5 dose levels, while the largest number of applications was due to surgery Resectio prostatae transurethralis 61. Statistical analysis indicates that there is no significant difference in the average number of consumption based on the number of surgical procedures ($p > 0.05$).

The largest number of requests for blood was for hysteroscopy surgery to remove a myoma according to the number of spent dose/units of blood in surgery Curettage. Statistical analysis indicates that there is a signifi-

Type of surgery	N No of surgeries	Mean Transfu- sions	Std.dev.	Min.	Max.
Mastectomia radicalis	1	10	.	10	10
Gastrectomia partialis	1	10	.	10	10
Gastroenteritis et colitis radi- ationalis	1	10	.	10	10
Exploratio cavi peritonealis	2	5.5	4.94975	2	9
Resectio prostatae transure- thralis	2	5	0	5	5
Excisio abscessus	1	4	.	4	4
Nephrectomia	2	3.5	3.53553	1	6
Hemicolectomia I. dex lapa- roscopica	14	3.2308	3.39494	0	11
Amputatio cruris	1	3	.	3	3
Resectio colonis sigmoidei cum colostomia sec.	6	2.8333	2.48328	1	6
Drainage haemothorax	2	2.5	2.12132	1	4
Adenotomia	6	2	1.67332	0	5
Hemicolectomia I. sin	3	2	0	2	2
TEA a. iliaceae	1	2	.	2	2
Whipple pancreatoduodenec- tomia	3	1.3333	1.52753	0	3
Appendectomia	1	1	.	1	1
Ccolectomia totalis and anastomosis ileorectalis	1	1	.	1	1
Amputatio abdominoperinealis rectalis sec. Miles	2	1	0	1	1
Revisio abdominalis acuta	1	1	.	1	1
Bypass extra-anatomica	3	1	0	1	1
Ileus	3	0.3333	0.57735	0	1
Ukupno	57	2.8070	2.94860	0.00	11.00

Table 1. The surgical intensive care: the number of spent units of blood in relation to the number and type of request for surgery. $F=1.726$; $p=0.074$

Type of surgery	N No of surger- ies	Mean Transfu- sions	Std.dev.	Min.	Max.
Gastrectomia partialis	2	3	1.41421	2	4
Colectomia totalis and anastho- misis ileorectalis	1	2.5	2.38048	0	5
Gastrotomia expl. suttura loci sanguinans	2	2	.	2	2
Resectio ventriculi cum GEA sec. Bihrlot II	3	2	.	2	2
Gastrectomia totalis cum Ruex en Y anasthomosis	3	2	.	2	2
Nephrectomia	2	2	.	2	2
Melena. neoznačeno	1	2	.	2	2
Bypass femoropoplitealis inferior	1	2	.	2	2
Amputatio cruris	3	2	.	2	2
Whipple pancreatoduodenec- tomia	1	1	.	1	1
Pancreatetectomia partialis - Whipple	3	1	.	1	1
Hemicolectomia I. dex	8	1	1.69031	0	5
Resectio colonis sigmoidei cum colostomia sec. Hartman	11	1	1.26491	0	3
Ileus. non specificatus	3	1	2	0	4
Aneurysma aortae abdominalis	1	1	.	1	1
Hemicolectomia I. dex laparo- scopica	7	0.3333	0.8165	0	2
Total	52	1.0192	1.40713	.00	5.00

Table 2. General Surgery: number of used units of blood in relation to the number and type of request for surgery. $F=0.698$; $p=0.812$

Type of surgery	N No of surgeries	Mean Transfu- sions	Std.dev.	Min.	Max.
Discus hernia	72	0	0	0	0
Surgery of the me- niscus	1	5	.	5	5
Amputation of the lower leg	2	3	.	3	3
External fixation of fractures of the lower leg	2	2.5	0.70711	2	3
Other surgeries on the hip joint	3	2	2.82843	0	4
Other surgeries of the knee or lower leg	3	1.6667	1.52753	0	3
The primary installa- tion of hip prosthesis	98	1.6122	1.57711	0	11
Internal fixation of fractures of the lower leg using plates and screws	18	1.5	1.58114	0	5
Resolving fractures of the knee/shin by combined method	3	1	.	1	1
Amputation of thigh	4	0.25	0.5	0	1
Total	206	1.0146	1.47327	0.00	11.00

Table 3. Orthopedics: number of used units of blood in relation to the number and type of request for surgery. $F=6.750$; $p=0.0001$

cant difference in the average number of consumption to the number of surgeries ($p<0.05$). With delivery wards on average is the highest issued blood for surgery Hysterectomy totalis abdominals. Statistical analysis indicates that there is a significant difference in the average number of consumption to surgery ($p<0.05$).

5. DISCUSSION

Sufficient quantities of blood prepared for surgical programs play an important role in the stabilization of the patient and increasing the function of vital organs in

Type of surgery	N No of surgeries	Mean Transfu- sions	Std.dev.	Min.	Max.
Mastectomia totalis	1	5	.	5	5
Hemicolectomia I. dex	1	5	.	5	5
Amputatio abdominoperinea- lis rectalis sec. Miles	5	2	1.41421	0	4
TUR tumoris vesicae urinariae	2	2	0	2	2
Repeated surgery hip and thigh due to deep infection	1	2	.	2	2
Resectio prostatae radicalis	13	1.3333	1.72328	0	5
Ex tumor abd.	1	1	.	1	1
Ex. Abscesus	1	1	.	1	1
Resectio colonis sigmoidei cum colostomia sec. Hartman	2	1	0	1	1
Nephrectomia	9	1	1.58114	0	5
Amputations of the shoulder joint or the upper arm	2	1	0	1	1
Amputatio femoris	5	0.8	0.83666	0	2
Resectio prostatae trans- vesicalis	15	0.7778	2.33333	0	7
Resectio prostatae trans- uretralis	61	0.4262	1.34733	0	8
Total	119	0.7966	1.54455	0.00	8.00

Table 4: Urology, number of used units of blood in relation to the number and type of request for surgery. $F=1.509$; $p=0.099$

Type of surgery	N No of surger- ies	Mean Transfu- sions	Std.dev.	Min.	Max.
Curettage	3	3	2.64575	1	6
Hysterectomy totalis abdominalis	72	0.5139	2.05552	0	15
Hysterectomy totalis vaginalis	18	0.25	0.46291	0	1
Laparoscopy/resectio/ incisio cystae ovarii	66	0.1061	0.43426	0	2
Colpoplastica ant. et. post.	11	0.0909	0.30151	0	1
Hysteroscopio et myomec- tomia	92	0.0122	0.11043	0	1
Conisatio cervicis	11	0	0	0	0
Total	273	0.2088	1.15857	0.00	15.00

Table 5. Gynaecology, number of used units of blood in relation to the number and type of request for surgery. $F=1.843$; $p=0.029$

Type of surgery	N No of surgeries	Mean Transfu- sions	Std.dev.	Min.	Max.
Hysterectomy totalis abdom- inalis	3	4	5.65685	0	8
Status post partum	6	2	0.89443	1	3
Partus sectione caesarea electiva	208	0.1154	0.6341	0	7
Total	217	0.2028	0.88474	0.00	8.00

Table 6. Delivery department, number of used units of blood in relation to the number and type of request for surgery. $F=29.683$; $p=0.0001$

the event of blood loss. This study was aimed at assessing the required amount of blood and consumption at certain surgical procedures in the General Hospital "Prim. Dr. Abdulah Nakas". To that end, the retrospective study found no preoperative requirements for blood and blood products and their actual consumption of various operational programs in certain surgical departments in the period from June 1, 2014 – December 31, 2014. During this period, there was the total of 927 requests for blood. Since the Department of Transfusion Medicine at this

institution uses two types of requisitions for different blood testing, in terms of rationalization of reagents and consumables transfusion materials, it was found that there were 623 requests, or 67.2% for testing BT/MT, while 304 or 32.8% for testing BT/AB/MT. General Hospital "Prim. Dr. Abdulah Nakas" the hospital that has the surgical of abdominal, urological, orthopedic, ENT surgery and gynecology and obstetrics ward. The largest number of requests was from gynecology 273 or 29.5%, followed by obstetrics department with 217 requests, or 23.4%, orthopedics 206 (22.2%), urology 119 (12.8%), surgical intensive 57 (6.2 %), general surgery 52 (5.6%). The lowest number of applications was the ORL 3 requirements or 0.3%. In respect of the months in the time the largest number of applications was 166 in December, or 17.9%, and October 153, or 16.5%, and the lowest number of applications was in the month of June, 109 or 11.8%. In terms of the type of operational requirements the majority of requests were for surgery elective cesarean section 208 (22.5%) at delivery ward, then for surgery or hip replacement in orthopedics with 98 (10.6%) requests and hysteroscopic removal of uterine fibroids with 92 (10.0%) requests. The average age of patients was 52.2 ± 20.1 years with the youngest patient aged 9 and the oldest at the age of 97 years. Women were more prevalent with 686 or 74% of the time compared to men. Although the largest number of surgeries was the gynecology and maternity analysis shows total consumption of blood and blood products to surgery statistical analysis indicates that there is a significant difference in the average number of consumption to surgery ($p < 0.05$). According to reports in the literature of gynecological bleeding showing that these operational procedures can be successfully controlled without the use of blood, and to women, especially of childbearing age to avoid transfusions due to known risk of transfusion with more possible sensitization to blood antigens (4). Sensitization to blood antigens, particularly affect the pregnancy with all the other possible early and late risks associated with transfusions. Among younger women recommended to resort to mostly other / alternative or surgical methods at stopping bleeding (4, 5). Treatment with multiple traumas, surgical patients often requires blood transfusion in very different quantities. However, the precise incidence of blood transfusion in these patients is not known (6). It has been reported that 10-15% of the concentrated red blood cells used in the treatment of patients with multiple traumas in the United States (7). The phrase, massive transfusion defines the application of more than 10 units of concentrated red blood cells, it has an impact on the length of hospitalization as well as the health system of a country in terms of costs, also has an impact on the development of potential complications in about 22% of patients (8). Early complications of massive transfusion are leucopenia, hypothermia, acidosis, hyperkalemia, hypocalcemia, immunomodulation and hemodilution/coagulopathy (8-11). Late complications of massive transfusion are: failure of organs and organ systems, especially the cardiovascular, pulmonary, renal, multi-organ failure, possible infection, hepatitis and HIV

(12-17). Data on the incidence of these complications are very rare in the literature, to the late twentieth centuries when monitoring shows the survival rate of patients with massive transfusion, which was very low (15). Analyzing potentially poor outcome of patients with massive transfusion, with increasing costs, the question arises whether there is a limit to the amount of use of blood (13-18).

6. CONCLUSION

In General Hospital "Prim. Dr. Abdulah Nakas" in the same time period maximum consumed doses had gynecology at operational program Hysterectomy totalis abdominals 15 doses of blood, then orthopedics surgery at Primary hip prosthesis 11, intensive care for 10 operational programs Mastectomy radicalis, gastrectomy partialis and unmarked surgery with complications radiation (Gastroenteritis et colitis radiationalis). The established processes and control of processes (management of disorders on Transfusion Unit as predictor of safety of transfusion treatment), thus continuously monitor the possible critical points in the transfusion process.

- Conflict of interest: none declared.

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