Journal of Blood Disorders & Transfusion
ISSN: 2155-9864
OPEN ACCESS Freely available online
Research Article

Pre-Operative Prescription of Erythrocyte Concentrates in Surgery and Gyneco-Obstetrics at Cuk

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ABSTRACT

Background: The practice of blood transfusion is common at the University Clinics of Kinshasa (CUK), with a trend towards a decrease in average transfusion rates between 2015 and 2016. However a gap persists between the still insufficient donation and the needs in blood derivatives.

Objective: The objective of this work was to assess the level of need according to the efficient management of red cell concentrates and according to certain bioclinical components.

Methods: A literature review was conducted in patients operated in Surgery and Obstetrics-Gynaecology during the period of January 2014 to December 2016. The Haematology and Immuno-transfusion unit of CUK were used as reference for the Surgical and Obstetric Gynaecology Services.

Results: In a total of 1512 patient records from the two surgical departments analysed, the mean pre-transfusion haemoglobinemia was 9.6 ± 2.5g/dL. Unjustified prescriptions and unjustified expenditures were more associated with Surgery, Obstetrics and restrictive transfusion strategy. Advanced age, preoperative haemoglobinemia collapse and surgical services were independent predictors of the number of bags ordered.

Conclusion: Inadequate prescribing of unwarranted blood bags was pejorative in patients transfused from a low socioeconomic level. Further prospective studies are needed. They could include other parameters not addressed in this study such as the quality of the prescriber, the surgeon who operated and the duration of delivery of the unit ordered.

Keywords: Prescription; haemoglobin; inadequacy; packed red blood cells.

INTRODUCTION

Transfusion of erythrocyte concentrates (ECs) has been used for many years to increase haemoglobin (Hb) levels [1]. This practice carries risks that may be infectious, immunological and hemodynamic. As a result, the current literature recommends a restrictive transfusion strategy that aims to maintain an Hb level >9-10 g/dL [2]. However, it is interesting to note that there is heterogeneity in blood transfusion management despite the recommendation of several guidelines for a restrictive rather than liberal blood management strategy. This heterogeneity persists between countries and between hospitals, but also within hospitals between different practitioners [1,3].

However, as early as 1999, Bracey et al. showed that the adoption of a restrictive transfusion policy (target Hb 8 g/dL) allowed a

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Received: September 15, 2021; **Accepted:** September 29, 2021; **Published:** October 06, 2021

Citation: Kakema C, Longo-Mbenza B, Ngwidiwo JB, Nkasu DKN, Taty RT, Mavoungou YVYVM, et al. (2021) Pre-Operative Prescription of Erythrocyte Concentrates in Surgery and Gyneco-Obstetrics at Cuk. J Blood Disord Transfus. 12: 477

reduction in the consumption of packed red blood cells without an increase in complications [4]. In 2010, Hajjar et al. reported that while the restrictive policy resulted in lower intra-and postoperative haemoglobin levels in cardiac surgery patients, the adoption of a restrictive transfusion policy can be recommended in cardiac surgery, as well as in intensive care [5] and orthopedic surgery [6].

In obstetrical practice, the level of hemodilution must take into account maternal volume changes and fetal risk. In the context of Caesarean section, the tolerated haemoglobin value before fetal extraction is 8 g/Dl at Cliniques Universitaires de Kinshasa (CUK), Democratic Republic of Congo (DRC), the practice of blood transfusion (BT) is common with a trend towards low average monthly transfusion rates in 2016. In addition, the gap persists between the blood transfusions provided (2724 transfusions) and the capacity of the CUK BS (2115 bags collected) to ensure the demands of clinicians.

In addition, most blood transfusions performed at CUK are without audit (clinical governance, good transfusion practices), without standardization of the quantity of EC ordered and transfused with exposure to transfusion risks [7]. This void based on valid publications with regard to the transfusion strategy (liberal and restrictive) [4-6], justified th e initiation of the present study whose objective is to assess the level of needs according to the efficient management of ECs and according to some bioclinical components in Surgery and Gynaeco-Obstetrics at CUK during the period from January 2014 to December 2016.

METHODS

This was a literature review that included 1512 patients operated on in the Departments of Surgery and Obstetrics Gynaecology from January 2014 to December 2016. The information was from medical records for retrospective analysis.

The Departments of Surgery and Gynaeco-Obstetrics as well as the Immunohematology (Bang Bank) and Cytohematology laboratories of CUK were used as the setting for the present study. Junior, senior, specialist and faculty doctors were the prescribers of ECs of patients assigned to the study Departments.

Sampling

an exhaustive sampling of the records of patients operated on during the study period was carried out. Only the records of patients operated on in the Surgery and Gynaeco-obstetrics Department of the University Clinics of Kinshasa were included in the study.

Variables of interest

The parameters of interest were age, sex, urgency of the procedure (yes or no), type of procedure, surgeon who operated, preoperative haemoglobin level, number of bags ordered, transfusion performed (yes or no), number of units transfused on the day of the procedure (D0), number of units transfused after the day of the procedure (JA0), and the haemoglobin level at discharge. The Department of Surgery is divided into the following departments: General Surgery (including Digestive Surgery, Plastic Surgery and General Surgery), Orthopaedic Surgery, Pediatric Surgery, Thoracic Surgery, Neurosurgery, and Urological Surgery. The Department of Gynaecology and Obstetrics was composed of two services: general gynaecology and obstetrics. The data were collected from the patients' files after verification, simultaneously in the files of the Departments of Surgery, Gyneco-obstetrics and the registers of the Hematology and Immunotransfusion Unit (Blood Bank) of the CUK. This strategy ensured the validity and completeness of the data of interest.

Operational definitions

Transfusion on D0 was defined as receiving a transfusion during surgery; transfusion after D0 was defined as receiving a transfusion after surgery (postoperative); control haemoglobin was that obtained 48 hours after transfusion; liberal transfusion strategy was defined as maintaining Hb >10 g/dL; restrictive transfusion strategy was defined as maintaining Hb >7 g/dL, adjusted (adjusted) restrictive transfusion strategy: transfusion if Hb < 7 g/dL to maintain it between 7 and 10 depending on patient condition and circumstances.

Statistical analysis

Categorical data were presented by their numbers (n) and percentages (proportions). Associations between categorical variables were tested by Pearson's Chi-square test. Normality of quantitative variables was assessed by the Kolmogorov-Smirnov test. Quantitative variables were characterized by the mean ± standard deviation (X ± SD) or the median with its interquartile range (Med (IQR)). The means of ages and Hb levels with normal distribution were compared by Student's t test between two groups but also with analysis of variances (ANOVA) between ≥ 3 groups. On the other hand, the mean values of ordered blood bags and transfused blood bags with skewed distributions were compared by the nonparametric Mann-Whitney U test between two groups. In univariate (bivariate) analysis, the association between two continuous or quantitative variables was determined by Pearson's r coefficient in case of normal distribution but also by Spearman's rho (ρ) coefficient in case of abnormal distribution. Multivariate analysis using a linear multiple regression model predicted the number of bags transfused after adjustment for confounding values. Discriminant analysis, a multivariate model, was used to classify the different transfusion strategies. The threshold of statistical significance was set at $p<0.05$. All statistical analyses were performed with SPSS 23 software.

RESULTS

General characteristics of the study population

Sex: Out of a total of 1512 records reviewed, 914 were from females versus 598 from males with a sex ratio of 2 females: 1 male. This study population was also divided into 598 (39.6%) men in surgery, 382 (25.3%) women in surgery and 530 (35.1%) women in obstetrics and gynaecology. The sex ratio varied significantly across the different clinical departments: no gender predominance in general surgery by contrast male overrepresentation with ≥ 2H: 1F in the rest of the clinical departments.

Age: The mean age of the study population was 39.3 ± 16.8 years, the mode was 36 years, and the median value was 36 years. Figure 1 draws a symmetrical age distribution of all patients in the study.

Study services: Of all the cases listed, one third came from the General Surgery department. On the other hand, Thoracic and Pediatric Surgery were under represented as shown in Figure 2.

Haemoglobin comparison

Representation of the average preoperative haemoglobin level by department: In general, all patients were characterized by the presence of anemia with a mean haemoglobin value of 9.6 ± 2.5 g/dL. There was a highly significant ($p<0.0001$) and uneven variation in mean haemoglobin values across departments: the highest values in neurosurgery, orthopedic surgery and urological surgery; intermediate values in general surgery, thoracic surgery, pediatric surgery and general gynaecology and the lowest values in obstetrics (Table 1). Figures 3A and 3B shows the evolution and variability of haemoglobin levels across clinical services: the highest peak in neurosurgery and the 2nd in orthopedic surgery, the great variability according to Quartiles very large in general surgery, urological surgery, neurosurgery, general gynaecology and obstetrics against a very precise variability in orthopedic surgery, pediatric surgery and thoracic surgery. As expected, haemoglobin levels were more collapsed ($p<0.0001$) in the Department of Obstetrics and Gynaecology (8.6±2.4 g/dL) than in the Department of Surgery (10.2 ± 2.5 g/dL). Figures 4A-4C demonstrates the evolution, variability, and significant range ($p<0.0001$) of haemoglobin levels across men in Surgery (10.4±2.4), women in Surgery (9.9 ± 2.4g/dL), and women in OB/GYN (8.6 ± 2.4 g/dL) Average preoperative haemoglobin level by urgency of procedure: The mean preoperative Hb level was significantly lower ($p<0.0001$) in urgent procedures (Hb=8.3 ± 2.4 g/dL) than in scheduled procedures (Hb=10 ± 2.4 g/d/L).

Average preoperative Hb level according to blood transfusion or not: Of the total population, 62.2% (n=940), 24.8% (n=375) and 13% of the patients had not been transfused, had been transfused and had no information about blood transfusion respectively. The mean preoperative Hb level was inexorably lower in women in GO without transfusion information than in women in Surgery and in men in Surgery (Figure 5).

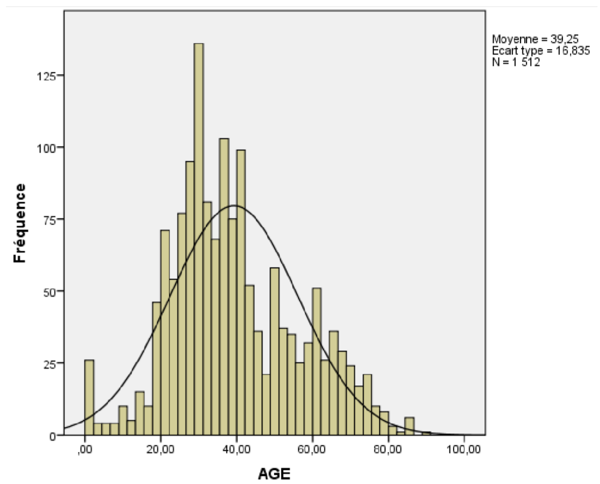

Figure 1: Age distribution of the patients in the study

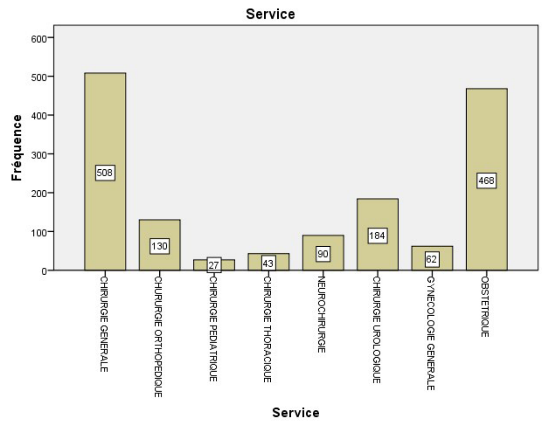

Figure 2: Representation of the number of patients by clinical services

Table 1: Representation of the average Hb level by service.

Services	N	Mean ± SD
General surgery	507	9.820 ± 2.845
Orthopedic surgery	130	10.834 ± 0.937
Pediatric surgery	27	9.593 ± 1.087
Thoracic surgery	43	9.735 ± 0.993
Neurosurgery	90	11.646 ± 1.881
Urological surgery	183	10.244 ± 2.272
General gynecology	62	9.535 ± 2.299
Obstetrics	468	8.457 ± 2.353

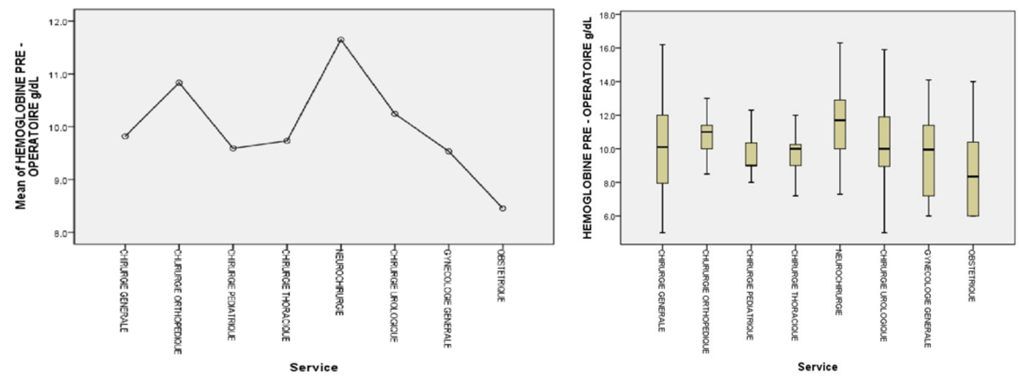

Figure 3A-3B: Evolution (A) and variability (B) of mean preoperative hemoglobin values

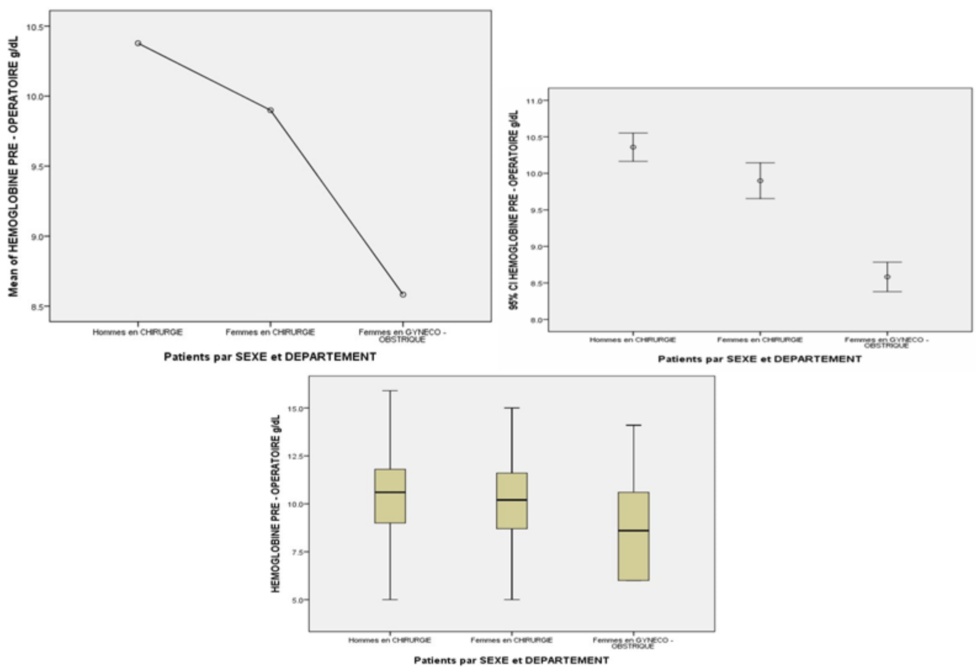

Figure 4A-4C: Comparison of mean and median Hb values by sex and study departments.

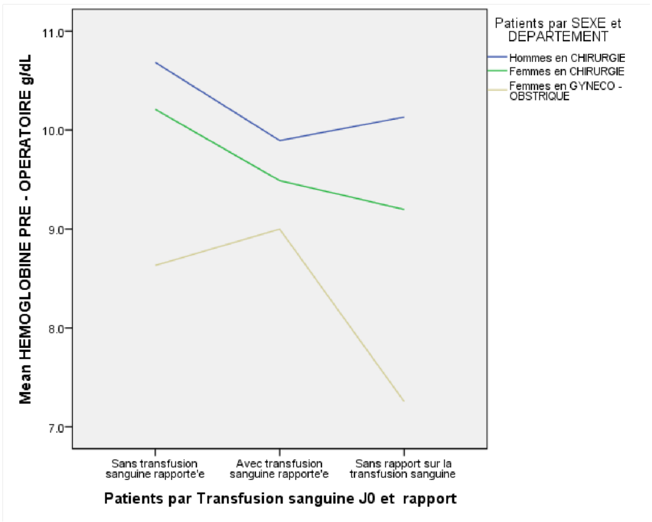

Figure 5: Evolution of mean preoperative Hb levels according to the interaction between gender and Department.

Prescription of blood bags

The majority of patients 84.2% (n=1273) had been instructed to purchase blood bags Unwarranted EC prescriptions and blood transfusion on the day of surgery (TJ0) and APJ0 of the 1506 bags ordered, 51.7% (n= 779) were actually transfused to patients with a significant difference between the General Surgery department on D0 and after the day of the operation (APJ0). But the remaining 48.3% (n=727) were considered as unjustified EC prescriptions in this study population: 251 in General Surgery, 39 in Orthopedic Surgery, 4 in Pediatric Surgery, 25 in Thoracic Surgery, 44 in Neurosurgery, 62 in Urological Surgery, 59 in General Gynaecology and 243 in Obstetrics. Figure 6 shows the inadequacy characterized by the surplus of unjustified prescriptions and their unjustified expenses in the General Surgery and Obstetrics department. There was a highly significant ($p< 0.0001$) and uneven variation in transfusions at D0 and transfusions after D0 across all clinical departments of patient admission (Table 2).

Number of bags transfused per patient on D0: There was a highly significant ($p<0.0001$) and uneven variation in the mean number of bags transfused to patients on D0: the highest rate being in thoracic surgery. But considering the blood transfusion ratio on D0, no value was specified in patients without TS report (Figure 7).

Number of bags transfused per patient after D0: Table 3 and Figure 8 report a highly significant ($p<0.0001$) and unequal evolution of the average number of bags transfused after D0: the average peak being observed in Thoracic Surgery. Men in Surgery had more ($p=0.004$) APJ0 transfused bags than women in Surgery and women in Obstetrics-Gynaecology. Paradoxically, the mean rate of bags transfused after D0 was significantly higher ($p<0.0001$) in patients without reported blood transfusion than in patients with reported blood transfusion and in patients without blood transfusion.

Prediction of bags transfused on D0: The prediction of the number of bags transfused on D0 was obtained in bivariate analysis (univariate). The number of bags ordered was positively correlated with the age of the patients ($r=0.155$; $P<0.0001$ Pearson correlation), but negatively correlated with the preoperative Hb level ($r=-0.320$; $P<0.0001$) and with the interaction between sex and department (coefficient $r=-0.0001$). In multivariate analysis (linear multiple regression, by 3-step strategy (STEP WISE)) and after adjustment by urgency or not of the intervention, the advancement in age (age groups) was correlated in an independent and positive way with the increase in the number of bags ordered whereas the decrease in the Hb rate and the men in Surgery were associated in an independent and inverse way with the increase in the number of bags ordered at the end of the 3rd strategy step. The age alone introduced in the first step of the model was thus the most important variable in the prediction of the number of bags ordered. The interaction between gender and the Departments of care was the 2nd variable introduced in the 2nd step of the mathematical model while Hb was introduced in the 3rd strategic step (Table 4).

Blood transfusion on D0: Department of Surgery ($p<0.0001$) and male gender ($p<0.0001$) were significantly and positively associated with peak blood transfusion incidence rates on D0 while there was no significant association between elective or urgent procedures ($p=0.272$) and blood transfusion incidence rate on D0 (Figure 9). Transfusion after D0: There was also a significant and positive association between the Department of Surgery ($p=0.004$) and male gender ($p=0.007$) and the excess incidence rates of postoperative ST, while there was no association between the urgency and non-urgency of the procedure ($p=0.295$) (Figure 10).

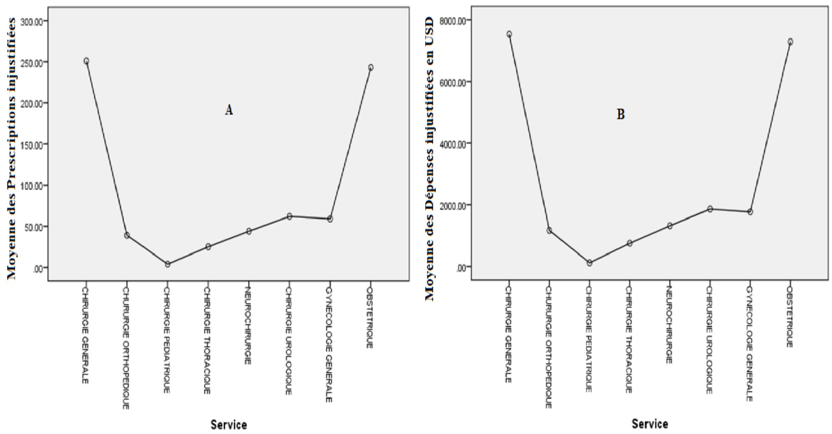

Figure 6: Mean values of unwarranted prescriptions (A) and unwarranted expenditures (B) by clinical service.

Table 2: Proportions of patients by clinical services at and after D0 of transfusion.

Services	TJ0 (%)	TaJ0 (%)
General surgery	266(39,1)	36(36,7)
Orthopaedic surgery	40(5,9)	6(6,1)
Pediatric surgery	1(0,1)	1(1,0)
Thoracic surgery	55(8,1)	10(10,2)
Neuro surgery	62(9,1)	6(6,1)
Urological surgery	88(12,9)	20(20,4)
General gynecology	21(3,1)	1(1,0)
Obstetrics	148(21,7)	18(18,4)

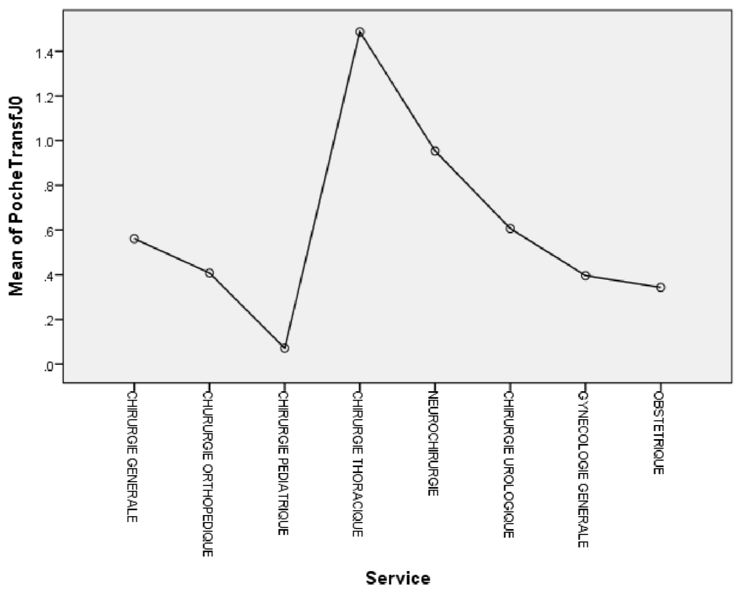

Figure 7: Evolution of the average number of bags transfused on D0 according to the Services.

Table 3: Average number of bags transfused APJ0 by service.

Service	n	Mean ± SD
Thoracic surgery	26	0,38 ± 1,09
Neurosurgery	46	0,13 ± 0,40
Urological surgery	104	0,19 ± 0,60
General gynecology	49	0,02 ± 0,14
Obstetrics	376	0,05 ± 0,28

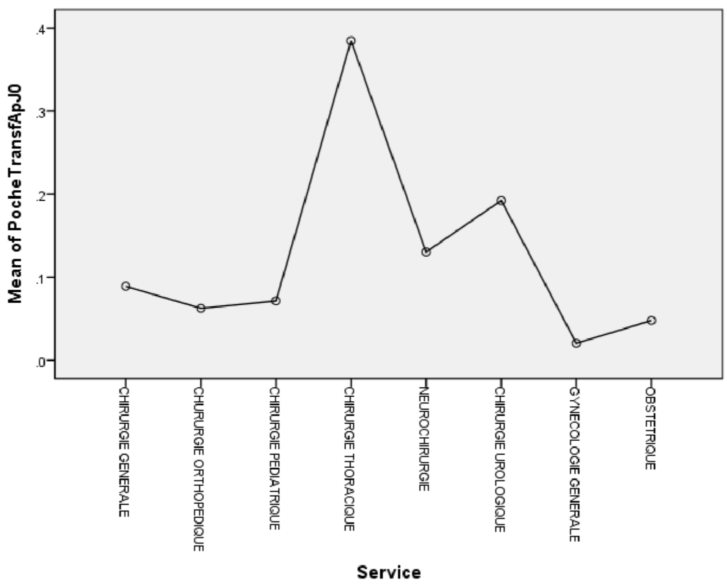

Figure 8: Evolution of the average number of bags transfused AP Day 0 according to clinical services.

Table 4: Comparison of average values of bags ordered and bags transfused by type of transfusion strategy.

		n	Mean ± SD	p-value
Order pocket	Hb<10 g/dL	567	1,23 ± 1,31	
	Hb>=10 g/L	706	1,15 ± 1,24	0,283
	Total	1273	1,18 ± 1,27	
Pockettransfj0	Hb<10 g/dL	595	0,52 ± 0,93	
	Hb>=10 g/dL	722	0,52 ± ,02	0,94
	Total	1317	0,52 ± 0,98	

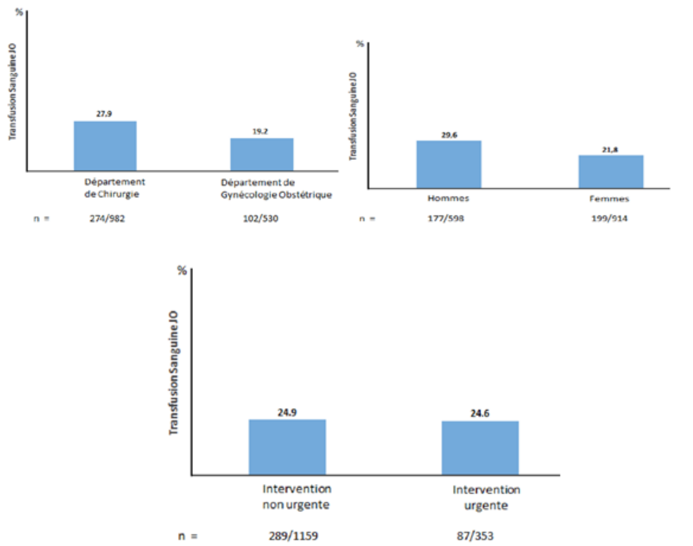

Figure 9A-9C: Distribution of D0 blood transfusion incidence rates by department, gender.

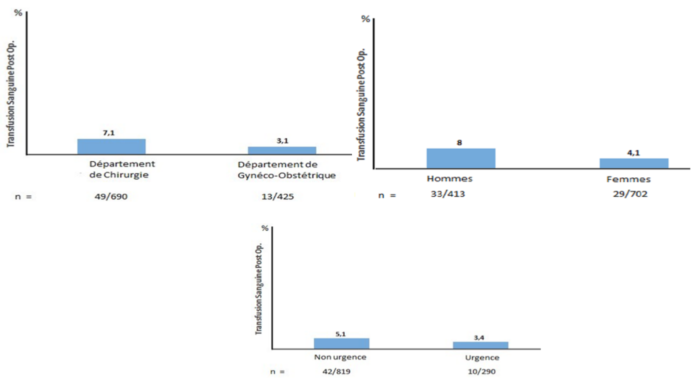

Figure 10A-10C: Distribution of incidence rates of postoperative blood transfusion.

Type of transfusion strategy and bags ordered

Liberal transfusion strategy, bags ordered and bags transfused on D0: The mean values of blood bags ordered (p=0.283) and blood bags transfused did not vary significantly between the two thresholds of Hb level relative to the liberal transfusion strategy (Table 5).

Restrictive transfusion strategy, bags ordered and blood bags transfused on D0: Table 6 and Figure 11 show very significant and very respective variations in the mean values of blood bags ordered and blood bags transfused on Day 0 between the two Hb thresholds of the restrictive transfusion strategy.

Liberal, restrictive and adjusted (managed) transfusion strategy

Univariate analyses: The categories of preoperative Hb <7 g/dL, between 7-9.99 g/dL, and ≥ 10 g/dL characterized the restrictive, adjusted, and liberal transfusion strategies, respectively. There was a significant (ANOVA, P<0.0001) and positive correlation between preoperative Hb categories and mean age values in the study population. In contrast, there was a significant (ANOVA, P<0.0001) and inverse correlation between Hb categories and mean values of unwarranted blood prescriptions. There was also a significant (ANOVA, P<0.0001) and negative association between preoperative Hb categories and mean values of unwarranted expenditures. There was therefore a lack of relevance in the prescription of blood bags and an underestimation of the average values of the bags transfused at the expense of the restrictive strategy and the liberal strategy in comparison with the values relating to the managed strategy.

Table 5: Comparison of average values of bags ordered and bags transfused according to restrictive strategy.

		n	Mean ± SD
Order pocket	Hb<7 g/dL	258	0,85 ± 1,07
	Hb>=7 g/dL	1015	1,27 ± ,30
	Total	1273	1,18 ± 1,27
Pockettransfj0	Hb<7 g/dL	263	0,25 ± 0,63
	Hb>=7 g/dL	1054	0,58 ± 1,04
	Total	1317	0,52 ± 0,98

Table 6: Coefficient by function of classifications in discriminant analysis

Preoperative Hb categories	Hb<7 g/dL	Hb = 7-9.99 g/dL	Hb>=10 g/dL
Pre-operative hemoglobin g/dl	5,858	8,716	11,582
Unjustified requirements	0,020	0,010	0,006
Constant	-20,879	-39,894	-68,391

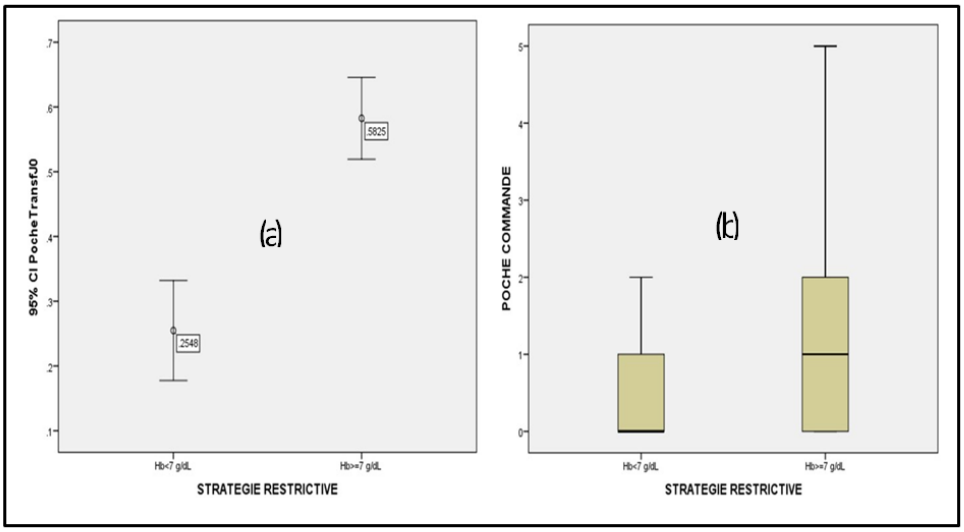

Figure 11A-11B: Comparisons of means(a) and variability(b) of bags transfused and bags ordered according to the restrictive strategy.

Multivariate analysis: After adjustment for age (confounder), discriminant analysis significantly classified (test for equality of group means, P<0.0001 for preoperative Hb, for postoperative Hb, and for unjustified prescriptions; Box M ddl at 2nd step 244572; P<0.0001) the Hb categories (Table 7 and Figure 12). Thus, only the preoperative Hb, the postoperative Hb and the unjustified prescription were able to discriminate the said transfusion strategies.

Table 7: Prediction of the number of blood bags ordered in linear multiple regression (multivariate).

	Model	B	Unstandardized coefficients	Standardized coefficients	t	Sig.	95.0% C.I for B
			Std. Error	beta			Lower bound
1	(Constant)	0.103	0.077		1.33	0.184	-0.049
	Age groups	0.092	0.016	0.155	5.698	0	0.061
2	(Constant)	0.414	0.113		3.654	0	
	Age groups	0.076	0.017	0.128	4.572	0	0.192
		-0.12	0.032	-0.105	-3.748	0	0.044
	Patients by sex and Department						-0.183
3	(Constant)	0.752	0.17		4.435	0	0.419
	Age groups	0.077	0.017	0.129	4.595	0	0.044
	Patients by sex and department	-0.145	0.033	-0.127	-4.359	0	-0.211
	Pre-Operative hemoglobin g/dL	-0.03	0.011	-0.076	-2.674	0.008	-0.052

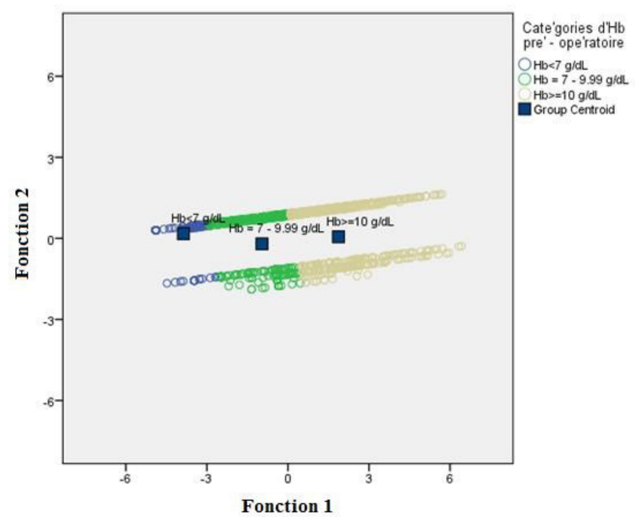

Figure 11A-11B: Comparisons of means(a) and variability(b) of bags transfused and bags ordered according to the restrictive strategy.

DISCUSSION

The objective of the present study was to estimate the level of need and to identify the predictive factors for the transfusion of blood bags ordered and transfused in the pre-and postoperative periods. This study also assessed the appropriateness (adequacy) of EC prescriptions in a tertiary health level (CUK) in Kinshasa, Democratic Republic of Congo. Preoperative Hb levels were compared by gender, age progression, and between surgical departments at CUK.

Patients and demographics

The present study observed a female predominance in the study population during the period January 2014 to December 2016. The sex ratio close to 1.5 in favor of females reflects the inclusion of the Department of Gynaecology-Obstetrics as one of the settings for the study. Indeed, in the Department of Surgery, out of the 980 patient records recruited, only 382 (39%) patients were female against 598 (61%) male i.e a sex ratio F: M of 0.64. The overrepresentation of women in blood transfusion is plausible in developing countries in general [8] and in sub-Saharan Africa in view of the malaria endemic especially during pregnancy [9]. Malaria endemicity results in endemic anaemia, with dramatic peaks during acute malaria attacks, especially in children and pregnant women [8]. However, 35% of the patients were admitted to the Department of Gynaecology and Obstetrics. Dolly Munlemvo Matondo (2013) in a study evaluating transfusion practices at CUK also found a female predominance with a sex ratio of 2.57 [10]. In developed countries, there is a male overrepresentation with cancers in general among transfused cases [11,12]. H. Gouezec et al. also found a male predominance

[13]. All patients in the study population were young with a median age of 36 years with an interquartile range of 28-50 years. The 20-29 and 30-39 age groups were the most represented (55.5%) in both sexes. These ages correspond to the period of reproductive biology [14,15] and that of economic productivity [16]. Dolly Mulemvo in 2013 in her study in CUK, DRC found a predominance of the study population in the age group of 41-50 [10]. A study done in Mali in 2013 found similar data with a modal age range in the study population of 26-35 years [9]. There was also a very significant variation in the mean age values between the departments of the Department of Surgery: general surgery 43 years, orthopaedic surgery 38 years, thoracic surgery 40 years, urological surgery 51 years. This variability can be explained by the specificity of each department. But considering the patients admitted in the Department of Surgery, there was a male predominance compared to females. On the other hand, the sex ratio was different in different departments. In general surgery the sex ratio was 1H: 1F against a sex ratio of 2H:1F respectively in the departments of Orthopaedic Surgery and Paediatric Surgery; and a sex ratio of 3H:1F in the departments of thoracic and urological surgery.

Blood Hb concentration

The present study revealed a highly significant and uneven variation across all parameters of interest. Preoperative Hb threshold by department

The Obstetrics Department had the lowest mean preoperative Hb level (8.4g/dL) compared with other surgical departments evaluated in this study. Bleeding during menstruation, pathological pregnancies (retro placental hemorrhage/HRP, placenta previa, molar pregnancies, and extra uterine pregnancy/EMT) and intraoperative uterine bleeding could explain this difference [17]. Low Hb in women is also related to hemodilution during pregnancy and iron deficiency [18]. According to WHO, 61% of pregnant women in Africa are anemic [19]. Anemia is often endemic in Africa and is related to the almost chronic infestation by malaria and intestinal worms. H. Gouezec et al. in a multicenter study of the relevance of prescriptions of red blood cell concentrates in 2010 in France found a mean preoperative Hb level of 7.89 ± 1.24 g/dL [16]. The lowest mean Hb (6.9 g/dL) was found in Obstetrics and the highest (8.93 g/dL) in Orthopaedic Surgery [20-22].

Hb levels, demographics and clinical services

This study found a mean preoperative Hb level of 9.6 ± 2.5 g/dL regardless of gender. On the other hand, Dolly Mulemvo in 2013 (DRC) [10], Bula Bula in Kinshasa in 2003 [23], Giral in Paris in 2012 [24], Toumi in Casablanca in 2006 [25] and Sorro L. in 1999 found respectively, 10.7 g/dL; 10.6 g/dL; 12.4 g/dL; 13 g/dL; 14 g/dL [10,23-26]. The Hb level in the present study is lower than that found in the other studies cited above. This can be explained by the inclusion of obstetric women in the population of this study who are generally anemic [19]. The 29-39 and >80 age groups in the entire study population and women under 50 years of age were the most vulnerable and had the lowest mean Hb of 9.3 g/dL. This means that advancing age in men in Surgery and young age of women in Obstetrics will be the challenge of non-communicable diseases including cancers and pathologies associated with genital activity in women [27].

Emergency and Hb level

Despite the majority of scheduled surgeries (above 60%), the mean Hb level in patients whose surgery was scheduled was similar to that of patients whose surgery was done on an emergency basis. This result is logical given the average preoperative Hb level, which is generally lower than 8.5 g/dL. On the other hand, in the Ivorian context, 72.01% of cases of transfusion were performed on an emergency basis. More than half (63.59%) of these transfusions were observed in obstetrics, moreover these Ivorian data reported preoperative Hb values similar to those in the present study [27].

Audit and red blood cell concentrates

This study sought to determine the adequacy between the blood bags ordered and the bags actually transfused in the Departments of Surgery and Gynaecology-Obstetrics of the CUK, and thus to identify a possible non-rational use of blood units.

Ordering blood bags

Out of a total of 1506 bags ordered preoperatively in the study departments, only 681 (45.22%) bags were actually used intraoperatively. This discrepancy may be justified by the lack of a transfusion protocol in these departments. In fact, in his study, Franco Verlicchi in Italy in 2010, shows that in each hospital, the transfusion protocol for ordering blood must reflect the team's habits in using blood for routine procedures according to their complexities and expected blood loss, and must take into account the local context and possibilities [28]. At CUK, it is often these last 2 aspects that motivate surgeons and resuscitators to reserve blood for patients, especially since the BS is not always able to meet the hospital's transfusion needs and especially to respond in an emergency. In addition to the lack of a transfusion protocol, the absence of precise criteria for the indication of EC transfusion, as stated by Goffn C et al. and Moves B et al., results in a significant percentage of blood orders and transfusions that are not often justified [29,30]. Réboul-Marty J et al. also found a discrepancy between the number of bags prescribed and the number of bags transfused in 7.6% of cases [31]. This mismatch between the bags ordered and the bags actually transfused was also found in Dolly Mulemvo's study at CUK in 2013 [10].

Blood transfusion

This study found a rate of 24.9% of intraoperative transfusion, which is lower than that found by A Ouatara (42%) in Burkina Faso in 2003 [32] and by Sylvie Ricane in Paris (32%) in 2009 [33]. In fact, the Burkinabe and French studies worked in Cardiac Surgery (Thoracic Surgery), which remains one of the surgeries where recourse to transfusion of blood derivatives remains very frequent [34]. The mean number of transfusions on D0 and APJ0 were highest in the Thoracic Surgery department compared with the mean number observed in the other clinical departments in this study. In addition, the mean number of bags transfused APJ0 were respectively higher in male patients in Surgery and in patients without blood transfusion report. The present study identified advancing age, collapsing Hb level and men in Surgery as significant and independent predictors of EC blood prescriptions. Ouattara A. et al identified type and duration of surgery (complexity), preoperative Hb level, urgency of surgery and reoperation as predictors of preoperative EC transfusion [31]. Other French authors found that only the Hb level was significantly related to justified prescriptions [31].

Adequacy and inadequacy of blood bag prescriptions in relation to transfusion

In any case, this study observed that a large number of the bags ordered had not been used (727 bags or 48.1%). Thus, the activity reports from January to October 2017 of the CUK Blood Bank generally noted that a significant number of the reserved blood bags had expired and consequently were destroyed. This waste suggests the adequacy of prescriptions compared to recommendations missing in the DRC. In some health systems in developed countries, there are repositories under the umbrella of evidence-based data [11,12,15,17,19,31]. The concordance between blood products prescribed by different clinical services and the number of blood bags transfused was also missing in this study. In addition, many bags ordered in an imprecise manner and the financial expenses of the patients transfused require planning, quantification and justification of the reasons for prescribing blood products. In contrast, the number of justified blood prescriptions is quite satisfactory in the developed country [35,36].

Transfusion strategy

Results for liberal and restrictive transfusion strategies were obtained in patients admitted to the Department of Surgery and Gyneco-Obstetrics at CUK. Justified and unjustified blood prescriptions all together did not vary significantly with Hb ≤10 g/dL [37]. According to E. Fominskiy et al. the reference guidelines support the use of a restrictive strategy in blood transfusion management in a variety of clinical settings [38]. However, recent publications on randomized controlled trials [39-41] have shown a reduction in mortality in cardiac, orthopedic and oncologic surgery with the use of a liberal strategy. In the present study, it is difficult to state that the operators in the study departments adopted any strategy. Moreover, in France, very few prescriptions (4%) are made on the basis of Hb levels ≥ 10g/dL and nearly 60% of prescriptions are made for Hb levels between 7 and 8 g/dL [31]. In the present study, the number of blood prescriptions was significantly more frequent in case of Hb levels <7 g/dL compared to Hb levels ≥ 7 g/dL according to the restrictive strategy at CUK. These results corroborate the information from the study by J. Reboul-Marty et al in France [31].

Strengths and limitations of the study

The present study has the merit of having addressed in detail the use of erythrocyte concentrates ordered preoperatively for patients admitted to Gynaeco-Obstetrics and Surgery at CUK. Multivariate analysis removed some confounding factors in the prediction of the number of blood bags transfused. It nevertheless has certain limitations. Indeed, it did not seek the justifications for prescribing blood bags preoperatively, due to the objectives of the study and also to the poor management of data and patient files. Information on the different haemoglobin levels (biological data in general), the notion of transfusion or not, the quality of the prescriber and the operator were not reported systematically and in a uniform manner. This made collection difficult and reduced the exploitation of certain aspects. The experience of the prescribers could not be evaluated in this study, unlike in some studies.

CONCLUSION

The results of this study demonstrate the role of female gender and advancing age in blood transfusion requirements. There is also an important role for the interaction between male gender and surgical admission in the surplus of bags ordered and in the collapse of haemoglobinemia. Inadequate prescribing of unwarranted blood bags is detrimental to patients transfused at CUK. Further prospective studies are needed. They could include other parameters not addressed in this study, such as the quality of the prescriber, the surgeon who operated, and the duration of delivery of the unit ordered.

AUTHORS' CONTRIBUTIONS

MSNN AND CKH participated in the study design, data collection was supervised by CKH; BLM analyzed the data; BLM, CKH, and MSNN interpreted the data; all authors made intellectual contributions to the draft manuscript and approved the final version of the manuscript for submission.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Van-Straten AH, Firanescu C, Hamad MA, Tan ME, ter Woorst JF, Martens EJ, et al. Peripheral vascular disease as a predictor of survival after coronary artery bypasses grafting: comparison with a matched general population. Ann Thoracic surg 2010;89: 414-420.

2. Holst LB, Haase N, Wetterslev J, Wernerman J, Guttormsen AB, Karlsson S, et al. Winding: Does the TRISS study support a universal restrictive transfusion strategy for patients in septic shock? 2014 N Engl J Med 371: 1381-1391.

3. Ferraris VA, Brown JR, Despotis GJ, Hammon JW, Reece TB, Saha SP et al. 2011 update to the Society of Thoracic Surgeons and the Society of Cardiovascular Anesthesiologists blood conservation clinical practice guidelines. Ann Thorac Surg 2011; 91: 944-82.

4. Kluytmans JA, Wertheim HF. Nasal carriage of Staphylococcus aureus and prevention of nosocomial infections. Infection. 2005 Feb;33(1):3-8.

5. Agence française de sécurité sanitaire des produits de santé. Good practice recommendation. Diagnosis and antibiotic therapy of communityacquired bacterial urinary tract infections in adults. Med Mal Infect. 2008.

6. Hakeberg M, Dernevik L, Gatzinsky P, Eklöf C, Kennergren C, Jontell M. The significance of oral health and dental treatment for the postoperative outcome of heart valve surgery. Scandcardiovasc J 1999; 33: 5-8.

7. Toungouz M, Mathys E, Thomas I, Deneys V, Hübner R. Good transfusion practices for hospitals. Conseil Supérieur de la Santé. Belgium, 2010; (8381):1-80.

8. M. Chobli. Which blood for which patients in Africa in 2011? Rev Afr Anesth Med Urg.Tome. 2011.

9. Guindo A, Touré BA , Guindo P , Baraika MA , Sarro Y S , Fané B. Plasmodium falciparum infectious risk associated with blood transfusion in sickle cell patients at the CRLD of Bamako, Mali, Transfus Med. 2013-201.

10. Munlemvo D, Nsiala J, Tozin R, Situakibanza H, Lepira F, Amisi E, Kilembe A. Évaluation des pratiques transfusionnelles périopératoires aux cliniques universitaires de Kinshasa. Trans clin et bio. 2014;4(21):247-8.

11. Ayantunde AA, Ng MY, Pal S, Welch NT, Parsons SL. Analysis of blood transfusion predictors in patients undergoing elective oesophagectomy for cancer. BMC Surgery 2008, 8:3 doi: 10.1186/1471-2482-8-3.

12. Lyon RM, de Sausmarez E, McWhirter E, Wareham G, Nelson M, Matthies A, et al. Pre-hospital transfusion of packed red blood cells in 147 patients from a UK helicopter emergency medical service. Scandinavian journal of trauma, resuscitation and emergency medicine. 2017; 25(1):1-0.

13. ZALAMBANI A. The effects of an ageing population on the health system the case of blood demand.

14. Kouakou F, Effoh D, Loué V. Transfusion practice in the gynaeco-obstetrical environment. About 753 transfusions performed at the CHU of Cocody (Abidjan-RCI). Rev Afr Anesth Méd Urg Tome. 2011.

15. Sawadogo KCC. Practice of blood transfusion in the gynecology and obstetrics department of the Yalgado Ouedraogo University Hospital (Burkina Faso). 2012.

16. Qualitative study on surgical stays for shoulder pathologies and professional activity Observatoire Régional de la Santé Rhône-Alpes; 2009.

17. Management of blood transfusion in the obstetrical environment at HOMEL in Cotonou.

18. Dan Baruch. Iron supplementation during pregnancy La Revue de Presse du DMG Paris DIDEROT. 2009; 350-351.

19. World Health Organization. The prevalence of anaemia in Women: a tabulation of available information. WHO. 1992; 2:143.

20. So-Osman C, Cicilia J, Brand A, Schipperus M, Berning B, Scherjon S. Triggers and appropriateness of red blood cell transfusions in the postpartum patient - a retrospective audit. Vox Sang. 2010; 98:65-69.

21. Vuille-Lessard E, Boudreault D, Girard F, Ruel M, Chagnon M, Hardy JF. Red blood cell transfusion practice in elective orthopedic surgery: a multicenter cohort study. Transfusion. 2010

22. Zilberberg MD, Stern LS, Wiederkehr DP, Doyle JJ, Shorr AF. Anemia, transfusions and hospital outcomes among critically ill patients on prolonged acute mechanical ventilation: a retrospective cohort study. Crit Care. 2008; 12(2): R60.

23. Bula BM. La transfusion autologue programmée gage de sécurité transfusionnelle, Mémoire de fin de Spécialisation, Université de Kinshasa, 2003.

24. Giral T. Influence of bleeding kinetics on transfusion strategy after knee and hip prosthetic surgery. Prospective observational study, Dissertation for the obtention of the DES d'Anesthésie-Réanimation. Académie de Paris. 2012.

25. Toumi LI. Les facteurs prédictifs de la transfusion sanguine au cours de la chirurgie des meningiomes.

26. Abo Y, Kodo M, Sie E, Soro L, Traore A. Interet de la transfusion autologue differe (TAD) dans le service de traumatologie au CHU de Yopougon. Rev Int des Sci Med. 2006:59-61.

27. Kouakou F, Effoh D, Loué V. Transfusion practice in the gynaeco-obstetrical environment. About 753 transfusions performed at the CHU of Cocody (Abidjan-RCI). Rev Afr Anesth Méd Urg Tome. 2011.

28. Verlicchi F. Evaluation of clinical appropriateness of blood transfusion. Blood Trans. 2010; 8(2):89.

29. Coffin C, Matz K, Rich E. Algorithms for evaluating the appropriateness of blood transfusion. Transf. 1989;29(4):298-303.

30. Mozes B, Epstein M, Bassat B, Modan B. Halkin H. Evaluation of the appropriateness of blood and blood product transfusion using pres et criteria. Transf. 1989; 29:473-6.

31. Marty JR, Roux GL, Djoudi R. Evaluation of the prescription of red blood cell concentrates in a university hospital. Transfus Clin Biol. 1999; 6: 105-180.

32. Ouattara A, Niculescu M, Boccara GA, Landi M, Vaissier E, Léger P, et al. Identification of predictive factors of homologous blood transfusion in cardiac surgery from an observational study. Ann Fran d'Anesth et de Réa. 2003; 278-283.

33. Ricome S. Evaluation of transfusion practices in cardiac surgery at the Bichat Hospital and identification of patients for whom transfusion could have been avoided, Acadé de Paris. 2009.

34. Ng CS, Wans, Yim AP, AMf AA, Pulmonary dysfunction after cardiac surgery. Chest. 2002; 121: 1269-1277.

35. Dietrich EB. Evaluation of blood transfusion therapy. Transf. 1965; 5: 82-8.

36. Reece RL, Beckette RS. Epidemiology of single-unit transfusion. J Am Med Assoc. 1966; 195: 113-8.

37. Holst LB, Haase N, Wetterslev J, Wernerman J, Guttormsen AB, Karlsson S, et al, Winding: Does the TRISS study support a universal restrictive transfusion strategy for patients with septic shock. N Engl J Med. 2014. 371: 1381-1391.

38. Fominskiy E, Putzu A, Monaco F. A Liberal transfusion strategy improves survival in perioperative but not in critically ill patients. A meta-analysis of randomised trials. Brit J Ana, 115 (4): 511-19 (2015).

39. Murphy GJ, Pike K, Rogers CA. Liberal or restrictive transfusion after cardiac surgery. N Engl J Med. 2015; 372: 997-1008.

40. Almeida DJP, Vincent JL, Galas FR. Transfusion requirements in surgical oncology patients: a prospective, randomized controlled trial. Anesthesiology .2015; 122: 29-38.

41. Gregersen M, Borris LC, Damsgaard EM. Postoperative blood transfusion strategy in frail, anemic elderly patients with hip fracture. Acta Orthop. 2015; 86: 363-72.