

Factors associated with knowledge of the nursing staff at a teaching hospital on blood transfusion¹

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Objective: to determine whether there is an association between knowledge of the nursing professionals about blood transfusion and the variables related to the professional aspects. **Method:** this is an observational, cross-sectional and quantitative study, carried out at a large general teaching hospital. The sample consisted of 209 nursing professionals, obtained by simple random sampling. For data collection, a checklist was used. In the univariate analysis, descriptive statistics and central trend and dispersion measures were used. In the bivariate analysis, Student's t-Test, analysis of variance and Pearson's correlation were used. To determine the predictors, multiple linear regression was applied. The Institutional Review Board (Opinion number 2434) approved the study. **Results:** the overall average knowledge score was 52.66%; in the Pre-transfusion Step, it corresponded to 53.38%; in the Transfusion Step 51.25% and, in the Post-transfusion Step, 62.68%. The factors related to knowledge were professional category and received training and/or guidance to accomplish the transfusion process ($p < 0.01$). **Conclusion:** this study showed the influence of training and guidance on the knowledge and provided a diagnosis to identify the professionals' difficulties regarding the transfusion process.

Descriptors: Knowledge; Nursing; Blood Component Transfusion.

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Introduction

Blood therapy plays an important therapeutic role, being used to treat various health problems. Countless efforts have been made to guarantee the quality of the transfusion process and the security of receivers⁽¹⁾.

The blood, its components and its derivatives are used as the base to treat many diseases and transplants, chemotherapy and surgery, turning them into essential and irreplaceable products. Despite presenting risks by involving biological products of human origin, blood transfusion is an essential part of health care, promotion and recovery⁽²⁻³⁾.

In Brazil, the standardization of transfusion procedures is determined by Resolution number 57 of the Board of Directors (RBD), issued on December 16th 2010, which determines the Health Regulations⁽⁴⁾, and by Ordinance number 1353, published by the Ministry of Health (MH) on June 13th, 2011. The latter determines the Technical Regulations for services related to the cyclical production of human blood and its components and transfusion procedures. These regulations establish rules that blood transfusion professionals need to know and follow⁽⁵⁾.

Nursing has an important role in ensuring transfusion safety, because the nursing team is responsible for knowing the indications for transfusions, checking data to prevent errors, guiding patients on blood transfusion, detecting and acting in compliance with transfusion reactions and documenting the procedure^(2,6-7). Due to the complexity of the transfusion process and the need for expertise during its development, this process requires skilled and trained professionals to achieve transfusion safety. Nursing professionals are directly involved in the care of patients submitted to blood transfusion. Therefore, the correct storage of blood and its identification without failures depends largely on the performance of the nursing team, which highlights the importance of the scientific knowledge on blood transfusion and the technical skills of the nursing staff, in order to prevent the occurrence of complications and patient injury⁽⁸⁾.

Knowledge is essential for humans, because it permits attributing meaning to the multiplicity of phenomena that surround them, whether those relating to physical objects, people, events or abstract ideas⁽⁹⁾.

A number of studies in this area show deficient knowledge of the nursing staff and the inappropriateness of the approaches used during the transfusion. There

are few studies, however, that point out the factors that may be related to the knowledge deficits in this area.

Based on the above, the objective of this research was to determine whether there is an association between the knowledge of the nursing team professionals about blood transfusion and the variables related to professional aspects.

Method

This is an observational study with a cross-sectional design and quantitative data analysis. This study was conducted in all care units of a large, general public teaching hospital, which offers high complexity care and is located in the region known as Triangulo Mineiro, in the city of Uberaba, State of Minas Gerais, Brazil.

The target population (N) consisted of 617 nursing professionals (88 nurses, 390 nursing technicians and 134 assistant nurses) who provided direct care to patients on all shifts and sectors, in the institution of study. The sample size (n) was calculated assuming a determination coefficient of $R^2=0.10$, in a multiple linear regression model with five predictors, with significance level or type I error $\alpha=0.01$, and type II error $\beta=0.1$, resulting in an a priori statistical power of 90%. The statistical software *Power Analysis and Sample Size* (PASS), version 2002, was used. The values mentioned above were entered and a minimum sample size of 206 interviews (n=206) was obtained. To obtain the sample, a simple random drawing was performed, using the *Statistical Package for Social Sciences* (SPSS), version 20. The sample consisted of 209 nursing team professionals (nurses, nursing technicians and assistant nurses) who provided direct assistance to customers, in all shifts and sectors of the study institution, and the sample was proportional to each professional category.

The following inclusion criteria were considered: being employed by the Federal University of Triangulo Mineiro (UFTM) or Foundation for Teaching and Research of Uberaba (FUNEPU); working in units where the survey was carried out; providing direct care to patient and, be working during the months in which the data collection was performed. It was excluded from the study professionals who were absent on the day of interview, due to vacation, sick leave, time off, or those not found after three attempts.

For the data collection, it was used a research instrument checklist type developed by the authors from the MH Ordinance number 1353/2011, the RBD number 57/2010 of the National Health Surveillance

Agency (ANVISA), and the Conduct Manual for Clinical and Hematological Practices of Hemominas. The instrument contained questions related to personal data, professional aspects and 35 questions about blood transfusion, classified into Pre-transfusion Step (PTS), Transfusion Step (TS) and Post-transfusion Step (POTS). Each question had only one correct answer, and it was assigned 1 (one) point to each question correctly marked.

Before applying the instruments, they were submitted to content validation by means of assessment performed by experts in hemotherapy of the University. Participated in the validation two professionals with Masters degree and four with Ph.D degree. The internal consistency analysis of the instrument was evaluated using the α Cronbach coefficient that, for dichotomous items, true or false, is equivalent to the Kuder-Richardson (KR20) coefficient.

After validation, a pilot test with 10 members of the nursing team was conducted in order to verify the clarity and applicability of the instrument, without the need of making adaptations.

Data were collected from April to June 2013. The professionals received an Informed Consent and, after signing it, they received the data collection instrument and its respective filling instructions. Subsequently, data were entered into a spreadsheet of the *Microsoft Office Excel*[®] for *Windows*[®] program. Typing was performed by two people, with double entry, with subsequent verification of the consistency, consolidation and validation.

The data entered in *Excel*[®] spreadsheet were imported from SPSS statistic software version 20, for data processing and analysis. Initially, univariate analysis was performed, in which the qualitative variables were analyzed using descriptive statistics through the distribution of absolute and percentage frequency, while for the quantitative variables it was used centrality of descriptive measures (mean) and dispersion (standard deviation, minimum and maximum value). To calculate the knowledge score, it was used a formula in which the number of items correctly answered was divided by the total number of items and then multiplied by one hundred.

The steps used to calculate the subscore were: Pre-transfusion Step (PTS); transfusion Step (TS); and Post-transfusion Step (POTS).

Although not shown in the results, the multiple linear regression analysis was preceded by a bivariate analysis using the Student's t-Test for categorical

dichotomous variables, the analysis of variance (ANOVA) for variables with more than two categories and the Pearson correlation for quantitative variables. The criterion for inclusion of predictors in the multiple linear regression was to consider $\alpha=0.05$ as significance level.

The bivariate analysis revealed five predictors: received training and guidance; participate in training; professional category; number of blood transfusions/month; length of professional experience. The professional category was dichotomized, since it was realized that, from a practical perspective, nursing technicians and nursing assistants are not different. The nature of the other predictor variables was maintained, but the variables "received training or guidance" and "participate in training" were classified as of dichotomous nature, and the variables "number of blood transfusions/month" and "length of professional experience" as of quantitative nature. The statistical significance level was $p \leq 0.01$ in the regression analysis. It is worth to highlight that the prerequisites of the bivariate analysis were observed (normality and homocedasticity), as well as the behavior of residues in the multiple linear regression analysis such as linearity, normality and homocedasticity.

This study was developed as established by Resolution 196/96 of the National Ethics Committee, with the approval of the institution researched and the Research Committee of the Federal University of Triangulo Mineiro (CEP-UFTM), under protocol number 2434. The anonymity of all participants was guaranteed identifying them by numbers.

Results

The sample consisted of 29 nurses, 146 nursing technicians and 34 nursing assistants, who provided direct care to patients of the hospital where study was carried out.

The average age of professionals was 38.2 years, with minimum of 22 and maximum of 61 years, 29.66% of the professionals were between 22 and 31 years, 24.40% between 42 and 51 years, 10.53% between 52 and 61, and there was a higher concentration in the age group between 32 and 41 years (35.41%). Most were female (81.8%).

Regarding the professional aspects, the most prevalent category was the nursing technicians (69.9%), followed by nursing assistants (16.3%) and nurses (13.9%). Most received training or graduated from public institutions (51.7%), and the other ones (48.3%) graduated from

private institutions. The prevailing institutional bond was FUNEPU (52.6%), and 47.4% were affiliated with UFTM.

It was observed that the professionals had an average of 144.25 months of training, 147.07 months of professional experience, 117.73 months of work in the institution where the study was carried out, and average of 80.74 months of work in the unit.

Regarding to the work shift, 46.4% worked at night, 27.8%, in the morning, 23.4%, in the afternoon and 2.4% worked in a system of 8 hours per day.

Table 1 shows the frequency distribution, according to the unit (Critical and semi-critical areas).

Table 1 - Frequency distribution according to the professional's unit. Uberaba, MG, Brazil, 2013

Unit	N	%
Critical areas		
Oncology units	5	2.4
Emergency Room Units	32	15.3
Intensive Care Units	54	25.8
Surgical Unit	17	8.1
Hemodynamics	7	3.3
Unit infectious and parasitic diseases	8	3.8
Renal Therapy Unit	5	2.4
Semi-critical areas		
Hospitalization Unit - Adult	56	26.8
Hospitalization Unit - Children	22	10.5
Day hospital	3	1.4
Total	209	100

Concerning the administration of blood transfusions, the average number of blood transfusions reported by the professional was of 4.30 times/month, with minimum of zero and maximum of 43.33 times/month. With regard to receiving training or guidance of the institution for this purpose, 88% of professionals reported having been trained, 60.3% participated in some specific training program for blood transfusion, averaging once, minimum of zero and a maximum of 20 times. As for specific training courses for blood transfusion, 35.4% reported having participated, and 10.5% said they had participated in specific scientific events for blood transfusion and hemotherapy.

Regarding to postgraduate level courses, 58 (27.8%) professionals reported having postgraduation, of which 58 (27.8%) had specialization and one (0.5%) had Masters degree. The most prevalent postgraduate programs were Teaching (7.18%), Intensive Care (4.30%), Occupational Health (4.30%) and Emergency Services (2.39%). When asked about searching for information in the literature, 73.7% of participants reported that they often seek information and get

answers to their questions about blood transfusion. As regards the rule/guideline followed in the transfusion practice, most participants (73.2%) reported adopting the Standard Operating Procedure Manual (SOP) and the Nursing Intervention Plan (NIP) of the institution, and 13.4% reported not following or knowing any rule or guideline, as shown in Table 2.

Table 2 - Frequency distribution of rule/guideline followed in the transfusion practice. Uberaba, MG, Brazil, 2013

Rule/Guideline	N	%
RBD number 57*	5	2.4
Ordinance number 1353†	8	3.8
SOP‡/NIP§	153	73.2
RBD number 57* and SOP‡/PIE§	3	1.4
RBD number 153 and Ordinance number 1353†	1	5
RBD number 153 and SOP‡/PIE§	3	1.4
Ordinance number 1353† and SOP‡/PIE§	6	2.9
RBD number 153 , Ordinance number 1352† and SOP‡/PIE§	1	5
RBD number 153 , RBD number 57*, Ordinance number 1353† and SOP‡/PIE§	1	5
Does not follow or know any rule/guideline	28	13.4
Total	209	100

*Resolution of the Board of Directors number 57 of December 16th, 2010

†Ministry of Health Ordinance number 1353 of June 13th, 2011

‡Standard Operating Procedure of the institution

§ Nursing Intervention Plan of the institution

||Resolution of the Board of Directors number 153 of June 14th, 2004

It is noteworthy that 92.8% of professionals feel confident to carry out the transfusion process.

The average overall knowledge score was of 52.66%, with minimum of 17.14% and maximum of 74.29%. In pre-transfusion step, the average was 53.38%. In transfusion step, the average was of 51.25%. In the post-transfusional step, the average was of 62.68%, as shown in Table 3.

The value of Cronbach coefficient was $\alpha=0.57$. It is noteworthy that, considering the diverse conceptual nature of the knowledge items measured by the instrument, this is an appropriated value.

According to the bivariate analysis, professionals who received training or guidance to carry out the transfusion process attended specific training for blood transfusion, were postgraduated, knew or followed some rule and/or guideline and had higher knowledge scores than the other professionals. The variables "type of educational institution" and "participation in training courses specific for blood transfusion" were marginally significant, $p=0.016$ and $p=0.015$, respectively.

In the correlation between the variables "professional category" and "shift" and the scores, it was

observed that professional category was statistically significant ($p < 0.001$ in the overall knowledge score, $p = 0.017$ in the Pre-transfusion Step, $p < 0.001$ in the Transfusion step), ie, the nurses had greater knowledge than other professional groups. Professionals working 8 hours per day had higher knowledge scores at all stages, however it was considered significant only in the Transfusion Step, and yet, it was considered marginally significant ($p = 0.018$). In the correlation among numerical variables, it was significant only regarding the number of blood transfusions performed in the month, which showed that the more the professionals administer blood transfusions, the greater is their experience and the greater is their knowledge on the procedure ($p = 0.007$ in Overall Score, $p = 0.008$ and Transfusion Step).

For the linear regression analysis, five predictor variables were considered: received training or guidance to perform blood transfusion; participate in specific training on blood transfusion; professional category; number of blood transfusions/month; and length of professional practice. Table 4 shows the correlations.

In the linear regression analysis, it is noticed statistical significance associating the overall score and the Transfusion Step with the predictor variables "Professional category" ($p = 0.001$) and "received training and/or guidance for carrying out the transfusion process" ($p < 0.001$). The other predictors showed no significant influence on the knowledge score.

Table 3 - Knowledge scores on blood transfusion – Uberaba, MG, Brazil, 2013

Frequency distribution	Average (%)	Median	SD	Min. (%)	Max. (%)
Overall score	52.7	54.3	10.2	17.1	74.3
Pre-transfusion Step Score	53.4	57.1	17.1	0	100
Transfusional Step Score	51.2	52	10.9	16	72
Post-transfusional Step Score	62.7	66.7	26.8	0	100

Table 4 - Association among Overall scores and the Transfusion Steps (TS) and the predictor variables - Uberaba, MG, Brazil, 2013

Variable	Score							
	Overall Score		Pre-transfusional Step		Transfusional Step		Post-transfusional Step	
	β	p	β	p	β	p	β	p
Received training or guidance	0.214	0.001	0.039	0.584	0.232	0.001	0.117	0.098
Participates in specific training	0.105	0.122	0.150	0.038	0.450	0.506	0.090	0.203
Professional category	0.266	<0.001	0.101	0.170	0.262	<0.001	0.153	0.036
Number of blood transfusions/month	0.790	0.249	-0.013	0.859	0.088	0.201	0.074	0.306
Length of professional practice	0.450	0.502	-0.101	0.156	0.100	0.137	0.014	0.847

Discussion

The average age of professionals was 38.2 years with a high concentration in the age group between 32 and 41 years. These data corroborate the other studies in which the mean age was between 36.8 and 37.9 years, with the highest concentration in the age group between 31 and 40 years of age^(2-3,10-12). With respect to gender, females prevailed, corroborating the results found in the literature^(2-3,6,11,13). This result was expected since this is a nursing feature. The feminization process of the nursing team exceeds 90%; however, there is a growing presence of the male contingent in nursing, showing a current trend⁽¹⁴⁾.

The most prevalent category was the nursing technician (69.9%). This is corroborated by studies in university hospitals, which showed a higher participation of nursing technicians^(6,11). However, a study conducted in a Teaching Hospital of Ribeirão Preto (SP) showed a higher participation of nurses (51.8%)⁽²⁾.

It was observed that most were educated in public institutions (51.7%). A research conducted in a teaching hospital in the interior of the State of Minas Gerais noted that most nurses (60%) received their training at public institutions, and nursing technicians have graduated from private institutions (63%)⁽¹¹⁾.

In relation to training time, professional performance, performance at the institution and

performance in the unity, a study carried out in France corroborated these findings, once it pointed out an average of 12 years of experience in the hospital where the study was carried out⁽¹⁰⁾. In other studies, most professionals reported six or more years of professional experience^(2,11,15).

Regarding to postgraduate level courses, 27.8% of the professionals reported having postgraduation. A study conducted in cities of the State of São Paulo found that 6% were postgraduated, and in the State of Minas Gerais researchers found that 88% of nurses were Ph.D^(2,11).

Some studies have found that most professionals received some guidance before starting the transfusion process, corroborating the findings of the present study^(2,11). However, a study conducted in a hospital in the State of Rio Grande do Norte noted that 74.1% of professionals did not participate in specific training for more than two months⁽⁶⁾. A study with nurses of medical and surgical units of three hospitals in Turkey showed that most professionals have not received guidelines for conducting transfusion practices⁽¹⁵⁾.

As for the search of information in the literature, most reported seeking information or asking questions about blood transfusion. However, it was observed that a considerable number of professionals (73.2%) reported to use the SOP and the PIE of the institution as guideline for their professional practice, and 13.4% expressed not knowing the rules of the Ministry of Health and ANVISA. A research carried out in a hospital of the State of Rio Grande do Norte noted that 82.5% of professionals reported to ignore the current resolution during the study period, corroborating the findings of this study⁽⁶⁾.

The average number of times that the professional performs blood transfusion was 4.30 times/month. Some studies showed that the nursing team members perform blood transfusions weekly^(2,6,10).

It was observed that 92.8% of professionals feel confident to carry out the transfusion process. In a study conducted in France, 83% of nurses considered themselves well informed with regard to transfusion⁽¹⁰⁾. Other research showed that, on average, 60% of professionals considered themselves informed about the transfusion practices^(6,11). However, a study conducted in cities of the State of São Paulo, 58.8% of participants considered themselves little informed or misinformed on the subject⁽²⁾. In a study performed in a public hospital in the South of Brazil, the authors found that 69% of professionals reported feeling self-confident when performing transfusions, and all the respondents

(100%) reported to know the risks associated with blood transfusions⁽¹²⁾.

It can be inferred that the more informed the professionals are about the procedure and its guidelines, the more confident they are for carrying out the method.

Concerning to the evaluation of the knowledge on blood transfusion, it was observed usually lower overall score average (52.7%) as well as in the three Steps. Other studies using data collection instruments different of this study corroborate this study findings. A study conducted in Mali, West Africa, showed that 53.9% of participants had insufficient knowledge and the group of nurses and midwives had more inadequacies in their knowledge⁽¹⁶⁾. Another study showed an average knowledge score of 20.9, ranging from 6 to 61 points⁽¹⁰⁾. A research carried out with nurses in Shahrekord, Iran, concluded that knowledge of the nurses on indications and complications of blood transfusion was reasonable, since 16.2% had excellent knowledge, 59% had good knowledge and 24.8 % had low level of knowledge⁽¹⁷⁾. A study conducted in Rio Grande do Norte identified a better knowledge in the pre-transfusion steps (51.8%) and in the transfusion step (55.5%), and inappropriate in the post-transfusion step (62.9%)⁽⁶⁾. It must consider that often the experienced dilemma is that at times there is slack of knowledge for decision making. Therefore, it was identified the importance of knowledge on the process steps in order to guarantee transfusion safety⁽¹⁸⁾. The data found in the literature are worrying because transfusion safety is strongly related to the correct and early identification of warning signs of a transfusion reaction, as well as the appropriate conducts in eventual complications.

In the linear regression analysis, it was noted statistical significance only for the professional category ($p = 0.001$) and the orientation for performing the transfusion process ($p < 0.001$). Other studies support the findings of this research. In a study with professional nursing staff of a university hospital of the city of Ribeirão Preto (SP), which used multiple correspondence analysis as methodology, it was found a relationship between self-perception of knowledge on transfusion and performance, only for the professional nurse category. The more informed the professional feels, the better his performance⁽²⁾. In another study conducted in France, which used linear regression analysis, the authors found a relationship between low knowledge and not receiving training, and feeling little informed⁽¹⁰⁾. Research carried out in hospitals of Turkey found divergent results,

in which there was a statistically significant relation regarding the experience length⁽¹⁵⁾.

As limitation, considering the design of this research, there was no observation of administration of blood products practices, which did not compromise the achievement of the objectives. It is suggested to conduct further research in this area including the systematic observation of practice related to blood transfusion aiming the transfusion safety.

Conclusion

This study highlighted the lack of knowledge of the nursing team professionals on blood transfusion, as well as the influence of training and guidance on knowledge. Furthermore, it also provided a diagnosis to identify the main difficulties of professionals with respect to the steps of the transfusion process.

It was identified the need for interventions such as continuous and permanent education, as well as periodic training of nursing staff professionals about acting in this practice. It is important to emphasize the importance of conducting training to develop knowledge, skills and competencies and applying tools for assessment of knowledge, periodically. From these actions, it will be possible to develop improvements in the quality of the implementation of procedures and the consequent practical monitoring.

It is suggested that prospective studies are carried out in order to verify the practice of nursing in relation to the administration of blood products.

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