Evaluating the Knowledge and Practices of Nurses and Paramedics in Blood Transfusion Services – A survey in the states of Tamil Nadu and Pondicherry, India

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Abstract:

BACKGROUND: Blood transfusion service is an important part of our healthcare system whose aim is to provide safe, effective blood components for the patient's requirement. The laboratory technicians and nurses working in the blood bank form the core for the effective functioning of blood bank. The study was to analyze the knowledge, attitude, and practice of nurses and paramedics such as laboratory technicians working in blood banks and whether intervention of a training program had any benefit to the participants.

MATERIALS AND METHODS: This study was conducted in our department which is a regional training center approved by the National AIDS Control Organization for training medical officers, laboratory technicians, and staff nurses working in blood banks. There were a total number of 48 government run hospital blood banks who participated in the study and we conducted six training programs for 43 nurses and 64 laboratory technicians working in blood banks from the southern states of Tamil Nadu and Pondicherry in India. The training program was for 5 days for technicians and 3 days for nurses with theory sessions followed by hands on practical classes regarding the daily activities in blood bank. They were given a pre-evaluation questionnaire to test their knowledge, attitude, and practice followed by a post evaluation questionnaire after conducting the training program.

RESULTS: The mean percentage score in the pre evaluation test before the training program for nurses and technicians was 47% and 53% while after the training program; the mean percentage was 66.8% and 77% which was statistically significant in both the groups. The correct blood bank practices followed by nurses and laboratory technicians overall were 67% and 75%, respectively. The technicians and nurses scored poorly in blood bank practices related to hemovigilance.

DISCUSSIONS: Regular and standardized training can lead to improvements in the knowledge, skills, and practice of nurses and paramedics who provide blood transfusion services. The constraints faced by the nurses and paramedical personnel needs to be addressed for the overall betterment of blood transfusion services.

CONCLUSIONS: The increase in the knowledge subsequently contributed to a better practice in the technicians. The concept of haemovigilance and error reporting has to be stressed on the nurses and paramedics to improve their good practices.

Keywords:

Haemovigilance, paramedics, training

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Introduction

Blood transfusion service is an important part of the National Health Service and there is no alternative for blood and its components. The blood transfusion service covers an extensive area from donor motivation, screening, counseling, phlebotomy, processing of blood components, transfusion-transmitted infectious screening, blood storage, blood grouping, crossmatching, issue of blood to transfusion-dependent patients, and monitoring of any adverse transfusion reactions. The operation of the blood bank and processing of whole blood for components is carried out under the active direction and personal supervision of competent technical staff by a qualified medical officer.[1] The laboratory technicians and nurses working in the blood bank form the core for the effective functioning of blood bank. While the job functions of a nurse deal primarily with donor management, maintaining records and other blood bank-related activities, the laboratory technician covers a broad area including infectious screening, component preparation, immunohematology workup, quality control, and biomedical waste management. The quality, safety, and efficacy of blood components depend on well-equipped blood banks with trained workforce.[2] There are not many studies regarding the healthcare worker that runs this blood transfusion services. This study was undertaken to analyze the knowledge, attitude, practice of nurses, and paramedical staffs such as laboratory technicians working in blood transfusion services.

To analyze the knowledge, attitude, and practice of nurses and technicians working in blood banks. To find whether intervention of a training program had any benefits to the participants. To improve their overall performance in a blood bank by identifying the problems faced by them in a blood bank.

Materials and Methods

This study was conducted in the Department of Transfusion Medicine, The Tamil Nadu, Dr. M. G. R Medical University; Chennai, Tamil Nadu which is a regional training center approved by National AIDS Control Organization (NACO) for training medical officers, laboratory technicians and staff nurses working in blood banks.

The technicians and nurses who came for the training program conducted by NACO were from government run hospital blood banks from the states of Tamil Nadu and Pondicherry and all of them were included in the study. The total number of blood banks which participated in the study was 48 and we conducted six training programs for nurses and paramedics from the year 2015 to 2017. From these, 43 staff nurses and 64 laboratory technicians working in blood banks participated in the study. Informed written consent was obtained for the participation in the study.

They were given a pretest questionnaire to test their knowledge followed by another questionnaire (separate for laboratory technicians and staff nurses) testing their attitude practice in blood transfusion services. The training program was then conducted by our departmental faculties (3-day program for nurses and a 5-day program for technicians) which involved power point presentations from faculties of transfusion medicine, practical sessions, and group activities related to transfusion medicine. The daily schedule of the training programme was for 3 h of theory sessions in the morning followed by hands on practical classes for 3 h in the afternoon. Group activities related to blood bank involving the participants were held in between in each theory sessions to break the monotony of classes. The theory sessions were split into topics and were taken for 45-min duration each as presentations by in house and external transfusion medicine resource persons. The training module was formulated by NACO, Ministry of Health and Family Welfare to emphasize Good Laboratory Practices and Quality Management Services in blood transfusion services. The questionnaire was validated previously by using a selected number of participants in our department before the actual study.

On the last day, a posttest questionnaire (same set of questions asked in pretest) was given to all the participants and their knowledge was tested after the training program. Paired *t*-test was used as the statistical tool in our study.

Results

The mean overall experience for the nurses who had participated in the study was around 18 years and their experience in blood banking was 6 years. Similarly, the mean overall experience for the laboratory technicians who had participated in the study was around 11 years and their experience in blood banking was 5 years. The average duty hours per week were 35 h for nurses and 48 h for laboratory technicians. While 63% of nurses said they had previously attended blood bank training program, only 42% of the technicians had previously attended training program.

The mean scored in the pre evaluation test by the staff nurses was 11.8 whereas the mean in the post test was 16.7 out of 25. This was statistically significant ($P < 0.05$) on using a paired *t*-test analysis. Similarly, the mean scored in the pre evaluation test by laboratory technicians was 13.3 and the mean scored in the posttest was 19.3.

This was also statistically significant ($P < 0.001$) on using a paired t-test.

We had given a separate set of eight questions given for both laboratory technicians and nurses which were problem based scenarios testing their blood bank practices. The correct blood bank practices followed by nurses and laboratory technicians overall were 67.5% and 75%, respectively.

We found there was a statistical significance ($P < 0.005$) between the knowledge and blood bank practices in the laboratory technicians. The blood bank practices were statistically significant both with pre- and post-evaluation test conducted before and after training program. However, there was no statistical significance ($P > 0.05$) noted between the knowledge and blood bank practices in the nurses.

Questions were asked in relation to their belief and attitude regarding blood transfusion services to both laboratory technicians and staff nurses. While 81.4% of nurses preferred to work in wards other than blood banks, 59.4% of technicians preferred to work in other laboratories. The major problem faced by nurses (28.7%) in the blood bank was lack of training to work in blood bank, whereas for 31.3% of the technicians, it was work pressure. Both nurses (93%) and technicians (100%) believed record maintenance was very important in blood bank. While 37% of the nurses said serology was the most difficult area to work in blood bank, only 9% of the technicians replied the same way. Phlebotomy (60%) was the most comfortable area for the nurses while immunohematology (77%) was the preferred one for technicians. Only 50% of both laboratory technicians and nurses said they had adequate staff working in their blood banks. Around 75% of both laboratory technicians and nurses said they were aware of their job functions. While only 46.5% of nurses working in blood bank said they had been given additional work, it was 64% of technicians who felt they were additional work apart from blood bank activities. While 67% of the nurses felt they had adequate equipments in their blood bank, only 52% of laboratory technicians felt the same.

Discussion

The mean percentage score in the pre evaluation test and post evaluation test were 47% and 66.8%, respectively. This was statistically significant ($P < 0.05$) on using a paired t-test analysis. Talati *et al.* on her study in Knowledge and awareness among nurses regarding the blood transfusion services and practices reported that on-the-job training and education sessions focused toward pretransfusion checks and bedside practices may help in improving the nurses' knowledge.[3] Similarly, the mean percentage in the pre evaluation test before the training program for laboratory technicians was 53% while after the training programme; the mean percentage was 77%. This was also statistically significant ($P < 0.001$) on using a paired t-test. Zeinab *et al.* in her study concludes that relatively short-term in-service training can significantly improve nurses' knowledge and practice.[4] The improvement in the laboratory technicians was significantly higher and better than the nurses proving the fact that the training programme was more beneficial in increasing the knowledge for laboratory technicians than nurses. Another reason could be the training period was longer (5 days) for the laboratory technicians when compared to the staff nurses (3 days).

The correct blood bank practices followed by nurses and laboratory technicians overall were 67% [Table 1] and 75% [Table 2], respectively. The practices in which 44% of the nurses chose the wrong option was "*Your blood bank staff mistakenly entered a wrong blood group in the register. What will you do?*" Most of them had chosen the option of "*changing and enter the correct report without anybody knowledge*". de Vries *et al.* in his review on hemovigilance reports that the majority of preventable adverse reactions are due to clerical errors.[5] The importance of reporting these incidents to the medical officer has to

Table 1: Blood bank practices – multiple choice questionnaire staff nurses

Area covered	Question	Nurses who correctly answered (%)
Phlebotomy	Your immediate response after noticing a swelling in the donor's phlebotomy site after blood collection?	74
Donor care	What will you do if donor faints after blood collection?	98
Blood collection	How much ml of blood do you collect in a standard 350 ml blood bag?	44
Serology	Donor has been tested reactive for HIV. Your next step?	81
Record maintenance	Your blood bank staff mistakenly entered a wrong blood group in the register. What will you do?	40
Cross matching	Your have received 4 requests for blood units at the same time. How will you respond?	81
Issue	You have given wrong blood group report to a patient in a ward. You notice it next day. How will you proceed?	49
Transfusion reaction	The ward staff returns the blood bag complaining of transfusion reaction. Your next step?	72

Table 2: Blood bank practices – multiple choice questionnaire lab techncians

Area covered	Question	Techncians who correctly answered (%)
Biosafety	You have pricked yourself with needle while collecting blood. What will you do?	81
Blood spillage	What do you do in case of spillage of blood on work surface?	95
Sample labelling	You received a blood sample with patients details not entered. What do you do?	37
Serology	Donor has been tested reactive for HIV. Your next step?	80
Record maintenance	Your blood bank staff mistakenly entered a wrong blood group in the register. What will you do?	75
Cross matching	Your have received 4 requests for blood units at the same time. How will you respond?	75
Issue	You have given wrong blood group report to a patient in a ward. You notice it next day. How will you proceed?	70
Transfusion reaction	The ward staff returns the blood bag complaining of transfusion reaction. Your next step?	89

be emphasized to the nurses to prevent future "errors" and being a part of hemovigilance program. Sorra *et al.* while studying the staff attitudes about event reporting and patient safety culture in hospital transfusion services reports the transfusion services had very positive attitudes about event reporting and safety culture, but there is a need to increase reporting of deviations from procedures and mistakes that staff catch and correct on their own.[6] The other practices poorly followed by nurses was not knowing the allowable amount of blood collection in a standard 350 ml blood bag and replacing a wrong blood grouping report in a ward with a new one without informing anyone. Sindhulina *et al.* in their study reported repeated training of laboratory and clinical staffs are methods to reduce identification errors and also bedside blood grouping can be used as a method of active surveillance.[7]

Similarly, the wrong practice was followed by laboratory technicians concerning this question *"You received a blood sample with patients details not entered. What do you do?"* The majority (47%) of the laboratory technicians chose the wrong option *"I will inform ward staff to write patient details and then receive blood sample"*. Maskens *et al.* in their study on hospital-based transfusion error reports the most common high-severity error in the transfusion service was blood sample accepted despite not meeting acceptance criteria.[8] The outstanding finding every year from Serious Hazards of Transfusion UK confidential hemovigilance reporting is that incorrect blood component transfusions make up the largest group of adverse incidents and are the most serious of these are ABO-incompatible red cell transfusions resulting in death or major morbidity.[9] Most are due to clerical error\which occurs at bedside while collecting blood sample from the patient or misidentification of blood sample at the blood bank. Porras *et al.* in their study on beside labeling errors reported following educational intervention, the percentage of wrongly labeled samples decreased from 7·3% (preeducational) to

5·8% (posteducational).[10] Our paramedics have to be stressed onthe negative impact of labeling samples away from the patient which greatly increases the risk of mislabeling.

The blood bank practices were statistically significant ($P < 0.005$) with knowledge (both pre and post training) for the laboratory technicians. This gives a clear indication that increase in the knowledge definitely contributes to better practices for technicians. Cabaudd reported in his study that transfusion's good practices are based on knowledge of the process and the skill in blood transfusion fields.[11] However, we noticed no significance between the nurses knowledge and their blood bank pratcices.

When we compared the laboratory technicians (64%) who had said additional work was given to them and the score they obtained in their practice, we found it was statistically significant ($P = 0.005$). However, there was no significance between their experience (overall as well as blood bank) and their knowledge or practice. Dubey *et al.* in their study on nurses and technicians in blood banks in north india reported the knowledge of blood bank staff having more experience was significantly higher compared to the other participants.[12] In our study, the laboratory technicians (42%) who had said they had attended a previous training programme did not significantly have higher knowledge Nor scored better in their practice.

We found there was no correlation or significance with the nurse's experience (overall as well as blood bank) and their knowledge or practice. Elazazay *et al.* in their knowledge and practices of nurses reported negative correlation between nurses' knowledge and performance before and after the training program in relation to their age, years of experience, and educational level.[13] Similarly, the nurses who had been given additional work (46%) and those who had

previous blood bank training (63%) did not have any statistical significance with their knowledge or practice. Multifaceted educational intervention appears to be effective in improving nurses' adherence on the pre transfusion checking practices of nurses in hospital in a study conducted by Furmedge *et al*.[14]

The major problem concerning the nurses was not having adequate training to work in a blood bank. This can be attributed mainly to the limited exposure they undergo regarding blood bank techniques during their nursing course. According to the Drug and Cosmetics rule (amended up to 2016) which is the licensing authority of blood banks in India, the qualification to work in a blood bank for nurses is "a registered nurse" with no mention of any specific training in blood or blood components.[15] It is also a concern for blood transfusion services that a majority of nurses (81.4%) prefer working in wards than in a blood bank. Botting *et al*. in their study on reports mentorship and support for the transfusion nurse role in hospitals successfully generated improvements in hospital transfusion practice.[16] Laboratory technicians cited work pressure as the major constraint to work in a blood bank. This may be due to the additional work (64%) given to the laboratory technicians. Heddle *et al*. in their QUEST study reports high volume of workload distractions and interruptions were contributory factors for errors.[17]

Blood transfusion services is a multistep, multidisciplinary process in which the human error rate has remained unchanged despite multiple interventions (education, training, competency testing, and guidelines).[18] Bolton-Maggs and Cohen in her review states errors still occur even after training and competency-assessment of Healthcare professionals as there is a human factor involved.[19] The concept of just-culture has to be introduced in blood transfusion services which emphasize that errors result from system based issues and not human failure.[8] We found in our study that the concept of hemovigilance and error reporting (44% of nurses and 73% of technicians had answered correctly) has to be stressed on the nurses and paramedics to improve their good practices.

Conclusion

Regular and standardized training can lead to improvements in the knowledge, skills, and practice of nurses and paramedics who provide blood transfusion services. Training program will facilitate trained manpower which will ultimately enhance quality of transfusion services. We found in our study, training programme were beneficial in increasing the knowledge of nurses and paramedics. The increase in the knowledge subsequently contributed to a better

practice in the technicians. The constraints faced by the nurses and paramedical personnel needs to be addressed for the overall betterment of blood transfusion services. However, to find whether training program really improved their knowledge, skills and practice, a posttraining follow-up study is necessary in their respective blood banks.

Conflicts of interest
There are no conflicts of interest.

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