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Transfusion reactions as an indicator of service quality of blood transfusion in Sanglah general hospital Denpasar Bali-Indonesia



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ABSTRACT

Background: One of the fatal side effects of transfusion is transfusion reactions. The incidence of transfusion reaction in Sanglah Hospital is still relatively high and far from national target which is 0.01%. To achieve the target of quality, it is necessary to set up an active program so that the number of incidence of transfusion reactions can be decreased.

Methods: Pre and posttest interventional study was conducted for 6 months in Sanglah Hospital Bali. All nurses in wards which is blood product frequently used was involved in this study. The intervention in this study was in the form of education and training programs on the application of the closed system and cold chain in the distribution of blood products as well as improved service system.

Results: The results showed a decline in the incidence of transfusion reactions occurred every month during the study. The incidence of transfusion reactions occurred each month was 0.77%, 0.56%, 0.5%, 0.49%, 0.45% and 0.38% respectively. The average reduction in the incidence of transfusion reactions was 0.08% every month. The type of transfusion reaction that occurred was 59% urticaria, 29% fever, 7% shortness of breath, 4% fever and chills, and 1% shock.

Conclusion: Education and training programs on the application of the cold chain system and closed system in the distribution of blood products as well as the improvement of service system helped reduce the number of the incidence of transfusion reactions in Sanglah Hospital Bali.

Keywords: Transfusion reaction, Training Program, Cold Chain System, Closed system distribution.

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INTRODUCTION

Blood transfusion is a medical procedure that usually indicated as the last resort to save patients who suffer from deficiency in certain or whole components of blood (e.g. anemia, thrombocytopenia, bleeding, coagulopathy, etc.). The decision should be based on strong indication which involve comprehensive evaluation of patient condition including hemoglobin, platelet, blood type, as well as history of allergic reaction. Although blood transfusions are greatly beneficial to most patients, in some cases blood transfusions also can cause various side effects which generally termed transfusion reactions.¹ There are dozens types of transfusion reactions.

Starting from transfusion reaction which appears within 24 hours (acute transfusion reactions) to a transfusion reaction that appears a few days to several weeks after transfusion (delayed transfusion reactions).^{1,2}

The severity of transfusion reactions ranges from mild to severe or even life-threatening. Some clinical features of transfusion reactions include fever, chills, shortness of breath, multiple organs failure, manifestations in the skin (urticaria, rash, Flushing, oedema), jaundice, hemoglobinuria,

nausea, vomiting, bleeding, oliguria, anuria, and the others.^{1,2} Aside from the underlying disease, if transfusion reaction has occurred, it is mandatory to treat the disease completely before more serious sequelae develop. Thus, transfusion reaction potentially delayed patient's management related to underlying disease, rising medical cost, and prolong patient's hospital admission.

In the international accreditation standards set by the Joint Commission International (JCI), each hospital is obliged to report, monitor and evaluate to reduce the incidence of transfusion reactions. Such provisions also apply in Indonesia which stated that the incidence of transfusion reactions is one of the indicators of quality of service as the minimum service standard in hospital. The target incidence of transfusion reaction is $\leq 0.01\%$ per month.³ According on this target, the incidence of transfusion reactions in Sanglah Hospital is still relatively high. In 2014, the average incidence of transfusion reactions reached 0.52%. The majority of transfusion reactions occurred was fever and urticaria. Efforts to reduce the incidence of transfusion reaction by utilizing the leukocyte-reduction technology, gamma irradiation, anti-HLA

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examination, anti-HPA and the others, are still difficult to achieve because of limited funding and the availability of equipment's. Based on the problems stated above, it is very important to make new managerial breakthroughs in order to reduce the incidence of transfusion reaction.

MATERIAL AND METHODS

Data and specimen collection

An interventional research with pre and posttest design was conducted in Sanglah Hospital from September 2014 until February 2015. All nurses in Sanglah hospital were included as study population. The samples were all nurses on duty on the ward with the highest number of blood product usage like Internal Medicine, Surgery, Obstetrics and Gynecology and Paedriatic Department. The intervention in this study was in the form of education and training programs on the application of the closed system and cold chain in the distribution of blood products as well as improved service system. In the first month (September 2014) education and training program was provided and all of the research subjects were gathered and procedure materials for distributing and transporting blood products was given as well as training to properly pack the blood products in the cold box. In the following months the interventions were carried out by the dissemination of the blood service operational standards procedure to each ward in aforementioned Departments. Improvement program of service system was conducted by strict supervision of cold chain and close system in the distribution and transportation of blood products as well as supervision of implementation of the "A 30-minute rule". Blood products that were already taken out from blood bank should be immediately returned to the blood bank within a maximum of 30 minutes if the bloods were canceled to be used. Officers who violated this procedure were to be immediately reprimanded and re-educated. The program was conducted for 6 months (ended in February 2015) and incidence of transfusion reactions that occurred was evaluated every month.

RESULTS

In the first month of the intervention (September 2014) the number of occurrences of transfusion reactions was 19 out of the total 2475 number of transfused blood units for the month. The following month, the number of incident of transfusion reactions per total blood bags transfused was respectively 13/2323, 10/1980, 10/2030, 9/2011, 9/2327. The incidence of transfusion reactions found was

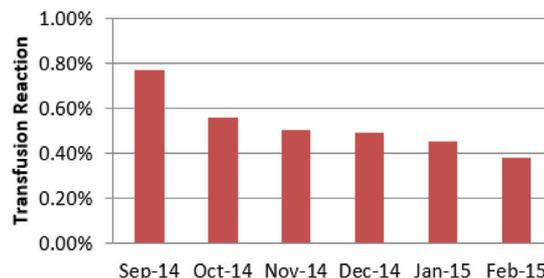


Figure 1 Incidence of Transfusion Reaction in Sanglah General Hospital Bali

mostly those of the components of Pack Red Cells (PRC) followed by the component of Thrombocyte Concentrate (TC) and only a small portion of the components of Fresh Frozen Plasma (FFP).

The results (Figure 1) showed a decline in the incidence of transfusion reactions every month during the time of research. From August 2014 until February 2015, the incidence of transfusion reactions per month was 0.77%, 0.56%, 0.5%, 0.49%, 0.45% and 0.38% respectively. The mean reduction in the incidence of transfusion reactions was 0.08% every month. The type of transfusion reaction that occurred during the six-month of research is shown in the following figure:

The majority of transfusion reactions occurred were urticaria and fever. The number of cases of transfusion reactions varied, ranging from pediatric to geriatric and the ratio of the number of transfusion reactions in pediatric patients and those in adults ranged from 1: 2-3. Most cases of transfusion reactions occurred in the ward of the Department of Internal Medicine, but when it is compared with the proportion of blood usages, transfusion reactions percentage divided by the total number of blood units transfused was almost the same in each ward. Of the 70 cases of transfusion reactions that occurred, 88% of cases were classified as mild, 11% were classified as moderate and 1% of case was classified as severe transfusion reactions.

DISCUSSION

Transfusion reaction is defined as a side effect which occurs during or after the transfusion. Based on the time of its occurrence, transfusion reaction can be divided into acute and delay transfusion reactions. Acute transfusion reaction appears within 24 hours from the time of transfusion meanwhile delayed transfusion reaction occur after 24 hours. Transfusion reaction can also be divided into immune and non-immune as well as infectious and non-infectious based on its pathophysiology.⁴

Many factors contribute to transfusion reactions of blood products administration. These factors can

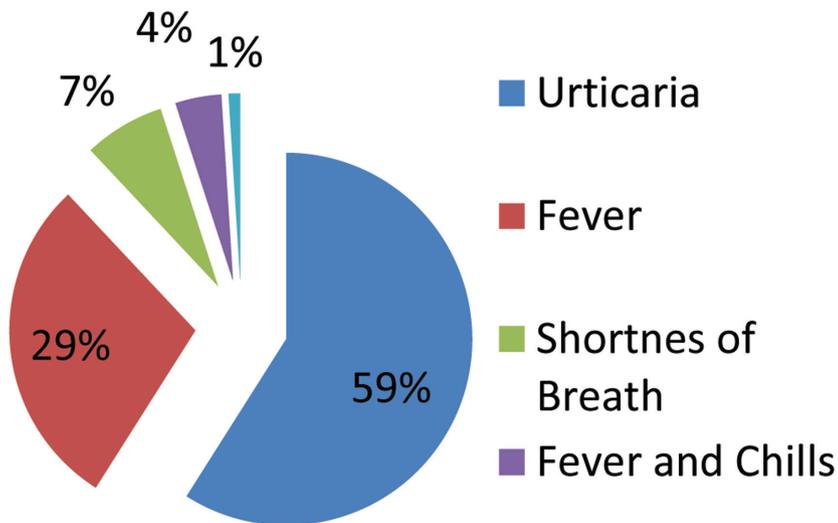


Figure 2 Type of Transfusion Reaction in Sanglah General Hospital Bali

be derived from the blood product itself, the patient factors or the environmental condition where the transfusion is done. Transfusion reactions have different types of outcomes that can increase the incidence of mortality and morbidity.⁴ The principles of transfusion shall be in accordance with the motto set by the World Health Organization (WHO) “Getting the right blood to the right patient at the right time” that must be implemented so that the incidence of transfusion reactions can be reduced.²

Various measures can be taken to reduce the incidence of transfusion reactions, but sometimes not all such effort can be applied in various situations. In places where the blood transfusion service has been developed, pre-storage leukocyte reduction can be conducted regularly to prevent the occurrence of febrile non hemolytic reactions. By using this procedure, more than 99.9% of leukocytes can be removed from blood, leaving behind almost only erythrocytes and platelets components. The target level of leukocytes remaining in the product is less than 5×10^6 leukocytes in a single unit component of Red Blood Cells (RBC). Leukocyte filtration performed before storage (pre-storage filtration) or for collecting blood from a donor is better than the bedside filtration.^{5,6} Examination of anti-IgA antibodies and Human Leukocyte Antigen (HLA) antibodies is also common practice in some centers to prevent allergic and anaphylactic transfusion reactions.⁵ In places with limited facilities and funding, the examination cannot be applied routinely. Nevertheless, there still a simple and inexpensive method that can be applied to improve service quality of blood transfusion and storage as well as minimizing risk of transfusion reaction.

Blood transfusion and storage service in Sanglah Hospital in Bali currently is still developing. To compensate instrumental limitation, various

laboratory tests and processing technology was routinely used to minimize the risk of transfusion reaction. Nonetheless reporting and documentation of the incidence of transfusion reactions have been conducted regularly since 2012. The simple efforts to reduce the incidence of transfusion reactions have been started. From the results of the study with intervention, in the form of programs of education and training on the application of the cold chain and closed systems in the distribution of blood products to the staffs in the ward, and improvement service system have been able to reduce the incidence of transfusion reactions consistently each month during study period. Indeed, reduction achieved has never reached the intended target, but at least these efforts have helped to reduce the adverse effects of transfusion and preventing the emergence of new problems regarding patient's condition.

Febrile and allergic reactions are the type of transfusion reactions most commonly occur during and after the transfusion.⁷ Febrile that appear without the hemolytic process is called a Febrile Non Hemolytic Transfusion Reaction (FNHTR). The classic definition of FNHTR is the increase in body temperature $\geq 1^\circ\text{C}$ during or within two hours after the transfusion is completed. Febrile reactions can be accompanied by chills, headache, vomiting and discomfort feeling.⁸ In this study, it also found allergic reactions such as urticaria and febrile as the top of the type of transfusion reactions. The frequency of febrile transfusion reactions depends on the type of blood components given, the storage conditions of blood products, and variety of specific factors from the patient themselves.⁹ In this study, the storage conditions for blood bank is considered to be optimal, according to standard procedure. Blood products were already stored on standard storage area with checked and constant temperature. Temperature, facilities, transportation systems, and distribution of blood products have been improved to become more standardized. Furthermore, transportation and distribution of blood by using cold box is already equipped with a thermometer and training program regarding techniques of standard transportation and distribution of blood products was already implemented to the officers as well as tightening “the 30 -minute rules”. Through these efforts the incidence of transfusion reactions began to be lowered.

Based on the literature, the risk of transfusion reactions such as urticaria may occur at 1: 100 units of blood transfused. Transfusion reactions like fever occurred in 1: 300, transfusion reactions that lead to heart failure 1: 700, disorders of the lung such as shortness is approximately 1: 10,000, and transfusion reactions due to improper type of blood

groups of ABO occurs in 1: 40,000 units of blood transfused.¹⁰ In this study, a lower risk of transfusion reactions such as urticaria, heat, and heart failure were 1: 320, 1: 657 and 1: 13,146 respectively. Transfusion reaction with lung involvement such as shortness of breath obtained higher risk of 1: 2,629. Risk difference that was obtained in this study is most likely caused by the different number of subjects and periods of observation. In this study, observations were made in a shorter time, in just six months.

CONCLUSION

Educational programs and training on the application of cold chain and closed systems in the distribution of blood products and the improvement of service system have helped reducing the incidence of transfusion reactions.

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