

A prospective audit of transfusion requests in a tertiary care hospital for the use of fresh frozen plasma

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Abstract:

Aims and Background: Like any other drug, therapeutic use of fresh frozen plasma (FFP) has its own side effects, adverse reactions and risks involved. Overall use of FFP has been on the increase in most tertiary care hospitals. Since the guidelines for FFP use in a clinical setting are not well defined, the present study aims at defining the appropriateness of use of FFP in the light of its risks and benefits as a drug. **Materials and Methods:** We carried out a prospective survey of 821 transfusion orders for 2,915 units of fresh frozen plasma components in our hospital over a 4-month period and recorded indication for transfusion and the number of components requested. **Results:** Five hundred seventy-three (69.8%) of transfusion requests affecting 2,202 (75.54%) units of FFP were appropriately indicated, while 248 (30.2%) of FFP requests were inappropriately indicated. The majority of fresh frozen plasma requests used were for surgical bleeding (22.77%) because of the deranged coagulation profile before surgery in most of the patients. It was followed by liver disease and transplantation (12.54%). Out of 821 patients, 586 were male and 235 were female. **Conclusion:** Inappropriate requests accounted for 30.2% of the total FFP requests in patients who had normal coagulation parameters. Regular audits, appropriate training of medical staff, conducting regular CMEs are the measures being incorporated in our hospital to rationalize the use of blood components.

Key words:

Appropriate, audit, fresh frozen plasma, tertiary hospital, transfusion

Blood transfusion raises serious issues of safety and economics; therefore, every transfusional procedure must be indicated correctly.^[1] Fresh frozen plasma (FFP) has been available since 1941 and was initially often used as volume replacement. With the availability of albumin and hydroxyethyl starch and a better understanding that FFP is contraindicated for volume expansion, it is now used in cases of excessive bleeding or to prevent bleeding in those patients with abnormal coagulation tests that are undergoing an invasive procedure.^[2] Fresh frozen plasma is plasma frozen within 6-8 h of collection, and it is stored at -18°C or lower for up to 1 year to preserve all factors at hemostatic levels, including the labile factors V and VIII. FFP is thawed in a water bath at $30-37^{\circ}\text{C}$ for 30 min and can be stored after thawing for up to 24 h at $2-8^{\circ}\text{C}$. FFP must be ABO compatible or identical.^[3]

FFP is the primary source of coagulation factors for patients with coagulation factor deficiencies. Factor deficiencies severe enough to be clinically significant are usually associated with prolongation of the coagulation screening tests (prothrombin time, partial thromboplastin time) at least 1.5 times the control value. The major indications for FFP are replacement therapy for

documented coagulation factor deficiency in a bleeding patient or patient undergoing an invasive procedure, reversal of warfarin effect, massive blood transfusion, antithrombin III deficiency, for treatment of immunodeficiency and thrombotic thrombocytopenic purpura.^[3,4] It is also the most common blood component to be used without indication in clinical practice. Patients receiving FFP unnecessarily have the risk of allergic reactions, viral transmission, transfusion-associated lung injury and volume overload without any clinical benefit.^[5] Hence the use of FFP is not without potential danger. In this study, we prospectively analyzed transfusion requests in a tertiary care hospital to ascertain their appropriateness according to standard guidelines.

Materials and Methods

We conducted this study at the Department of Transfusion Medicine, Indraprastha Apollo Hospital. It is a 695-bedded hospital with a broad range of medical and surgical specialties. On an average, the Department of Transfusion Medicine receives approximately 5,000 transfusion orders of FFP and issues approximately 11,000 units of FFP annually to cater to patients.

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A prospective audit of the fresh frozen plasma requisition forms was carried out over a 4-month period from August 2005 to November 2005. The requests were analyzed as regards the history of previous transfusion, clinical indications for transfusion and the number of units required. We applied College of American Pathologist^[6] (CAP) guidelines to validate each request for transfusion in relation to the clinical indication.

Results

In all, 821 request orders for blood transfusion for 2,915 units of fresh frozen plasma were analyzed during the study period. Out of the 821 patients presenting with different clinical indications, 586 were male and 235 were female. In 89 (10.8%) patients, coagulation screening was not performed, and in 154 (18.75%) patients the International Normalized Ratio (INR) was found to be less than 1.5.

Request forms of patients with INR >1.5 and / patients in whom clinical criteria for FFP usage were fulfilled were classified as appropriate; otherwise, they were inappropriate (CAP Guidelines for fresh frozen plasma). On the basis of these criteria, out of 821 requests, 573 (69.8%) were transfused appropriately with 2,202 units of FFP while 248 (30.2%) were transfused inappropriately with 713 units of FFP.

Surgical bleeding was the most common indication for a transfusion decision, with 187 (22.77%) requests, followed by 103 (12.54%) requests for liver disease and transplantation. The various indications for transfusion observed in our study are given in Figure 1. A considerably high percentage of requests were for patients whose requests did not mention the indications, and some were also emergency requests. These are mentioned as 'others' in Figure 1.

Discussion

The result of this prospective audit of transfusion requests for the use of FFP showed 69.8% were appropriate and 30.2% were inappropriate requests. Studies have been carried out at other centers and have yielded variable results. A study done by Vishwanathan *et al.*^[7] showed 30.39% of FFP requests received were with questionable indications. A prospective audit by Kakkar *et al.*^[8] indicated 23.1% were inappropriate FFP requests. Chatterjee *et al.*^[9] found 39% were inappropriate issues among

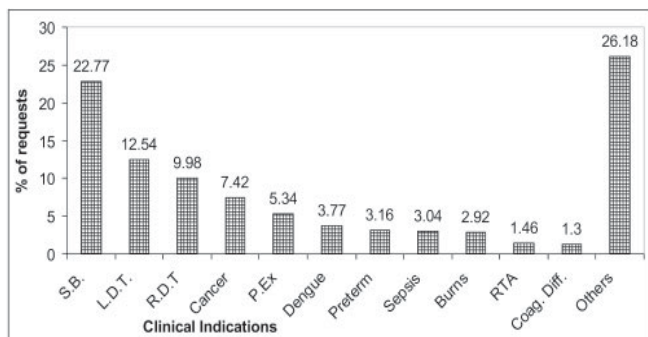


Figure 1: Distribution of 821 transfusion requests for the use of FFP. (SB - surgical bleeding; LDT - liver disease and transplantation; RDT - renal disease and transplantation; P.Ex - plasma exchange; RTA - road traffic accident; Coag. Diff. - coagulation deficiency).

Table 1: Inappropriate use of fresh frozen plasma comparison of various studies

Various studies	Inappropriate fresh frozen plasma usage (%)
Vishwanathan <i>et al.</i> ^[7]	30.39
Kakkar <i>et al.</i> ^[8]	23.10
Chatterjee <i>et al.</i> ^[9]	39.00
Basu <i>et al.</i> ^[10]	42.00
Makroo <i>et al.</i> (present study)	30.20
Eagleton <i>et al.</i> ^[12]	34.00
Hui <i>et al.</i> ^[14]	28.00
Chng <i>et al.</i> ^[13]	73.00
Luk <i>et al.</i> ^[15]	53.00

surgical oncology patients. Basu *et al.*^[10] did a study on FFP usage, finding 42% were inappropriate FFP orders issued. Mohanty *et al.* have stated that hematologists need to agree on blood components indications prior to instituting a pre-transfusion approval program in order to provide optimal management.^[11]

A study by Eagleton *et al.*^[12] showed 66% appropriate FFP usage, while a retrospective analysis by Chng *et al.*^[13] showed only 27% appropriate usage. But the finding of Hui *et al.*^[14] suggests more appropriate usage, that is 72%, in comparison to this study. Furthermore, the appropriate use of FFP found in the prospective study done by Luk *et al.*^[15] was only 47%, which is significantly less than this finding. Inappropriate FFP usage in various studies is given in Table 1.

This study showed that the requests for FFP were for all age groups, with adult predominance. The majority of FFP requests used were for surgical bleeding (22.77%). The high use of FFP in bypass surgery is likely due to heavy heparinization to counteract the thrombogenicity of bypass circuit, receiving 25,000 to 30,000 units of heparin; and at the end of surgery, heparin is reversed by protamine. Excessive postoperative bleeding may require more protamine.^[16] Liver disease and transplantation are the next most common indications for FFP use in our study.

Conclusion

Inappropriate requests accounted for 30.2% of the total FFP requests in patients who had normal coagulation parameters. There has been a rising trend of FFP use in surgical bleeding, chronic liver disease, liver transplantation and plasma exchanges at our hospital. Regular audits, appropriate training of medical staff, conducting regular CMEs are the measures being incorporated in our hospital to rationalize the use of blood components. Regular audit of blood request forms by the hematologists / transfusion medicine specialists can go a long way for ensuring optimization of hemotherapy.

References

1. Saxena S, Weiner JM, Rabinowitz A, Fridey J, Shulman IA, Carmel R. Transfusion practice in medicine patients. *Arch Intern Med* 1993;153:2575-80.
2. O'Shaughnessy DF, Atterbury C, Bolton Maggs P, Murphy M, Thomas D, Yates S, *et al.* Guidelines for the use of fresh-frozen plasma, cryoprecipitate and cryosupernatant. *Br J Haematol* 2004;126:11-28.
3. Makroo RN. *Compendium of transfusion medicine*. 1st ed. 1999. p. 127-9,153.

4. British Committee for Standards in Hematology working party of the Blood Transfusion Task Force: Guidelines for the use of fresh frozen plasma transfusion medicine. Vol 2. 1992. p. 57-63.
5. American Association of Blood Banks: Blood Transfusion Therapy: A Physician's Handbook, 7th ed. Triulzi DJ, editor. American Association of Blood Banks: Bethesda, MD; 2002.
6. College of American pathologist, Transfusion Guidelines for the use of fresh frozen plasma. 1994.
7. Vishwanathan C, Jain R, Kamath M. Blood utilization review in a tertiary care hospital. *Indian J Haematol Blood Transf* 1999;17:26-31.
8. Kakkar N, Kaur R, Dhanoa T. A prospective audit of transfusion requests in a tertiary hospital. *Indian J Haematol Blood Transf* 2003;21:159-60.
9. Chatterjee M, Bharucha ZS. Retrospective audit of transfusion practice in surgical oncology. *Indian J Haematol Blood Transf* 1998;16:107-12.
10. Basu S, Marwaha N. Fresh frozen plasma: Indications and patterns of usage. *Indian J Haematol Blood Transf* 2001;19:51-2.
11. Mohanty D, Pathare AV. Audit in Transfusion Medicine - Time to wake up. *Indian J Haematol Blood Transf* 1999;17:25.
12. Eagleton H, Benjamin S, Murphy MF. Audits of appropriate use of FFP. *Blood Matters* 2000;4:5-8.
13. Chng WJ, Tan MK, Kuperan P. An audit of fresh frozen plasma usage in an acute general hospital in Singapore. *Singapore Med J* 2003;44:574-8.
14. Hui CH, Williams I, Davis K. Clinical audit of the use of fresh-frozen plasma and platelets in a tertiary teaching hospital and the impact of a new transfusion request form. *Intern Med J* 2005;35:283-8.
15. Luk C, Eckert KM, Barr RM, Chin-Yee IH. Prospective audit of the use of fresh-frozen plasma, based on Canadian Medical Association transfusion guidelines. *CMAJ* 2002;166:1539-40.
16. Bull BS, Huse WM, Brauer FS, Korpman RA. Heparin therapy during extracorporeal circulation. II. The use of a dose-response curve to individualize heparin and protamine dosage. *J Thorac Cardiovasc Surg* 1975;69:685-9.

Source of Support: Nil, **Conflict of Interest:** None declared.