An audit of blood component therapy in a Canadian general teaching hospital

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As part of a quality assurance program a retrospective audit of transfusion practices for packed red blood cells, fresh frozen plasma and albumin was undertaken with predetermined criteria in a general teaching hospital. Of 520 transfusion episodes with 1218 units of packed red blood cells given to 297 patients 88% were considered appropriate; of 106 episodes with 405 units of fresh frozen plasma given to 83 patients 90% were deemed appropriate; and of 187 episodes with 320 units of albumin given to 99 patients 64% were considered appropriate. The results of this audit, when compared with those of other surveys of blood use in a similar population, suggest that pretransfusion approval of requested components would reduce the number of inappropriate transfusions.

Dans le cadre du contrôle de la qualité, on a institué dans un hôpital général universitaire la présente étude rétrospective des transfusions de culots de globules rouges, de plasma frais congelé et d'albumine, selon des critères déterminés d'avance. On considère comme indiquées 88% des 520 transfusions totalisant 1218 culots de globules rouges faites à 297 sujets, 90% des 106 transfusions de plasma frais congelé totalisant 405 sacs faites à 83 sujets et 64% des 187 injections d'albumine totalisant 320 sacs faites à 99 sujets. Si on compare ces données à celles d'autres enquêtes sur des populations semblables, on peut croire qu'un régime d'approbation préalable de la transfusion rendrait moins fréquent le recours injustifié à celle-ci.

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Blood transfusion therapy is a major aspect of the practice of medicine. Despite all its potential benefits it is expensive, especially for certain blood components, and is associated with a risk of adverse reactions and disease transmission. For these reasons clinical quality assurance programs have been advocated to ensure the appropriate use of blood and blood components.[1,2]

The two audits most widely used in assessing the effectiveness of transfusion therapy are a systems audit and a medical practice audit.[1] The systems audit is performed by the institution's blood transfusion service and emphasizes the operational aspects of a service, measuring such parameters as rates of expiry of blood components, cross-matching to transfusion ratios and workload statistics. Medical practice audits are performed to assess the appropriateness of transfusion practices.

We describe a medical practice audit, which must be considered part of the duties of physicians responsible for Canadian hospital-based transfusion services. It was developed to complement the quality assurance program at St. Joseph's Health Centre of London and was specifically designed to address transfusion practices for packed red blood cells, fresh frozen plasma and albumin. Coagulation factor concentrates and platelet units were not considered because these products can be released from the hospital's blood bank only after consultation with the hematologist on duty and are ordered only by the hematology and oncology services. The results of the audit were compared with those of similar studies to explain our results and discrepancies.

Patients and methods

The charts of patients admitted to St. Joseph's over approximately 8 months in 1986–87 who had received packed red blood cells (297 patients over 2 months), fresh frozen plasma (83 patients over 8 months) and albumin (99 patients over 3 months) were reviewed retrospectively. The names of the

patients were obtained from the records of the blood transfusion service. Outpatients and patients admitted to the neonatal intensive care unit were excluded.

Three survey forms, developed and provided by Dr. Anita Ali, of the Canadian Red Cross Blood Transfusion Service, Hamilton, Ont., were used to assess the criteria for transfusion.[3] The forms were based on an algorithm for appropriate use of packed red blood cells, fresh frozen plasma and albumin.

The indications for transfusion with packed red blood cells were active documented hemorrhage, lack of response to hematinic therapy, chemotherapy-induced bone marrow suppression, marked anemia with evidence of cardiorespiratory decompensation, and transfusion-dependent hematologic disorders. The indications for use of fresh frozen plasma were hemorrhage associated with a known coagulation defect, hepatic disease, anticoagulation therapy, massive transfusion and plasma exchange therapy. The indications for albumin transfusion were hypoalbuminemia with hypovolemic shock, hypotension, or oliguria related to liver failure, protein-losing nephropathy or protein-losing enteropathy.

After the admission notes, progress notes, operative records and laboratory data in the hospital charts were reviewed each transfusion was assessed with the appropriate algorithm and designated as either appropriate or inappropriate. A tranfusion episode was defined as an order for packed red blood cells or blood components irrespective of the number of units used. Other information obtained and analysed included the hospital service ordering the transfusion and the total number of units transfused for any given episode.

Results

Packed red blood cells

We reviewed 297 patients' charts, which represented 304 admissions during the study period. These patients had received 1218 units of packed red blood cells during 520 transfusion episodes; 90% of the units and 88% of the transfusion episodes were deemed appropriate (Table I). The proportion of appropriate transfusions for individual services ranged from 67% to 95% (Table II); the proportions of units used by Surgery, Medicine, Obstetrics/Gynecology and Family Medicine were 56%, 35%, 7% and 2% respectively.

Fresh frozen plasma

We reviewed 83 patients' charts, which represented 83 admissions. The 405 units of fresh frozen plasma were administered during 106 transfusion episodes, 90% of which were considered appropriate (Table I). The proportion of appropriate transfusions for individual services ranged from 85% to 100% (Table II); the proportions of units used by Surgery, Medicine, Obstetrics/Gynecology and Pediatrics were 51%, 40%, 8% and 1% respectively.

Albumin

A total of 99 patients, representing 99 admissions to hospital, had received 320 units of albumin: 112 units of 5% albumin solution and 208 units of 25% solution. The units had been given during 187 transfusion episodes, 64% of which were considered appropriate (Table I). The proportion of appropriate transfusions according to service ranged from 60% to 100% (Table II); the proportions of units used by Surgery, Medicine and Obstetrics/Gynecology were 65%, 34% and 1% respectively.

Discussion

The medical practice audit was performed as part of an ongoing institutional quality assurance program that monitors the use of blood and blood component therapy. Our study addressed only the appropriateness of transfusions of packed red blood cells, fresh frozen plasma and albumin.

The criteria we used for transfusions of packed

Table II — Appropriate transfusions by service

Service	Proportion (%) of appropriate transfusions		
	Packed red blood cells	Fresh frozen plasma	Albumin
Medicine	87	95	70
Surgery	87	85	60
Obstetrics/ Gynecology	95	89	100‡
Family Medicine	67*	–	–
Pediatrics	–	100†	–

*Represents only six transfusions.
†Represents only one transfusion.
‡Represents only three transfusions.

Table I — Appropriate transfusions by number of units and transfusion episodes

Variable	Packed red blood cells	Fresh frozen plasma	Albumin
Number of patients	297	83	99
Number of units transfused	1218	405	320
Number of transfusion episodes	520	106	187
Appropriate number (and %) of units transfused	1094 (90)	383 (95)	206 (64)
Appropriate number (and %) of transfusion episodes	455 (88)	95 (90)	119 (64)

red blood cells were consistent with those recommended by several authors.[1,4,5] We found that 90% of the transfused units and 88% of the transfusion episodes were appropriate. Ali, Vander Giessen and Blajchman,[3] from their pilot study with the same algorithm that we used, found that 20% of transfusions with packed red blood cells were inappropriate. Most studies have compared the use of packed red blood cells and the use of whole blood or have analysed the use of packed red blood cells in only specific clinical situations.[6] Tartter and Barron[6] noted that 25% of the units of blood given to 39% of patients undergoing surgery for colorectal cancer had been unnecessary. In our study the transfusions of packed red blood cells were most often found to be inappropriate in patients with evidence of bleeding but without significant changes in hemoglobin level or in patients who had received a transfusion during surgery but in whom the postoperative hemoglobin levels did not reflect a significant blood loss. Tartter and Barron found that in most instances of inappropriate transfusion the transfusions had been given intraoperatively, irrespective of the patient's hematocrit.

The dramatic rise in the use of fresh frozen plasma over the previous decade prompted a consensus conference by the National Institutes of Health (NIH), Bethesda, Maryland,[7] in 1984 to determine the indications for using fresh frozen plasma; we used those guidelines for our audit except in cases of massive transfusion. Our hospital's protocol for massive transfusion requires less blood loss than does the NIH protocol (six units of blood within 12 hours v. replacement of equivalent of one blood volume within several hours).

Our audit showed that 95% of the units of fresh frozen plasma were transfused appropriately in 90% of the transfusion episodes and that the transfusions were appropriate in 85% or more of the episodes on the various services. In the study by Ali and colleagues[3] 70% of the transfusion episodes with fresh frozen plasma were considered appropriate. Other studies found that 62% to 70% of transfusions of fresh frozen plasma were deemed appropriate.[8-11] Our high rate of appropriate transfusions was due to several factors. The studies that showed low rates of appropriate use of fresh frozen plasma had included patients who had received plasma for cardiac surgery, a procedure that is not performed at our institution. The release of fresh frozen plasma by the blood transfusion service at our hospital must be approved by the laboratory hematologist or be deemed appropriate according to our protocol for massive transfusion. Most of the transfusions that were deemed inappropriate had been given to patients who had apparently required massive transfusion and therefore did not meet our defined criteria. These findings will require further study by our institution's blood transfusion service; however, it has been shown that prospective concurrent audits with mandatory approval before transfusion will result in more appropriate use of platelets and the use of fewer units.[12] At our institution the release of fresh frozen plasma, platelets and factor concentrates must be approved by the hematologist before transfusion or meet pretransfusion criteria.

Indications for using albumin were outlined at the 1977 NIH consensus conference,[13] and the criteria we used followed those recommendations. A total of 64% of the units of albumin used and the same proportion of transfusion episodes were judged appropriate. The proportion varied from 40% to 100% according to hospital service; the 100% represented a very small number of episodes. Alexander and associates[14] reported that 41% of the units of albumin administered to the patients in their series were appropriately transfused. In our study most of the inappropriately given units were for patients who, despite having normal albumin levels, had not been given an adequate trial of crystalloid therapy for hypotension or hypovolemia. Often no indication for the albumin transfusion was documented in the progress notes. Although albumin is considered one of the safest transfusion products,[15] it is expensive to produce; the inappropriate use of this product needs to be addressed at our health centre.

Our audit demonstrated that the transfusion practices at St. Joseph's are similar to or better than those at other institutions. We recognize that the audit criteria can be considered too rigid for initial assessment in an emergency clinical situation. However, such criteria must be seen not as rigid standards but, rather, as aids to emphasizing clinical presentation when a potential for poor transfusion practices exists. Only by addressing these problem areas will optimal use of blood and blood components be achieved.

There are two other approaches to reducing the number of unnecessary transfusions: retrospective analysis of transfusion practices with continuing education and pretransfusion approval of blood component therapy. Both require a significant amount of effort by a hospital's blood transfusion service but are necessary for the provision of safe and effective transfusions to patients. In our experience pretransfusion approval and the requirement to meet established criteria are effective mechanisms through which to improve transfusion practices.

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Meetings
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June 4-8, 1989: Joint Meeting of the Canadian Society of Clinical Chemists, Canadian Association of Medical Biochemists and American Association of Clinical Chemistry (Upstate New York Section)
Hamilton Convention Centre, Hamilton, Ont.
Darius J. Nazir, CSCC 1989 Annual Conference, Hamilton Health Sciences Laboratory Program, PO Box 2000, Stn. A, Hamilton, Ont. L8N 3Z5; (416) 527-0271, ext. 4558

June 4-9, 1989: 5th International Conference on AIDS
Convention Centre, Montreal
Kenness Canada Inc., PO Box 120, Stn. B, Montreal, PQ H3B 3J5; (514) 844-4442, FAX (514) 284-2968

June 4-10, 1989: Cardiac Rehabilitation Exercise Specialist Workshop (incorporating the American College of Sports Medicine Exercise Specialist Certification Practical Examination)
University of Ottawa Heart Institute
Mr. F. Monopoli, University of Ottawa, 631 King Edward Ave., Ottawa, Ont. K1N 6N5

June 7-9, 1989: Conference of the Royal Society of Canada and the Federation of Canadian Demographers: Facing the Demographic Future
Laval University, Quebec
Population Studies Centre, Rm. 3227, Social Science Centre, University of Western Ontario, London, Ont. N6A 5C2; (519) 661-3819

June 8-10, 1989: Annual Meeting of the Medical Society of Prince Edward Island
Mill River Resort, Woodstock, PEI
Marilyn Lowther, executive secretary, Medical Society of Prince Edward Island, 100-18 Queen St., Charlottetown, PEI C1A 4A1; (902) 892-7527

June 8-10, 1989: Canadian Psychological Association Annual Convention
World Trade and Convention Centre, Halifax
Mary Ahearn, convention coordinator, Canadian Psychological Association, Vincent Road, Old Chelsea, PQ J0X 2N0; (819) 827-3927

June 8-10, 1989: 7th Annual Conference of the Atlantic Action Group for Healthy Heart and Stroke Prevention
Convention Centre, Saint John, NB
Dr. S.P. Handa, chairman, Organizing/Program Committee, PO Box 2100, Saint John, NB E2L 4L2; (506) 648-6843

June 9-10, 1989: Toronto Neurology Update
Sutton Place Hotel, Toronto
Continuing Medical Education, Faculty of Medicine, Medical Sciences Building, University of Toronto, Toronto, Ont. M5S 1A8; (416) 978-2718

June 9-12, 1989: Congrès de la pharmacie québécoise, Ordre des pharmaciens du Québec
Gray Rocks Inn, Laurentides, PQ
Micheline Brisebois, 301-266 ouest rue Notre Dame, Montréal, PQ H2Y 1T6; (514) 284-9588