Leaders

Blood bank audit

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Medical audit forms a component of quality assurance and quality improvement in health care delivery.^{1,2} Medical audit has been defined as a systematic approach to peer review of medical care to identify opportunities for improvement and to realise them.³ The main object is the improvement of patient care by reducing unnecessary procedures (which incidentally share the hazards of necessary procedures) and the prevention of iatrogenic disease.^{4,5} From an economic point of view, audit can also improve resource management.⁶ McKee *et al*⁴ lament the tendency of audit, hitherto, to deal with activity rather than outcome; other authors have stressed the importance of feedback and re-audit to ensure the effectiveness of audit in producing improvement in outcome.^{7,8} For optimal results, the subject of medical audit should be of high frequency and high risk or high cost; education should be an important implication of audit.⁹ Blood bank audit or better perhaps, transfusion medicine audit, is part of the larger field of medical audit, yet clearly also involves questions of resource audit and management, and audit of product quality.¹⁰ Theoretically, blood bank or transfusion medicine audit embraces all procedures from blood procurement to the long term consequences of transfusion. The scope of this brief review is largely confined to the clinical practice of transfusion and resource management in the hospital blood bank.

The question may be raised—are audits necessary? Without belabouring the point, a small number of examples will illustrate the desirability of audit. Kelly and Kellie,¹¹ in a brief but extensively referenced review, indicated that a substantial but not clearly defined proportion of medical services are superfluous, advocated the active development of practice guidelines, and concluded that, so far, such efforts have had little influence on practice.

Audits in surgery have determined that there is an increased frequency of unnecessary surgery in the hands of inexperienced surgeons¹² and that there is significant variation in outcome from surgeon to surgeon in the treatment of carcinoma of the colon;¹³ both studies suggest room for improvement. Variability in transfusion practice in association with surgery is well established in the United States (for example, in coronary artery bypass grafting^{14,15}) and in Europe with respect to various procedures.¹⁶ It seems unlikely that uniformly appropriate surgical and transfusion practice

would lead to such marked variability in transfusion requirements. Finally, in spite of all the injunctions in the classroom, textbooks and at the bedside, simple iron deficiency anaemia is still frequently treated with transfusion and, in many instances, treatment with oral iron is not prescribed.¹⁷

Thus, it seems clear that audit of transfusion, properly applied, can provide grounds for improvement not only in transfusion medicine, but also in other areas of medical practice. Whether these grounds will prove fertile soil for the promotion of better medical practice remains another question.

Inherent in the discussion of audit, feedback and outcome is the question of structured practice guidelines or practice standards. In transfusion medicine the major stimulus to their development was the perceived need, under the threat of transfusion transmissible disease, to define the indications for transfusion and to try to confine treatment to those situations where it was really necessary. Two important statements on indications for red cell transfusion have been made, one following a National Institutes of Health (NIH) consensus conference¹⁸ and the other by the American College of Physicians.^{19,20} These guidelines stress the need to judge the requirement for red cell transfusion in the light of adequate tissue oxygen delivery rather than an arbitrary transfusion "trigger" based on a particular haemoglobin or haematocrit value, and also stress the desirability of considering alternatives. Other authors²¹⁻²³ have emphasised the risk of inappropriate withholding of transfusion.

Recent application of American College of Physicians guidelines to red cell transfusion practice in a Canadian teaching hospital suggests that, in spite of the long standing concept of guidelines and audit, and publicity surrounding the hazards of transfusion, a substantial proportion of red cell transfusions are still given without apparent clinical justification.²⁴

In the case of platelets, a NIH conference²⁵ reviewed indications for and risks of platelet transfusion and, more recently, the British Committee for Standards in Haematology published their own guidelines.²⁶ Various authors have published criteria for, and results of, audit of platelet use.^{27,28} In a critical review, Beutler²⁹ seriously questions the widely used criterion of a platelet count of $20 \times 10^9/l$ as an indication for platelet transfusion. Detailed practice para-

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meters for platelet transfusion have recently been published by the College of American Pathologists.³⁰

Like platelets, transfusion of fresh frozen plasma (FFP) has been subjected to review and guidelines have been produced for its use.^{31,32} In spite of these statements, excessive transfusion of FFP probably persists for largely inappropriate indications.³³⁻³⁵ Guidelines for transfusion of FFP have been reviewed elsewhere.^{27,30}

One area where audit has been difficult to pursue and for which little information is available is that of long term follow-up and we know little of the frequency of adverse long term consequences and outcomes of transfusion of blood and blood products.³⁶

In supplying feedback on audit in general to physicians, the information should be precise and clinically relevant, and should have a high chance of producing change in practice, as the information is expensive to accumulate. Furthermore, for an optimal response the information is best presented close to the time of decision making.³⁷ A number of reports indicate success of education programmes and pre-transfusion consultation in reducing the use of FFP^{38,39} and platelets.⁴⁰ However, these are time-consuming activities which are not readily sustained and the durability of the response remains uncertain.⁴¹ Toy⁴² has summarised the determinants of the success of education in transfusion practice as significant inappropriate use, timely audit and individual physician education. The introduction and expansion of autologous surgical predeposit programmes, partly stimulated by increased awareness of transfusion hazards, have been associated with changes in red cell transfusion practices.⁴³⁻⁴⁵

In one study⁴⁶ application of an initial set of criteria suggested that 8% of therapeutic platelet transfusions and 78% of prophylactic transfusions were inappropriate. This led to review of the criteria with ordering physicians and modification of the guidelines. When these were then applied prospectively to platelet transfusion, they resulted in a 14% overall decrease in platelet consumption.⁴⁶

All-in-all, however, the evidence available so far suggests that changes in practice require considerable effort, and that, in spite of the promulgation of "guidelines" and "prudent strategies", progress in changing clinical practice remains less than desirable.

The use of audit for management purposes is a byproduct of the medical audit; it defines practice in an institution and permits both comparison with other institutions and data banks, and establishment of a routine blood order schedule^{47,48} appropriate to the individual institution.⁴⁹ Such measures contribute to more efficient use of inventory and decreased wastage. Using carefully compiled blood order schedules, agreed to by surgeons, unnecessary crossmatching can be reduced and in a general hospital a crossmatch to transfusion ratio of less than 2 to 1 should be readily achievable.^{50,51}

Use of audit to reduce unnecessary transfusion and outdated of blood, and make more efficient use of inventory will become more

important, as we face, on both sides of the Atlantic, diminishing supplies of blood (Aye M T, Cash J D, Duguid J K M, Surgenor D M, 1994, personal communications) resulting from increasingly stringent donor requirements and declining public interest in donating blood.⁵²⁻⁵⁴ It has recently been shown that, in practice, implementation of audit with monitoring can significantly reduce the use of allogeneic blood products with considerable cost savings⁵⁵ and decreased reliance on conventional blood donation.

In our enthusiasm to audit the use of blood products it is easy to overlook some of the more prosaic aspects of transfusion medicine which nevertheless present hazards to the patient and which may, indeed, exceed those of the biological consequences of unnecessary transfusion. These principally involve errors in specimen and patient identification at the time of specimen procurement or at the time of blood product administration.⁵⁶⁻⁵⁹ Such errors are frequently, or perhaps usually, poorly documented.⁵⁹ Rigorous measures to detect errors and rectify the cause where possible can be effective and represent a classic example of audit leading to quality improvement.⁶⁰

Recently, attention has been directed⁶¹ towards the growing relative importance of bacterial contamination of blood products (as our current concern about the true risks of virus transmission has diminished). This is an area in which audit, quality surveillance and appropriate response are required.

Where technical procedures and reagent quality are not regulated by legislation, audit of procedures, reagents and test protocols should be scrupulously and regularly carried out and results recorded.⁶²

The question of audit and guidelines for paediatric transfusion medicine has not been specifically discussed here. The same general principles apply and guidelines for audit have recently received wide support in North America.⁶³ Nor has this review attempted to discuss the audit, outcome studies and education involved in the use of the numerous other blood products available such as cryoprecipitate, clotting factor concentrates and intravenous immunoglobulin products. Again, the same general principles apply as to any blood product. Where new products become available, adequate trials of efficacy and safety form a type of audit.

Various aspects of audit in transfusion medicine, including setting of standards upon which to base audit and surveillance of transfusion practice, the role of transfusion audit committees and the importance of education at all levels of involvement in transfusion, have been recently reviewed by Lenes and Goodnough.⁶⁴

Comments

1 Numerous audits of blood use have been performed for various purposes including assessment of practice and management of resources. They demonstrate wide variations in clinical transfusion practice and, in many instances, have identified in-

- appropriate practice (usually over-transfusion) and room for improvement.
- 2 Improvement requires energetic educational interventions which may be expensive and time-consuming, and are best used in high frequency, high risk situations and delivered at or close to the time of clinical decision. Wider exposure of the physicians of the future to transfusion medicine now might have benefits later.
 - 3 Audits should be designed within the framework of practice guidelines, structured to use objective criteria and should encourage economical blood product use; feedback to physicians based on widely accepted criteria for medical practice is essential for effecting change.
 - 4 Audits should be capable of repetition to document effectiveness of attempts at change; re-audits (that is, "closing the loop") are an essential part of the process.
 - 5 Major efforts are and will be required if the natural inertia and passive resistance to change in medical practice are to be overcome. The results of some recent audits showing lack of significant change in practice, in spite of widespread information on practice guidelines and publicity, support this view.
 - 6 The neglected area of "administrative errors" in transfusion medicine practice requires attention and the introduction of quality improvement measures. Included should be notation of indications for and administration of blood products in the patient record.
 - 7 The quality of blood bank techniques, reagents and performance should be regarded as within the sphere of audit.
 - 8 The extent and implications of bacterial contamination of blood products require assessment and development of audit and outcome studies to determine their cause and true clinical importance.
 - 9 The institutional (hospital) approach to audit, feedback and outcome studies in transfusion medicine requires involvement of providers of clinical services as well as transfusion medicine personnel usually co-ordinated through a hospital Transfusion Committee.⁶⁵ Commitment of management to improve transfusion practice is essential for success.
 - 10 Most audits have dealt with the immediate conduct and effects of transfusion practice. Mechanisms for the audit of long term effects of transfusion should be developed.
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