Audit

Are we overusing blood transfusing after elective joint replacement? – a simple method to reduce the use of a scarce resource

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Objectives: To determine the proportion of patients who received a blood transfusion after joint replacement, and to devise a simple method to ensure patients were transfused based on strict clinical and haematological need.

Design: Prospective audit over 2 years.

Patients and Methods: The study group was 151 patients who underwent total hip and knee arthroplasty in a typical district general hospital (Kettering) over a 2-year period. They were divided into three consecutive groups. Current practice was audited (producing the first group of 62 patients) and transfusion rates were compared to regional figures. Local guidelines were drawn up. A form was introduced on which the indications for any transfusion had to be documented prior to transfusion of the blood. This was designed to encourage transfusion only on strong clinical grounds or an haemoglobin (Hb) level < 8 g/dl. Transfusion practice was then re-audited (producing the second group of 44 patients) to assess whether practice had improved. A year later, all relevant staff were reminded by letter of the guidelines. The process was then re-audited (producing the third group of 45 patients) again to determine whether practice remained improved or not.

Results: In the first audit (current practice) of 62 patients, the overall transfusion rate was 71%, with a higher rate in the hip replacement group (84%) ordered mainly by anaesthetic staff. Ward staff were reluctant not to transfuse patients whose Hb level fell below 10 g/dl. In the second audit, the transfusion rate fell by nearly 50% to 37%, with almost identical figures for knee and hip replacement. In the third audit of 45 patients, a year later, the transfusion rate was 40% overall.

Conclusions: Patients were being transfused routinely, generally without good clinical evidence of benefit to the patient. The audit process was successful in instituting change for the better in blood transfusion practice for elective joint replacement. The improved practice can be largely maintained provided staff are regularly reminded of appropriate guidelines and encouraged to transfuse for clinical need only. For absolute adherence to guidelines, we would recommend a compulsory form system be introduced for transfusion in the per-operative period, to ensure blood transfusion is only given when absolutely necessary.

Key words: Blood transfusion use – Joint replacement – Audit

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Red blood cell transfusion is common in patients who have undergone total joint replacement. Relatively low haemoglobin (Hb) levels in the postoperative period represent an optimum between blood viscosity and oxygen-carrying capacity. A level as low as 7 g/dl can meet physiological requirements provided adequate intravascular volume for tissue perfusion is maintained.¹ Wide variations exist. Wide variations exist in the indications for transfusion between different hospitals and clinicians, as demonstrated by the Sanguis Study group in 1994.²

Transfusion carries a small, but significant, risk to the patient of disease transmission, in particular HIV and hepatitis viruses, hypersensitivity reactions, adverse immunomodulation and haemodynamic overload.³ As an increasingly scarce and expensive resource, its use in the elective situation must be tempered by a careful analysis of the risk- and cost-benefit ratios to the patient.

Our hypothesis was that patients at our institution were being transfused more out of routine in certain circumstances than for a proven clinical need. We, therefore, decided to audit the process to identify the problem.

Patients and Methods

A prospective audit of practice was carried out over a 2-year period from January 2000 to December 2001.

Audit 1 (current practice)

Sixty-three consecutive patients undergoing primary total hip or knee replacement under two consultant surgeons were followed prospectively over a 6-month period. The following information was recorded: pre-operative haemoglobin, intra-operative blood loss, postoperative drainage, postoperative haemoglobin, number of units of blood transfused by whom and for what reason and post-transfusion haemoglobin. Any adverse events were documented.

Audit 2 (institution of guidelines and formal documentation of indications for transfusion)

Anaesthetic surgical and ward staff were informed of the findings of audit 1. The reason for any transfusion after elective knee or hip replacement now had to be documented on a form provided with the notes. Blood was only to be transfused if the patient showed signs of cardiovascular instability from excessive intra-operative blood loss, was symptomatically anaemic postoperatively, or the haemoglobin level fell below 8 g/dl.⁴ A further 43 consecutive patients under the same two consultant surgeons had the same parameters listed above prospectively recorded over a 5-month period.

Audit 3 (re-audit of practice)

A further 45 consecutive patients undergoing joint replacement a year later were prospectively audited. All anaesthetic and surgical staff were reminded by letter of the guidelines and encouraged to document the reason for any transfusion on the provided forms in the medical notes.

Results

In the audit of 'current practice', the average haemoglobin (Hb) of 13.0 g/dl (range, 10.0–15.8 g/dl) fell to 10.5 (range, 8.9–12.7 g/dl) following surgery. Forty-five patients were transfused an average 2.3 units each (102 units in total) to an average post-transfusion Hb of 10.7 (range, 7.9–13.3 g/dl). The transfusion rate for hip replacement was 84% and 58% for knee replacement (Table 1). Overall the transfusion rate was 71%.

In the second audit (following institution of guidelines), a similar fall in Hb was seen following surgery. The transfusion rate fell to 38% for hip replacement and 35% for knee replacement; 37% overall.

In the third audit, a year later, similar falls in Hb were again recorded. The transfusion rate was 40% overall. The figure for knee replacement had fallen slightly to 32% from the second audit, whereas that for hip replacement had increased by 10% to 48%. An average of 2.4 units per patient was transfused to 18 patients (42 units in total).

Documentation of reasons for transfusion, either on the form in phase 2 or the notes in phase 3, was 33% overall and never exceeded 50%.

Discussion

The 'current practice' audit showed that a high proportion of elective joint replacements, especially hip replacements, were being routinely transfused intra-operatively on the instructions of anaesthetic staff, often without significant measured blood loss, laboratory tests or clear evidence of clinical need. Similarly, once on the ward, asymptomatic patients were being transfused in response to a single low haemoglobin result. It was concluded that blood was being transfused on the basis of routine and availability rather than absolute clinical need. These data were compared with data compiled by the Oxford Blood Centre which found similar

Table 1 Overall transfusion rates for the three groups

	Total	Knees	Hips
Audit 1 (n = 63)	71%	58% (n = 31)	84% (n = 32)
Audit 2 (n = 43)	37%	35% (n = 17)	38% (n = 26)
Audit 3 (n = 45)	40%	32% (n = 22)	48% (n = 23)

Table 2 Changing patterns of ordering blood transfusion over the three audits

Audit Location of transfusion	1		2		3	
	TKR	THR	TKR	THR	TKR	THR
Ward (SHO)	56%	8%	50%	40%	57%	9%
Theatre (anaesthetist)	44%	92%	50%	60%	43%	91%

TKR, total knee replacement; THR, total hip replacement.

results. The Oxford group performed an audit in October 2000 of blood usage in primary total hip replacements in regional hospitals and found wide variations in the use of blood transfusion suggesting scope for reduction in its use.⁴

Guidelines for transfusion following major elective joint replacement were drawn up in keeping with regional recommendations. These guidelines required the anaesthetic and surgical staff to re-assess the clinical need for blood transfusion and document it on the provided form. This led to a dramatic reduction in the overall transfusion rate (72% to 37%) in the second audit.

In order to re-assess transfusion practice a year later, the same staff groups were reminded explicitly of the previous guidelines and specifically asked to ensure clear documentation in cases where blood was prescribed. The transfusion rate remained significantly lower than prior to the audit cycle (40%), with 34 units of blood for every 50 patients undergoing joint replacement being saved compared to the earlier period. This was achieved without recourse to a compulsory form system; however, documentation of indications for transfusion remained very poor.

No adverse effects were seen in either of groups 2 or 3 as a result of reduced transfusion rates.

It was noted that patients undergoing hip replacement were much more likely to be transfused in theatre than on the ward (Table 2, groups 1 and 3). Knee replacement transfusion was fairly evenly distributed between the ward and theatre. This suggests that anaesthetists had a lower threshold for transfusing the hip replacement group, presumably as a reaction to per-operative blood loss into suction sumps and swabs. Blood loss is less apparent intra-operatively in total knee replacement performed under tourniquet, which is standard practice at our institution. These patients were far less likely to be transfused in theatre. In group 2, the introduction of the form encouraged the anaesthetist to transfuse on clear clinical need only with a reminder of the relative lack of risk in allowing Hb concentration to fall at least as far as 8 g/dl.¹ Transfusion in theatre for hip replacement in this phase was greatly reduced. However, the reduction was not fully maintained a year later. There was a 10% increase in transfusion for hip replacement, the additional amounts being prescribed by the anaesthetist in theatre.

We found that staff on the wards were reluctant not to transfuse patients whose Hb level fell below 10 g/dl, especially if the patient was unwell in any other way

postoperatively. This had a relatively greater effect on the knee replacement group, which were less likely to have been transfused in theatre (Table 2). This goes against the evidence that sick patients in particular are best managed with a Hb level of around 8–9 g/dl.⁵

Similar falls in haemoglobin concentration with surgery across all three groups suggest that they were comparable for the purposes of this study. The same group of surgeons and theatre staff were involved throughout the study. Ward SHOs and anaesthetists varied from one group to the next, particularly between groups 2 and 3, as is typically the case in a district general hospital.

Conclusions

The audit process was successful in instituting change for the better in blood transfusion practice for elective hip and knee replacement in a typical district general hospital. The improved practice can be largely maintained provided staff are regularly reminded of appropriate guidelines and encouraged to transfuse for clinical need only. For absolute adherence to guidelines, we would recommend the introduction of a compulsory form system, most usefully for intra- and immediate postoperative transfusion ordered by the anaesthetist, which would be checked prior to the issue of blood. This would reduce unnecessary transfusion in theatre during hip replacement in reaction to overt, but not excessive, operative blood loss. Individual trusts must decide whether the additional resources required for this would justify the slight additional reduction in transfusion rates.

References

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