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The Use of Single-Unit Blood Transfusion

A review for the Department of Health

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The use of single-unit blood transfusions - a review

Introduction

The circumstances in which single units of blood or blood products are administered in this country and the extent of their use emerged as an issue when the Department of Health's Advisory Committee on Virological Safety of Blood was considering whether donations should be screened for HCV.

The practice of single-unit transfusion is generally considered to be undesirable on the grounds that in only relatively few instances can it be justified clinically and, outside such situations, its use simply incurs the risks of transmitting infection, transfusion reactions and, exceptionally, circulatory overload without imparting any benefits. Single-unit transfusions then represent a waste of resources.

The author was asked to review what is known about current practice, and to advise the Department what research, if any, might be needed to elucidate matters.

Procedure

A search of the English language scientific literature was conducted using the MEDLINE facility, citing the key-words single-unit, transfusion, guidelines, utilisation and reaction(s) in various combinations.

Discussions were held with the following clinicians, all of whom were known to be involved in one way or another in the formulation or dissemination of information about blood transfusion policy.

Dr J Coleman, Registrar, The Royal College of Pathologists.

Dr H Gunson, Director, National Blood Transfusion Service.

Dr B McClelland, Director, Edinburgh and South East Scotland Blood Transfusion Service.

Dr J A F Napier, Medical Director, National Blood Transfusion Service (Wales).

Dr W Wagstaff, Chairman, Sub-Committee on Blood Transfusion of the SAC Haematology, Royal College of Pathologists.

Professor A H Waters, Chairman, British Committee for Standards in Haematology.

Dr J K Wood, Secretary, British Committee for Standards in Haematology.

The arguments

Single-unit transfusions of red cells are generally thought to be unwarranted in as much as the oxygen-carrying enhancement they represent is marginal, except in certain circumstances such as for small-volume recipients and for the augmentation of an autologous transfusion; or where the quantity needed to produce a desired result is less than anticipated; or when the patient dies while the transfusion is progressing.

In practice, where otherwise they do occur they are assumed to be due to questionable clinical judgement about the need for 'top-up' enhancements during or after surgery, particularly for the elderly, or about the need in obstetric cases. The extent of their use for non-surgical cases is not so well known but, again, it is commonly thought to be associated with the 'top-up' philosophy.

In community surveys of women it has been found that serious symptoms due to iron deficiency are uncommon with blood haemoglobin levels above 8 grams per 100 ml; moreover, while oral iron administered to such women with symptoms raises the haemoglobin level, its impact on those symptoms is not significantly different from that of an oral placebo[1]. The relationship between changes in the haemoglobin level, however achieved, and perceived wellbeing on the part of the individual is unclear therefore, and is not sufficiently direct to imply that a single unit of red cells would normally be beneficial.

Nearly twenty years ago it was pointed out that in auditing transfusion practice the risk in concentrating upon identifying single-unit transfusions was that clinicians might simply use two units instead of one in order to avoid closer scrutiny. Moreover, it was

argued, moves to abolish all but the essential uses of single-unit transfusions ought to be accompanied by moves to reduce two-unit utilisation to one, three-unit to two, four-unit to three, and so on, in order to minimise the attendant risks of transfusion[2].

The cost-containment programmes associated in the United States with Medicare, and the stringent requirements for professional audit demanded by the Joint Commission on Accreditation of Hospitals appears to have reduced the incidence of single-unit transfusions to acceptable, justifiable levels in most American hospitals, so much so that by 1985 the Commission's Manual for accreditation of hospitals no longer required the review of single-unit transfusions to be performed routinely[3-5].

Present state of knowledge

Our present state of knowledge of blood product transfusion practice in this country is incomplete and not accurately ascertainable using existing routine information systems.

The National Blood Transfusion Service Directorate's Management Information System receives its data sets from Regional Blood Transfusion Services. These in turn, describe only the nature and volumes of products donated, processed and distributed to hospital blood banks. No routine data exist at regional level on transfusion practice in the institutions served which would allow the incidence of single-unit transfusions to be measured.

The records of hospital blood banks can, in theory, provide data routinely on the numbers and types of blood product ordered, cross-matched, issued and returned from wards and outpatient clinics in defined periods. Napier and his colleagues used these sources to describe the efficiency of use of blood for surgery in south and mid Wales[6]. Cross-match to transfusion ratios were found to vary among the 17 hospitals from 1.3 to 4.2. Ten per cent of the administrations were of single units, most instances presumably reflecting better than expected control of blood loss (Napier, 1991, personal communication). The provisional tariff for maximum blood order for surgery which was constructed from the findings included no recommendation for a single-unit transfusion in any circumstances.

The requirements of the Consumer Protection Act (1987) mean that hospital blood banks, as suppliers of products and keepers of equipment, have to maintain very stringent standards of record keeping and documentation. A task force of the British Committee for Standards in Haematology has produced guidelines on product liability for hospital blood banks, calling attention to the forms of documentation and other standard operating procedures which are necessary[7]. It is conceivable, nevertheless, that blood bank records of issue and return will not always provide a complete picture of how the products are used at ward or clinic level. In the European Community-supported collaborative study (SANGUIS) (which involves three British centres) of the use of blood components, plasma fractions and artificial colloid solutions in surgical practice, concentrating on six operations of major or intermediate complexity, the levels of discrepancy between blood bank records and other clinical records among participating hospitals ranged from -4% to +9% (McClelland, 1991, personal communication). If discrepancies between data sources were to occur proportionately more often in respect of single-unit transfusions their value as information sources for any medical audit aimed at curbing this procedure would be lessened. No systematic, representative validation exercise involving blood bank records and other clinical records appears to have been performed in the UK.

Some hospitals are known to have established transfusion committees which review transfusion practice and advise on the planning of the service. The extent to which these committees now exist, their terms of reference, how they are constituted, and what range of functions they actually perform is not known, nor do we know what guidance or yardsticks are followed when audit is being applied. Guidelines for implementation of a maximum surgical blood order schedule have been issued by the British Committee for Standards in Haematology, and an example of a maximum blood order schedule prepared to meet the needs of a large teaching hospital was given with them[8]. While, presumably, this schedule had the support of the task force which constructed the guidelines, its level of general acceptability is not known, nor whether the schedule reflects common practice; neither do we know about the extent to which schedules have been adopted in the medical and surgical specialties in other hospitals, nor what adherence there is to them.

Levels of clinical knowledge, the organisational context and practice style influences transfusion decision making. In a recent study by researchers at Harvard Medical School of 122 general surgeons, orthopaedic surgeons and anaesthesiologists in three

Boston hospitals widespread deficiencies were found in the clinicians' knowledge of transfusion indications and risks, each transfusion risk being estimated correctly by fewer than half of the physicians surveyed, and knowledge of four transfusion indications being complete only among a third of them[9]. Consultants had lower knowledge scores than did residents but were more confident of their knowledge; nevertheless, residents in practice followed their chiefs' desires, resulting in potentially inappropriate transfusions being given. The authors concluded that well-established practice strategies were not being revised as new information became available. We do not know whether there are similar attitudinal influences on transfusion practice in this country.

A final comment on the present state of knowledge is that transfusion strategy appears to be based almost entirely on clinical consensus based on wide experience over many years. Reports of clinical trials, systematically organised with random allocation of patients to different types of transfusion intervention or non-intervention, are rare. There are ethical issues involved in mounting such trials, particularly issues of safety, with possible attendant risks of transfusion or non transfusion. If systematic auditing of the tariffs and schedules recommended for transfusion practice among our hospitals were to show moderate or wide degrees of variation, there might be scope for mounting comparative trials of similar but not identical transfusion practices (2 units against 3 etc), the outcomes being measured both in technical terms (haematocrit, etc) and in terms of impact on overall health and well-being (health status profiles, etc).

Next steps

Neither the overall pattern of transfusion practice in this country nor any variations in it are at all well known. The issues of safety, effectiveness and resource conservation which are involved, along with the more stringent requirements imposed by recent legislation imply that there may now be a 'need to know'.

Certain initiatives have already been taken. The Royal College of Physicians' Research Unit is collaborating with The British Committee for Standards in Haematology to produce transfusion guidelines for the medical specialities, and the Royal College of Pathologists is considering mounting a survey of transfusion practice under the auspices of its Blood Transfusion Sub Committee. Individual surveys of practice within regions

may also be in progress, but there is no systematic knowledge of these centrally available.

There are several issues which need to be clarified by means of appropriate research:

1 **What variations if any, currently exist among institutions in transfusion practice in relation to medical and surgical patients with measurably similar clinical states and conditions?**

This is the aim of the SANGUIS project in respect of certain surgical operations. Research to clarify this issue would, in passing, identify the circumstances in which single-unit transfusions are used. Ideally, it should also identify circumstances in which transfusions were indicated but were not used.

A precursor to researching this question however is the need to determine:

2 **How accurate and complete are the various sources of information about transfusion practice, and on which of the sources, alone or in combination, may investigations be reliably based.**

Basically, the issue here is whether or not such studies can be based entirely on the records of the hospital blood banks:

3 **What variations, if any, exist among ordering clinicians in their knowledge of the indications for, and risks of transfusion of various products, and what clinician attributes characterise these variations?**

The supposition behind this question is that the determinants of clinical decision making in the UK may be similar to those described among Boston clinicians:

4 **What methodological strategy should be adopted in order to answer question 1 above (describing the variations in practice)?**

One efficient method, which has been adopted in other health care studies, is to conduct, retrospectively using existing records, a representative national sample census of patients into whom one or more blood products were transfused on a particular day. This would be based on the records of the blood bank for that day augmented, if shown in a pilot study to be necessary for completeness of data coverage, by other clinical records. The point in the transfusion "career" of each patient represented by the activity on that day would be charted from the records, and the antecedent and subsequent number of transfusions in the sequence recorded.

An alternative approach would be to survey the products issued and returned by the blood banks over a defined period of time and to build up a picture of the complete transfusion record of every patient transfused during that period.

Neither of these methods however would identify those patients who did not receive transfusions but who, had they been treated in other hospitals, might have done. The SANGUIS approach embraces this wider consideration. In theory, it should be possible to explore the issue by linking the clinical and biographical data held in a hospital's Patient Administration System to the data held by the hospital blood bank. In practice it is difficult because the respective computing systems are rarely compatible. This should not be an insurmountable problem however. During the course of this review it was ascertained that the Canadian Red Cross' Blood Transfusion Service was piloting such a scheme in the central Ontario hospitals as a precursor to studying inter-hospital variations in transfusion practice.

A similar approach, but using manual record linkage, was adopted in a recent study of inter-hospital transfusion practice involving 2579 patients in Central Virginia[10]. This study showed that different "transfusion triggers" existed in various hospitals. One of the dangers of not first describing critically the range of transfusion practices used in this country is that some institutions may, in implementing clinical audit of transfusion practice, simply set their own standards without being aware of the extent to which their practices vary from those of most other institutions:

5 How should such research be organised?

Research into variations in practice needs to be geographically and institutionally representative. The Royal Colleges can mount and manage such studies. However, each college might approach the issues principally from the standpoint of its own constituency. Joint approaches might be feasible between the Colleges, or between the College(s) in a supervisory role on the one hand and a University health services research unit operating from a stand-apart position.

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