

## Original Article

# Blood Conservation in Elective Surgery

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### ABSTRACT

**Background:** Blood transfusion is often a life-saving measure for surgical patients. In the era of numerous blood-transmitted diseases and known documented complications, however, blood transfusion is limited to patients who require blood replacement therapy. In elective surgery, blood transfusion is quite uncommon and most of the cross-matched blood is not used. Time and effort spent in cross-matching for each patient undergoing a surgical procedure is considerable. This study was initiated to determine ways to reduce the unnecessary demands on our blood bank and to support a suggested blood transfusion policy in our institution.

**Materials and Methods:** This review was carried out at King Fahd Hospital of the University, Eastern Province of Saudi Arabia. It covered a four year period, from January 1995 - December 1998. During this time, a proposed

blood utilization policy was submitted to all major departments for review and approval. The department of surgery was one of the first departments to accept and attempt to implement the suggested policy. This study reviewed the pre- and post-policy blood utilization.

**Results:** The calculated cross-match transfusion (CT) ratio for the two years after implementing the policy was 2.1:1 as compared to 4.8:1 before implementation. This is a 50% reduction. Despite the drop in the CT ratio, the type and screen requests increased only by 10.2%.

**Conclusion:** The implementation of our blood utilization policy is a very important method in saving hospital resources and manpower. This policy, if adopted nationwide, will lead to enormous grand total savings that can be directed towards improvement of blood bank and hospital services.

KEYWORDS: blood bank, blood transfusion, blood utilization policy

### INTRODUCTION

The optimal function of a surgical department depends on an efficient around-the-clock blood dispensing service by the blood bank. Reports from different parts of the world revealed an unintentional misuse of the blood bank services causing a great burden on its resources, namely wastage of blood, reagents and manpower. The decision to transfuse blood is a complex one. Firm guidelines must be set and implemented in order to prevent excessive wastage and save hospital resources.

### MATERIALS AND METHODS

This retrospective study was carried out at King Fahd Hospital of the University, Al-Khobar, Eastern Province of Saudi Arabia. It covered a four-year period from 1995 to 1998. During this time, the blood utilization policy was suggested and implemented (1995-1996 prior to the policy and 1997-1998 after implementation). The blood utilization policy was suggested when a large amount of underutilized cross-matched blood was wasted. The policy included the following limitations:

1. Cross-matching is limited to major cases or cases with expected perioperative bleeding with the minimum of two cross-matched units.
2. Blood grouping for elective moderate to major procedures with lower risks of bleeding.
3. Blood bank should be on the alert to dispense blood for the blood-grouped patients on short notice.

Data was retrieved from the operating room and blood bank records for the above specified period. The elective surgeries included were thyroidectomy, thoracotomy, mastectomy, splenectomy, cholecystectomy, exploration laparotomy and hemorrhoidectomy. A total of 300 patients were included in this study: 117 patients prior to the policy, and 183 patients after the policy. The number of cross-matched, transfused, non-transfused blood and the type and screen were recorded and analyzed for the two-years before the policy implementation and then compared to the two years after.

### RESULTS

The total number of cross-matched/transfused (CT) samples for the pre-implementation period

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(1995-1996) were 309/65. This is compared to 213/76 during the post-implementation period (1997-1998). The calculated CT ratio before the implementation of the policy was 4.8:1 as compared to 2.8:1 after implementation. This 50% reduction in CT ratio is mainly attributed to the compliance with the new policy. Type-and-screen requests rose by only 10% (from 23.1% to 33.3%) for the above period.

## DISCUSSION

The optimal function of a surgical department is related to an efficient around-the-clock blood dispensing service by the blood bank. Reports from different parts of the world have revealed an unintentional misuse of blood bank services, causing a great burden on resources; namely wastage of blood, reagents and manpower. Some reports revealed that non-transfused blood was cross-matched 3-10 times for different patients. When calculating the time spent performing these cross-matches, it was estimated that a technician can cross-match three units per hour. This results in 54.5% wasted technician working time, leading to an average blood bank annual loss of US\$25,000.00 for one 120-bed department of surgery<sup>[1]</sup>. Cancelled scheduled cases also waste resources including valuable operating room and personnel time. In addition, they directly affect the blood bank, leading to the cancellation of cross-matched blood, and consequently resulting in a waste of personnel time and effort, as well as the unnecessary wastage of reagents, leading to increased shelf time of unused blood<sup>[2]</sup>.

Since the introduction of blood transfusion into clinical practice, its appropriate use has been the subject for debate. It has been reported that only 30% of cross-matched blood is used in elective surgery<sup>[3]</sup>. Awareness of the hazards of blood transfusion is becoming more obvious due to the expansion of various aspects of blood transfusion services and the increased understanding of transfusion science in recent years<sup>[4]</sup>. Serious hazards of transfusion (SHOT) are well-documented in the literature. These include incorrect administered blood, acute and delayed transfusion reactions, transfusion related acute lung injury, transfusion associated graft-versus-host disease, post-transfusion purpura, and transfusion transmitted infections. However, transfusions can be quite safe if vigilance is adopted to ensure correct identification of blood and patients<sup>[5]</sup>.

In elective surgery, preoperative blood order often goes beyond the real need. The surgeons' habits to order cross-matched blood are mainly to cover the medico-legal aspects in case the patient

bleeds. The total lack of knowledge about the time and speed of the type-and-screen process and the possibility of quick blood provision is not understood by many surgeons. These unfounded habits have led to considerable time-expiry of blood, as well as the unnecessary use of laboratory personnel time and reagents. The firm recommendation for type and screen policy to substitute the cross-matching trend reportedly saved approximately US\$80,000 in a 350-bed general hospital in Australia<sup>[6]</sup>.

Preoperative over-ordering of blood is a very common practice in many institutes. It leads to holding up of blood bank reserve, aging of the blood units and wastage of blood bank resources. The introduction of a Maximum Surgical Blood Order Schedule (MSBOS) in some centers seems to be helpful in auto-reduction of blood requests. The MSBOS is the maximum number of blood units transfused in 90% of cases during the surgical procedure and within 72 hours postoperatively. Using this method of monitoring, most patients would need to be only type-and-screened prior to elective surgical procedures<sup>[7]</sup>. Another similar study showed 77% over-ordering for elective procedures and suggested a policy of type-and-screen for most elective surgical patients<sup>[8]</sup>.

Personal pre-operative blood donation is an easily applicable, cost effective and well-tolerated procedure, yet is under-utilized. It was stated these patients bleed less at surgery because of the enhanced erythropoiesis with the new efficient red cells, platelets and hemostatic factors. Therefore, they required fewer blood transfusions and suffer less postoperative infections.

Danish and international studies have documented that a preoperative blood ordering policy in elective surgery is extremely inefficient if not based on knowledge of actual transfusion frequencies and requirements. They revised the impact of a type-and-screen (T&S) policy in elective surgery. Cross-match ordering, transfusion extent, and safety were assessed prospectively. Only 2.4% of patients with T&S were transfused, and 18.1% of the cross-matched group were actually transfused. CT ratio was 5.3:3. This study reported that there were no reported complication from the T&S policy, outdated declined from 9 to 3.2% and an estimated 1000 units were saved during the year.

Hypotensive anesthesia induced by using prostaglandin E1 has also been suggested as a method in reducing intra-operative blood loss during mastectomies by 50%, thereby reducing the demand for preoperative blood transfusion<sup>[9]</sup>. Another recently reported method to avoid intra-operative blood transfusion in vascular patients is the use of an oxygen therapeutic solution, which is

thought to provide an oxygen bridge that can help stabilize anemic patients who require immediate oxygen carrying support.

Many efforts and considerable time go into blood and blood product preparations. Labile blood products include packed red blood cells and platelet concentrates are produced using cell separators (apheresis) which mandates mechanical and manpower costs. Blood and blood products should be prescribed only if the benefits of transfusion outweigh the risks and alternate forms of therapy are ineffective. Expiry rates increase because blood is booked and not used. This incurs a heavy load on the blood bank in terms of excessive expenditure involving reagents, other materials and excessive working hours. Unnecessary reservation of blood also makes this blood unavailable to patients who need transfusions urgently. In addition it causes wastage by storage and approaching shelf life (42 days)<sup>[10]</sup>.

The decision to transfuse red blood cells is a complex one. A simple guideline based upon a single parameter such as the hemoglobin level cannot possibly encompass the variety of clinical situations in which these decisions must be made. With an improved understanding of the physiology of anemia and transfusion, and an appreciation of the effectiveness and limitations of the compensatory mechanisms, better decisions can be made<sup>[11]</sup>.

This current study demonstrates that blood was over-ordered in most procedures, meaningful reductions were seen in cross-match requests, number of units cross-matched and units transfused after implementation of blood utilization policy. The policy has, to some extent, succeeded in curtailing unnecessary transfusion practices.

Few guidelines exist for determining transfusion needs and strategies, namely the appropriate use of autologous versus homologous blood for elective surgery. A suggested algorithm based on the analysis of the procedure, maximum surgical blood ordering schedule, patient status, and patient suitability for autologous alternatives, may be helpful in reduction of the homologous blood use (to only 4.2%), and reduced autologous wastage to less than 5%<sup>[12]</sup>.

## CONCLUSION

A strong institutional commitment is required for the implementation of a blood utilization policy. It is an ideal method in saving hospital resources and manpower. Implementation of guidelines for preoperative laboratory investigations and blood ordering for elective surgery will result in a reduction in the number of tests without adverse impact on patient morbidity or mortality. This policy, if adopted nationwide, will lead to enormous grand total savings that can be directed towards improvement of blood bank and hospital services

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