SCIENTIFIC ARTICLE

# Blood use in elective surgical procedures in a "type A" base hospital

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**Keywords:** MSBOS; blood orders; crossmatch to transfusion ratio; blood use; surgical patients

**Abstract**

**Introduction**

Blood orders for surgical patients make up a considerable portion of total blood requests but the majority doesn't lead to a transfusion. Routine crossmatching and reserving blood for all surgeries can be reduced by establishing a *Maximum Surgical Blood Ordering Schedul*e [MSBOS]. We have analyzed blood utilization in Base Hospital Puttalam and formulated an MSBOS with this study.

**Material and methods**

A total of 2145 surgeries from surgical and gynaecology & obstetric units during the period January to December 2019 were analysed. Patients who underwent massive transfusions and patients having a pre-operative haemoglobin concentration less than 8.3g/dl or obtained a pre-operative transfusion were excluded considering transfusions to correct preoperative anaemia. The crossmatch to transfusion ratio [C: T], transfusion probability [T%] and transfusion index [TI] was calculated for each surgical procedure. The procedures having a C: T of >3:1 was recommended for group and screen [G&S].

**Results**

Of a total of 2145 patients, 90% were females. A total of 1565 units were requested and 1521 units were crossmatched for 2034 patients while only 193 were transfused. Overall indices for the study population are CT ratio of 7.8:1, %T of 10.4% and TI of 0.15. Indices for surgical unit patients are CT ratio of 5:1, %T of 15.2% and TI of 0.29. By using the MSBOS total of 1403 cross matches could have been avoided.

**Conclusions**

By implementing the MSBOS 92% of cross matches for elective surgeries could have been avoided. The results are on par with the previous studies done at tertiary health care centres.

**Introduction**

Requesting blood for elective surgeries anticipating an event of unexpected haemorrhage is a common practice. Although newer advances in surgical hemostasis have reduced intraoperative bleeding and thus reduced the need for perioperative blood transfusions, over reservation of blood and blood products for surgical patients is observed in many institutes and most often readily justified as for a safety margin [1]. Over requesting with minimal utilization results in waste of reagents, human resource and increase the time blood packs spend in reserved status thus potentially increasing discard rates [2].

Blood requests for a surgical procedure result in checking the blood group of the patients then performing a routine crossmatch to find out whether the blood pack is compatible for transfusion. This takes up to 2 hours to perform which increases the time blood units spend outside stored temperature. Once the blood product is crossmatched the pack is reserved for that patient for 72 hours thus making it unavailable for other patients [3].

Maximum surgical blood ordering schedule [MSBOS] is a guideline initiated by Friedman in 1973 which increases the efficiency of blood usage [4]. It is prepared by analyzing the blood usage in respect of each surgical procedure. Using the MSBOS a prediction could be made if a transfusion is needed for a specific surgery. It provides recommendations on whether a routine crossmatch is necessary or whether blood grouping and antibody screening are sufficient for each procedure.

Currently, all the blood requests are crossmatched at Base Hospital Puttalam and preliminary observation suggests over-ordering of blood products. Previous studies done in National Hospital Colombo Sri Lanka, Lady Ridgeway Hospital for Children, Sri Jayawardanapura General Hospital and De Soysa Hospital for Women all suggest similar findings [5] [6] [7] [8]. There are no published studies done in base hospitals in Sri Lanka to the authors' knowledge. This study aims to analyze blood usage to prepare an MSBOS to be implemented through Hospital Transfusion Committee.

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**Material and methods**

A list of all elective surgeries done at Base Hospital Puttalam during the period January to December 2019 were formulated through theatre registers in retrospect. A total of 2145 surgical patients from surgical and gyn & obs units were included in the study. The blood requests received for these patients were traced from the blood bank and bed head tickets were traced from the medical records unit. Patients who underwent preoperative blood transfusion or had pre-op haemoglobin concentrations of <8.3g/dl and patients who underwent massive transfusion were excluded [3] [9]. Massive transfusion is defined as the replacement of one or more blood volumes within 24 hours [>10 units of red cell units for an adult] [10]. Data on patient demography, type of surgery, number of red cell units requested, crossmatched and transfused were noted on the data extraction form.

The following standard indices were calculated and tabulated in respect to surgical procedure studied.

$$\text{Crossmatch to transfusion ratio (CT ratio)} = \frac{\text{number of units cross matched}}{\text{number of units transfused}}$$

$$\text{Transfusion probability (\%T)} = \frac{\text{number of patients transfused}}{\text{number of patients crossmatched}} \times 100$$

$$\text{Transfusion Index (TI)} = \frac{\text{number of units transfused}}{\text{number of patients cross matched}}$$

**Results**

From a total of 2145 patients with their age ranging from 2-88 years, 90% were females. Patients having a pre-op blood transfusion, haemoglobin concentration of <8.3g/dl or patients who had massive transfusion were excluded [n=111]. All the requests for blood resulted in a routine crossmatch. A total of 1565 units were requested and 1521 units were crossmatched for 2034 patients [1567 patients from gyn & obs unit and 467 patients from the surgical unit] while only 193 were transfused.

This study reveals the CT ratio of 8.7:1, %T of 9.7% and TI of 0.13 for elective gyn & obs and CT ratio of 5:1, %T of 15.2% and TI of 0.29 for surgical patients. Overall indices for the study population are CT ratio of 7.8:1, %T of 10.4% and TI of 0.15

Table 1 (supplementary) summarizes the MSBOS formulated with calculated standard indices

**Discussion**

Access to safe, affordable surgery depends on a sufficient and safe blood supply. Blood is a scarce product vulnerable to limited shelf life. Through over reservation of blood, efficient use of already collected blood is hampered. In this setting, it is prudent to implement evidence-based guidelines tailored for local settings through multisectoral collaboration. Thereby reducing the wastage of precious resources which could be otherwise spent on a patient with a real need.

Previous studies suggest MSBOS designed specifically for an institute reduces unnecessary crossmatching which is time-consuming and expensive [11]. In creating an MSBOS the standard indices of crossmatch to transfusion ratio [C/T ratio], transfusion probability [%T] and transfusion index [TI] is calculated by analyzing transfusion data with respect for each surgery. If the surgical procedure has a C/T ratio ≥3 and TI ≤ 0.5 and T% of ≤ 30 group and screen method is recommended instead of crossmatching due to less probability a subsequent blood transfusion [3] [12].

The standard indices in both gynaecological and obstetrics patients and surgical patients who underwent elective surgeries both fall way outside of justifiable values for routine crossmatching.

Furthermore, data suggest gynaecological procedures like laparoscopic dye test, cervical biopsy, cervical polypectomy and medical management of miscarriage did not lead to a transfusion at all. Procedures like elective cesarean section, total abdominal hysterectomy, vaginal hysterectomy, myomectomy and repair of cystocele can be managed with blood grouping, screening for antibodies and saving serum for a future transfusion. Dilatation and curettage, evacuation of retained products of conception warrants group and screen and crossmatch of a unit of blood.

Considering surgical procedures like thyroidectomy, axillary fat pad excision, laparoscopic cholecystectomy, fistulectomy, lateral internal sphincterotomy, colostomy, jejunostomy, circumcision, hydrocelectomy, orchidectomy, orchidopexy and pyelolithotomy did not necessitate a transfusion. Procedures including inguinal hernial repair, appendicectomy, mastectomy, wide local excision of breast lump, saphenofemoral ligation and nephrectomy can be managed with group and screen. Procedures including esophagectomy, below and above-knee amputation, abdominoperineal resection, hemorrhoidectomy and laparotomy warrant crossmatching of the recommended amount of blood.

This study concludes with designing an institute specific MSBOS with 2019 data to be implemented through the hospital transfusion committee. The schedule requires regular evaluation and updates. With the implementation of MSBOS around 92% [n=1403] of cross matches done for routine surgeries can be reduced and thereby save time, costly reagents and potentially improve the shelf life of bloodstock.

All authors disclose no conflict of interest. The study was conducted in accordance with the ethical standards of the relevant institutional or national ethics committee and the Helsinki Declaration of 1975, as revised in 2000.

**References**


1. Frank SM, Oleyar MJ, Ness PM, Tobian AAR. Reducing unnecessary preoperative blood orders and costs by implementing an updated institution-specific maximum surgical blood order schedule and a remote electronic blood release system. Anesthesiology. 2014;121 [3]:501-9. https://doi.org/10.1097/ALN.0000000000000338
2. Mintz PD, Nordine RB, Henry JB, Webb WR. Expected hemotherapy in elective surgery. N Y State J Med [Internet]. 1976 [cited 2021 May 2];76 [4]:532-7. Available from: https://pubmed.ncbi.nlm.nih.gov/1063298/
3. Gamage CA, Pratheepan P, Sivaganesh S. Rationale for blood request: cross match versus group and screen. Sri Lanka J Surg. 2014;31 [3]:24. https://doi.org/10.4038/sljs.v31i3.6225
4. Friedman BA. An analysis of surgical blood use in United States hospitals with application to the maximum surgical blood order schedule. Transfusion. 1979;19 [3]:268-78. https://doi.org/10.1046/j.1537-2995.1979.19379204208.x
5. Chandrasinghe P, De Alwis I, Hettiarachchi A, Jayasekara S. Current blood ordering practice at the national hospital of sri lanka: Step towards a maximum surgical blood order schedule [MSBOS]. Vol. 97, Vox Sanguinis. 2009. 67 p.
6. Perera W, Thilakarathne G. Retrospective analysis of cross mach to issue ratio of routine surgeries of largest pediatric hospital in Sri Lanka. Vox Sang. 2009;97 [S1]:160.
7. Aarewatte P. A study of blood usage in a tertiary care hospital in Sri Lanka. Vol. 101, Vox Sanguinis. 2011. 42-43 p.
8. Munasinghe S, Liyanapatabandi D, Ziard M, Liyanarachchi K, Jayasekera D, Alahakoon S, et al. Safety of gynecological surgeries in transfusion medicine point of view: A study on blood ordering and transfusion habits of elective gynecological surgeries in a tertiary care hospital in Sri Lanka.. Vox Sang. 2009;97 [S1]:158.
9. Yazer MH, Triulzi DJ. AABB red blood cell transfusion guidelines: Something for almost everyone. JAMA - Journal of the American Medical Association. 2016; https://doi.org/10.1001/jama.2016.10887
10. Ellawala RN, Gonsalkorala K, Wijesiriwardena IS. Implementation of massive transfusion protocol [MTP] for trauma. Sri Lanka J Surg. 2015;33 [2]:3. https://doi.org/10.4038/sljs.v33i2.8144
11. Hardy NM, Bolen FH, Shatney CH. Maximum surgical blood order schedule reduces hospital costs. Am Surg [Internet]. 1987 Apr [cited 2019 Jul 20];53 [4]:223-5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/3579029
12. Friedman BA, Oberman HA, Chadwick AR, Kingdon KI. The Maximum Surgical Blood Order Schedule and Surgical Blood Use in the United States. Transfusion [Internet]. 1976 [cited 2021 May 2];16 [4]:380-7. Available from: https://pubmed.ncbi.nlm.nih.gov/951737/