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Original Research Article

Step towards Formulating a Maximum Surgical Blood Ordering Schedule in Obstetrics and Gynecology: An Audit of Blood Utilization Practices in a Teaching Hospital in Nepal

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ABSTRACT:

Introduction: Blood transfusion is an essential part of perioperative care in surgeries in obstetrics and gynecology. A tendency of over ordering of blood imposes additional workload to the blood bank and extra cost to the laboratory and patients. Maximum surgical blood ordering schedule (MSBOS) is a guide which helps in the decision of ordering and transfusing blood which reduces blood wastage. This study was done with the aim of evaluating the blood ordering and utilization patterns in obstetric and gynecologic surgeries and formulation of MSBOS for these procedures for the institute. **Methods**: This is a cross-sectional, hospital based study conducted for the duration of three months. All patients undergoing major and minor surgeries at the department were included. Crossmatch to transfusion ratio (C/T), transfusion probability (%T), transfusion index (TI) and MSBOS were calculated for each procedure. **Results**: Total 309 surgeries were performed in the department during the study period of three months. Most common surgery was emergency cesarean section (*n*=164, 53.1%) followed by abdominal hysterectomy (*n*=43, 13.9%). Utilization of crossmatched blood was 22.51%. Overall transfusion rate for all surgeries was 3.88%. Overall C/T ratio, %T, and TI were 4.44, 9.83 and 0.27 respectively which elicited indiscriminate ordering of blood. **Conclusion**: Over ordering and under utilization of blood were seen in this audit. Blood ordering patterns need to change in order to minimize over ordering of blood which may prevent abuse of the system. MSBOS maybe an useful tool in this institute as it allows optimum blood usage for surgeries.

Keywords: blood grouping and crossmatching • blood transfusion • surgical blood loss

INTRODUCTION:

Blood crossmatching and transfusion is a common need in obstetrics and gynecology wards. Hemorrhage remains the leading cause of maternal mortality in developing countries and the leading indication for transfusion in obstetric complications.[1,2] Hysterectomy is the most common surgery performed in gynecology with a transfusion rate up to 8.6%.[3] Blood transfusion is a part of postoperative care in gynecological surgeries and is also an essential part of emergency obstetric care which reduces morbidity and mortality. Despite the necessity, blood transfusion is not without risk, so the challenge lies in reducing superfluous transfusions.

Blood is scarce in many part of the world due to lack of volunteer donors and a national system for blood management. In addition to the unavailability of blood, another issue is the over ordering of blood which imposes additional workload to the blood bank and extra cost to the laboratory and to the patients. Ordering of blood is usually a common practice

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in elective and emergency surgical procedures but report suggests that only 30% of blood cross-matched has been used in elective surgeries.[4]

To deal with all these tribulations, the maximum surgical blood ordering schedule (MSBOS) was devised which is a table of elective surgical procedures listing the number of units of blood routinely crossmatched preoperatively. The MSBOS is only meant as a guide and the decision of ordering and transfusing blood can be changed as per the clinical judgment and individual patient needs.[5]

This study was done with the aim of evaluating the blood ordering and utilization patterns in obstetric and gynecologic surgeries and formulation of MSBOS for these procedures so that blood can be saved for critical situations.

METHODS:

This is a cross-sectional, hospital based study conducted at department of Obstetrics and Gynecology, Lumbini Medical College Teaching Hospital for the duration of three months, 1st July 2016 to 30th September 2016, after the approval of the institutional review board.

All patients undergoing major and minor surgeries at the department were included. At the time of discharge, preset proforma was filled for each patient. Age of the patient, type and indication of surgery, number of blood ordered, crossmatched and transfused and preoperative and postoperative hemoglobin were noted for each patient.

Blood utilization was calculated using the following indices:[5,6]

1) Crossmatch to transfusion ratio (C/T ratio) = number of units crossmatched divided by the number of units transfused

   Ratio of 2.5 and below was suggested to be indicative of efficient blood usage.

2) Transfusion probability (% T) = (number of patients transfused divided by the number of patients crossmatched) × 100.

   A value of 30% and above was considered indicative of significant blood usage.

3) Transfusion index (TI) = number of units transfused divided by the number of patients crossmatched.

   A value of 0.5 or more is indicative of efficient blood usage.

Thus, Maximal Surgical Blood Order Schedule (MSBOS) = 1.5 × TI was calculated for this institute. Data was entered and analyzed using SPSS 21.0. Results were expressed are percentages and ratios.

RESULTS:

Total 309 surgeries were performed in the department during the study period of three months. Table 1 shows the list of surgeries undertaken. Total elective surgeries were 135 and emergency surgeries were 174 (164 caesarean section, and 10 evacuation for incomplete abortion and molar pregnancy). Most surgeries (*n*=245, 79.28%) were done under spinal anesthesia, 25 (8.1%) under general anesthesia, 23 (7.44%) under short intravenous anesthesia and 16 (5.18%) cases under local anesthesia.

Blood was requested and grouped and screened in 288 (93.2%) patients. Total units of blood ordered were 442 out of which only 34 (7.6%) units were transfused. Total unit of blood cross matched was 151 and the total unit of blood transfused was 34, therefore transfusion rate amongst those crossmatched was 22.5%. Overall transfusion rate for all surgeries was 3.88%.

Mean number of units requested per surgery was 1.43 (*SD*=0.785) and mean number transfused was 0.11 (*SD*=0.557). Mean preoperative and

Table 1: *List of surgeries performed during the study period*

Surgery	***n(%)***
Em LSCS	164 (53.1)
El LSCS	27 (8.7)
Laparotomy	
Ectopic	3 (1.0)
Others	12 (3.9)
Laparoscopy	
Diagnostic	3 (1.0)
Others	3 (1.0)
Hysterectomy	
Vaginal	9 (2.9)
Abdominal	43 (13.9)
S and E for:	
TOP	16 (5.2)
Missed abortion	8 (2.6)
Incomplete abortion	8 (2.6)
Molar pregnancy	7 (2.3)
Therapeutic D and C	6 (1.9)
Total	**309 (100%)**

***Em**: Emergency; **El**: Elective; **S and E**: Suction and evacuation. **D and C**: dilatation and curettage **TOP**: termination of pregnancy*

postoperative hemoglobin were 11.59 (*SD*=1.29) and 10.46 (*SD*=1.24) respectively.

The overall utilization of ordered and crossmatched blood is shown in Table 2. Overall C/T ratio, %T, and TI were 4.44, 9.83 and 0.27 respectively which signifies over ordering of blood and underutilization.

Table 3 shows the blood utilization indices for different surgeries and also the calculated MSBOS.

DISCUSSION:

Various studies in different countries of the world have shown over ordering of blood by surgeons with utilization ranging from five to forty percent.[5] Reports from India, Kuwait, and Nigeria have shown a utilization rate of 69.7%,[6] 13.6%,[7] and 28% respectively.[8] This study shows utilization of 7.6% amongst blood requested and 22.5% amongst those cross-matched which suggests indiscriminate ordering of blood. Although blood ordering is a common practice in surgical field, over the last 17 years, there has been a general trend towards a reduced use of blood transfusion in obstetrics and gynecological practice.[9] Findings of this study suggests otherwise.

The cross-match rate for hysterectomy has been reported at 28%, and the transfusion rate varies between 2.8% and 8.6%.[3] The transfusion rate for Total Abdominal Hysterectomy (TAH) in this study was 22.5% which is high. This could be due to more number of complicated cases requiring blood transfusion or prevalence of anemia and low pre operative hemoglobin in the patients selected for surgery.

In a study by Vibhute M. et al., out of 1145 units of blood cross-matched for the first 500 patients, only 265 were transfused with non-utilization of 76.86% of ordered blood.[7] In general surgery patients in Bir hospital Kathmandu, 13.6% utilization was reported.[8] In this study the blood utilization in Obstetrics and Gynaecology (OBGyn) surgeries was 7.6%. Study in Ethiopia by Belayeneh et al., reported CT, %T, TI for elective surgery in obstetrics and gynecological surgeries was 2.9, 0.23 and 0.57 respectively and for emergency surgeries, 1.8, 0.64 and 0.44 respectively.[10] This rate is even

Table 2 : Utilization of ordered and crossmatched blood.

Blood ordered	442
Blood transfused	34
Blood crossmatched	151
Blood transfused	34

Table 3: Blood utilization indices.

	C/T ratio			Transfusion probability (%T)			Transfusion Index			MSBOS 1.5 x TI
Surgery	units crossmatched (*n*)	units transfused (*n*)	C/T	patients transfused (*n*)	patients crosmatched (*n*)	%T	units transfu-sed (*n*)	patients crossmat-ched (*n*)	TI	
Em LSCS	24	0	∞	0	24	0	0	24	0	0
El LSCS	18	0	∞	0	18	0	0	18	0	0
Laparotomy										
Ectopic	6	0	∞	0	3	0	0	3	0	0
Others	9	0	∞	0	9	0	0	9	0	0
Hysterectomy										
Vaginal	15	0	∞	0	9	0	0	9	0	0
Abdominal	55	34	1.6	9	40	22.5	34	40	0.85	1.27
S and E										
TOP	4	0	∞	0	4	0	0	4	0	0
Missed abortion	4	0	∞	0	5	0	0	5	0	0
Incomplete abortion	11	6	1.8	3	5	60	6	5	1.2	1.8
Molar	5	0	∞	0	5	0	0	5	0	0
D and C	0	0	0	0	0	0	0	0	—	0
Total	**151**	**34**	**4.44**	**12**	**122**	**9.83**	**34**	**122**	**0.27**	**0.40**

***Em**: Emergency; **El**: Elective; **S and E**: Suction and evacuation. **D and C**: Dilatation and Curettage*

lower than that in our study showing inadequate utilization of blood in this region.

A number of indices are used to determine the efficiency of blood ordering and utilization system. Boral Henry was the first that suggested the use of crossmatch to transfusion ratio (C/T ratio) in 1975.[5] Consequently, a number of authors used C/T ratio for evaluating blood transfusion practices. Ideally, this ratio should be 1.0, but a ratio of 2.5 and below was suggested to be indicative of efficient blood usage.[6] The overall C/T ratio in our study was 4.44 which is similar to 5.7 reported by Richardson NG. et al.[11] C/T ratio for trans-abdominal hysterectomy (TAH) was 1.6 and for suction evacuation for incomplete abortion was 1.8 in this study which is higher than 1.09 for TAH and 0.8 for suction evacuation reported by Thabah R. et al.[12] They also reported C/T ratio of 2.4 for cesarean section, six for laparotomy, 6.5 for vaginal hysterectomy and 1.6 for ectopic pregnancy. The C/T ratio for these surgeries could not be calculated in our institute as there were no cases requiring blood transfusion for these surgeries during the study period.

The average number of units used per patient cross-matched is indicated by the transfusion index (TI) and signifies the appropriateness of number of units cross-matched. A value of 0.5 or more is indicative of efficient blood usage.[5,6] In the same study by Thabah R. et al, TI of 1.5 was reported for TAH and in Pakistan by Chawla et al, TI for TAH was 0.33.[12,13] In our study it was 0.85 for TAH signifying efficient blood usage. There was aptness of cross-matched and transfused blood. Transfusion probability of 30% and above is considered indicative of significant blood usage. The %T in this study was 22.5% which is comparable to 22.2% for LSCS in a study by Thabah et al. but much lower than the 41.6% for TAH.[12]

Unnecessary ordering of blood for surgical patients can be reduced without having any detrimental effect on the quality of patient care. Use of blood conservation policies such as the MSBOS has succeeded in limiting unnecessary transfusion practices by estimating the amount of blood that will be needed for the individual procedure. This is a criterion developed from institutional usage statistics providing a figure for the number of units to be crossmatched for any given surgical procedure.[14] Calculated MSBOS in this study for TAH was 1.2 and for suction evacuation for incomplete abortion was 1.8. To calculate MSBOS for other surgeries, probably a longer duration study is required as the rate of transfusion in this institute was found to be low.

The amount of blood ordered and cross-matched depends on various factors. First is the location of the blood bank. This institute has a blood bank for storage, grouping, and screening and crossmatching of blood but blood components are not prepared here. The operation theatre and blood bank is in the same floor in the hospital, porting of blood is a priority and communication is clear between the operation theatre and the blood bank. Emergency need is clearly defined. In case of emergency, immediate crossmatching is available round the clock. So only required crossmatching is done.[15] In case of emergency situations, availability of blood is ensured by registered volunteer donors, mainly medical and nursing students which make the surgeons and anesthesiologists confident of blood availability. Preoperative blood sample is obtained in all cases of major surgeries, grouping and screening is done and serum saved for crossmatching.

Despite of these facilities and arrangements, blood utilization is inefficient in this institute as shown by the utilization indices. This could be because of the second most important factor affecting blood utilization that is preoperative hemoglobin of the patient. The mean preoperative hemoglobin in this study was 11.59 (*SD*=1.29). When the patient is anemic, the tendency to order and crossmatch more unit of blood is also increased. On the other hand, despite patients being anemic, blood transfusion rate is low. This can be explained by the availability and use of alternate strategies like parenteral iron therapy which is a common practice in postoperative care. The use of intravenous Iron sucrose has reduced the use of blood products.

Third, crossmatching of blood depends on the indications for transfusion. In our institute common indications for blood transfusion in relation to caesarean section are: a hemoglobin less than 10 g/dL; presence of red cell antibodies; antepartum hemorrhage or bleeding coagulopathies, second or more caesarean section; severe pre-eclampsia; second stage caesarean sections, failed instrumental delivery; which is similar to the standard recommendations.[9] Incidentally, number of cases meeting the indications for blood transfusion were minimum during the study period.

Lastly, blood wastage also depends on the skills and protocols of surgeons and the anesthesiologists. Intraoperative blood loss depends on their expertise and so does ordering transfusions for a particular surgery.

Introduction of a MSBOS has demonstrated

improvements in blood ordering practices leading to large financial savings without compromising the standards of patient care. We have formulated MSBOS for a few surgeries in this study and if implemented, may reduce inefficiencies in blood ordering practices like those shown in other studies.[7,10,16] In a study by Atrah H. et al., after the implementation of MSBOS, C/T ratio showed an immediate but transient improvement (3.6 to 2.2) with regard to blood use in the Gynecology and the Obstetrics wards respectively.[16] Despite such encouraging data, we cannot depend on MSBOS alone as it is formulated using surgical procedure alone, it does not keep in account the preoperative status of the patient.

In this institute so far, blood requesting for surgical procedures has been done based on subjective anticipation of blood loss rather than on evidence based estimates. Though efforts were made to formulate a guideline, no consensus has been reached. Therefore this ordering schedule derived from hospital data will be an objective evidence for decision making which may decrease the number of unnecessary crossmatching of blood.

Authors recommend the use of MSBOS in Obstetrics and Gynecology wards so that it can have a significant and sustained impact on reducing unnecessary blood ordering. We also recommend further studies of longer duration to be done to formulate MSBOS for all types of surgeries in the department. Future studies are also recommended to analyze the expected improvement in blood ordering practices. To maintain effective MSBOS implementation, reviewing and adjustment should be done regularly as per need. For this purpose, the creation of a multidisciplinary hospital transfusion committee including hematologist and anesthesiologist is necessary.

MSBOS does not account for preoperative condition of the patient so other amendments can be considered before MSBOS algorithm is followed.

CONCLUSION:

The overall blood utilization was not encouraging and blood ordering patterns have to change in order to minimize over ordering of blood which may prevent abuse of the system. MSBOS may be particularly beneficial in this teaching institute as preoperative ordering is often done by interns and residents unfamiliar with blood utilization related to specific procedures. MSBOS is a guide to optimum blood usage in surgeries which can decrease over ordering of blood thereby reducing unnecessary financial burden, laboratory workload and wastage due to outdating without compromising protocols of standard patient care. Thus MSBOS maybe be a useful tool for this institute.

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