REVIEW OF BLOOD CROSS-MATCH ORDERING AND TRANSFUSION PRACTICES FOR ELECTIVE HYSTERECTOMIES AT SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE: FIRST STEP TOWARDS A MAXIMUM SURGICAL BLOOD ORDERING SCHEDULE

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ABSTRACT

BACKGROUND: Requesting blood before surgery is a common practice. Studies show that majority of blood requested by surgeons are not utilized and this over ordering practices of blood will create a burden on the transfusion service. It diverts blood from the pool and makes it unavailable for other needy patients.

OBJECTIVE: The objective of this study is to assess the blood requesting and utilization patterns in relation to elective hysterectomies preformed at Saint Paul's Hospital Millennium Medical College (SPHMMC) in Addis Ababa.

METHODOLOGY: A hospital based retrospective study was conducted at SPHMMC from February to March 2014. All elective hysterectomies performed in the time period of September 2011 to August 2013 were included for the study and the associated blood cross-match ordering and transfusion practice was audited.

RESULT: A total of 532 units of blood were cross-matched for the 265 patients who underwent hysterectomies. But, of those only 74 (13.9%) units of blood were transfused to 39 (14.7%) patients. The findings of this study has also shown that for vaginal hysterectomy there is no need to prepare blood while for abdominal hysterectomy, abdominal hysterectomy with salpingo-oophorectomy and de-bulking surgery for ovarian tumour preparing only a unit of blood is enough.

CONCLUSION: The results of the study showed that for most of the elective hysterectomies performed at SPHMMC, the level of blood utilization was minimal and there is significant over ordering of blood and associated wastage of resources. The process whereby fixed units of blood are requested for every patient irrespective of the diagnosis and type of surgical procedure should be revised.

KEY WORDS: Surgery, elective hysterectomy, blood transfusion and transfusion indices

INTRODUCTION

Preoperative blood ordering is usually based on subjective anticipation of blood loss instead of evidence based estimates of average requirement in a particular procedure. Studies have depicted that there are gross over ordering practices of blood to be transfused comparing with the actual or anticipated needs [1-3]. Many units of blood routinely ordered by surgeons are not utilized, but are held as reserve and become unavailable for other needy patients.

This results in inventory problems for blood banks, loss of shelf life and wastage of blood. It also causes unnecessary wastages of laboratory reagents and other pertinent resources like human and time. Moreover, such practices have greater implications in resource-constrained settings of the poor countries like Ethiopia.

Elective hysterectomy is one of the surgical procedures in which significant intra-operative blood loss is anticipated and cross-matched blood is ordered preoperatively. The accompanying blood loss and need for blood products depends on different factors which includes the route of surgery and indication for the hysterectomy. At Saint Paul's hospital in Addis Ababa at least two units of blood are cross-matched routinely for all elective hysterectomies. Such injudicious preoperative over ordering of blood can burden the physical and human resources of the health care facility and also increase the cost of medical care [4, 5].

A Maximum Surgical Blood Order Schedule (MSBOS) is a system which provides evidence based guidelines for frequently performed elective surgical procedures by recommending the maximum number of units of blood to be cross-matched preoperatively. A MSBOS reduces the preoperative cross matching of blood in surgical cases in which there is less likelihood of blood transfusion [6].

There are various transfusion indices which include Cross-match to Transfusion Ratio (C/T ratio), Transfusion

Probability (%T), Transfusion Index (TI) and Maximal Surgical Blood Order Schedule (MSBOS) for assessing the appropriateness of blood ordered to an anticipated surgical procedure to be performed. The following formulas illustrate how to calculate the different indices of blood ordering practices in case of various surgical procedures as required. C/T ratio =No. of Units Cross-Matched/ No. of Units Transfused The use of C/T ratio was first suggested by Boral Henry in 1975. Ideally, this ratio should be1.0 but a ratio of 2.5 and below was suggested to be indicative of efficient blood usage [6]. %T=No. of Patients Transfused X 100/ Number of Patients Cross-Matched. The use of %T was suggested by Mead *et al* in 1980 and a value of 30% and above has been suggested as appropriate [3].TI= No. of Units Transfused/ Number of Patients Cross-Matched

TI signifies the appropriateness of numbers of units cross matched. A value of 0.5 or more is indicative of efficient blood usage [6].

Maximal Surgical Blood Order Schedule (MSBOS) =1.5 x TI MSBOS estimates the amount of blood that will be needed for the individual procedures [6].

Implementation of maximal surgical blood order schedule has almost universally resulted in substantial reduction of direct and indirect costs. It was also proven to be an effective tool for quality assurance by reducing the stress on the blood transfusion services, more efficient use of blood stocks and reduction in the wastage due to outdating [7].

Thus, this retrospective study on units of blood required and transfused for elective hysterectomies was conducted to find out the current transfusion practices as a first step towards developing a MSBOS for Saint Paul's Hospital in Addis Ababa and other health facilities in the country as required.

METHODS AND MATERIALS

This is a hospital based retrospective study conducted at SPHMMC in Addis Ababa, the capital City of Ethiopia. Saint Paul Hospital is a tertiary level referral and teaching hospital which provides health services to more than 200,000 people annually who are referred from all corners of the country.

The operation theatre registration book was used to identify all the elective hysterectomies done in previous two years, i.e., between September 2011 and August 2013. The medical records of all patients were retrieved and relevant information was extracted from operation and aesthesia

notes, patient history and progress notes using a structured questionnaire. Those patients whose medical records were not available were excluded.

Data was analysed using a Statistical Package for Social Sciences version 20.0. The C/T ratio, Transfusion Index (Ti), Transfusion probability (%T) and Maximum Surgical Blood Order Schedule (MSBOS) of elective hysterectomies done for various diagnoses and modalities of hysterectomy were determined.

Ethical clearance was obtained from the institutional review board of SPHMMC prior to the actual data collection. No identifiers were used for any collected data and the questionnaires used for collecting data were kept in a safe and secured conditions during both the study and data entry period. Finally they were discarded in a safe place after successfully completing the data entry process.

RESULTS

During the study period a total of 1,023 gynaecologic surgeries were done of which 312 (30.5%) were elective hysterectomies. Forty seven medical records (15.1%) were missed and the study was conducted on a total of 265 patients, making the retrieval rate 84.9%.

From the 265 patients 126 (47.5%) were from Addis Ababa city administration, 89 (33.6%) from Oromia Region, 32 (12.1%) from SNNPR and the rest (6.8%) were from other regions of the country. The mean age of the patients included in the study was 46 with a SD of 11 years and ranged between 20 and 85 years.

The most common indication for hysterectomy was uterovaginal prolapse which accounted for more than half (54.7%) followed by symptomatic myoma (17.0%) and ovarian tumour (15.1%). The other identified indications for hysterectomy are shown in table 1. The most commonly performed operative

procedures was vaginal hysterectomy as shown in table 2. The average pre-op haematocrit was 39 % with a SD of 6% (Table 3). The lowest mean haematocrit (30%) was found in those with a diagnosis of gestational trophoblastic disease. The average duration of surgery was 87minutes with a SD of 32 minutes.

The average intraoperative blood loss was 338 ml with a SD of 204 ml. The mean blood loss ranges from 50 ml for elective hysterectomies done for UVP to 1000 ml for ovarian tumours. The average duration of hospital stay was 12 days ranging from 6 to 57 days. The majority of patients stayed in the hospital for less than 10 days. Almost all patients, i.e., 264 (99.6 %) were discharged with good outcomes but one patient (0.4%) died. During the study period, a total of 532 units of blood were requested and cross-matched for elective hysterectomies. Of those, a total of 74 units transfused to 39 patients and that makes the utilization rate of prepared blood only 13.9%.

Among those twelve (16.21%) were transfused preoperatively, 41 (55.40%) intra operative and 21 (28.39%) were transfused in the post-operative period.

Among the 12 units of blood which were transfused preoperatively for 6 patients, one unit was transfused for a woman who had vaginal hysterectomy; four units for two cases who had abdominal hysterectomy; one unit for a patient for whom de-bulking surgery was done for ovarian tumour and the rest six units for two patients who had abdominal hysterectomy and bilateral salpigo-oophorectomy.

Of the 41 units of blood transfused in the intra operatively, 24 units were transfused to 14 patients who were diagnosed as cases of myoma; 13 units of blood to 6 patients admitted with a diagnosis of ovarian tumour and the rest 4 units were to patients admitted with other diagnoses including GTD. The operative procedures done to the patients who had intraoperative transfusions were abdominal hysterectomy for 11 patients; de-bulking surgery for 6 patients with ovarian tumour and abdominal hysterectomy with salpingo-oophorectomy for 5 patients.

The remaining 21 units of blood (28.37%) were transfused during the post-operative period to a total of 11 patients**.** These patients had a diagnoses of GTD (36.37%), myoma (18.18%), ovarian tumour (18.18%), myoma with ovarian pathology (18.18) and UVP (9.09%).

The transfusion indices were calculated separately for the different indications and modalities of hysterectomies as shown in tables 4 and 5. The maximum C/T ratio of 96.66 was found for cases of uterovaginal prolapse and the minimum for GTD which was 1.57. Conversely the maximum %T of 63.63% was found for GTD and the minimum of 1.37% was found for uterovaginal prolapse (Table 4).

With regard to the operative procedure the maximum C/T ratio of 96 was found for vaginal hysterectomy and the minimum was for abdominal hysterectomy which was 2.5. The %T was least for vaginal hysterectomy (1.4%) indicating that less than two percent of blood is being utilized (Table5).

DISCUSSION

The study objectively evaluated the blood ordering and transfusion practice related to elective hysterectomies. It has revealed a significant over ordering of blood for elective hysterectomies with only 13.9 % of the cross-matched blood being actually transfused which is significantly below the recommended 30%. However, the finding of this study is comparable with the findings of other similar studies conducted in other countries. For instance, a prospective observational study done in Bir Hospital in Nepal showed that the blood requisitions were made to 79 patients who had undergone surgery in the general surgical department. Among 198 units of blood that were made available for these patients, only 27 (13.6%) units of blood were transfused to 18 (22.8%) patients [9].

It is recommended that hospitals keep their C/T ratio below 2.5 and TI above 0.5 for efficient utilization of blood and blood products (6).The overall C/T in this study was found to be 7.18 and the TI was 0.28. The findings of both indices have shown that there is significantly high over ordering of blood for transfusion in surgical settings. The C/T ratios of our findings are also much higher than the findings from the study conducted at the Main University Hospital in Egypt which showed the overall C/T ratio of 3.9 and TI was much lower than the 0.69 of the Main University hospital study [10].

When disaggregated by the types of indications for surgery, all the three indices showed that there was significant blood utilization for the elective hysterectomies performed for cases of GTD, myoma and associated ovarian masses. On the contrary, only 1.34% blood cross-matched for uterovaginal prolapse was utilized indicating the unnecessary wastage of resources and laboratory personnel's time in cross-matching the 98% of units of blood which were not used. Similarly, when the blood utilization is assessed by the routes of surgery, only 1.4% of cross-matched blood was utilized for vaginal hysterectomies.

The Maximum Surgical Blood Order Schedule (MSBOS) is a table of elective surgical procedures which lists the number of units of blood routinely cross-matched for each procedure pre-operatively. The schedule is based on a retrospective analysis of actual blood usage associated with the individual surgical procedure. It aims to correlate as closely as possible the amount of blood cross-matched to the amount of blood transfused [8].

Applying MSBOS to our study has showed that, for vaginal hysterectomy, there is no need to prepare blood while for abdominal hysterectomy, abdominal hysterectomy with salpingo-oophorectomy and debulking surgery for ovarian tumour only 1 unit of blood is enough. When the indication for hysterectomy is considered, 2 units of blood should be prepared for cases of GTD and myoma with associated ovarian pathologies, for other cases of myoma and ovarian tumours, one unit of blood would suffice. Only blood grouping and typing should be done for cases of uterovaginal prolapse. The MSBOS guideline prepared by University of Chicago Medical

Centre has relatively comparable recommendation. According to this guideline, for vaginal hysterectomy the blood type and screen or nothing (at surgeon's discretion) is recommended. But 2 units of blood should be prepared for ovarian cancer debulking and radical hysterectomy and in cases of abdominal hysterectomy for benign condition blood type and screen is recommended [11, 12].

The slight differences between the findings of this study and that of recommended in the guide line might be due to the fact in this study there were only 3 patients for whom radical hysterectomy was included that making generalization difficult.

CONCLUSION

As demonstrated in this study, there was significant over ordering of blood and wastage of resources associated with elective hysterectomies. The practices of requesting the fixed units of blood for each patient irrespective of the diagnosis and the procedure should be revised. In addition, the physicians should be clear with the number of units of blood they are supposed to request for each surgery. A system in which only the blood group should be determined prior to surgery should be instituted for surgeries anticipated to have insignificant blood loss. Finally, the MSBOS should be also determined for all the other surgical cases to be performed in the hospital setting and similar others.

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Table 1- Indications for elective hysterectomies done at SPHMMC between September 2011 and August 2013, Addis Ababa, Ethiopia

	Number of patients	Percent
Uterovaginal prolapse	145	54.7%
Symptomatic myoma	45	17.0%
Malignant ovarian tu-	40	15.1%
Gestational tropho-	11	4.2%
Other ovarian masses	7	2.6%
Others	17	6.4%
Total	265	100%

Table 2: Operative procedures of elective hysterectomies done at SPHMMC between September 2011 and August 2013, Addis Ababa, Ethiopia

Operative procedure	No. of patients	Percent (%)
Vaginal hysterectomy	144	54.3
Abdominal hysterectomy	43	16.3
Abdominal hysterectomy with Salpingo-oophorectomy	35	13.2
De-bulking surgery for ovarian tumour	40	15.1
Radical hysterectomy	3	1.1
Total	265	100

Table 3. Characteristics of patients who have undergone elective hysterectomy at SPHMMC between September 2011 and August 2013 by admission diagnosis, Addis Ababa, Ethiopia

Admission diagnosis	Mean age (years) ± SD	Mean pre-op Hct (%) SD±	Mean duration of surgery (minutes) ± SD	Mean intra op blood loss (ml) ± SD	Mean post op Hct (%) ±SD	Mean duration of hospital stay(days) ± SD
Uterovaginal prolapse	49±12	41±4	78±23	267±169	36±5	11±5
Symptomatic myoma	40±6	38±7	96±42	384±180	34±5	15±8
Ovarian tumour	44±10	38±6	106±34	473±265	34±6	16±10
GTD	38±6	30±10	73±17	375±177	30±5	13±4
Myoma +Ovarian pathology	42±9	34±15	110±47	350±71	33±12	14±5
Other ovarian mass	45±5	39±2	95±27	250±132	39±2	13±3
Cervical ca	48±15	42±4	120±44	400	41±10	10±1
Other	47±5	41±3	113±39		34±4	17±1
Total	46±11	39±6	87±32	338±204	35±5	13±7

Table 4: Transfusion indices by operative procedure and indication for elective hysterectomies done at SPHMMC between September 2011 and August 2013, Addis Ababa, Ethiopia

		C/T	%T	TI	MSBOS
Operative procedure	Vaginal hysterectomy	96	1.4%	0.02	0.03
	Abdominal hysterectomy	2.5	41.2%	0.8	1.2
	De-bulking surgery for ovarian tumour	5.1	20.0%	0.4	0.6
	Abdominal hysterectomy with salpingoopherectomy	3.5	28.6%	0.6	0.9
	Myoma	3.21	35.55%	0.62	0.93
	Ovarian Tumour	4.55	22.5%	0.45	0.67
Intra op diagnosis	GTD	1.57	63.63%	1.27	1.90
	Myoma+Ovarian pathology	2.00	44.44%	1.0	1.5
	Uterovaginal prolapse	96.66	1.37%	0.02	0.03
	Total	7.18	14.7%	0.28	0.42

REFERENCES

1. Hardy NM, Bolen FM, Shatney CH: Maximum Surgical Blood Order Schedule reduces hospital costs; AM. Surgery 1987; 53:223-5
2. Mintz, P. D., R. B. Nordine, J. B. Henry, and W. R. Webb: Expected hemotherapy in elective surgery. N.Y. State J. Med 1976; 76:532
3. Mead M, Anthony CD, Saltier M: Hemotherapy in elective surgery; An incident report, Review of literature and alternative guidelines for appraisal; AM. J. Clinical path.1980; 74: 221-7
4. Lim EJ, CG Lopez, Veera SN, Menaka N, Aminah A : Efficiency of blood usage for elective surgery in the University Hospital KualaLumpur: Malaysian J Pathol 1996; 18(2): 107-112
5. Lowery TA, Clark JA: Successful implementation of Maximum Surgical Blood Order Schedule: J Med Assoc, CA 1989; 78(155-8)
6. Friedman BA, Oberman HA, Chadwick AR, Kingon KI: The maximum surgical blood order schedule and surgical blood use in the United States. Transfusion 1976; 380-387
7. Argous S: Is routine cross matching for two units of blood necessary in elective surgery? AM,J, Surg.,1981;142: 370-1
8. Friedman BA: An analysis of surgical blood use in United States Hospital with application of the maximum blood surgical blood order schedule. Transfusion 1979; 19:268-78
9. Basnet RB, Lamichhane D, Sharma VK: A Study of Blood Requisition and Transfusion Practice in Surgery at Bir Hospital. PMJN 2009;9(2)
10. Samaa Z. Ibrahim, Heba M. Mamdouh, Amal M. Ramadan: Blood Utilization for Elective Surgeries at Main University Hospital in Alexandria, Egypt .Journal of American Science 2011;7(6):683-9
11. Friedman BA. An analysis of surgical blood use in United States. Hospital with application of the maximum blood surgical blood order schedule. Transfusion 1979:19:268-78.
12. S.K. Samarab. A. Friedman, P.J. Beitler:A study of blood utilization in association with hysterectomy: Transfusion 1983;23:490-5