Blood Transfusion Practice in Obstetric and Gynecology: Impact of Educational Programs to Create Awareness for Judicious Use of Blood Components

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Abstract The study presents the data analysis (1) To find out the trend of blood component use during the period 2003–2010 and to determine impact of component awareness programs on reduction in whole blood (WB) and single unit transfusions. (2) To determine Hb trigger. The details about blood units issued were entered in the integrated blood bank management software as well as in Microsoft Excel. The data of 4,838 cases of pregnancy anemia; 2,244 receiving blood for obstetric (Ob) hemorrhage including 270 cases of disseminated intravascular coagulation; 1,413 women having Gynecological (Gy) bleeding; 911 Ob, 2,032 Gy and 740 surgeries for Gy malignancy were analyzed. During the years 2003–2010 there was gradual increase in component utilization for pregnancy anemia, Ob/Gy surgeries and Ob/Gy bleeding and significant reduction in WB transfusions due to component awareness programs. But single unit transfusions showed comparatively lower trend of reduction. The mean Hb was 6.4 g/dL for pregnancy anemia, 8.1 g/dL for surgeries and 7.3 g/dL for Ob/Gy bleeding.

Keywords Pregnancy anemia · Obstetric/gynecological bleeding · Obstetric/gynecological surgeries · Whole blood · Blood components · Single unit transfusion

Introduction

The guidelines for blood transfusion to Obstetrics (Ob)/Gynecology (Gy) patients are available [1, 2]. But still there is a lack of awareness about judicious use of blood components. A study published in the year 2004 [3], observed that 58.5 % transfusions given to Ob/Gy patients were of whole blood (WB) which is a raw material used for blood component separation. The incidence of single unit transfusion was also high (about 30–40 %). We regularly carry out programs on “Judicious use of blood” for clinicians to update their knowledge about the blood component use. Such programs are often organized in collaboration with Gujarat State Blood Transfusion Council and Indian Medical Association.

This study analyzes 8 years’ data of transfusions given to Ob/Gy patients to assess WB and single unit transfusion usage. Simultaneously we also tried to determine Hemoglobin (Hb) trigger for different Ob/Gy indications for transfusion.

Materials and Methods

The requisitions received from hospitals from January 2003 to December 2010 were given computer generated identification number and the number was also generated for a patient. The details about blood units issued were entered in the integrated blood bank management software as well as in Microsoft Excel. Entries were double checked using parameters like name, age, sex, hospital, doctor etc. and units given to the same patient were pooled together. Data of 4,838 cases of pregnancy anemia; 2,244 women receiving blood for antepartum or post partum hemorrhage including 270 cases of disseminated intravascular coagulation (DIC);

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1,413 women having menorrhagia due to Gy complications; 911 Ob, 2,032 Gy and 740 surgeries for gynecological malignancy were analyzed.

The statistical evaluation was based on Student's "*t*" test and χ^2 test [4].

Our blood bank organizes at least two scientific programs for clinicians to educate them about judicious use of blood. Many programs are conducted in collaboration with Gujarat State Blood Transfusion Council and Indian Medical Association.

Results

The trend of blood component utilization during the years 2003–2010 in categories like anemia in pregnancy, Ob/Gy surgeries and Ob/Gy bleeding is shown Fig. 1. The graph shows gradual increase in component utilization. During the earlier years the component awareness was lowest for management of bleeding episodes in Ob/Gy cases and highest in pregnancy anemia management. In the year 2010 all three categories had comparable frequency of blood component utilization.

Table 1 shows that in the year 2003, 36.4 % women received WB for anemia in pregnancy. Gradually the incidence reduced significantly and during 2008–2010 it varied from 12.2 to 16.8 % only. Similar trend was observed with bleeding cases as WB transfusions were decreased from 36.5 to 18.9 %. The overall incidence of single unit red blood cells (RBC) transfusions (WB and RCC) though significantly reduced in pregnancy anemia

and bleeding cases, the trend was not as prominently evident as observed for the WB transfusions.

Table 2 shows that in all types of surgeries highly significant trend was observed in the reduction of WB transfusions. However number of single unit transfusions given to patients undergoing routine obstetric and gynecology surgeries though significantly reduced, comparatively lower trend of reduction was observed. Surgeries for Gy malignancy did not show statistically significant difference in single unit transfusions. However even in the year 2003 Cancer surgeons had ordered less number of single unit/case compared to other categories and their consumption of WB was also lower.

As seen in Table 3 blood component utilization was significantly higher in 270 of DIC cases compared to other categories ($p = 0.001$). There were no single unit transfusions. The frequency of WB use was 31.94 % in the year 2003 but decreased to 4.34 % in 2010 ($p = 0.001$). The cryoprecipitate which was never used in the years 2003 and 2004 was gradually more frequently ordered and in the year 2010 the utilization was 28.6 %.

The pretransfusion Hb values recorded on the patient's requisition form were analysed. In all categories of cases the Hb concentration range was 1.5–14 g/dL and >90 % women had Hb concentration ≤ 10 g/dL. However as seen in Table 4 severe anemia (Hb ≤ 5 g/dL) was present in 20.6 % cases of pregnancy anemia, 17.2 % in Ob/Gy bleeding cases and 7.8 % Ob/Gy/malignancy surgeries. The mean $\pm$ SD Hb values were 6.4 ± 1.6 , 7.3 and 8.1 ± 2.1 g/dL respectively in these three categories. "*t*" test showed statistically significant difference in mean

Fig. 1 Trends of blood component utilization

Table 1 Yearly trends of WB and single unit utilization for pregnancy anemia & Ob/Gy bleeding

Years	Pregnancy anemia			Ob/Gy bleeding			
	Total RBC products	WB units (%) [*]	Single units (%) ^{**}	Total units used	WB units (%) [*]	Total RBC products	Single units (%) ^{**}
2003	1,158	422 (36.4)	192 (16.6)	1,609	587 (36.5)	1,033	115 (11.1)
2004	1,401	381 (27.2)	197 (14.1)	1,452	641 (44.1)	1,173	136 (11.6)
2005	1,313	354 (27)	168 (12.8)	2,057	632 (30.7)	1,316	87 (6.6)
2006	1,319	281 (21.3)	172 (13.0)	1,717	522 (30.7)	1,166	100 (8.6)
2007	1,257	274 (21.8)	162 (12.9)	1,488	574 (38.6)	1,128	97 (8.6)
2008	1,296	158 (12.2)	176 (13.6)	1,887	439 (23.3)	1,350	100 (7.4)
2009	1,111	187 (16.8)	144 (13.0)	1,667	415 (24.9)	1,226	114 (9.3)
2010	1,162	181 (15.6)	136 (11.7)	1,703	309 (18.9)	1,177	95 (8.1)

^{*}WB utilization for pregnancy anemia and for Ob/Gy bleeding significantly reduced, $\Sigma\chi^2 = 229.36$ for 7 df, $p < 0.001$, $\Sigma\chi^2 = 274.1$ for 7 df, $p < 0.001$ respectively

^{**}Significant reduction in utilization of single units in pregnancy anemia, and for bleeding cases $\Sigma\chi^2 = 16.5$, 7 df, $p < 0.05$, $\Sigma\chi^2 = 28.62$, 7 df, $p < 0.005$ respectively

WB whole blood

Table 2 Trends of WB and single unit utilization for Ob/Gy and malignancy surgeries

Years	Ob/Gy routine surgery				Surgery for Gy malignancy			
	Total units used	WB units (%) [*]	Total RBC products	Single units (%) ^{**}	Total units used	WB units (%) [*]	Total RBC products	Single units (%) ^{**}
2003	599	465 (77.6)	595	130 (21.8)	190	124 (65.3)	153	22 (14.4)
2004	709	501 (70.7)	695	139 (20.0)	202	119 (58.9)	175	15 (7.4)
2005	797	525 (65.9)	745	127 (17.0)	236	100 (42.4)	203	14 (5.9)
2006	715	452 (63.2)	702	120 (17.1)	278	91 (32.7)	215	12 (4.)
2007	758	394 (52.0)	735	125 (17.0)	287	111 (38.7)	237	14 (5.9)
2008	866	338 (39.0)	851	141 (16.6)	269	67 (24.9)	244	26 (10.7)
2009	748	297 (39.7)	710	123 (17.3)	346	77 (22.3)	290	24 (8.3)
2010	934	283 (30.3)	921	127 (13.8)	361	67 (18.6)	315	37 (11.7)

^{*}Statistically significant reduction in whole blood transfusions, $\Sigma\chi^2 = 272.61$, 7 df for Ob/Gy Surgeries and $\Sigma\chi^2 = 133.35$ for gynec malignancies $p < 0.001$

^{**}Single unit transfusions significantly reduced in routine Ob/Gy Surgeries, $\Sigma\chi^2 = 17.6$, 8 df, $p < 0.05$

No significant difference in frequency of single unit transfusions in surgeries carried out for Gy malignancy $\Sigma\chi^2 = 7.62$, 7 df, $p \geq 0.1$

Ob obstetric, Gy gynecology, WB whole blood

values ($p = 0.001$). The Hb data was comparable in the years 2003–2006 and 2007–2010.

Discussion

Promoting component therapy not only brings down the requirement of WB, but also ensures optimum use of blood. Currently there are 30 major blood group systems and more than 308 red cell antigens [5]. However during pre transfusion testing blood bank tests for only ABO and Rh (D) antigens, thus transfusion poses a risk of alloimmunization to other blood group antigens. There are also

several other risks like transmission of infections, different types of transfusion reactions etc. [6]. Therefore clinicians must prevent single unit transfusion in adult patients which can raise Hb only by 1–1.5 g/dL.

The pregnant women have increased risk of anemia because of the grater requirements of iron during pregnancy. WB is contraindicated for anemia [1]. But this study reveals that it is being used by obstetricians. However there is a significant decline in the use from 36.4 % in the year 2003–15.6 % in the year of 2010. Thus now majority of the clinicians prefer to use red cell concentrate (packed red cells). The use of single unit transfusion has not declined much. Vachhani et al. [7] have reported 15.12 % incident

Table 3 Transfusion requirements for DIC cases

Years	Whole blood		RCC	FFP	RDP	SDP	Cryoppt		Total components	Total cases
	N	%					N	%		
2003	99	31.94	19	165	27	0	0	0	310	22
2004	81	16.77	48	231	27	6	0	0	483	34
2005	94	10.12	95	561	75	0	104	11.2	929	55
2006	82	10.73	99	451	50	12	70	9.16	764	50
2007	52	13.68	39	211	34	4	40	10.5	380	29
2008	34	6.80	86	253	32	7	88	17.6	500	33
2009	25	7.16	36	186	33	3	66	18.9	349	23
2010	15	4.34	74	136	20	2	99	28.6	346	24
Total	482	11.87	496	2,194	298	34	467	11.5	4,061	270

Statistically significant reduction in whole blood transfusions, $\Sigma\chi^2 = 85.6$, 7 df, $p < 0.001$

RCC red cell concentrate, SDP single donor platelets, FFP fresh frozen plasma, Cryoppt cryoprecipitate, RDP random donor platelets

Table 4 Mean $\pm$ SD the Hb concentration prior to transfusion in different conditions

Category	Years 2003–2006		Years 2007–2010	
	Total cases	Mean $\pm$ SD (range Hb g/dL)	Total cases	Mean $\pm$ SD (range Hb g/dL)
Pregnancy anemia	1,650	6.35 $\pm$ 1.6 (1.2–14.3)	1,661	6.4 $\pm$ 1.5 (1.8–12.6)
Ob/Gy routine and malignancy surgeries	1,328	8.21 $\pm$ 2.2 (1.0–14.9)	1,318	7.9 $\pm$ 1.9 (2.0–14)
Ob/Gy bleeding	877	7.5 $\pm$ 2.4 (1.2–14.9)	1,174	7.2 $\pm$ 2.2 (1.9–14)

No Significant difference in mean Hb, between 2003–2006 and 2007–2010 by “*t*” test in all categories, $p > 0.1$

Significant variation in mean Hb in three different categories of patients receiving transfusion, $F = 1,128$ for 2 and 8,005 df, $p < 0.001$

of single unit transfusions in Ob/Gy which is comparable to our study.

The trend of blood component utilization during 2003–2010 has revealed the increased awareness about component use for management of obstetric and gynecological hemorrhage. Studies have shown that significant bleeding in the post partum period or menorrhagia from menarche may be due to systemic hemostatic defect [8–10]. Obstetric bleeding particularly DIC in the post partum period requires components like RBC, platelets, FFP and Cryoprecipitate. According to Mercier and Bonnet [11] it is reasonable to use blood products like FFP, Red cells to control acute obstetric hemorrhage. They recommend the use of fibrinogen concentrate if plasma fibrinogen level is below 1 g/L and emphasize that data on proactive administration of platelets is insufficient to recommend routine use of platelets. The recombinant factor VIIa is advocated only after failure of other conventional therapies. Singi et al. [12] have recommended recombinant factor VIIa, 20–80 μ g/kg in severe cases of post partum hemorrhage.

Western countries have already stopped using WB for management of surgical bleeding. As early as in the year 1987, Hogman et al. [13] have recommended that the WB should not be transfused to surgery patients and discussed

in details about alternate choice of various components. In India many surgeons/anesthetists insist on transfusing WB to manage bleeding during surgery or post surgery complications. Our blood bank supplied WB to 77.6 % of women undergoing obstetric surgeries like caesarean section, ruptured ectopic pregnancy or gynecological surgeries. Relatively less frequency of WB usage was observed for surgeries performed for gynecological malignancies. Compared to year 2003 data, the year 2010 data showed that there was significant change in the attitude about WB transfusion, but efforts are still required to improve the awareness. Though we regularly conduct training programs and seminars and there are also CME programs conducted by Indian Medical Association on behalf of Gujarat state blood transfusion council, still there is a scope to create more awareness about the component use.

WHO strongly discourages single unit transfusion [1]. Gupte and Shaw [14] have observed maximum use (62.2 %) of single unit transfusions in urological surgeries and minimum (25.8 %) in cancer surgeries performed on adult patients. Our analysis of single unit transfusion showed decline from 21.8 to 13.8 % in Ob/Gy routine surgeries. Definite trend was not seen in Malignancy surgeries.

So-Osman et al. [15] have considered pre transfusion Hb threshold as 6.4 g/dL for non massive and 8.1 g/dL for

massive blood loss in post partum patients. In our retrospective study we have observed similar Hb triggers. In a study reported by Butwick et al. [16] pre transfusion Hb value of 7.6 g/dL is considered for transfusion management of obstetric hemorrhage and for treatment of postnatal anemia.

Conclusion

1. Overall incidence of blood component utilization significantly increased in all categories of obstetric/gynecological cases during 2003–2010. However efforts are still necessary to achieve 100 % blood component use.
2. We have encouraging response from clinicians in reducing WB and single unit transfusions, probably because of the Training programs, CME programs and seminars conducted by Gujarat Government, Indian Medical Association and our blood bank.
3. Except in surgeries for gynecological malignancies in all other categories there was significant reduction in single unit transfusion during 2003–2010. However in malignant cases overall frequency of single unit utilization was much lower than other categories.
4. The Hb trigger for giving transfusion was 6.4 g/dL for anemia in pregnancy, 8.1 for surgeries and 7.3 g/dL for management of Ob/Gy bleeding.

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