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SHORT COMMUNICATION

Successful reduction of massive postpartum haemorrhage by use of guidelines and staff education

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We reviewed all cases of massive primary postpartum haemorrhage greater than 1000 mL over a six month period in 1999 to establish the incidence, identify aetiological factors and implement change. Fifty-four cases (1.7%) were identified. We classified four as 'near-miss' maternal mortality. Over 60% were delivered by caesarean section. Seventy-six percent were due to uterine atony, 9% due to genital tract trauma and 15% were associated with significant antepartum haemorrhage from placenta praevia or abruption. No obvious labour or delivery risk factors were identified but deviation from hospital guidelines was common. Following revision of the guidelines, dissemination to staff and use of practice drills, we repeated the study on a prospective basis over the same time period in 2002. There was a significant reduction in the incidence of massive postpartum haemorrhage to 0.45%, and 100% adherence to the guidelines which resulted in a significant reduction in maternal morbidity. We believe that this approach can be replicated in other units.

Introduction

Primary postpartum haemorrhage has traditionally been defined as blood loss of greater than 500 mL within 24 hours of delivery, the incidence of which is quoted as approximately 5%. More recently, this definition has been challenged, due in particular to the inaccuracies of blood loss measurement. Furthermore, clinical definitions now include a fall in haematocrit and the need for transfusion.[1] Massive primary postpartum haemorrhage is defined as a blood loss of greater than 1000 mL within 24 hours of delivery and although there is little reported in the literature, the incidence is reported as 1–2% of all deliveries.[2] Although postpartum haemorrhage remains a far greater problem in developing countries, it features consistently as a significant cause of maternal mortality in developed countries, with an incidence of approximately one in 100,000 deliveries.[3] Substandard care, including a lack of familiarity with guidelines and a delay in recognition of the severity of blood loss, has been repeatedly cited as contributing factors. Previously identified risk factors for primary postpartum haemorrhage include maternal obesity, advanced maternal age, babies weighing more than 4 kg, antepartum haemorrhage and prolonged labour. We conducted an audit of massive postpartum haemorrhage at our hospital to assess the incidence, to identify possible aetiological factors, and if possible, to implement change based on findings of the audit.

Methods

A retrospective study was carried out on all the cases of massive postpartum haemorrhage identified during the period from 1st January 1999 to 30th June 1999. These cases were first identified from the delivery suite logbook. The relevant data were then obtained following review of patient charts.

Our hospital implements a policy of active management of the third stage of labour, which includes 1 mL Syntometrine im (5 units of syntocinon and 250 μg ergometrine) following all vaginal deliveries unless there is evidence of hypertension, when this is replaced by 5 IU syntocinon iv. At caesarean section delivery, 5 IU syntocinon iv is administered. In a small number of cases each year, the woman opts for a natural third stage and prophylaxis with an oxytocic agent is withheld. It is not routine to measure blood loss postpartum for all deliveries. However, when blood loss is considered to be substantial, every attempt is made to ascertain the total blood loss by measurement of blood retrieved from suction containers, and weighing of swabs. It is possible therefore that we have missed cases that truly were >1000 mL because swabs were not weighed.

Maternal age, parity, gestation, mode of delivery, cause of postpartum haemorrhage and grade of doctor managing the case were recorded. Maternal complications were noted

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including coagulation and renal dysfunction, need for transfusion and admission to the High Dependency Unit (HDU).

In an attempt to determine cases of 'near-miss' maternal mortality, we looked at cases of severe acute maternal morbidity. Our definition was based on all of the following being present: postpartum haemorrhage $\geq$2500 mL, blood transfusion $\geq$8 units, development of disseminated intravascular coagulation and admission to the High Dependency Unit.

Deviation from the hospital guidelines was analysed. We categorised these deviations from guidelines as minor or major. Minor deviations were those where one step in the management process was omitted (e.g. not giving a baseline oxytocic bolus but instead going straight to a 40 IU oxytocin infusion). Major deviations were those where two or more steps in the management process were omitted.

On completion of the audit, the guidelines for management of postpartum haemorrhage were revised and circulated to all staff involved with labour and delivery care. These included anaesthetic and obstetric doctors, midwives on the labour ward and midwives and nursing staff in the theatre. Regular training and the use of practice drills were conducted with both the junior medical staff and the midwifery staff. We subsequently carried out the audit again over a similar six month period from 1st January 2002 to 30th June 2002 on a prospective basis. All of the same information was collected again and comparisons were made between the two study periods.

Results

The results for the study periods are shown in Table 1. According to hospital policy, all 54 women in the first study period received prophylaxis with an oxytocic agent. Management of the ensuing postpartum haemorrhage was as follows: 18% of women received a repeat oxytocic, 15% received ergot derivatives, 85% received an oxytocin infusion, 47% received misoprostol (doses ranging from 400 to 1000 μg) and 7% received carboprost, either intramuscularly or intramyometrially. One of the three women who underwent caesarean hysterectomy died following the development of disseminated intravascular coagulopathy, which was superimposed on persistent haemorrhage related to placenta accreta/increta. This was an elective repeat caesarean section and she had persistent haemorrhage despite caesarean hysterectomy. There were four cases of severe maternal morbidity, giving an incidence of 0.13%. All four women recovered well and were well on discharge home.

We looked critically in each case at where there had been a deviation from our hospital guidelines (Fig. 1). This occurred in 20 (37%) cases. As outlined in Table 1, these occurred more commonly (>75% of cases) in normal and instrumental vaginal deliveries compared with caesarean section births. Minor deviations occurred in 13 cases and major deviations occurred in 7 (13%) cases. Five out of the seven major deviations were associated with caesarean section delivery. In these seven cases, there was no suggestion of disproportionate maternal morbidity, in that two required transfusion, one required an EUA and two were admitted to the High Dependency Unit. Among the four cases that were classified as 'near-miss' mortality, there was a major deviation from the hospital guidelines in only one case. Misoprostol was used in almost half the cases but

Table 1. Comparison of outcomes of massive postpartum haemorrhage for the two study periods.

	1999		2002	
	No.	%	No.	%
Total no. of deliveries	3176		3300	
Massive pospartum haemorrhage*	54	1.7	15	0.45
Obstetric factors				
Mean (SD) maternal age	28.5 (6.1)		27.6 (4.8)	
Primiparous	27	50	7	47
Previous lower segment caesarean section	7	13	0	
Previous postpartum haemorrhage	2	3.7	1	6.7
Antepartum haemorrhage	9	17	1	6.7
Mode of delivery				
Spontaneous vaginal delivery	13	24	4	27
Lower segment caesarean section elective	14	26	2	13
Lower segment caesarean section emergency	19	35	4	27
Instrumental delivery	8	15	5	33
Aetiology				
Atonic uterus	41	76	10	67
Genital tract trauma	5	9.3	2	13
Others	8	15	3	20
Estimated blood loss				
Total >1500 mL	28	52	5	33
Total >2000 mL	15	28	0	
Total >2500 mL	10	19	0	
Total >3000 mL	7	13	1	6.7
Maternal morbidity				
Any blood transfusion	26	48	5	33
Blood transfusion > 6 units	9	17	0	
Admit High Dependency Unit	25	46	2	13
Required examination under general anaesthesia	6	11	5	33
Peripartum hysterectomy	3	5.6	0	
Deviation from hospital guidelines				
Spontaneous vaginal delivery	10	77	0	
Elective lower segment caesarean section	3	21	0	
Emergency lower segment caesarean section	2	11	0	
Instrumental delivery	5	63	0	
Total	20	37	0	
Significant deviation from guidelines	7	13	0	

* $P < 0.001$.

Summon medical aid when blood loss exceeds 500 mL before and/or after delivery of the placenta, when there is doubt about the completeness of the placenta and membranes, and always when there is concern about a patient's condition.

Management with the placenta still in:

1. Rub up a contraction.
2. Give ergometrine 0.5 mL intravenously or syntometrine 1 mL intramuscularly.
3. Catheterise bladder if necessary.
4. Check maternal blood pressure and pulse rate.
5. If the patient is shocked, keep nil P.O.
6. Prepare for:
   a) Ensure iv access and set up iv syntocinon 40 unit infusion.
   b) Blood transfusion
   c) Examination under general anaesthesia (EUA) unless epidural *in situ.*
   d) Manual removal of the placenta
   e) Suturing of genital tract trauma as appropriate.

Management after delivery of placenta:

1. Rub up a contraction.
2. Give ergometrine 0.5 mL or syntometrine 1 mL.
3. Ensure iv access and set up iv infusion.
4. Catheterise bladder if necessary.
5. Check maternal blood pressure and pulse rate.
6. Retain placenta and membranes for inspection.
7. If uterus firmly contracted and bleeding persists, vulvo-vaginal examination to rule out trauma and repair as appropriate.
8. Intravenous syntocinon 40 unit infusion if atony persistent.
9. If continued loss despite above measures, prepare for:
   a) Blood transfusion
   b) Carboprost 250 mg to be available if atony persistent.
   c) Arrange examination under anaesthesia (GA unless epidural *in situ*).
   d) At EUA, undertake appropriate measures of removal of retained piece of placenta or suturing of genital tract trauma as indicated.

Fig. 1. Guidelines for the management of postpartum haemorrhage at the time of the study.

was not part of the hospital guideline at the time. However, it was used liberally on the basis of ease of administration, low cost, known rapid response and documented effect.[4] When the use of misoprostol was taken into account, we observed that rigorous, systematic and absolute adherence to the hospital guideline from start to finish was performed in only three cases of the total 54 cases.

The overall risk for primary postpartum haemorrhage in this series was 1.73%. In the second study period as a result of the change in guidelines and education of staff, there was less need for blood transfusion, and reduced rates of admission to the High Dependency Unit and in those requiring an examination under anaesthesia. In addition, there were no cases of peripartum hysterectomy, 'near-miss' maternal mortality or deviation from the updated hospital guidelines.

Discussion

Massive postpartum haemorrhage is associated with significant maternal morbidity and a small but consistent maternal mortality rate. Confidential Enquiry reports continue to highlight substandard care as an important factor in deaths attributable to postpartum haemorrhage.[3] This includes a lack of familiarity with the guidelines, which should be readily available in all delivery suites, a delay in involving more senior staff and a failure to adequately assess total blood loss prior to the development of a coagulopathy. It is encouraging to note that there has been a reduction in maternal mortality secondary to postpartum haemorrhage, from eight deaths in the triennium 1991–1993, to five deaths in the 1994–1996 report.

This audit of massive postpartum haemorrhage revealed an incidence of 1.7% of all deliveries, an incidence similar to that reported elsewhere.[2] The distribution of cases according to their aetiology was also similar to other studies. Grand multiparity is no longer considered by some workers to be a risk factor for postpartum haemorrhage,[5] and indeed this was not demonstrated in our series. We were unable to identify specific risk factors for postpartum haemorrhage but this is most likely because the number of cases is not big enough to tease out the association of certain risk factors with amount of total blood loss.

In the first study period of massive postpartum haemorrhage, guidelines were not strictly adhered to, with a somewhat *ad hoc* approach to the utilisation of the various treatment options available. The guidelines for the management of postpartum haemorrhage were followed only when the blood loss was thought to be very substantial. This observation is not entirely unexpected, as this has previously been identified as a cause for concern.[3] Greater focus on the evolving processes of clinical governance[6] and clinical risk management[7] has been advocated, and this approach in our study with stricter adherence to the guidelines has led to a reduction in the incidence of massive postpartum haemorrhage.

Although the incidence of postpartum haemorrhage of greater than 1 L is quoted as approximately 1% of all deliveries, in reality, life-threatening postpartum haemorrhage or near-miss mortality due to haemorrhage is thought to occur on average four times a year in a large obstetric unit.[8] Our initial data suggest that the figure is more like eight times a year for our large unit and we noted that this complication was not particularly associated with deviation from hospital guidelines. The relative infrequency of this obstetric emergency does not allow for a familiarity with the drill required to manage this situation efficiently. Nonetheless, the importance of practice drills, similar to those for management of shoulder dystocia, cannot be emphasised enough and this approach in our study resulted in no case of 'near-miss' maternal mortality in the repeat audit. It is interesting to note that with the regular dissemination of these guidelines and the use of practice drills, we observed no deviation from hospital guidelines in the 15 cases of postpartum haemorrhage in the second study period.

Women delivered by caesarean section deliveries, both elective and emergency, in 61% of massive postpartum haemorrhage cases. This underlines the fact that caesarean section is not an insignificant operation. The significant differences in relative risk of primary postpartum haemorrhage calculated in this series only serves to reinforce this point. This information is not only interesting but also clinically very important for counselling purposes. Confidential Enquiry data of assessment of mode of delivery revealed that of a total of 169 deaths (direct and indirect), 93 were associated with caesarean section.[3]

Almost 50% of all patients in this audit received misoprostol. It has been shown to produce rapid sustained uterine contraction and can be effectively administered orally, vaginally or rectally.[4] It is a cheap and effective alternative to carboprost and has established itself as a useful treatment option in atonic postpartum haemorrhage where first-line treatment has failed. While it was not formally a part of the hospital guidelines during the first study period, it was subsequently incorporated into the updated guidelines, not as a replacement to a bolus oxytocic but as an adjunct to this first-line response. Of note, 93% of women received misoprostol as part of their management. Since the time of our initial study in 1999, a randomised controlled trial from South Africa has reported that rectal misoprostol appears to be a safe method of treating postpartum haemorrhage and may even be better than a combination of intramuscular syntometrine and an intravenous syntocinon infusion.[9] These authors make a case for keeping misoprostol in the emergency drug cupboard of all labour wards.

Conclusions

In our institution, following the first audit, the guidelines were updated and distributed to all the staff. This was done in association with the use of practice drills on a regular basis. This approach resulted in a significant reduction in the incidence of massive postpartum haemorrhage and, in addition, led to a significant reduction in maternal morbidity. We would recommend this approach in other units. Our study highlights several important points in relation to uncommon but potentially life-threatening obstetric events such as massive postpartum haemorrhage. Firstly, massive postpartum haemorrhage is associated with significant maternal morbidity and mortality. It is essential to familiarise medical staff with the guidelines for the management of postpartum haemorrhage through training, and guidelines should be readily available for easy reference. Such an approach in this study resulted in a significant reduction in massive postpartum haemorrhage and the associated complications. We recommend such an approach in other units.

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