Use of Oxytocin during Caesarean Section at Princess Marina Hospital, Botswana: an audit of clinical practice

by

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Declaration

“Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree.

Signature: ..... Date: .....”

ABSTRACT

Introduction

Oxytocin is widely used as a uterotonic agent for preventing post partum haemorrhage. In the setting of caesarean section (CS) the dose and mode of administration of oxytocin differs according to different guidelines. This may be a source of uncertainty among the different prescribers of the drug. Most of the guidelines available, recommend a slow intravenous bolus of 5 international units (iu). Alternatively, an infusion of 20 iu over two hours is endorsed by the World Health Organisation (WHO). However, there have been many recent studies looking at the prophylactic use of oxytocin at caesarean section to prevent haemorrhage associated with the surgery. Although these studies have unequivocally shown that doses of oxytocin needed for prophylaxis against uterine atony at caesarean section are lower than those routinely used, many clinicians still use generally higher doses. Inappropriate doses of oxytocin have been indentified as contributory to some cases of maternal deaths.

Aim

The main aim of this study was to clinically audit the current standard of practice with regards to the use of oxytocin during caesarean section at a referral hospital in Botswana.

Methods

A clinical audit of pregnant women having a caesarean section (CS) and given oxytocin at the time of the operation was conducted over a three month period. Data including indications for CS; dose regimens of oxytocin; prescribing clinician designation; type of anaesthesia used for the CS; and estimated blood loss were collected.

Results

A total of 139 patients were included. A wide variety of dosing regimens were observed. The most common dose was 20 iu infusion (31.7%). The potentially dangerous regimen of 10 iu intravenous bolus of oxytocin was used in 12.9% of CS. Further doses were utilized in 57(41%) patients. The top three indications for CS were fetal distress

36(24.5%), dystocia 32(21.8%) and a previous CS 25(17%). Estimated blood loss (EBL) ranged from 50-2000 ml. General anaesthesia was the most popular type of anaesthesia used during the study, accounting for 64% compared to 36% where spinal anaesthesia was used. In emergency CS general anaesthesia was used in 81/115 (70.4%) of mothers as opposed to 8/24 (33.3%) of elective CS.

Conclusion

The use of oxytocin during CS in the local setting does not generally follow recommended practice and current literature. This has potentially harmful consequences such as increased maternal morbidity and mortality. Education and guidance by evidence based national practice guidelines and protocols could help alleviate the problem.

INTRODUCTION

The Millennium Development Goals (MDG) are a United Nations initiative that set specific targets for health and development. One of the main targets is the reduction of maternal mortality by 75% by the year 2015.[1]The leading causes of maternal death in the African setting are haemorrhage (33.9%), sepsis/infections (9.7%) and hypertensive disorders (9.1%) according to a World Health Organization (WHO) systemic review of 2006.[2] In South Africa, the National Committee for Confidential Enquiries into Maternal Deaths (NCCEMD) has identified obstetric haemorrhage as the third most common cause of maternal death.[3] Recent statistical briefs from the Botswana Central Statistics Office (CSO) highlight that in 2009, a total of 86 maternal deaths were recorded in Botswana. The leading causes were obstetric haemorrhage (15.1%), unspecified HIV disease (12.8%) and genital tract and pelvic infections (8.1%).[4]The proportion of obstetric haemorrhage occurring in relation to caesarean section is not specified in any of these reports.

Reducing maternal morbidity and mortality is a key Millennium Development Goal (MDG) to which Botswana is a signatory. The maternal mortality rate for Botswana is relatively high for a middle income country (330 per 100 000) and Botswana is not on a trajectory to meet the MDG goal (38 per 100 000).[1] Over 98% of deliveries in Botswana occur in a health facility.[5] Factors that significantly contribute to maternal morbidity and mortality need to be identified and managed in clinical practice. A national Maternal Mortality Audit Committee based in the Ministry of Health exists and reviews all cases of maternal mortality as they are reported.

Oxytocin is a commonly used drug in obstetrics to prevent haemorrhage, as part of a protocol in induction of labour, augmentation of labour, in the presence of a poorly contracting uterus and to maintain good uterine contraction in the third stage of labour. Recent research has identified the optimal intravenous dose for post-caesarean section oxytocin as 3-5 international units (iu) after delivery of the baby, as a single prophylactic dose for all cases to prevent haemorrhage.[6-8] Dose related complications can and do occur and put the life of the pregnant woman at risk. Oxytocin has generally been associated with major complications when incorrectly used. These include fetal hypoxia,

hyperstimulation of the uterus and uterine rupture.[9] When given as an intravenous bolus, oxytocin causes transient hypotension, reflex tachycardia and an increase in cardiac output in a dose related manner.[6,7,8,10] It has also been noted to cause QT prolongation and known to precipitate cardiac arrhythmias.[11]

As well as being a preventive measure, the use of oxytocin in the perioperative obstetric patient may paradoxically also contribute to maternal morbidity and mortality.[12] The recognition of the potential negative contribution of oxytocin during childbirth has resulted in much debate about the appropriate dosing and mode of administration of this important drug.

Caesarean section rates are increasing internationally.[13,14,15,16] As the number of caesarean sections carried out in our hospitals increases, there is also a relative increase in the use of uterotonic drugs like oxytocin needed to arrest bleeding occurring during this major operation. Guidelines have been developed to assist in safe use of oxytocin in order to prevent the morbidity and mortality that may be caused by its adverse effects. Although oxytocin is used routinely, there appears to be variation in the approach of different users with some use clearly outside the recommended approach.[17,18,25]

The current standard of practice with regard to the use of oxytocin during caesarean section at Princess Marina Hospital (PMH) has not been assessed and established through any formal audit. The aim of this study was to establish the current standard of practice in the local setting.

LITERATURE REVIEW

Oxytocin has an established role in the management of post partum haemorrhage (PPH). The adverse effects of oxytocin have been identified as one of the causes of preventable maternal deaths.[12]

Physiology of Oxytocin

Oxytocin is a posterior pituitary hormone and was the first among peptide hormones to have its structure determined and the first to be chemically synthesized in biologically active form.[20] Oxytocin is produced in the hypothalamus, stored in the posterior pituitary

gland and is secreted in a pulsatile manner.[20,43] Oxytocin receptors have been found in the breast, ovary, endometrium and myometrium.[20] Oxytocin binds to a G-protein on the surface of the uterine myocyte. This then leads to the generation of 1,2-diacylglycerol (DAG) and inositol 1,4,5-triphosphate (IP3) through the action of phospholipase C on phosphatidyl-inositol biphosphate(IP2). DAG stimulates prostaglandin release and IP3 triggers the sarcoplasmic reticulum to release calcium.[20,24,43] The increase in intracellular calcium concentration caused by its release from the endoplasmic reticulum is not adequate for a full activation of the myometrial contractile mechanism, and extracellular calcium is necessary for adequate oxytocin action. The oxytocin–G-protein complex causes conformational changes in voltage-operated calcium channels and increases intracellular entry of calcium and decreases its efflux.[21,43] The calcium then binds to calmodulin and activate myosin light chain kinase thus leading to uterine smooth muscle contraction.[20,24]

The number of oxytocin receptors expressed in the myometrium increases as pregnancy advances from 12 weeks gestation.[44] Following continuous and prolonged exposure to oxytocin, there is significant loss in the capacity of the myometrial cells to respond as a result of oxytocin receptor desensitisation.[26,43]

Appropriate dose of oxytocin at caesarean section

Research has been directed at finding the optimal dose of oxytocin that balances the risk of adverse effects with the benefit of preventing haemorrhage during and after caesarean section. The minimum effective dose at elective CS was found to be 0.35 iu given as an intravenous bolus.[19] This landmark study proved that the historically high doses of more than 5 iu oxytocin were not necessary to maintain uterine contractions post-caesarean section as lower doses are equally effective. Other studies have confirmed that doses between 0.5 and 3 iu are effective with fewer side effects.[20,21] More recently, an intravenous bolus of 2 iu was found to be superior to a 5 iu intravenous bolus in women undergoing elective CS. The lower dose was associated with less haemodynamic changes, and less emetic symptoms.[22] Conversely, the minimum effective dose for non-elective caesarean section has been determined to be approximately 3 iu.[23] This apparently higher dose requirement for non-elective CS compared to elective CS is

consistent with existing evidence of oxytocin receptor desensitization following oxytocin exposure during labour.[21,22,26] In view of the oxytocin receptor desensitation from repeated doses, there have been suggestions to consider alternative uterotonics to control haemorrhage occurring as a result of uterine atony despite further doses of oxytocin.[24]

The evidence presented by these studies supports the current low dose recommendations by the Royal College of Obstetricians and Gynaecologists (RCOG) and the National Institute for Health and Clinical Excellence (NICE), both of which recommend 5 iu as an intravenous bolus to maintain uterine contraction during caesarean delivery.[27,28] However, the studies cited above provide evidence for use of even lower doses of oxytocin than is endorsed by current guidelines.

Although recent research has revealed that lower doses are effective, the licensed oxytocin dose for CS is 5 iu by slow intravenous injection, consistent with the current RCOG and NICE guidelines.[29] The literature relating to the appropriate dose of oxytocin at caesarean section appears to be limited to Randomised Control Trails mentioned above. Systematic reviews on the subject have not been reported even though guidelines by professional bodies exist. It is likely that as more research efforts go into investigating oxytocin use during CS that higher level evidence pertaining to dosing will emerge from future systematic reviews.

Appropriate infusion rate

In terms of oxytocin infusion there appears to be no consensus regarding the optimal infusion rates needed to prevent haemorrhage at caesarean section.Different infusion doses of oxytocin (5-20 iu) during elective CS have been investigated and no benefit was found in terms of uterine contraction and amount of blood loss when infusing more than 5 iu of intravenous oxytocin to term pregnant women undergoing elective CS.[30] An infusion of 5 iu (1 iu/min) was not found to be superior to a 5 iu intravenous bolus in terms of estimated blood loss in women undergoing elective CS.[8] A comparative study determined the minimum effective dose at which 90% of elective CS patients were judged to have adequate uterine tone to be 0.29 iu/min. This infusion dose is equivalent to 15 iu of oxytocin in one litre of intravenous fluid given over one hour. [31] The World

Health Organisation (WHO) recommends infusing 20 iu oxytocin in one litre of crystalloid given 60 drops/min over two hours as prophylaxis against bleeding caused by uterine atony during CS.[32]

Inappropriate use of Oxytocin at caesarean section

A survey of 240 obstetric anaesthetists in the UK revealed that 87% of the 179 respondents gave 10 iu oxytocin at caesarean section and 50% of them gave this by rapid bolus.[17] A survey conducted in other countries demonstrated that up to 14% of clinicians use a 10 iu bolus oxytocin.[24]

The Confidential Enquiry into Maternal Deaths in the UK identified the use of 10 iu intravenously as a cause of death during the resuscitation of a hypovolaemic patient during CS in the period 1997-1999.[12,33] In South Africa, two maternal deaths have recently been linked to the use of high doses of oxytocin.[33]

Statement of problem and objective of this study including relevance to Family Medicine

Family Medicine training in Africa prepares doctors to function within the district health system in both primary care and district hospital.[34] Botswana's health care system is based on a primary care model. There are 29 health districts served by 17 primary hospitals and 15 district hospitals.[35] Primary and district hospitals in Botswana are mostly staffed by medical officers (non specialists) who provide general medical and surgical care. Caesarean section and basic obstetric anaesthesia are among some of the competencies required to work in primary and district hospitals. Although recognized as a health district, Gaborone does not have a primary nor district hospital and so PMH is often utilized as such by default.

The recently established medical school at the University of Botswana has started post-graduate training in Family Medicine. Family medicine graduates from this programme will soon form part of the workforce in the country's primary and district hospitals.

Currently there are few locally trained doctors in the country and according to Dr.K. Malefho, the Ministry of Health permanent secretary, more than 60% of all doctors in the

country employed by the ministry are not Batswana. (Personal communication, August 24, 2011) The few Batswana non specialist doctors who work in the primary and district hospitals, began their medical careers at one of the major referral hospitals before being transferred to work in primary and secondary care facilities. Most of the expatriate doctors in primary and district hospitals are non specialists with a diverse medical experience prior to practicing in Botswana. When these medical officers move to independent practice in primary and district hospitals, guidance is needed to assist in their work. Additionally, the variety of educational background of junior doctors in Botswana means that there is likely to be a wide range of practice standards. To mitigate the potential for divergence from established recommendations, local protocols are needed. A national protocol on the use of oxytocin during CS would offer guidance and perhaps curb maternal mortality that may result from inappropriate use of oxytocin in primary and district hospitals. However, before such a protocol is drawn up, the situation needs to be assessed.

The standard of practice with regard to oxytocin in public health facilities has not been reported in Botswana. No protocols are in place to govern the way oxytocin is used during CS in the local setting.

AIMS AND OBJECTIVES

The main objective of this study is to establish the current standard of practice with regards to the use of oxytocin during CS. Furthermore, the study aims to identify areas of concern that may possibly be addressed by issuing locally produced practice guidelines and targeted continuing medical education programmes. This aim will be carried out through the following objectives:

1. To establish and document the doses of oxytocin used at caesarean section at PMH.

2. To establish and document the current routes of administration of oxytocin during caesarean sections at PMH.

3. To establish and document the average estimated blood loss (EBL) during caesarean section at PMH where oxytocin was prescribed.

4. To establish and document the indications for caesarean section where oxytocin was prescribed at PMH.

5. To establish and document the average age of the patients who have caesarean delivery and were prescribed oxytocin at PMH.

6. To compare the rates of emergency versus elective caesarean sections where oxytocin was used.

7. To compare the types of anaesthesia used during caesarean section when oxytocin was used.

8. To compare current practice of oxytocin use in obstetrics at PMH with international best practice.

METHODS

Study design

A clinical audit of current clinical practice involving routinely maintained medical records of patients who had caesarean section at Princess Marina Hospital, Botswana.

Setting

Princess Marina Hospital (PMH) is one of three major referral public hospitals in Botswana**.** It is located in the capital city of Gaborone and serves the greater Gaborone population as well as receiving referrals from other primary and secondary healthcare facilities in the southern part of the country, a catchment population of about a million people. In Botswana, the various clinicians directly involved with the use of oxytocin during caesarean section include medical officers, anaesthetic nurses, obstetrics & gynaecology specialists and specialist anaesthetists. Princess Marina serves as one of the training sites for internship by new medical graduates. The medical workforce of PMH is regularly reshuffled as doctors and nurses are transferred to various primary and secondary health care facilities in Botswana where they work with less specialist supervision. PMH was thus chosen as a setting for the present study as it has a high volume of cases and is a starting point for junior doctors returning from MBBS abroad

doing their housemanship en route to serve in various primary and district hospitals in Botswana.

Princess Marina Hospital provides essential obstetric service for the population of over 191 000 Gaborone residents and additionally receives referrals from primary and secondary health facilities in the southern part of Botswana. A dedicated obstetric and gynaecology theatre is operational on a 24 hour basis catering for emergency and elective operations. Medical officers (non specialists) in the department of obstetrics and gynaecology work on a rotational arrangement to attend to caesarean sections occurring at the hospital. Anaesthesia is similarly offered by the anaesthetic department medical officers, anaesthetic nurses and specialists.

Decisions to perform emergency caesarean sections are made by the on-call medical officer. Decisions about elective caesarean sections are mostly effected by the obstetricians seeing patients referred from the catchment area primary care facilities, through the outpatient obstetric clinics.

All post-caesarean section mothers are admitted to one post-natal ward with an average length of hospital stay of three to five days. Medical records of post CS patients including the anaesthetic record are kept in the ward until the patient is discharged.

Selection / sampling of patients

The study was conducted between 1st March 2011 and 31st May 2011. Data was transcribed from patients' medical records of all women admitted to the post-natal ward following a CS done at PMH where oxytocin was used during and after the operation.

Data Collection

The principal researcher personally reviewed patients' medical notes of all post-caesarean section patients admitted to the ward. These were identified from the admission register kept in the ward. The identified patient's records were cross checked with the theatre record. The medication chart, operative notes and anaesthetic record where reviewed. Only patients who had been prescribed oxytocin were included.

A structured data collection form was developed to gather information on age; dose of oxytocin; route of administration; whether further doses of uterotonics were used; indication for CS; whether CS was elective or emergency; type of anaesthesia; estimated blood loss (EBL); and who prescribed the oxytocin. The information was transcribed into the data collection form and later into an electronic database (MS EXCEL).

Where there was more than one indication for CS recorded on the patient's notes, all were noted as separate indications in the results. Dystocia was taken to include cephalopelvic disproportion (CPD), delayed 1st and 2nd stage of labour and failed vacuum extraction.

Data analysis

Descriptive statistics were used for the analysis of the pooled data. Data was analysed descriptively as frequencies, means and percentages.

Ethical consideration

Ethical approval was obtained from the Health Research Ethics Committee at the University of Stellenbosch and the Research Ethics committees of the Botswana Ministry of Health and the Princess Marina Hospital. A waiver of patient consent was obtained since the study only required examination of routinely maintained medical records.

RESULTS

A total of 139 mothers who had a CS were included in the study with a mean maternal age of 28.9 years [range 16-43 years]. Out of the 139 CS operations included, 24 (17.3%) were elective and 115 (82.7%) were emergency. Table 1 shows that general anaesthesia (GA) was the most popular type of anaesthesia used during the study, accounting for 64% compared to 36% where spinal anaesthesia was used. In emergency CS, general anaesthesia was used in 81/115 (70.4%) of mothers as opposed to 8/24 (33.3%) of elective CS. Use of epidural anaesthesia was not reported.

Table1: Type of anaesthesia in emergency and elective caesarean section

Anaesthesia	Elective n [%]	Emergency n[%]	Total n[%]
Spinal	16 [11.5]	34 [24.5]	50 [36]
General anaesthesia	8 [5.6]	81 [58.3]	89 [64]
Total	24	115	139 [100]

The top three indications for CS were fetal distress 36(24.5%), dystocia 32(21.8%) and a previous CS 25(17%) as shown in Table 2 and Figure 1. One CS was performed for poor maternal effort, a reason not usually recognized as a standard obstetric indication for CS.

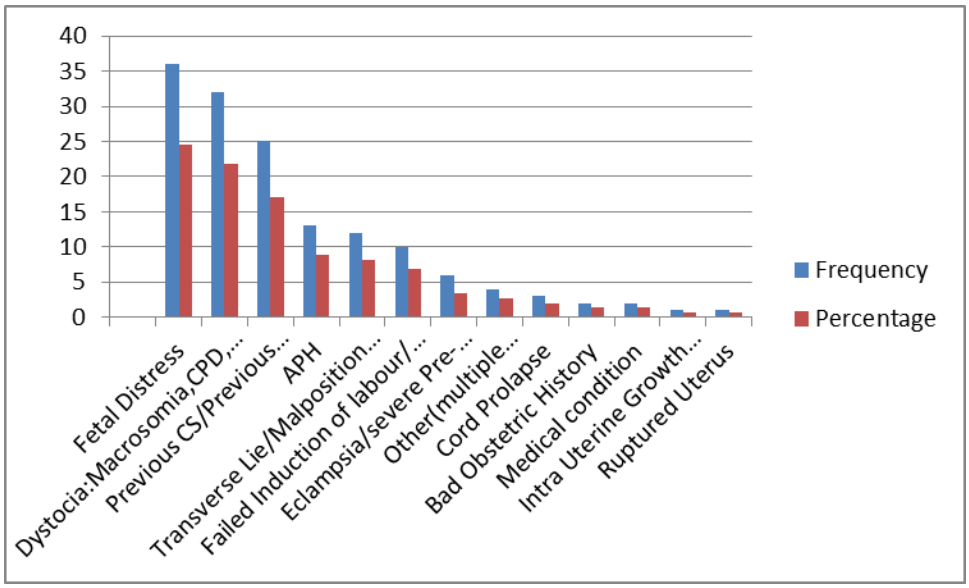
Table 2: Indications for caesarean section (N=139)

Indication	Frequency	Percentage
Fetal Distress	36	24.5
Dystocia	32	21.8
Previous CS/Previous myectomy	25	17
Antepartum haemorrhage	13	8.8
Transverse Lie/Malposition including breech	12	8.2
Failed Induction of labour/ Post dates	10	6.8
Eclampsia/severe Pre-	6	3.4

Eclampsia		
Other(multiple fibroids/twins/poor maternal effort)	4	2.7
Cord Prolapse	3	2
Bad Obstetric History	2	1.4
Medical condition	2	1.4
Ruptured Uterus	1	0.7
Intra Uterine Growth Restriction	1	0.7
Total	***147**	**100**

***where multiple indications were recorded, all were noted as separate indications.

Figure 1: Indications for caesarean section



The different indications for CS were represented to different extents depending on whether the CS was done as an emergency or elective operation. This is shown in Table 3 and Table 4.

Table 3: Indications for Emergency Caesarean Section

Indication	**Frequency**	**Percentage**
Fetal Distress	35	28.2
Dystocia	29	23.4
Previous Caesarean section in labour	14	11.3
Antepartum Haemorrhage	13	10.5
Malposition	12	9.7
Eclampsia	6	4.8
Cord prolapse	3	2.4
Post dates	3	2.4
Failed Induction of labour	2	1.6
Medical condition	2	1.6
Ruptured Uterus	1	0.8
Intra Uterine Growth Restriction	1	0.8
Bad Obstetric History	1	0.8
Twins	1	0.8
Poor Maternal effort	1	0.8
Total	**124**	**100**

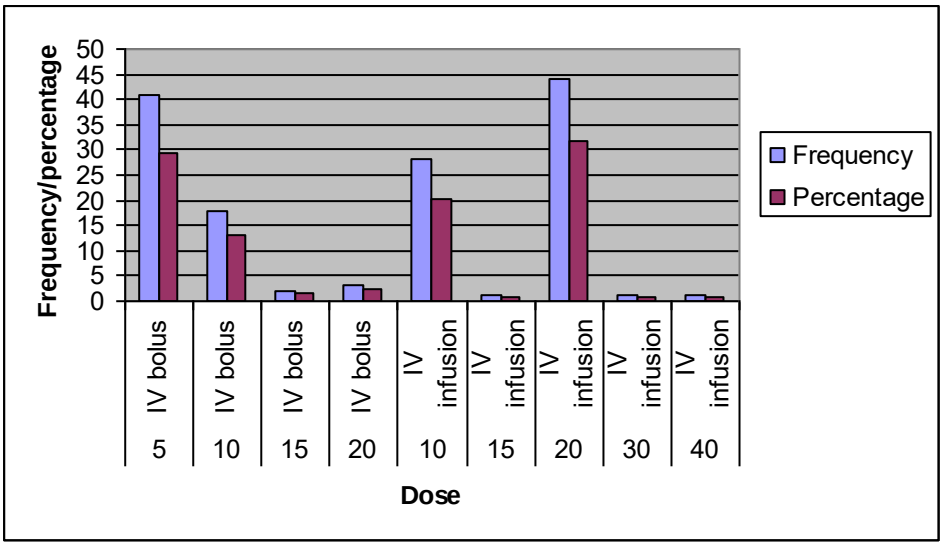
Table 4: Indications for Elective Caesarean Section

Indication	Frequency	Percentage
Previous CS	12	50
Dystocia	6	25
Post dates	5	20.8
Bad obstetric history	1	4.2
Total	**24**	**100**

Prescribing practices differed widely with medical officers and anaesthetic nurses accounted for 100% of patients where the 10 iu intravenous bolus was used despite recommendations against this practice. Anaesthetic nurses accounted for the three patients where an intravenous bolus of 20 iu bolus was used.

Different doses and routes of administration for oxytocin were observed as shown in Figure 2. The most common dose was 20 iu intravenous infusion (31.7%). Other regimens were: 5 iu intravenous bolus (29.5%); 10 iu intravenous infusion (20.1 %); 10 iu intravenous bolus (12.9); 15 iu intravenous bolus (1.4%); 15 iu intravenous infusion (0.7%); 20 iu intravenous bolus (0.7%); 30 iu intravenous infusion (0.7%) and 40 iu intravenous infusion (0.7%).

Figure 2: Different doses and routes of administration of oxytocin



Further doses of uterotonics were utilized in 57(41%) mothers. The regimens used included 10 iu oxytocin intravenous infusion; 15 iu oxytocin intravenous infusion; 20 iu oxytocin intravenous infusion and varying doses of syntometrine given by intramuscular injection.

Estimated blood loss (EBL) ranged from 50-2000 ml. Table 5 shows the mean EBL and the doses of oxytocin prescribed when the EBL was estimated. This is graphically represented in Figure 3 which also shows the frequency of the different doses used. There was no direct relation observed between the EBL and the dose of oxytocin used. A clustering of patients with EBL below 500 ml was observed around the 5 iu intravenous bolus and the 20 iu infusion as shown in Table 6 for the 23 elective CS where EBL was documented.

Figure 3: Estimated blood loss (EBL) and oxytocin doses

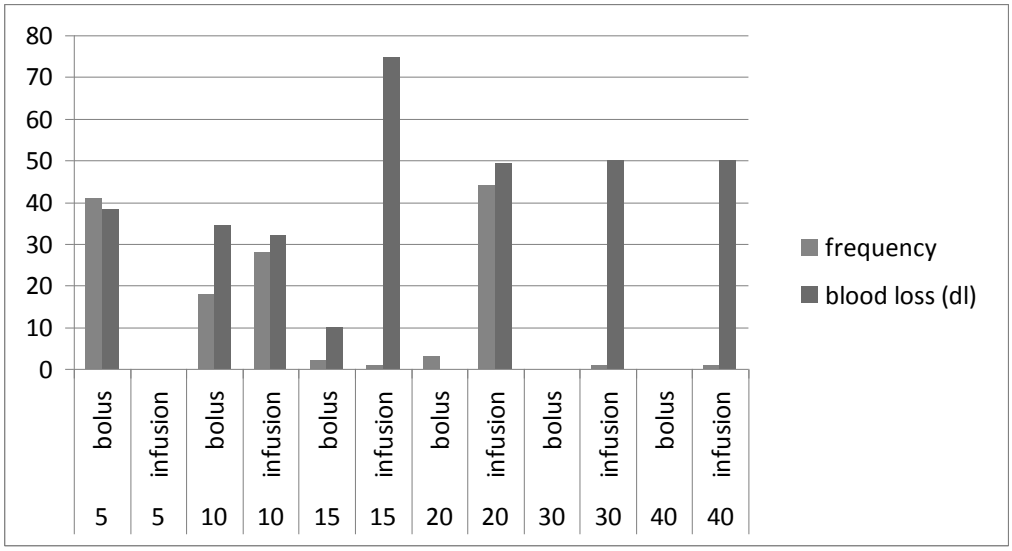


Table 5: Dose of oxytocin used and estimated blood loss.

Dose	**Average Blood Loss (ml)**	**Blood loss range**
5 iu IV bolus	382	100 − 1500
10 iu IV bolus	346	0 − 900
10 iu IV infusion	320	100 − 900
15 iu IV bolus	350	350
15 iu IV infusion	100	100 − 200
20 iu IV bolus	750	300 − 1200
20 iu IV Infusion	493	100 − 2000
30 iu IV infusion	500	500 − 1200
40 iu IV infusion	500	500

Table 6: Blood loss vs oxytocin doses in elective patients

Blood Loss													
	800												
	700								**1**				
	600	**1**											
	500												
	400	**3**							**3**				
	300	**3**							**1**				
	200	**4**							**1**				
	100	**1**			**2**		**1**		**2**				
	0			**1**									
		5 in bolus	5 iu inf.	10 iu bolus	10 iu inf.	15 iu bolus	15 iu inf.	20 iu bolus	20 iu inf.	30 iu bolus	30 iu inf.	40 iu bolus	40 iu inf.
Oxytocin doses													

Inf.: infusion

DISCUSSION

In the present study, it is evident that only 30% of users were adhering to the recommended practice of 5 iu intravenous oxytocin at CS as recommended by the RCOG and NICE guidelines. A total of 31.7% of participants in the study used an infusion of 20 iu in one litre of a crystalloid solution. However, the infusion rate was not recorded as

given over two hours. This shows that the WHO guideline was only partially followed in the study.

Very high doses were occasionally used during the study period. The high doses (20 iu bolus, 30 iu infusion, 40 iu infusion) were used mostly when EBL was more than or equal to 500ml although this observation was not consistent. By definition this degree of blood loss is considered to be post partum haemorrhage and infusions of this magnitude is expected in the management of such. However, in the setting of a CS, 500ml blood loss would be expected. So a dose relationship between blood loss and oxytocin might be expected, but this was not the case in this study. This may be partly due to the mixed population of elective and non-elective CS. The distribution of oxytocin doses in relation to EBL was only analysed among elective patients. [Table 6]. Blood loss is clustered at the lower ranges below 500ml in 21 patients out of the total 23 elective operations where it was documented but the oxytocin doses given ranged from 5 to 20 iu with majority of mothers receiving either a 5iu bolus or a 20 iu infusion. A 20 iu intravenous bolus of oxytocin is not recommended by any of the guidelines and is likely to be associated with adverse effects that could result in significant morbidity and mortality peri-operatively.[6,7,8,10] Estimation of blood loss at caesarean section has been shown elsewhere to vary widely according to a clinician's perception.[21] This is demonstrated by the wide range of EBL demonstrated in this study.

The proportion of emergency to elective CS was high. This is likely due to the fact that high risk pregnancies are referred as emergencies to PHM as a tertiary centre. Note the high rates of dystocia as an indication for emergency CS, which accounted for 29(20.9%) compared to only six (4.3%) done electively. This revelation is surprising considering the fact that over 90% of pregnant women in Botswana have had antenatal follow up and 97% deliver in a health facility.[5] This may mean that dystocia is not adequately predicted clinically in the antenatal period prior to delivery. Dystocia could be predicted and confirmed through clinical pelvimetry, a skill evidently in danger of being lost as a result of lack of training.[36]

However, there is also the issue of definition of CPD as it is generally accepted in obstetrics that CPD cannot be excluded unless oxytocin is used.[36] This implies that CPD

can only be diagnosed in labour when oxytocin has been used. In our study it was not clear as to whether any of the CPD cases received oxytocin in labour prior to the CS. However, all the CPD patients where diagnosed in labour.

Overall, dystocia accounted for 21.8 % of indications for CS placing it among the top three indications for CS. This finding concurs with reports from Ghana where CPD was the second commonest indication for CS.[37] In general terms, this is not too dissimilar to reports that CPD accounts for about 21-53% of all CS births in the developing world.[37]

Fetal distress (FD) was noted as the commonest indication overall for CS and emergency CS where oxytocin was used, contributing 25% and 28.2% respectively. Although this study looked at a subset of pregnant women who were prescribed oxytocin during CS and not all CS, the percentages regarding fetal distress appear high. International studies suggest that rates for fetal distress as an indication for CS were as low as 6-17% in Ghana and as high as 46% in the UK for repeated emergency CS.[37,38]

The significant contribution of fetal distress as an indication for CS in our study begs the question of whether this entity is accurately diagnosed. In our setting, fetal distress is diagnosed on observation of fetal heart rate on cardiotocograph (CTG). Despite the high sensitivity of CTG in detecting fetal distress, it has the disadvantage of having a high rate of false positives as well as inter-and intra-observer variation.[39] Confirmation of fetal distress (FD) through fetal scalp blood pH is not done in our setting. Perhaps this lack of laboratory confirmation of FD inadvertently leads to a lower threshold for diagnosing FD. Although fetal scalp blood sampling is a reassuring test to confirm FD, it is invasive and evidence for its use as gold standard is weak.[40]

The varied practices with regard to dosing and administration of oxytocin during CS revealed in this study, reflects an educational need. It is likely that such a wide variation will contribute to morbidity and mortality and perhaps establishment of protocols would rectify the problem. The groups that strayed from recommended practice most were non specialist doctors (medical officers) and anaesthetic nurses. This suggests that there may be a significant gap in knowledge amongst these groups and the obstetricians. However, during the study this group was also represented in larger numbers than the obstetricians.

This greater representation of medical officers was influenced by the fact that CS is delegated to medical officers in the local setting and obstetricians mostly get involved when their assistance is needed for complicated CS.

General anaesthesia was the most popular type of anaesthesia used, especially in emergency CS. The rates of general anaesthesia appear higher than in other African countries such as Nigeria, which reported a rate of 47.6%.[41] The high uptake of general anaesthesia as opposed to regional anaesthesia in the present study potentially increases anaesthesia related causes of maternal morbidity and mortality. This is supported by the fact that most of the direct anaesthetic deaths reported to the Confidential Inquiries into Maternal Deaths involved general anaesthetic.[42]

The results of the audit were presented at a joint meeting of the department of obstetrics and gynaecology and the department of anaesthesia. There was a general consensus about the need to develop a local protocol on the use of oxytocin during CS.

Strengths and weaknesses of the study

The unique setting of PMH that provides local district hospital type services and regional referral hospital services with a high volume of patients, presents a peculiar advantage in conducting this study. A variety of users were represented in the study with the majority being non- specialists, a situation closer in reality to the staff compliment of primary and district hospitals.

The study did not identify specific individuals (but rather groups) who prescribed specific doses and thus potentially harmful practice could not be linked to specific individuals. However, this is useful in not creating a climate of blame, a clear objective of clinical audit.

The study could not clearly distinguish whether oxytocin was primarily given as prophylaxis or treatment since this was not stated in the patients' records from which data was transcribed. This highlights the fact that patient notes were not being adequately recorded. The question would have been addressed better in a prospective study when prescribers indication for use of oxytocin could have been defined.

Implications and recommendations

A focus on improvement of current clinical practice with regard to the use of oxytocin during CS could follow the following recommendations:

1. Develop a national protocol for prophylactic use of oxytocin at caesarean section. Such a protocol should take into account currently available data presented in scientific literature and reviewed here. The protocol should afford a choice to use a slow bolus of 5 iu or less OR an infusion of 20 iu in one litre of crystalloid given over two hours.

2. Junior doctors, anaesthetic nurses and non-specialist doctors transferred to primary and district hospitals should be targeted for Continuing Medical Education (CME) activities that include training on appropriate use of oxytocin at CS. This should also be addressed in the initial training of these clinicians and that of family physicians as they rotate through the departments of obstetrics and anaesthetics.

3. The results of the audit to be discussed at departmental meeting of obstetrics and anaesthesia and at a general clinical meeting (grand rounds) at PMH.

4. Review (re-audit) to complete the cycle through similar processes after implementation of recommendations. These could be done as early as three months after implementation of the recommendation.

CONCLUSIONS

The use of oxytocin during CS in the local setting does not generally follow recommended practice and current literature. This has potentially harmful consequences such as increased maternal morbidity and mortality. Education and guidance by national practice guidelines and protocols could help alleviate the problem. This audit could be used as a baseline for future assessment of clinical practice at PMH and as a stimulus to similar clinical audits in other centres.

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