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2013-05-14
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PROFILES AND OUTCOMES OF WOMEN UNDERGOING HYSTERECTOMY FOR PRIMARY POSTPARTUM HAEMORRHAGE AT CHRIS HANI BARAGWANATH HOSPITAL

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Medicine in the branch of Obstetrics and Gynaecology

Johannesburg, 2012

DECLARATION

I, Taheera Hassim, declare that this research report is my own work. It is being submitted for the degree of Master of Medicine in the branch of Obstetrics and Gynaecology in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

---------- day of----------, 2012

In memory of my father
Sikandar Hassim Kalla
1949-1994

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Publications and Presentations:

Hassim T. Profiles and outcomes of women undergoing hysterectomy for primary postpartum haemorrhage at Chris Hani Baragwanath Hospital. Twenty Nineth Conference on Priorities in Perinatal Care in South Africa.

Hassim T. Profiles and outcomes of women undergoing hysterectomy for primary postpartum haemorrhage at Chris Hani Baragwanath Hospital. Annual Ethicon Registrar Symposium September 2010.

Acknowledgements

The author acknowledges the assistance of Dr Karlyn Frank and Professor EJ Buchmann from Chris Hani Baragwanath Hospital in completing this research report.
We are grateful to the department of medical records of Chris Hani Baragwanath Hospital for helping with the identification of records for the collection of data.

ABSTRACT

Objective

The study aimed to identify the profiles and outcomes of women undergoing hysterectomy for primary postpartum haemorrhage (PPH).

Methods

This was a retrospective descriptive study of maternal records of all women that underwent hysterectomy for primary postpartum haemorrhage (PPH) from January 2008 to December 2008

Results

Twenty-seven women underwent hysterectomies for primary postpartum haemorrhage (PPH). Eighty nine percent of the women were booked, with a mean of 4.8 antenatal visits. Previous caesarean section and retained placenta were the main risk factors associated with hysterectomy for PPH, with retained placenta being the principle etiological factor (37% of cases). Forty percent of patients had one or more previous caesarean section. Atony was the leading cause of emergency hysterectomy (63%) Subtotal hysterectomy appeared to be the procedure of choice (70% of cases) Conservative management was not attempted in most cases. After hysterectomy, 18(29%) of women were admitted to the multidisciplinary intensive care unit. Two women died (7%).

Conclusion

Postpartum haemorrhage requiring hysterectomy appears to be an unpredictable emergency with no specific risk profile for peripartum hysterectomy. Conservative management could have been attempted more frequently. The findings have implications

for peripheral hospitals that manage obstetric patients who have no specific risk factors for PPH The possibility of emergency hysterectomies exists for all births and health workers need to be able to recognize and manage this emergency appropriately. Peripartum hysterectomy (PPH) may be a lifesaving procedure and every obstetric doctor needs to be proficient in performing a subtotal hysterectomy at the very least

Introduction

Background and literature review

Throughout the world, over 600 000 women die annually during pregnancy and childbirth.[1] The global maternal mortality ratio is estimated at 400 per 100 000 live births.[2] Maternal deaths from obstetric haemorrhage are one of the top 5 causes of maternal mortality.[3] Obstetric haemorrhage is a leading cause of more than half of all maternal deaths occurring within 24 hours of delivery.[4] According to The Practice Bulletin from the American College of Obstetricians and Gynaecologists, • it is estimat that, worldwide, 140 000 women die of postpartum haemorrhage (PPH) each year, one every 4 minutes.[5] Over the years the peripartum hysterectomy has become a life-saving procedure in cases of intractable postpartum haemorrhage or when conservative measur have failed.

In developed countries, PPH ranks in the top 3 causes of maternal mortality. In South Africa obstetric haemorrhage is one of the five leading causes of maternal death.[6] The direct pregnancy-related maternal mortality rate in the United States is approximately 7-10 women per 100 000 live births and national statistics suggest that approximately 8% of these deaths are caused by PPH.[7] In the most recent Triennial Confidential Enquiry into Maternal Deaths in the United Kingdom (2003-2005), PPH also remained one of the top three direct causes of maternal deaths.[8]

WHO estimates that 529 000 women die each year from pregnancy-related causes and almost all these deaths occur in developing countries. The reason is the lack of resources.[9] World-wide 150 000 women per year bleed to death during or immediately after labour.[10] In developing countries PPH contributes to 17% to 40% of maternal mortality and 40% of maternal morbidity.[11] In low income countries the risk of maternal death from postpartum haemorrhage is approximately 1 in 1000 deliveries[12] as opposed to the UK where the risk is about 1 in 100 000 deliveries.[13]

The ultimate weapon in our arsenal against postpartum haemorrhage is the hysterectomy. However, before we reach this stage it is important that we identify the patient in need of this intervention and exhaust all possible medical and fertility preserving surgery before this procedure is resorted to. This is what the bulk of the literature review shall focus on.

The rates of peripartum hysterectomy and risk factors will be discussed later in the literature review.

Quantifying Postpartum Blood loss defining PPH

The definition of PPH is generally vague and problematic. PPH is defined as blood loss of more than 500 ml following vaginal delivery and more than 1000 ml following caesarean delivery.[14] the classification has also been based on the timing of the onset of bleeding in relation to the delivery. Haemorrhage within the first 24 hours of vaginal delivery is termed 'primary' postpartum haemorrhage, whereas bleeding occurring later but within 6 weeks of delivery, is termed 'secondary' postpartum haemorrhage.[15]

Estimates of blood loss at delivery are subjective, unreliable and inaccurate. Studies have suggested that caregivers consistently underestimate true blood loss.[16-18] It has been suggested to use a 10% fall in hematocrit value to define PPH, but this change is dependent on the timing of the test and the amount of fluid resuscitation given.[19]

It is important to consider the differing capacities of individual patients to cope with blood loss. A healthy woman has a 30-50% increase in blood volume in a normal singleton pregnancy and is generally tolerant of blood loss. Haemodynamic compensation may be poor in the woman who has a preexisting anaemia, an underlying cardiac condition, or a volume-contracted condition secondary to dehydration or pre-eclampsia. Therefore, various authors have suggested that PPH be diagnosed with any amount of blood loss that compromises the haemodynamic stability of the woman.[20,21,22]

Most blood loss related to childbirth occurs within the first hour after birth, and the most frequent cause of haemorrhage is early postpartum uterine atony.[23] In clinical practice, the amount of blood lost during childbirth is usually visually estimated by the birth attendant.

Visual estimation is the most frequently practiced method of determining blood loss during childbirth globally. This method is still used despite repeated studies showing its inaccuracy.[21] Prasertcharoensuk compared visual estimation with direct measurement of blood loss during vaginal birth.[22] The incidence of PPH was underestimated in the visual estimation by 89%. Duthie and colleagues found that actual blood loss was higher

than estimated blood loss during vaginal births; the underestimation increased as the quantity of blood loss increased.[20]

Risk factors For Postpartum Haemorrhage (PPH)

Risk factors for PPH are not necessarily the same for peripartum hysterectomy which is why we undertook this study, as risk factors for peripartum hysterectomy for the most part occur during labour and delivery

Clinicians should try to identify risk factors antenatally and during labour so that high-risk women should be delivered at the highest level of care. However, significant life threatening bleeding can occur in the absence of risk factors and without warning. All caregivers and facilities involved in maternity care must have a clear plan for the prevention and management of PPH. This includes resuscitation skills and familiarity with all medical and surgical therapies available. Well practiced drills should also be in place

The risk factors for postpartum haemorrhage as mentioned in the literature are retained placenta, failure to progress in the second stage, hypertensive disorders of pregnancy, induction of labour and instrumental deliveries.[24] These are all intrapartum risk factors except for hypertensive disorders which may be the only risk factor discovered antenatally. From a study by Sheiner, pre-eclampsia was a definite risk factor for PPH as was receiving a blood transfusion previously.[24] In a study by Bracero, an association between emergency caesarean section and major haemorrhage was due to the indication for caesarean delivery or to the procedure itself was identified.[25] Further and well known

risk factors for PPH include an overdistended uterus either due to a large fetus, polyhydramnios or multiple pregnancies.[26] Precipitate labour and those in which oxytocin has been used to augment labour are at risk for PPH. High parity and intrauterine infection are also predisposing factors to postpartum haemorrhage.[27] The administration of a general anaesthetic has also been shown to be associated with PPH.[28]

According to a study done by Machado, emergency peripartum hysterectomy was found to be more common following caesarean section than vaginal delivery and the predominant indication for emergency peripartum hysterectomy was abnormal placentation (placenta previa/accreta), uterine atony and uterine rupture.[29] However the risk factors identified in Machado's study were previous caesarean section, scarred uterus, multiparity and older age groups.[29]

Prevention of Postpartum Haemorrhage

PPH is mostly unpredictable. Up to 90% of women who experience PPH have no previously identifiable risk factors.[30] Uterine atony has been implicated in 70 to 90% of all PPH cases.[30] • Active management of the third stage of labour (AMTSL) can prevent 60 % of uterine atony and is an evidence-based, feasible, low-cost intervention.[30] Prevention of PPH can significantly reduce maternal mortality and morbidity.

The Bristol[31] and Hinchingbrooke[32] randomized control trials provided evidence that AMTSL significantly reduces postpartum haemorrhage, decreases blood loss, and decreases the need for blood transfusions.

The International Confederation of Midwives (ICM) and the International Federation of Gynaecology and Obstetrics (FIGO) are advocating AMOTSL (Active management of the third stage of labour) in order to reduce maternal mortality.[30] In a joint statement issued in November 2003, they state that the usual components of active management of the third stage of labour include:

- Administration of uterotonic agents (the drug of choice is oxytocin, 10 units intramuscularly).
- Controlled cord traction.
- Uterine massage after delivery of the placenta.

ICM and FIGO further stated that "Every attendant at birth needs to have the knowledge, skills and critical judgment needed to carry out active management of the third state of labour and access to needed supplies and equipment.",[30]

If bleeding continues despite the active management of the third stage of labour and the health care attendant has diagnosed PPH the following medical therapies should be attempted.[33]

Drug	Oxytocin (Drug of choice)	Ergometrine	Misoprostol	Prostaglandin F2„
Efficacy	Highly effective	Effective	Less effective than oxytocin	Effective
Response time	Acts in 2-3 minutes	Acts in 6-7 minutes	Acts in 13-42 minutes	Acts in 3-10 minutes
Route of administration	Intravenous/ intramuscular	Intravenous/ intramuscular	Oral or per rectum	Intravenous/ intramyometrial
Storage	2€8° C	2€8° C	Room temperature	2€8° C
Side effects	Minimal Hypotension, Fluid overload,	GIT effects, Headache Convulsions, Elevated BP	Shivering, elevated temperature, GIT effects	Bronchospasm, GIT effects
Contra indications		Hypertension, Cardiac disease, Raynauds phenomenon	Known allergy to prostaglandins	Hypertension, Cardiopulmonary disease, thyroid disease, asthma

Table 1: Medical First Choices

2. Bimanualcompression of the uterus

Bimanual compression of the uterus can be both temporizing as well as definitive treatment for PPH. This method involves grasping the fundus through the abdominal wall andinsertion of a fist into the posterior fornix. The aim is to manually fold the uterus on itself thereby reducing atony.

3. Anti-shock trousers

Recently the use of the anti-shock garment has been found to stabilize the patient while awaiting definitive treatment by compressing peripheral vessels and centralizing blood flow. Although we did not have access to this garment in our hospitals it is being tested in other African countries[34]

4. Intrauterinetamponade

Once medical therapy fails to control postpartum haemorrhage, internal uterine tamponade should be considered. The principle behind tamponade of the uterine cavity is that temporary and steady mechanical compression of the bleeding surfaces of the placental site can be performed whilst awaiting natural haemostatic mechanisms to occur or whilst awaiting transfer to a higher level of care. An examination under anaesthesia should be carried out to exclude lacerations, retained placental tissue and to expel clots from the uterine cavity. Thereafter the following tamponade procedures may be attempted and are usually left in place for 24hours

a) Sengstaken-Blakemore Tube

There is no diagnostic test to identify those patients with haemorrhage that need surgery but Condous and colleagues proposed the use of an inflated Sengstaken Blakemore balloon catheter to identify patients who will or will not need surgery (…tamponade test*ƒ*).[35] This is a prognostic test which is not limited to the Sengstaken Blakemore tube. If the tamponade test is positive, the possibility of uterine preservation exists and this also gives an opportunity to reverse and correct any consumptive coagulopathy.[36,37,38] In a series of studies, tamponade successfully prevented surgery in 83-87% of cases.[35,36] It is simple and easy to use, and does not require special skills for utilization. It has not been designed for the shape of the uterus and may be costly in a resource poor setting.[37]

Figure 1: Sengstaken-Blakemore tube[37]

b) Rusch hydrostatic urological balloon

It is similar to the Sengstaken Blakemore tube.[39] It is easy to use and does not require skill. It is cheaper than the Sengstaken Blakemore tube and has an overturned pear-shape that better fits the uterine cavity, with less risk of self expulsion.[37] Insertion does not require anaesthesia, and removal is painless and simple.[39]

Figure 2: Rusch Balloon[37]

c) The Bakri balloon

The SOS Bakri tamponade balloon catheter has been designed to provide temporary control and reduction of postpartum uterine bleeding when conservative management is warranted.[37,40] It can be inserted in theatre or in the labour ward after both vaginal or caesarean delivery. The balloon can also be inserted at the time of caesarean section after delivery of the placenta. The balloon is inserted under ultrasound guidance or blindly and inflated to the required volume (250-500ml of fluid medium) needed to arrest the bleeding. Following vaginal delivery, the balloon portion of the catheter is inserted into the uterus vaginally through the internal os of the cervix. After caesarean delivery, the deflated balloon is passed through the caesarean incision into the uterine cavity with the inflation port passing through the cervix into the vagina. The uterine incision is then closed. It is important to avoid puncturing the balloon while suturing the uterine incision. A vaginal swab soaked with an antiseptic solution is inserted into the vaginal canal to maintain correct placement of the balloon and maximize the tamponade effect. The balloon is then inflated with warm sterile fluid (not gas) to the desired volume for tamponade.[41] It may be left in the uterus for 24-48 hours.

Gentle traction on the balloon shaft ensures correct contact between the balloon and the tissue surface, this enhances the tamponade effect. Should blood loss decline through the drainage port and fluid connecting bag, the Bakri balloon can be assumed to be successful. However this innovation is expensive in and may not be available in resource poor settings.[37]

Figure 3: Bakri Balloon[37]

d) Foley catheter

A foley catheter balloon can also be used for intrauterine tamponade.[43] A 24F Foley catheter balloon bulb can reach 150ml before it bursts. Multiple catheters may be used but this cannot ensure complete compression of the uterus. However it may be worth trying in limited resource settings.

e) Hydrostatic condom catheter

It consists of a sterile rubber catheter fitted with a condom as the tamponade device.[44] The catheter is inserted within the condom and tied near the mouth of the condom with a silk thread, whilst the outer end is connected to a saline administration set. After placement into the uterus, the condom is inflated with 250-500ml of saline. The outer end of the catheter is folded and tied with silk once bleeding has stopped.[37] The vaginal cavity is packed with roller gauze and sanitary pads to keep the balloon in situ. It is kept for 24-48 hours. This is a cheap and easy method of tamponade in resource poor countries.

f) Uterine packing

It is not an ideal technique to control major haemorrhage, but can be used should balloon catheters or balloons not be available.[45] This technique entails carefully placing several lengths of gauze into the uterine cavity in order to occlude the uterine space. There are many disadvantages to this[37]:

- Experience is required to pack properly.
- It needs to be done quickly.

- Continual haemorrhage may be difficult to recognize early because blood needs to soak through the pack in order to reveal ongoing haemorrhage.
- It is difficult to assess compressibility of the pack and thus efficacy of tamponade.
- There is risk of trauma and infection.
- Removal of the pack may necessitate a separate surgical procedure under anaesthetic.
- This method of tamponade may be used while arranging transfer of the patient to the next level of care.[37]

5. Embolization

The main objective of embolization is to stop active bleeding from the uterus or birth canal and to prevent further haemorrhage. For this procedure there needs to be a experienced radiologist who is available at all times. Patients must be stable in order for this procedure to be carried out. In facilities where this is available, it should be the procedure of choice prior to surgery when other options have been exhausted.

Currently, most PPH cases requiring hysterectomy are related to placenta praevia. These patients can be commonly diagnosed before delivery and are usually delivered by elective caesarean birth. This planning may allow increased use of invasive radiological services in the management of such cases. Post-procedure complications such as fever, uterine necrosis, vascular perforation, and infection have been described.[46] There is limited data on future fertility after this procedure.[47]

A Severe Postpartum Haemorrhage Score (SPPH) comprising of five independent predictors has been described in identifying patients with PPH at risk of persistent genital tract bleeding and who will need an interventional haemostatic procedure.[48]

The five parameters used to make up the score are:

1. Abnormalities of placental implantation
2. Prothrombin time
3. Heart rate
4. Fibrinogen
5. Troponin I detectable[48]

The higher the SPPH score, the more likely the need for an advanced interventional procedure such as embolisation. However, locally this service has not been employed routinely in our hospitals.

6. Conservative Surgical Management

Previously the surgical management of postpartum haemorrhage consisted of using an intrauterine pack, ligation of uterine arteries, stepwise devascularization and the last resort, subtotal or total hysterectomy.[37]

a) The B-Lynch Suture

In 1997, the Brace suture technique was first described by B-Lynch and colleagues.[49] The B-lynch suturing technique may particularly be useful because of its simplicity of application, life saving potential, relative safety and capacity for preserving the uterus and thus fertility. So, it should be considered as first line surgical treatment before resorting to hysterectomy.[49]

A laparotomy is necessary to gain access to the uterus. A Foley's catheter must be inserted prior to the laparotomy. A lower segment transverse incision is made or the recent lower segment caesarean section scar is removed. The uterine cavity is checked for retained placental fragments and swabbed out. The compression test, testing for the likely success of the B-Lynch suture is carried out prior to performing the procedure. The patient is placed in the Lloyd Davies or semi-lithotomy position. The vagina is swabbed by the assistant; who stands between the patient's legs in order to determine the presence and extent of the bleeding; while bimanual compression of the uterus is performed. The whole uterus is compressed by placing one hand posteriorly with the ends of fingers at the level of the cervix and the other hand anteriorly just below the bladder reflection. If the bleeding ceases on applying compression, application of the B-Lynch suture will probably be successful.[37,49]

The bladder is displaced inferiorly. The first stitch is placed 3 cm below the caesarean section/hysterotomy incision on the patient's left side and threaded through the uterine cavity to emerge 3 cm above the upper incision margin approximately 4 cm from the

lateral border of the uterus. The suture is then carried over the top of the uterus and to the posterior aspect. Once passed over the fundus, the suture should be vertical and lie about 4 cm from the cornua.

The suture is continued along the posterior surface of the uterus, then fed anteriorly and vertically to enter the posterior wall into the uterine cavity at the same level as the upper anterior entry point. The suture is then pulled under moderate tension assisted by bimanual compression exerted by the assistant. The suture is looped over the posterior surface of the fundus of the uterus and again over onto the anterior surface on the right side of the uterus. The needle is passed 3cm from the lateral border about 3cm above the caesarean section incision and exits 3cm below the incision. The two lengths of the suture are pulled taut assisted by bimanual compression to minimize trauma. The suture is tied about 3cm below the caesarean incision. The vagina is swabbed out by the second assistant and checked to ensure that the bleeding is controlled. The uterine incision is sutured closed. It is important that the assistant maintains compression of the uterus throughout the procedure to minimize bleeding and sutures slipping. The aim is to provide compression.[37,49] Vicryl is the suture of choice.

Figure 4: B-Lynch Compression Suture[37]

The Brace suture is very useful even in cases of placenta praevia and accreta. Moreover, the technique is simple and safe enough for junior doctors and trainees to learn and apply as identification of specific blood vessels is not required.[50] In a recent study, Smith and Baskett[51] assessed the use of B-Lynch suture as an alternative to hysterectomy for severe postpartum haemorrhage. In 7 cases of uterine atony at the time of caesarean section, all of which were unresponsive to all oxytocic agents, a B-Lynch compression suture was inserted before the decision to proceed to hysterectomy. In 6 out of 7 women, the bleeding was controlled with the suture. They concluded that the B-Lynch Compression Suture is easy to apply and should be considered in cases of severe atonic uterus when oxytocic agents fail, and before resorting to hysterectomy.[51]

Wergeland also concluded that stepwise devascularization and hysterectomy are technically difficult and time consuming while B-Lynch if performed early, is less multilating to women and can arrest serious postpartum haemorrhage.[52] In their study, they experienced 100% success. Hence, B-Lynch suturing technique has been successfully applied with no obvious problems to date and no apparent complications.[52]

In 2002, Hayman described a simplified uterine compression suture.[53] It is performed by tying two parallel vertical sutures from just above the bladder reflection to the fundus of the uterus. The vertical apposition sutures are commenced 3cm from the lateral border of the uterus passing the suture from the anterior wall through the posterior wall reaching the surface of the uterus at the level of the internal cervical os. The suture is then looped

over the fundus. The suture is tied with a three knot technique. Up to 4 sutures can be applied. The technique is quick, easy and cost effective and can be adopted even by the most junior obstetrics registrar or medical officer. Unlike the B-Lynch suture there is no need to open the lower segment especially when PPH follows a vaginal delivery. A recent study conducted over 5 years, application of the Hayman stitch avoided hysterectomy in 93.75% patients with PPH.[54] It was noted in the study that the Hayman stitch was only applied in haemodynamically stable patients and not shocked or unstable patients; therefore accounting for such a high success rate. The postoperative course in this study was uncomplicated and did not affect fertility or uterine anatomy in the follow up at caesarean section.

Figure 5: Hayman suture[37]

In 2003, Cho proposed a •box, suturing technique. The suture is passed from the anterior wall through the posterior wall in a box like application of 4cm in size from the fundus to the lower segment in order to obliterate the uterine cavity. Multiple through-and-through square sutures can be applied to cover the entire body of the uterus. These can be extremely useful in bleeding from placenta praevia.[37]

Figure 6: Cho Suture[37]

A variety of surgical techniques have been proposed to avoid hysterectomy, each is associated with identifiable benefits and risks. Simple conservative measures should be tried first. Ligations of ovarian, uterine or internal iliac arteries are complex measures that are also recommended, however these require sufficient training and skill. Obstetricians should be aware that a higher risk of failure of the procedure is to be expected in case of PPH due to morbidly adherent placenta. In such a situation, to avoid any delay in management, the literature suggests that peripartum hysterectomy should be immediately considered.[55,56,57] O'Leary found bilateral uterine artery ligation helpful in 95% of cases, however, the technique failed in cases of placenta previa or accreta.[55,56]

Bilateral internal iliac ligation is successful in arresting hysterectomy in about 50% of the cases. However, delay in carrying out this procedure leads to a poor prognosis. It also has a number of recognized potential complications, including ligature of the external iliac artery, damage to internal or external iliac veins, ureteral injury and causing retroperitoneal hematoma.[58,59]

b) Systematic devascularisation of the uterus

1) Uterine artery ligation

Uterine artery ligation is a relatively simple procedure that can be performed by most obstetricians, and can be highly effective in controlling bleeding from uterine sources. These arteries provide approximately 90% of uterine blood flow. Although the uterus

may remain atonic, blanching is usually present but the blood flow is greatly diminished or arrested when both arteries are ligated.

The broad ligament is opened on either side and both index fingers are directed medially towards the lateral border of the uterus separating the tissue for about 3-5cm both upwards and downwards. This allows visualization of the ureter and uterine artery. A vicryl/1 suture is inserted around the uterine artery incorporating 1.5cm of the myometrium either at the level of the internal cervical os or 1.5cm above it. The artery does not need to be transected. Unilateral occlusion may sufficiently stop bleeding.

In a series of 265 cases, O'Leary reported a 95% success rate using this procedure in PPH unresponsive to uterotonics in patients who had a caesarean births.[56] Another series of 103 cases had a 100% success rate if a stepwise approach was taken.[57] Ovarian artery ligation was performed if required. Menstrual flow and fertility were not adversely affected.[57,60]

2) Ovarian artery ligation

The ovarian artery arises directly from the aorta and eventually anastomoses with the uterine artery in the utero-ovarian ligament. Ligation is performed just inferior to this point in a manner similar to that of uterine artery ligation. The suture is placed 1-1.5cm below the medial attachment of the suspensory ligament of the ovary; incorporating 1.5cm of the myometrium. The amount of uterine blood flow supplied by these vessels

may increase following uterine artery ligation. The procedure is easy to perform; however, the potential benefit must be weighed against the time required to perform the variousligations.

3) Internal iliac artery ligation

Internaliliac artery ligation can be effective to reduce bleeding from all sources within the genital tract by reducing the pulse pressure in the pelvic arterial circulation, thus converting an arterial system into a venous system.[59] One study indicated that pulse pressure was reduced by 77% with unilateral ligation and by 85% with bilateral ligation.[61] Internal iliacartery ligation is more difficult to perform and more commonly associated with damage to nearby structures. In patients who undergo internal iliacartery ligation, uterine artery ligation has usually already failed.

Prerequisites for the procedure include a stable patient, a surgeon experienced in the procedure, and a desire to maintain reproductive potential.[62] The round ligament is clamped 3cm medially from the pelvic sidewall. The retroperitoneal space is entered by creating a space using the index fingers bilaterally into the broad ligament and gently pushing down towards the lateral sidewall in both upwards and downwards directions. This allowsexposure of the common iliac bifurcation and the internal iliac artery. The internal iliac artery traverses inferiorly for 3cmand divides into anterior and posterior divisions. Ligation may involve the common iliac artery or just the anterior division. The tip of a Roberts-type forceps or Lahey forceps is placed between the proximal 2cm common iliac artery or just the anterior division; and the iliac vein. A separation is made

between artery and vein. A vicryl/1 suture is looped through the partition and around the artery. One or two sutures can be used, however it is not necessary to cut the arteries. Bilateral ligature is more effective than a unilateral procedure and reduces the chance of returning to theatre for further surgery.

Hysterectomy is required if internal iliac artery ligation is unsuccessful. Patients in whom internal iliac artery ligation has failed have greater morbidity than those in whom the procedure has not been attempted. The likelihood of benefit from the procedure must be balanced against the potential risks.

Figure 7: stepwise devascularisation[37]

Figure 8: Ligation of internal iliac artery [37]

7. Pelvic pressure pack

Once emergency hysterectomy is done as a last resort,[63] if severe haemorrhage may continue as a result of a secondary coagulopathy. A simple pelvic pressure pack device can be an invaluable, low-tech tool for stemming catastrophic postpartum bleeding. It was first described in the medical literature in 1926 by Logothetopulos, for the management of uncontrollable bleeding after hysterectomy.[64] It is also known as a mushroom, parachute, umbrella, pelvic pressure pack or Logothetopulos pack.

The pelvic pressure pack, which consists of a sterile bag filled with gauze rolls tied end to end, is placed through a transabdominal incision into the pelvis; the surgeon reaches up through the vagina to pull the pack's "stalk" out through the perineum and applies traction by attaching a litre of intravenous fluid to the stalk and letting it hang over the edge of the table. The thickness of the pack depends on the discretion of the surgeon. The pressure pack is a very useful device that is cheap and easy to construct in a resource-limited setting such as developing countries. It is useful especially where skills such as pelvic vascular ligation and selective arterial embolization are lacking.

The abdomen can also be packed with dry laparotomy packs wrapped in large Opsite dressings to prevent adhesions between the packs and pelvic organs. This will however require a repeat laparotomy 24-48 hours later for removal of the packs.

8. Recombinant Factor VIIa

Human recombinant factor VIIa (rFVIIa) is a new treatment modality that has been shown to be effective in controlling severe, life-threatening haemorrhage. Recombinant activated factor VIIa was developed for the treatment of spontaneous and/or surgical bleeding episodes in patients with Haemophilia A or B with formation of alloantibodies to FVIII or FIX after replacement. It acts on the extrinsic clotting pathway. Patients who develop massive, life-threatening postpartum haemorrhage often have a combination of a coagulopathic state and surgical bleeding. [38,40]

Administration of human recombinant factor VIIa may control the coagulopathic component of bleeding. Clinical experience presently suggests that rFVIIa is an effective haemostatic measure in severe obstetric haemorrhage. It may serve as an adjunctive treatment to surgical haemostasis as well as therapy where postpartum haemorrhage is refractory to current pharmaceutical and conservative surgical techniques. [38]

It is a very expensive treatment modality that is not available in resource poor centres. Doses vary from case to case and can be given every 2 hours between 100-150 mcg/kg until haemostasis is achieved. The literature states that haemostasis can be achieved between 10 to 40 minutes from administration. However there is a significant risk for a thromboembolic event. [40]

Peripartum hysterectomy

Introduction

In 1869, Horatio Storer performed the first caesarean hysterectomy in the United States. Initially this procedure was performed for emergency situations, but in the early 20th century it became an accepted means of sterilization[65]. Thereafter, Porro of Milan described the first caesarean hysterectomy in which the infant and mother survived; the procedure is frequently referred to as the Porro operation in his honor.[66]

Table 2. Incidence of peripartum hysterectomy/1000 live births – High Income Countries.

North America[38]	0.8
Canada[67]	0.46 (1998-2000)
Canada[67]	0.26 (1991 – 1993)
Ireland[68]	0.2 (1996-2005)
USA[69]	0.8

Table 3. Incidence of peripartum hysterectomy/1000 live births – Low Income Countries.

Nigeria[70]	4.0
Asian[71]	7.0
Pakistan[72]	5.5
Abbotabad (Pakistan – private hospital)[73]	0.1
King Edward Hospital (Durban)[74]	1.7

There is a considerable difference in the incidence of peripartum hysterectomy throughout the world. The differences can be attributed to the standard of obstetric services available, awareness of antenatal care and effective family planning service in

communities. It is believed in general, peripartum hysterectomy complicates about 1 in 1000 deliveries.[75]

In low income countries the maternal and child health care delivery system are poorly developed. The majority of patients are unbooked and come from poverty stricken areas. Labour wards are busy and understaffed, and management is not always optimal. Inappropriate use of the partogram results in prolonged labour, neglected prolonged second stage of labour and trauma. Delays in referral and lack of transportation contributes to poor outcomes. These are all significant risk factors for postpartum haemorrhage and are more common in the developing world.[74] In a local South African series, in King Edward VIII Hospital in Durban, Moodley et al found the rate to be 1.7/1000 deliveries[74], whereas in a study in Ghana the rate was 4.34/1000 deliveries.[76] These differences in the incidence of peripartum hysterectomy may be explained by the different levels of sophistication in obstetric health care and the patient health status.

The incidence is markedly low in developed countries due to good antenatal care; improve literacy rate and good nutritional and social factors. In the United States, the incidence is 0.08% of all deliveries[69] Perhaps postpartum haemorrhage is treated conservatively by sophisticated measures and drills before peripartum hysterectomy is resorted to.

In Canada, the peripartum hysterectomy rate for haemorrhage rose from 0.26 per 1000 deliveries in 1994-1993 to 0.46 per 1000 deliveries in 1998-2000[67], whereas in an Irish

study it fell from 0.85 per 1000 deliveries in 1966 to 1975 to 0.2 per 1000 in 1996 to 2005.[68] The incidence varies over time, depends on the healthcare setting and is strongly influenced by caesarean delivery rates.

Indications for peripartum hysterectomy

Caesarean delivery is the most important risk factor for peripartum hysterectomy. These women are 6 times more likely to undergo peripartum hysterectomies than women who deliver vaginally.[77] The risk of peripartum hysterectomy increases with the number of prior caesarean deliveries.[78] Repeat caesareans are associated with pathological placental localization, particularly as the number of repeat caesareans increases.[78] The morbidly adherent placenta has been found to be a major risk factor for uncontrolled PPH and emergency hysterectomy.[3] Risk factors for placenta accreta include placenta praevia with or without previous uterine surgery, prior myomectomy, previous caesarean delivery, Asherman's syndrome, submucous fibroids and maternal age older than 35 years.[61] The rates of caesarean delivery has increased significantly in recent years and studies have shown a significant increase in abnormal placentation, resulting in a worldwide increase in peripartum hysterectomy.[49] This statement is supported by numerous studies.

In a London hospital, 66% percent of women who had a peripartum hysterectomy, had delivered previously by caesarean section and 69% percent had an abnormally implanted placenta[49]

In a study in Utah, of more than 30000 women who had elective caesarean delivery, the risk of placenta accreta was 0.2%, 0.3%, 0.6%, 2.1%, 2.3% and 7.3% for women experiencing their first through sixth caesarean delivery, respectively. In patients with placenta praevia in the index pregnancy, the risk of accrete was 3%, 11%, 40%, 61%, and 67% for those undergoing their first through their fifth or greater caesarean deliveries, respectively.[42] Hysterectomy was required in 0.7% for the first caesarean delivery and increased with each antecedent caesarean delivery upto 9% for patients with their sixth or greater caesarean delivery.[42]

A Danish study found an 11 fold increased risk of peripartum hysterectomy after caesarean section compared to vaginal delivery, however their rates were higher in multiparous than nulliparous women.[79] However this study had a shorter recourse to surgery if the woman already had live children at home. In a Pakistani study the commonest risk factor was advanced maternal age, high parity and delivery by caesarean section.[80]

The most common indication for peripartum hysterectomy is intractable obstetric haemorrhage, underlying causes vary from series to series. In many series, placenta accreta and uterine atony are cited as most frequent indications for hysterectomy.[28,81,82,83] Other indications for peripartum hysterectomy include uterine rupture, extension of a uterine incision, leiomyoma, infection, genital lacerations and cervical cancer[28,81,82,83]

There has been a change of indications for peripartum hysterectomy. While uterine atony was the most common in the past, there has been an increase documentation of abnormal placentation of late.[28] The reason for this is most likely due to the rising caesarean section where has been a 7.7% increase in 7 years in Calgary for example.[28]

Procedure

Surgical technique for obstetric hysterectomy is different to that of non-obstetric hysterectomy. The physiologic changes in the maternal pelvis that accompany pregnancy are responsible for many of the surgical challenges of peripartum hysterectomy.

The blood vessels that supply the uterus, ovaries, and bladder are remarkably larger and more tortuous in pregnancy than in the nonpregnant state. Adjacent pelvic tissues are oedematous and friable.[37]

Edema of the structures surrounding the uterus allows easy dissection of surgical planes but produces large pedicles from which blood vessels may escape. Abdominal entry may have been via Pfanensteil or lower midline incision, therefore exposure may be difficult. Scarring from previous surgery, particularly previous caesarean sections, is a common complicating feature of a peripartum hysterectomy.

If the cervix and paravaginal tissue are not the source of the haemorrhage, a subtotal hysterectomy should be sufficient to achieve haemostasis and is safer, faster and easier to perform than a total hysterectomy. However, if the lower segment and paravaginal tissues

areinvolved in the haemorrhage, such as in the case of placenta praevia accreta, total hysterectomy will be necessary to achieve haemostasis.[37]

Stepwise approach to performing the peripartum hysterectomy.

The stepwise approach commonly employed at our institution will briefly be outlined here. Instruments and sutures will not been named as these may vary between centres.

There are several ways to perform a caesarean hysterectomy successfully. Any competent gynaecologic surgeon should be able to accomplish the task. When a caesarean hysterectomy is planned in advance, the surgeon has the luxury of a complete preoperative evaluation of the patient and her hematologic and coagulation status. The surgeon can prepare to fill the bladder to test its integrity, should that become necessary. The surgeon can choose experienced assistants and discuss procedures, necessary instruments, and sutures before the operation. In emergency cases, such luxuries do not exist, and the scene often becomes chaotic and the skill is the ingenuity of the surgical team has to be relied on.

Additional intravenous access should be obtained, and blood and blood products should be available. A caesarean hysterectomy can be accomplished through any commonly used abdominal wall incision. However it is prudent to use a midline skin incision in cases of emergency peripartum hysterectomy.

After the infant is delivered and the decision is made to proceed with a caesarean hysterectomy, the placenta is removed unless there is a placenta accreta. Removal of placenta accreta should not be attempted due to the possibility of life threatening haemorrhage.[59] If the patient is under regional anaesthesia, it may be necessary to convert to general anaesthesia for patient comfort and abdominal packing.

The cornua of the uterus are clamped superiorly; the broad ligament is opened parallel to the infundibulopelvic ligament to expose the retroperitoneum. The ureter can be seen crossing the iliac artery at the level of the bifurcation in the medial leaf of the broad ligament.[59]

The bladder must be dissected free before approaching the uterine arteries, and displaced below the operative field. The uterine vessels are significantly enlarged in pregnancy, and care must be taken in isolating or skeletonising them.

After the uterine arteries are ligated, the utero-ovarian ligament can be approached. The entire blood supply to the uterus is now secured. If the patient is unstable or if the amount of bleeding has been excessive, the surgeon should consider a subtotal hysterectomy, which shortens operating time while still accomplishing the primary goal of haemostasis. Once the uterus is removed, the stump is then sutured.

Intraoperative Complications

The problems encountered by surgeons are those of bleeding and urinary tract injury. Intraoperative bleeding difficulties from the adnexal pedicles, the uterine vascular pedicles, the cardinal ligaments, or angles of the vagina can arise at the start of bladder dissection. Large pedicles and clamp manipulation that tear pedicles away from the uterine wall are the most common problems that result in uterine vascular instability.[59]

Emergency cesarean hysterectomy presents special bleeding problems. Coagulopathies may be present when the patient is first encountered or may develop as the case progresses. In drastic emergencies, the aorta may be compressed for a time to stop copious bleeding while the field is cleared for a more direct attack on the bleeding problem.

The use of surgical packs is a frequently overlooked adjunct in obtaining hemostasis.[83] Temporary packing of a bleeding area can offer time, similar to that of compressing the aorta, and allow blood component replacement to catch up with a possible coagulopathy. Packs can also be used in a more definitive manner. In areas of diffuse venous bleeding, packs can be left in the abdomen after closure.[84]

The ureters are most closely approached at three points during the dissection in an hysterectomy: the infundibulopelvic ligament ligation site (when adnexal structures are removed), the uterosacral ligament dissection, and the uterine vascular and cardinal ligament pedicles. The most important principle in approaching the ureter in complicated

caesarean hysterectomy cases is direct visualization of the ureter, can inadvertently be lifted into the operative field, ligated or transected if not visualized. When the uterosacral ligament is divided as a separate pedicle, it must be carefully identified and accurately clamped and ligated without endangering the ureter.

Training in caesarean hysterectomies is often a weakness in most obstetrics and gynaecology training programs as this is a rare event and time wastage while teaching a junior may result in complications and morbidity. Any registrar skilled at performing a non-pregnant hysterectomy should be able to start this procedure until help arrives.

Total vs Subtotal

In most cases of emergency peripartum hysterectomy, there is a tendency to perform a subtotal or supracervical hysterectomy. In a series of studies, it has been shown that both operating time and bloodloss were significantly lower with the subtotal technique.[85,86,87] The risk of bladder or ureteric injury is also less. In a haemodynamically unstable patient it may be necessary to perform a subtotal hysterectomy, especially if bleeding is controlled to that point. It may however be necessary to remove the cervix as well in the case of a lower segment bleed, as in placenta praevia or placenta accreta. In Machado's study the decision of performing total or subtotal hysterectomy was influenced by the patient's condition.[29]

Clark and colleagues[87] found no significant differences in mean values for blood loss, operating time and hospital stay in obstetric patients undergoing total hysterectomy versus subtotal hysterectomy. Zelop and colleagues[88] had similar findings in their study. Undergoing subtotal hysterectomy may have long-term complaints of vaginal discharge, cyclical bleeding and a need for cervical cytology.[87] Total hysterectomy is technically more difficult and more likely to be associated with morbidity if placental localization involves the bladder.[80]

Primary versus definitive surgeon

The threshold for decision to proceed to a peripartum hysterectomy is often a difficult matter. Should the decision be made by the less experienced registrar managing the labour ward or should the decision be made by a specialist who is at home and has received a telephonic description of the case? In the absence of specialist management on the premises errors such as failure to exhaust all non operative and conservative measures may be made. The other problem is that while decisions on the best options of management are being made by less senior staff, patient mortality increases and problems like coagulopathy, massive blood loss and renal dysfunction can set in. The decision for hysterectomy should involve the anaesthetist, the most senior registrar on the premises and the patient herself as this carries the very delicate issue of fertility. Ogunniyi[89] who also felt that there was no real trigger for hysterectomy.

Short term morbidity

According to Wright et al, bladder and ureteral injury occur more commonly than non-pregnant hysterectomies.[90] There was no difference in rates of intestinal or vascular injuries. Rates of reoperation, post operative hemorrhage, wound complications and venous thromboembolism were all higher with peripartum hysterectomy.[90] The mortality is expected to be 25 times that of hysterectomies performed outside pregnancy[90]

In a study done in Calgary, the most common immediate complications were DIC, fever and ileus.[28] There were no maternal deaths in this series. Emergency peripartum hysterectomy is associated with short and long term morbidity.

In the recent literature, although the rates of PPH have increased the mortality has decreased, suggesting an improvement in the management of this condition.[91]

Objective of this study

The aim of this study was to characterise the profiles of women who are most at risk of requiring hysterectomies for primary postpartum haemorrhage (PPH). The objectives were as follows:

- To identify demographics
- To determine previous obstetric history
- To identify preexisting risk factors (pregnancy-related/non pregnancy-related)
- To identify short term morbidity
- To identify possible avoidable factors or missed opportunities

Methods

Setting

The study was set in Soweto, a large urban settlement to the south west of Johannesburg, South Africa, with a population of approximately two million. Chris Hani Baragwanath Academic Hospital (CHBAH), a 3200 bed institution, provides care to the residents of this area, and also functions as a tertiary referral center for hospitals in neighboring regions. Several primary care clinics in Soweto refer patients to CHB when necessary. Five of these clinics, Zola, Dobsonville, Mofolo, Lillian Ngoyi and Chiawelo, operate midwife obstetric units where deliveries are performed. All complicated and high risk deliveries are transferred to CHB for further management

Study population and sampling

This is a retrospective descriptive study of maternal records of all women that had a peripartum hysterectomy (defined as hysterectomy performed within the first 24 hours of delivery)[28] for PPH at Chris Hani Baragwanath Hospital from 1 January 2008 to 31 December 2008. Patients referred from other hospitals and local clinics were included in this study. The operation registers in the obstetric theatres, gynaecology theatre and JD Allen theatre (which form part of the main hospital complex) were analysed for patients that fitted the inclusion criteria. The records of these patients were retrieved from the records room and the relevant data was recorded.

Women delivering with a gestational age less than 24 weeks were excluded. Maternal demographics, medical, surgical and obstetric history were noted. Pregnancy, labour and delivery events including gestational age, mode of delivery, indication for caesarean section, indication and type of hysterectomy performed were noted. Additional conservative measures prior to hysterectomy, blood loss, amount of transfusion and type of blood products transfused and postoperative complications were also recorded. The duration of surgery as well as intraoperative blood loss was obtained from anaesthetic charts. Febrile morbidity was defined as a temperature of >38 degrees Celsius measured at least 24 hours after the hysterectomy on two occasions.

Definitions

We used the definition of PPH as blood loss of more than 500 ml following vaginal delivery or more than 1000 ml following caesarean delivery.[14] The classification has also been based on the timing of the onset of bleeding in relation to the delivery. Haemorrhage within the first 24 hours of vaginal delivery is termed primary postpartum haemorrhage, whereas bleeding occurring afterwards, but within 6 weeks of delivery, is termed secondary postpartum haemorrhage.[15]

Statistical analysis

Data from maternal records were entered onto a data capture sheet from maternal records. The data was then entered onto a Microsoft Excel Spreadsheet and was exported to Epi info Version 6 Statisical software. Descriptive data shall be presented as means, medians and ranges. Proportions will be presented as percentages with a 95% confidence interval.

Permission to undertake the study was obtained from the University of the Witwatersrand Human Research Ethics Committee (HREC), and from the hospital authorities. A copy of the HREC clearance form is attached as Appendix A.

Results

During the study period there were 23566 live deliveries at Chris Hani Baragwanath Academic Hospital and 9590 deliveries at the local clinics. There were 57 peripartum hysterectomies performed in all. Of the 57, only 27 were for primary postpartum haemorrhage. The other 30 did not fit the criteria of study ie they did not experience a PPH within the first 24 hours of delivery and underwent hysterectomy for indications such as sepsis and secondary postpartum haemorrhage. Twenty three women of the 27 women delivered at Chris Hani Baragwanath Hospital represenating an overall incidence of 0.97 hysterectomies per 1000 deliveries for primary postpartum haemorrhage. Four of the women delivered at the local clinics. Therefore our overall incidence was 0.8/1000 deliveries.

The mean age of the women was 29.7, median parity was 2 and the median gravidity was 3. Table 4 shows this into the ranges.

Table 4: Age, Parity and gravidity with ranges.

Age (mean ranges)	Parity (median)	Gravidity
29.7 (16-42)	2 (0-4)	3 (1-5)

In terms of antenatal follow up twenty four of the 27 (89%) were booked with a mean of 4.8 + 2.4 visits (range 2-11). The mean gestational age at booking was 23.2 weeks (range 13-32). The median gestational age at admission for delivery was 38 weeks (range 28-41).

There was only one twin pregnancy. The mean booking Hb was 11.2 ± 1.5 (range 7.1 - 13.5), 4 patients had Hb < 10mg/dl; and 3 between 10 - 10.9mg/dl.

Ten women were HIV positive (37%), 14 were HIV negative (51.9%) and 3 patients' results were unknown (11.1%). The median CD4 count was 336.5 (94 - 521) in the HIV+ group. Two (20%) women had a CD4 count <200, 6 (60%) had CD4 counts >200 and 2 (20%) did not have CD4 count results.

Table 5 shows details of the current pregnancy, labour and delivery. A large number of pregnancies were uncomplicated (62.9%), and the most common complication in the current pregnancy was pre-eclampsia (14.8%). One patient had a previous vaginal delivery with postpartum haemorrhage requiring blood transfusion. Seven women (25.9%) had one previous caesarean delivery and four (14.8%) had two previous caesarean deliveries. The indications for the previous caesareans were unknown in 9 women. Twenty women (74%) experienced spontaneous labour, and 3 (11.1%) were induced. The induction agent used was oral misoprostol. In an attempt to identify possible utero-relaxants we identified 1 woman who received MgSO4 for severe pre-eclampsia. Five women had a prolonged 1st stage of labour of >12 hours, with 1 woman in 1st stage for 26 hours. One woman with prolonged 1st stage of labour and 2 women with prolonged 2nd stage were augmented with syntocinon, for a median of 120 minutes (range 60 - 170 minutes).

Table 5. Details of Current Pregnancy and complications

Number	27
Twins	1
Pre-eclampsia	4
Ante-partum haemorrhage	3
Anaemia	2
Preterm labour	2
Preterm rupture of membranes	1
Fetal anomaly	2
Gestational hypertension	1
Chronic hypertension	2
Non-defining AIDS diseases	1
Spontaneous labour	20
Induced	3
Not in labour	4
Induction with misoprostol	3
1.Postdates	1
2.IUFD	1
3.Prolonged rupture of membranes	1

Table 6. Mode of delivery N=27(%)

Vaginal	14(52)
Planned Caesarean Section	4(15)
Emergency Caesarean Section	9(33)

Fourteen women (52%) delivered vaginally and 13(48 %) delivered by caesarean section. There were no instrumental deliveries. Nine (69.2%) were emergency caesarean section and 4 (30.8%) were planned caesarean deliveries. The indications for caesarean delivery have been shown in table 7. At time of caesarean 10 women had regional anaesthesia and 3 women had general anaesthesia. Most women delivered within 30 minutes of the onset of the 2nd stage of labour, median 10 minutes (range 5-95). Eight women took more than 30 minutes to complete the 3rd stage of labour, with 5 women taking more than 2 hours.

Table 7. Indications for Current Caesarean Section

Previous C/S X 2 (elective)	2
Previous C/S X 2 (emergency)	2
Fetal Distress	2
Fetal anomaly	1
Previous C/S X 1 € (elective)	1
Previous C/S X1 € (emergency)	1
APH € of unknown origin	1
Placenta praevia	1
Cephalo-pelvic Disproportion	2

All women received oxytocin routinely either intramuscularly or as an intravenous infusion as per hospital protocol at the time of delivery. From table 8, eighteen women (66.6%) had no additional therapies for haemorrhage other than hysterectomy. Only 7 (25.9%) women received additional uterotonics before hysterectomy. There were only 2 documented attempts of B-lynch sutures in the atonic group. Eight (29.6%) total hysterectomies were performed and 19 (70.4%) were subtotal. The extra haemostatic measures were only undertaken after the hysterectomy was done.

Table 8. Perioperative initiatives taken before hysterectomy

None	18
Uterotonic(Oxytocin, misoprostrol, PGF2	7
B lynch Stitchattempted	2

Table 9: Indications for peripartum Hysterectomy N=27

Uterine atony	17
Uterine laceration	5
Uterine rupture	3
Abnormally implanted placenta	1
Disseminated intravascular coagulopathy	1

As shown in table 9 the leading indications for hysterectomy were uterine atony (63%) and uterine laceration (18.5%). In the women with atonic uterus 10 had retained placenta, 2 had abruptio placenta and 1 had a uterine inversion. The median time from haemorrhage to theatre was 110 minutes (range 17-270 minutes). Time to hysterectomy and duration of surgery could not be assessed due to poor documentation.

Table 10. Extra haemostatic measures taken after hysterectomy

No internal iliac artery ligation or packs	13
Packs only	7
Internal iliac artery ligation and packs	5
Internal iliac artery ligation only	2

After the hysterectomy 13 patients did not require any further intervention in terms of packing or internal iliac artery ligation. However, 5 patients required both. Haemostasis was achieved in seven patients with packs alone.

Table 11. Primary Surgery

Emergency caesarean section	9
Evacuation of uterus	7
Examination under anaesthesia	4
Hysterectomy	4
Elective caesarean	3

The table above depicts the indications for primary surgery. As can be seen, caesarean section regardless of emergency or elective was the common indication for primary surgery. Four women had hysterectomy as primary surgery (3 women had uterine ruptures not amenable to repair and 1 woman had intractable atony following vaginal delivery, despite attempt at B-Lynch compression suture).

Table 12. Details regarding hysterectomy N=13

Number of hysterectomies performed at initial caesarean section	10
Number of hysterectomies performed after index caesarean section	3

Ten hysterectomies were performed at initial caesarean section and three were performed after the index caesarean section. Time delays could not be assessed due to poor documentation.

Table 13. Primary and Definitive surgeons

Primary Surgeon	
Junior registrar	15
Senior registrar	8
Consultant	4
Definitive Surgeon	
Consultant	19
Senior Registrar	8

The primary surgeons were junior registrars in most of the cases. Although senior registrars were involved in 30% of the definite surgery performing the hysterectomy, consultants remained the final surgeons.

In terms of blood and blood products used, one patient was transfused 21 units of packed red cells. Nine patients received fresh frozen plasma and one patient received 1 unit of cryoprecipitate. The pre-op blood loss of 9 patients was documented, median 1300ml (range 200-1700ml); intra-op blood loss for 15 patients was documented, median 1500ml (range 750-4300ml) and in 11 patients the median total blood loss was 3000ml (range 800-6000ml). Blood loss was poorly documented in patients files, both from the obstetrics and anaesthetic records and has been stated earlier is very inaccurate when done by visualization.

Table 14. Complications associated with Peripartum hysterectomy

Coagulopathy	13
Ventilatory Support	9
ICU stay	8
Renal dysfunction	4
Febrile morbidity	4
Pneumonia	3
Other Sepsis	2
Death	2
Wound sepsis	1

*NB: These conditions were not mutually exclusive

As highlighted in the table 14 coagulopathy was the most common complication. Although 13 patients had a coagulopathy, only 9 patients received Fresh Frozen Plasma and 1 received cryoprecipitate. This could be attributed to the lack of a protocol in managing coagulopathies, by both the obstetricians and anaesthetists. Poor documentation in the files may also constitute a reason for the apparent lack of administration of FFPs to these patients. Nine women required ventilatory support and 8 required ICU admission. One woman died during surgery and the other in the ICU. The woman that died intra-operatively succumbed to severe haemorrhage which was unresponsive to peripartum hysterectomy, blood products, internal iliac ligation and packing of the abdomen. The woman that demised in ICU suffered a ruptured subcapsular haematoma that continued to bleed despite abdominal packing and administration of blood products.

Discussion

We found an incidence of 0.9 hysterectomies per 1000 deliveries for primary postpartum haemorrhage. As stated before in the literature the incidence in developing countries is about 10/1000 live births as compared to 1/1000 live births in the 1st world. Interestingly our study demonstrates an incidence in keeping with developed rather than third world countries. There could be several reasons for this phenomenon. Our study was only conducted over one year showing an incidence of 0.9/1000 deliveries, whereas the studies described in the literature were conducted between a period of 10-20 years. We would need to conduct such a study over at least 10 years to be able to draw a comparison with other countries. Chris Hani Baragwanath Academic Hospital (CHBAH) is a tertiary training institution, where there are a number of experienced obstetricians. However this hospital also operates as a regional facility and therefore has up to 30% risk of walk-in patients (unpublished data). Further there is a blood bank on the facility, a good referral system and easy access into facility. Therefore seeking help is not delayed. In addition the maternity ward has 2 fully operational theatres and a High Care Area. Electricity is available for 24 hours of the day. CHBAH also has a state of the art ICU facility with highly trained intensivists. We also have specialist anaesthetists in the labour ward complex available 24 hours a day. At this institution the PPH algorithm is placed on the walls of the labour ward where they are clearly visible and well adhered to it[92]. The algorithm used forms part of the University of the Witwatersrand Obstetrics Protocol manual and is included as appendix B.

Although we lack some state of art equipment and facilities, we do have good infrastructure. In contrast to other developing countries the high incidence of peripartum hysterectomies can be attributed to poor resources and infrastructure. A large number of patients deliver at home with no active management of the third stage of labour. Late diagnosis of PPH and lack of transport to a higher level of care are contributory factors. Also the long distances those patients have to travel to access tertiary care may explain the high incidence of peripartum hysterectomy. Further, in the developing world the lack of trained birth attendants and skilled specialists may be a contributory factor.

In a study by Yoong et al, obstetric hysterectomy appeared to be more common with advancing maternal age, this was not the case from our study, our mean age was 30 years[10]. Our theory is that women tend to postpone childbirth in developed countries and thus complications are experienced in the older woman. There was no correlation with increasing parity in our study (median parity 2).

Most of the emergency hysterectomies were performed for intractable haemorrhage following caesarean sections, suggesting that a rise in caesarean sections may be a contributory factor. Forty one percent of cases in this series had undergone caesarean section. There was only one set of twins which further suggests that uterine distension is not necessarily a cause of peripartum hysterectomy, although it is a known cause of PPH.

Eight (29.6%) total hysterectomies were performed and 19 (70.4%) were subtotal. The extra haemostatic measures were only undertaken after the hysterectomy was done.

women had a prolonged 1st stage of labour of >12 hours, with 1 woman in 1st stage for 26 hours. This is a well known risk for PPH. One woman with prolonged 1st stage of labour and 2 women with prolonged 2nd stage were augmented with oxytocin for a median of 120 minutes (range-60-170 minutes). It is suggested that prolonged exposure to oxytocin saturates the oxytocin receptor making the uterus less likely to contract post partum.

It is interesting to note that eighteen of the twenty seven women received no other uterotonic in addition to the oxytocin that is given routinely for the 3rd stage. This could be either

- it was not indicated
- it was given but not documented by the doctor managing the emergency
- it was simply not considered as another line of therapy.

Although it is not common practice in our institution, uterine tamponade even in its most rudimentary form has been shown to successfully slow uterine bleeding to prevent hysterectomy.[93]

The Journal of Maternal, Fetal and Neonatal Medicine proposes the 4 Ts for PPH. Tone e.g. atony, Trauma e.g. Lacerations, Tissue e.g. retained placenta and Thrombin e.g. coagulopathy. Cochrane reviews of more than 3000 women undergoing NVD were given oxytocics versus no oxytocics. It was shown that the risk of PPH and severe PPH (greater than 1000ml) was decreased in the group were oxytocin was given.

A study of 16 cases of the Bakri balloon successfully stopped bleeding in 14 cases.[34] The recourse to hysterectomy by members of staff is a sad indictment on our inability to teach conservative methods and truly have any faith in their ability to work. While the definitive treatment for bleeding is the peripartum hysterectomy, are we being taught that this procedure should be done to get the patient out of the way instead of monitoring her over a period while the other measures are tried to have failed or succeeded. While in most of our state hospitals we lack sophisticated equipment e.g. the Bakri Balloon, simply ingenuity, like the use of the Foleys catheter and condom catheter have also been shown to be useful.

Perhaps recourse to hysterectomy is made rapidly by junior staff because severe morbidity encountered intra-operatively will be "fixed, by specialists who arrive on the scene. A similar feeling is shared by Selo-Ojeme[89] where it has been found that very few authors in their literature describe attempts at conservative management

It is also important to realize that in their series most of the surgeons who began the caesarean section were trainees, the definitive surgery (i.e. hysterectomy) was completed by consultants. In our study, senior registrars completed 8 peripartum hysterectomies while specialists were the definitive surgeon in 19 cases.

None of the patients had systematic devascularisation of the uterus and internal iliac artery ligation prior to the hysterectomy. It is unclear as to whether obstetrician trainees are exposed to and competent in these procedures. This study shows a failure or lack of use of conservative operative measures prior to hysterectomy. Recourse to hysterectomy usually implies that there was a failure in conservative therapy. Only 2 attempts at the B

lynch stitch were made in cases of atony. This could be attributed to the lack of knowledge and training with regards to insertion of the B-Lynch suture. In fifty five percent of the cases, the primary surgeons were medical officers or junior registrars. One could also speculate that a B-Lynch suture was attempted and had failed and thus was not documented as such in the patient's file post-surgery.

We cannot comment on the use of the B-Lynch suture in our study as we do not have a comparative study on its success in our facility. In the literature review the role of the B-Lynch was discussed comprehensively however it was our feeling that registrars or medical officers are not experienced with the procedure and opt for more drastic measures such as hysterectomy. Perhaps junior registrars should have the principals of the B-Lynch suture demonstrated to them at the time of ordinary caesarean section by seniors. This will guide them as to the exact placement of the suture and the method of compression.

In this study we can only look at the numbers of failures of conservative therapy resulting in hysterectomies, as we do not have a control group of successfully treated women who avoided hysterectomy due to the use of other therapies. With 2 deaths, we cannot draw any valid conclusions about the risk factors for mortality

The majority of the women had subtotal hysterectomies. Studies have shown that subtotal hysterectomy is preferable because of less haemorrhage, shorter operative time and ease

of surgery as compared to total hysterectomy.[85,86,87] It is also associated with smaller risk of visceral injury and urinary tract injuries.[89]

At the time of caesarean 10 women had regional anaesthesia and 3 women had general anaesthesia. This is a known risk factor for PPH due to the drugs causing uterine atony, however the contribution to this factor as a risk factor for peripartum hysterectomy is not known.

Eight women took more than 30 minutes to complete the 3rd stage of labour, with 5 women taking more than 2 hours. The International Confederation of Midwives (ICM) and the International Federation of Gynecology and Obstetrics (FIGO) are advocating AMOTSL in order to reduce maternal mortality. In a joint statement issued in November 2003, they state that the usual components of active management of the third stage of labor include: This has been mentioned before in the literature but bears repeating.

- Administration of uterotonic agents (the drug of choice is oxytocin, 10 units IM).
- Controlled cord traction.
- Uterine massage after delivery of the placenta[30]

It is clear from the figures quoted in our results that these guidelines were not adhered to or these were cases of morbidly adherent placenta that would have required surgical intervention anyway.

It is important to note the psychological impact of this procedure. In non-pregnant hysterectomies, patients are counselled about the absence of further fertility and

menstruation. Many have the option of discussing it with their family before a decision is made. Peripartum hysterectomy on the other hand is a life-saving procedure and patients are seldom counseled on the effects of the procedure. So it may be the case that a perfectly healthy woman arrives at the hospital for a normal delivery and leaves after several relook operations and without further options for further fertility. In their series Selo-Ojeme[89] had 3 women who required postpartum counseling. To the best of my knowledge we do not offer this service to these women.

Conclusion

PPH requiring hysterectomy is a rare and unpredictable event. The possibility of emergency hysterectomy exists for all births including those with no specific risk factors for PPH. Large series that are done over several years (e.g. 10 years in order to determine risk factors are fraught. Confounders such as new technology, protocols and the introduction of drugs such as misoprostol have changed the face of obstetrics. The delaying of childbirth in the developed world and the world wide increase in caesarean section rates (some on demand) have changed the risk factors for PPH and possibly for peripartum hysterectomy. The indication for emergency peripartum hysterectomy in recent years has changed from uterine atony to abnormal placentation (which is a result of a history of previous caesarean delivery). In view of this, we need to reconsider the option of offering caesarean delivery on demand to patients.

As stated before peripartum hysterectomy is a rare and catastrophic event. With our series of 27 in 23566 it is certainly not possible for every specialist and registrar to gain proficiency in the procedure. Antenatal recognition of the perceived risk factors and involvement of an experienced obstetrician at an early stage of management may reduce the need for an emergency peripartum hysterectomy and the conservative surgical measures (as described in the literature review) may be applicable in women with intractable postpartum haemorrhage that is unresponsive to medical treatment, early recourse to conservative surgical procedures may be beneficial. The choice of procedure will depend on the resources of the institution, skill of the obstetric team and

haemodynamic status of the patient. However it is within the scope of every doctor to insert an intravenous line for additional oxytocics, to apply bimanual pressure, to manually evacuate clots and retained products. These measures can save lives and reduce mortality. Perhaps teaching of trainees and postgraduates should focus on these measures rather than the complex procedure of peripartum hysterectomy. In the ideal situation, multidisciplinary team involvement, including consultant obstetrician, anaesthetist, haematologist, radiologist and midwifery staff, could significantly aid in the management and markedly reduce the mortality and morbidity in these patients.

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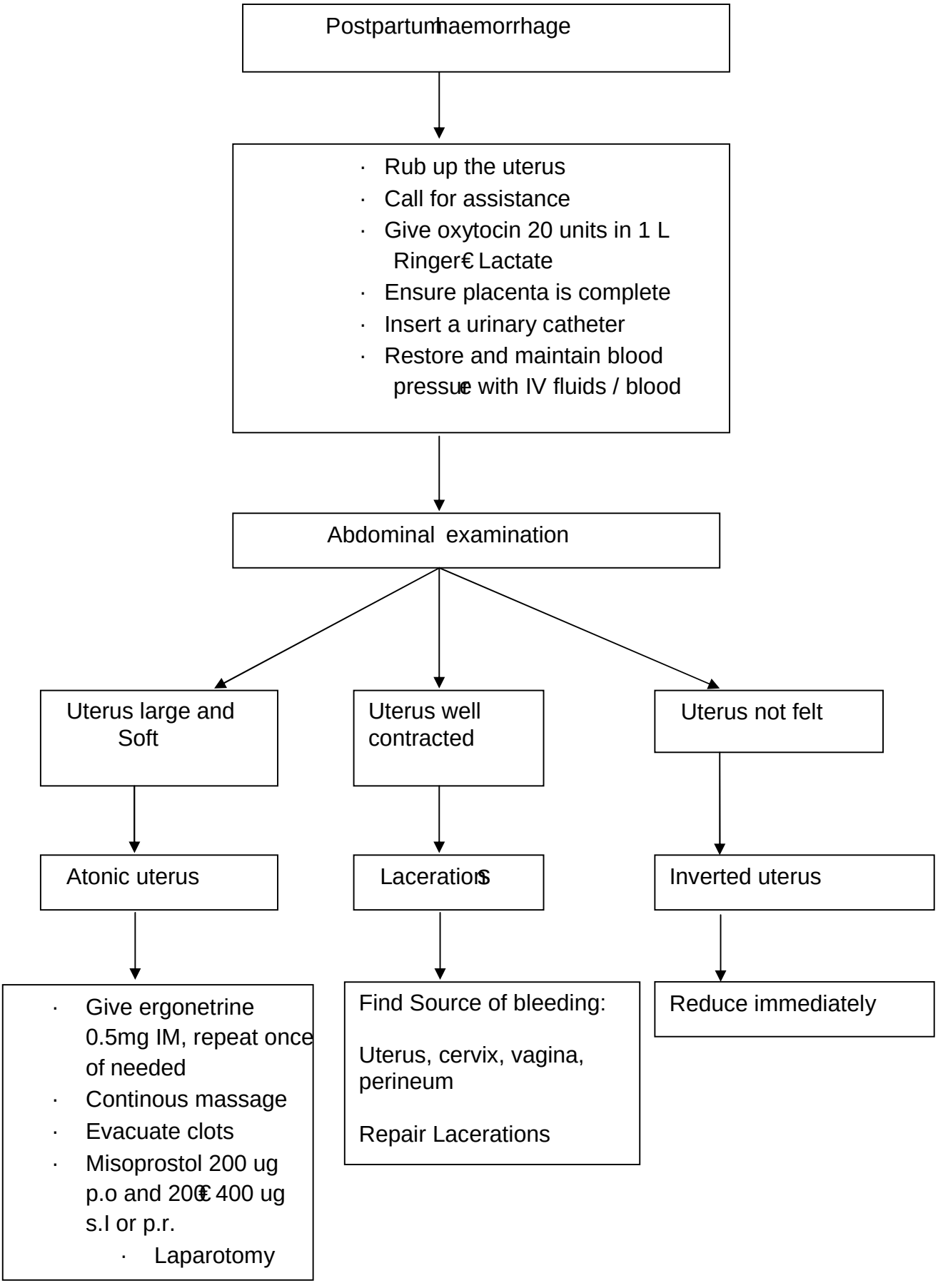
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APPENDIX A: Ethics Clearance Certificate

APPENDIX B: Algorithm for Management of Postpartum haemorrhage



APPENDIX C:

A MMed Research Protocol

PROFILE AND OUTCOMES OF WOMEN UNDERGOING PERIPARTUM HYSTERECTOMIES AT CHRIS HANI BARAGWANATH HOSPITAL

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Introduction.

Throughout the world over, 600 000 women die annually from pregnancy and childbirth (1). Maternal deaths from obstetric haemorrhage are among the leading 5 causes of maternal mortality (2). The global maternal mortality ratio is estimated at 400 per 100 000 live births (3). More than half of all maternal deaths occur within 24 hours of delivery, most commonly from excessive bleeding. It is estimated that, worldwide, 140 000 women die of postpartum haemorrhage each year, one every 4 minutes (4).Peripartum hysterectomy is defined as a hysterectomy which is performed within the first 24 hours of delivery (5). A …near miss‟ event may be defined as a …severe life threatening obstetric complication necessitating urgent medical intervention in order to prevent the likely death of the mother‟ (6). A peripartum hysterectomy is usually done in the cases of life threatening obstetric haemorrhage and is therefore considered a …near miss‟ event (6).

Identifying predisposing or risk factors and appropriately managing them may aid in the prevention of peripartum hysterectomy thus reducing the associated morbidity and mortality.

In the UK, Knight et al. found that uterine atony (53%) and morbidly adherent placentae (38%) were the most commonly reported causes of haemorrhage leading to peripartum hysterectomies(2). In this study cases were defined as any woman giving birth and subsequently undergoing a hysterectomy in the same clinical episode. No strict time definition was used and predisposing or risk factors were not examined.

In a Scottish study, Brace et al. found the rate of major haemorrhage was 3.7 per 1000 births(7); with uterine atony being the most common cause accounting for 48% of the cases. Parity, blood loss and placenta praevia as causes were independently associated with peripartum hysterectomy (12%). The successful and efficient management of postpartum haemorrhage in first world countries may aid in enhancing protocols for third world countries. However drug and equipment constraints need to be borne in mind in the setting of developing countries.

The relative frequencies of the indications for surgery in postpartum haemorrhage (PPH) shows an International variation. Obstetric haemorrhage was the third most common cause of maternal deaths in South Africa for the triennium 2002 to 2004, accounting for 442 deaths; PPH accounted for 313 deaths (8). Of the 313 deaths from PPH there were 4 main groups of primary causes, 67(21.4%) of PPH deaths were from retained placenta, 74(23.6%) were due to uterine atony; 84(26.8%) were due to uterine rupture making this the largest cause of PPH. The remaining cause was …other uterine trauma‟ accounting for 78 (24.9%) of PPH deaths. In this study, HIV testing was limited and the study could not conclude a link between HIV and PPH. In this study 83% of causes of PPH were assessed as …clearly avoidable. There was no discussion on the outcome of the babies

In a study by Yucel et al, in Turkey it was found that the emergency peripartum hysterectomy rate was higher after caesarian section (0.07%) than after vaginal

delivery (0.02%) (5). This relationship has not yet been investigated in South Africa.

Peripartum hysterectomy (of any cause not necessarily PPH) constitutes a major financial and social burden to a community, as it results in the utilization of a large amount of resources; such as ICU, blood, prolonged hospital stay and places a major demand on highly technical health care systems. Therefore it is important to identify patients at risk and anticipate the procedure and its complications; as early intervention and proper management facilitate optimal outcome. If we are able to devise a risk assessment system for peripartum hysterectomy, then all patients who fit the profile can be referred to appropriate levels of care, thus avoiding morbidity and mortality. This is the primary aim of this study.

AIM:

To identify the profile of women who are most at risk of requiring peripartum hysterectomy.

OBJECTIVES:

- To identify the demographic information of women who underwent peripartum hysterectomy
- To determine the previous obstetric history
- To establish a risk factor index
- To identify preexisting risk factors eg(pregnancy related eg. anemia and non pregnancy related eg. HIV) which predispose to hysterectomy
- Short term morbidity
- To identify possible avoidable factors/missed opportunities from administrative, health care worker or patient point of view

METHODS:

Design

Retrospective descriptive study of maternal records of all women that underwent peripartum hysterectomies at Chris Hani Baragwanath Hospital.

Study population

All women who had peripartum hysterectomies within the first 24 hours of delivery at Chris Hani Baragwanath Hospital from January 2008 to December 2008.

Sample Size

A convenience sample over a predetermined time period.

Exclusion Criteria

- Hysterectomy performed for sepsis
- Hysterectomy performed more than 24hours after delivery
- Hysterectomy performed in patients with a known bleeding disorder
- Hysterectomy complicated by ectopic pregnancy

- Hysterectomy from non viable pregnancy i.e. < 22 weeks

Limitations

- Short period of time over which the data is collected
- Quality of records does not always ensure that maternal details are present
- ICU records are frequently inaccessible and details of the stay are lost
- This study is not designed to determine the long term effects of peripartum hysterectomy. But this is not an objective of this study.

Data analysis:

Data will be entered onto a data capture sheet from the maternal records. The data will then be entered onto a Microsoft Excel Spreadsheet and will be exported to Epi Info version 6 statistical software. Descriptive data will be presented as means, medians and ranges. Proportions will be presented as percentages with a 95% confidence interval. Complicated statistical assistance will be obtained from a statistician.

Funding

All costs, which will be mainly stationery, will be borne by researcher.

Timing

The records reviewed will span a 12 month period from January 2008 to December 2008.

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APPENDIX D: Data Sheet

Data Capture Sheet Date of delivery:

Case No.			
Age:	Parity	Gravidity	
Booked:	Yes	No	
RVD:	Yes	No	Unknown
ARVfS:	CD4:	Start date	
No. completed months		Regimen:	
Booking Hb:		Pre-op Hb:	
Race:	B W A C	Gest Age:	
No of fetuses:			
Prev C/S:	Yes	No	Num
	Indication		
Prog of Labour:	1st Stage Hrs:	2nd Stage Hrs:	
Use of Drugs:			
Induction of labour:			
Augmentation of labour:			
Pregnancy Induced Hypertension:	Yes	No	
MgSO4:	Yes	No	
Chorioamnionitis	Yes	No	
Referral time from clinic			

Medical condition Cardiac, Diabetes, Epilepsy, Aids defining dx		Pregnancy Complications Preterm rupture of membranes Pre eclampsia Antepartum haemorrhage Intrauterine growth restriction	
Assisted delivery	Vacuum	Forceps	Success
Decision to go to TheatreTime:			
Anaest:	Start time:	Ending time:	Hrs: Min:
Surgery:	Start time:	Ending time:	
Packed red cells	Yes	No	Units:
Fresh frozen plasma:	Yes	No	Units:
Platelets:	Yes	No	Units:
Surgeon:	Junior Reg:	Senior Reg:	Cons:
Preop DIC:	Yes	No	
Prehysterectomy	Blynch stitch	Yes	No
Hysterctomy:	Total:	Subtotal:	Int iliac lig
Blood Loss:			
Morbidity ICU, Vent Support, Dialysis, Death,		CNS, RESP, CVS, Renal, DIC, Nosocomial	

Sepsis. Wound Febrile UTI		Perinatal: Stillbirth, Prematurity END	
Perinatal: Stillbirth, Prematurity END		Weight: APGAR:	1min: 5min:

Avoidable factors, missed opportunities and substandard care.

Patientorientated:			
Non attendance ANC:	Infrequent attendance:	Delay in seeking help	Other:
Administrative factors			
Delay in tranport from home to institution			
Delay transport between institutions			
Barrier to entry			
Lack of accessibility			
Lack of Health care facility			
Lack of ICU Bed			
Lack of Blood products			
Lack of personnel			
Lack of appropriately trained staff			
Communication problem			
Other			
Health worker orientated:		Resuscitation problems:	
Emergency management problems:	Level 1:	Level 2:	Level 3: