

Two systematic reviews,^{2,139} which includes the 2014 Cochrane review, focused on misoprostol to treat PPH and examined the optimal route and dosage, and its efficacy. Compared with 40 iu oxytocin infusion, 800 micrograms sublingual misoprostol was associated with a significant increase in the number of women who had blood loss of at least 1000 ml (RR 2.65, 95% CI 1.04–6.75) and who required blood transfusion (RR 1.47, 95% CI 1.02–2.14). The review authors concluded that oxytocin infusion should be recommended as first-line treatment for primary PPH. When used following prophylactic uterotonics, misoprostol and oxytocin infusion work similarly.

Evidence
level 1+

A study¹⁴⁰ of women in early pregnancy demonstrated that regardless of the route of administration (vaginal, sublingual or rectal), misoprostol took 1.0–2.5 hours to increase uterine tone. Clinicians should be aware of this delay in the clinical effect of misoprostol. Guidelines from WHO¹⁴¹ and the International Federation of Gynecology and Obstetrics¹⁴² recommend that in the management of PPH, misoprostol is administered sublingually.

Evidence
level 4

5.6.2 What surgical treatments can be employed to arrest the bleeding?

If pharmacological measures fail to control the haemorrhage, surgical interventions should be initiated sooner rather than later.

D

Intrauterine balloon tamponade is an appropriate first-line 'surgical' intervention for most women where uterine atony is the only or main cause of haemorrhage.

C

Conservative surgical interventions may be attempted as second line, depending on clinical circumstances and available expertise.

C

It is recommended that a laminated diagram of the brace suture technique be kept in theatre.

✓

Resort to hysterectomy sooner rather than later (especially in cases of placenta accreta or uterine rupture).

C

Ideally and when feasible, a second experienced clinician should be involved in the decision for hysterectomy.

✓

The use of pharmacological agents other than those detailed should not delay recourse to surgery. Once the decision is made to embark on surgical haemostasis, the most appropriate choice of procedure will depend, in part, on the experience and expertise of available staff.

Compression of the aorta may be a temporary but effective measure to allow time for resuscitation to catch up with the volume replacement and the appropriate surgical support to arrive. The judgement of senior clinicians, taking into account the individual woman's future reproductive aspirations, is required in deciding the appropriate sequence of interventions.

The management of placenta praevia accreta is associated with significant morbidity and guidance is available in the RCOG Green-top Guideline No. 27.¹²

5.6.2.1 Uterine balloon tamponade

Tamponade using various types of hydrostatic balloon catheter has superseded uterine packing for the control of atonic PPH.¹⁴³ Case series have used a Foley catheter,¹⁴⁴ Bakri balloon,¹⁴⁵ Sengstaken–Blakemore oesophageal catheter^{146,147} and a condom catheter.¹⁴⁸ The urological Rusch balloon has been described as preferable by virtue of larger capacity, ease of use and low cost.¹⁴⁹ A detailed protocol for uterine tamponade using the Rusch balloon is available.¹⁴⁹ The 2014 Scottish Confidential Audit of Severe Maternal Morbidity report identified 339 women who had an estimated blood loss of 2500 ml or higher; in 82 cases, balloon tamponade was employed, successfully avoiding hysterectomy in 75 (91%) women.¹⁵⁰ This success rate is of the same order as that reported in other case series.

Evidence
level 3

Some of the reports of balloon tamponade^{148,151} describe the intervention as the ‘tamponade test’. A ‘positive test’ (control of PPH following inflation of the balloon) indicates that laparotomy is not required, whereas a ‘negative test’ (continued PPH following inflation of the balloon) is an indication to proceed to laparotomy. The concept of balloon tamponade as a ‘test’ serves to affirm its place as first-line ‘surgical’ management. There is no clear evidence on how long the balloon tamponade should be left in place. In most cases, 4–6 hours of tamponade should be adequate to achieve haemostasis and ideally it should be removed during daytime hours, in the presence of appropriate senior staff, in case further intervention is necessary.^{146,147}

Evidence
level 4

A systematic review concluded that uterine balloon tamponade is an effective treatment for PPH in resource-poor settings.¹⁵²

Evidence
level 2++

5.6.2.2 Haemostatic suturing

Several case series¹⁵³ have been published describing success with haemostatic brace sutures. The best known version, described by B-Lynch in 1997,¹⁵⁴ requires hysterotomy for its insertion and is particularly suitable when the uterus has already been opened for a caesarean section. A review published in 2005¹⁵⁵ summarised nine case series of B-Lynch suturing (a total of 32 cases), reporting success in all but one case.

In 2002, Hayman et al.¹⁵⁶ described a modified compression suture which does not require hysterotomy, and success in 10/11 women managed with this suture has been reported.¹⁵⁷ Other authors have described variants on these techniques.^{158,159} Double vertical compression sutures have proved effective in treating PPH due to atony and placenta praevia. This may have a dual action of reducing uterine blood flow and compressing the bleeding surface.¹⁶⁰

Evidence
level 3

A prospective population-based study of 211 women treated with a uterine compression suture to control PPH concluded that the overall failure rate of sutures leading to hysterectomy was 25%.¹⁶¹ There was no difference in failure rate among B-Lynch, modified B-Lynch and other suture techniques. Risk factors for a hysterectomy included increasing age and vaginal delivery. In addition, a prolonged delay of 2–6 hours between delivery and uterine compression suture was independently associated with a four-fold increased risk of hysterectomy. This emphasises the need for careful postpartum evaluation of blood loss to avoid prolonged delay in haemorrhage recognition.

The 2014 Scottish Confidential Audit of Severe Maternal Morbidity report¹⁵⁰ identified 21 cases where haemostatic brace suturing was used for the management of PPH (greater than or equal to 2500 ml); hysterectomy was averted in 16 (76%) women. Again, this success rate is of the same order as that reported in other case series.

Evidence
level 3

These observational data suggest that haemostatic suture techniques are effective in controlling severe PPH and in reducing the need for hysterectomy. In the absence of comparative data to demonstrate that any one variant is superior to another, obstetricians are encouraged to familiarise themselves with one technique under the supervision of an experienced colleague. It is recommended that a laminated diagram of the brace suture technique be kept in theatre.

A systematic review¹⁶² has concluded that compression sutures are associated with a low complication rate. A higher risk of uterine ischaemia appeared to be caused when the procedure was combined with vessel ligation. No negative impact on fertility has been reported.

Evidence
level 3

Case series have reported the combined use of haemostatic suturing and balloon tamponade in the management of PPH.^{163–165}

5.6.2.3 Stepwise uterine devascularisation and internal iliac artery ligation

Stepwise uterine devascularisation describes the successive ligation of (i) one uterine artery, (ii) both uterine arteries, (iii) low uterine arteries, (iv) one ovarian artery and (v) both ovarian arteries, in the management of PPH.¹⁶⁶ The original case series¹⁶⁷ of 103 patients with intractable PPH not responding to medical management was effective in all cases without the need for hysterectomy, leading some clinicians to propose that stepwise uterine devascularisation should be the first-line conservative surgical treatment to control PPH.

When internal iliac artery ligation is being considered, a senior gynaecologist or vascular surgeon should be informed and involved since this technique requires a high degree of surgical skill and training, and may be associated with ureteric injury. A case series described 84 women with PPH from various causes who underwent internal iliac artery ligation as the first-line surgical intervention. Hysterectomy was subsequently required in 33 (39%) women.¹⁶⁸

Evidence
level 3

A study of 45 women following internal iliac artery ligation suggests that subsequent fertility and pregnancy outcomes are not impaired.¹⁶⁹

A systematic review¹⁷⁰ of fertility outcomes following the surgical management of PPH concluded that uterine devascularisation techniques, including internal iliac artery ligation, did not adversely affect future fertility, although, the number of studies and quality of evidence was limited.

Evidence
level 2++

5.6.2.4 Selective arterial occlusion or embolisation by interventional radiology

A large retrospective study¹⁷¹ has evaluated arterial embolisation in 251 patients after PPH. It was successful in arresting the bleeding in 86.5% (217/251). The analysis suggested that caesarean section delivery, disseminated intravascular coagulation and transfusion of more than 10 units of packed red cells were related to failed embolisation.

Evidence
level 3

The logistics of performing arterial occlusion or embolisation where the equipment or an interventional radiologist may not be available mean that uterine balloon tamponade is a more appropriate first-line treatment.

Follow-up studies of 17¹⁷² and 25¹⁷³ women who underwent arterial embolisation for treatment of PPH suggest that the intervention does not impair subsequent menstruation, fertility and obstetric outcomes. Selective arterial occlusion may also be effective after failed internal iliac artery ligation.¹⁷⁴

Evidence
level 3

5.6.2.5 Hysterectomy

The decision for hysterectomy should be made by an experienced consultant clinician and the decision preferably discussed with a second experienced clinician when feasible.²⁹ Early recourse to hysterectomy is recommended, especially where bleeding is associated with placenta accreta or uterine rupture.¹² Hysterectomy should not be delayed until the woman is in extremis or while less definitive procedures with which the surgeon has little experience are attempted. The procedure should be carried out by a surgeon who is experienced in carrying out hysterectomies. Subtotal hysterectomy is the operation of choice in many instances of PPH requiring hysterectomy, unless there is trauma to the cervix or a morbidly adherent placenta in the lower segment.

Evidence
level 4

Sequential reports of the Scottish Confidential Audit of Severe Maternal Morbidity from 2003 until 2012, summarised in the final 2014 publication,¹⁵⁰ have shown a statistically significant fall in the proportion of women with PPH (with blood loss greater than or equal to 2500 ml) requiring a hysterectomy to control the bleeding, and an increase in the use of conservative surgical techniques.

Evidence
level 3

5.6.3 Intensive and high dependency units and post-PPH care

The 2006–08 CMACE report¹⁰ identified that three deaths were due to lack of optimal care following PPH, and in particular, a lack of routine observation in the postpartum period. Sequential reports^{10,131} have recommended the use of MEOWS charts to alert caregivers to abnormal trends in haemodynamic measurements.

Evidence
level 4

A prospective audit¹⁷⁵ of the management of major PPH (defined in the audit as blood loss of 2500 ml or more, transfused 5 or more units of packed red cells or received treatment for coagulopathy) found that the majority of women received high dependency care on the labour ward, while only 21% were admitted to intensive care. The authors concluded that care for these women may be better provided by obstetricians and anaesthetists on the labour ward, a view that others have shared.¹⁷⁶

Evidence
level 3

6. How should secondary PPH be managed?

In women presenting with secondary PPH, an assessment of vaginal microbiology should be performed (high vaginal and endocervical swabs) and appropriate use of antimicrobial therapy should be initiated when endometritis is suspected.

D

A pelvic ultrasound may help to exclude the presence of retained products of conception (RPOC), although the diagnosis of retained products is unreliable.

C

Surgical evacuation of retained placental tissue should be undertaken or supervised by an experienced clinician.

D

The causes of secondary PPH are numerous and include endometritis, RPOC and subinvolution of the placental implantation site.^{177,178} The management of women presenting with secondary PPH should include an assessment of their haemodynamic status, an assessment of the blood loss and an evaluation of the woman's concerns (for example, is her bleeding becoming inconvenient because it has persisted longer than she had expected?).

Evidence level 4

Investigations should include bacteriological testing for endometritis (high vaginal swab), although a low yield of positive vaginal swab results has been reported in patients with secondary PPH.¹⁷⁹ In contrast, Pather et al.¹⁸⁰ found a high incidence of abnormal vaginal microbiology (52%) and endometritis in their case series, supporting the practice of routine assessment of vaginal microbiology and appropriate use of antimicrobial therapy in women presenting with secondary PPH.

Evidence level 3

A Cochrane review investigated the effect of different antibiotic regimens for the treatment of postpartum endometritis.¹⁸¹ This review concluded that a combination of clindamycin and gentamicin is appropriate, and that once uncomplicated endometritis has clinically improved with intravenous therapy, there is no additional benefit from further oral therapy. The management of women presenting with secondary PPH and sepsis is addressed in the RCOG Green-top Guideline No. 64b.¹⁸²

Evidence level 1–

Pelvic ultrasound scans are commonly performed on women presenting with secondary PPH to identify any RPOC. Case series^{180,183–186} have reported a wide range of sensitivities and specificities of ultrasound in the detection of RPOC (44–94% and 16–92%, respectively). These series suggest that the presence of an echogenic mass and a thickened 'endometrium' is associated with RPOC. In a prospective observational study¹⁸⁷ of 79 women with secondary PPH, Mulic-Lutvica and Axelsson concluded that an echogenic mass in the uterine cavity and an anteroposterior diameter of the cavity above the 90th centile (approximately 25 mm on days 1–7 postpartum) was associated with RPOC. Since the range of sensitivities and specificities of ultrasound in the detection of RPOC is so wide, the clinical findings, including the degree of bleeding and whether the cervical os is open, should be taken into account before the decision to undertake surgery is made. It has been proposed that colour flow Doppler imaging should be included in the evaluation of the postpartum uterus, although, there is no strong evidence to support its use;¹⁷⁸ its use may facilitate the diagnosis of pseudoaneurysms and arteriovenous malformations, which are rare but recognised causes of secondary PPH.^{188–190}

Evidence level 3