

## Management of Postpartum Hemorrhage: Overview of Management Principles

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**Received:** December 22, 2020; **Published:** December 29, 2020

### Abstract

**Introduction:** Postpartum hemorrhage (PPH) is a very common obstetric emergency. It is considered one of the most common causes of maternal mortality. The exact definition and cut-off of PPH is not unanimous and multiple criteria are used worldwide. Postpartum hemorrhage could be classified to primary (or early) PPH, which occur in the first 24 hours following delivery, and secondary (late or delayed) PPH that occur from 24 hours to 12 weeks after delivery.

**Aim of the Work:** In this review, we will outline the general principles of management of primary postpartum hemorrhage.

**Methodology:** We have conducted a thorough search of MEDLINE library using Medical Subject Heading (MeSH) on PubMed database.

**Conclusion:** Fibrinogen level is important measure for assessment of hemorrhage severity. The best method to estimate the amount of lost blood is through a routine quantification of blood loss (QBL). QBL is strongly recommended for all births.

**Keywords:** *Postpartum Hemorrhage; Third Stage of Labor; PPH; Bleeding in Delivery; Approach; Management*

### Introduction

Postpartum hemorrhage (PPH) is a very common obstetric emergency. It is considered one of the most common causes of maternal mortality in both developed and developing countries. However, the absolute risk of death from PPH remains much lower in developed countries. The incidence of PPH varies by the method of diagnosis from 3 to 10 percent of all deliveries [1,2]. The mortality rate following PPH approximately averages 2 percent. Mortality is affected by the overall health of pregnant women and the resources for treatment of PPH [3]. Anemic women at delivery due to poor nutrition or malaria are particularly vulnerable to severe sequelae of PPH. Prompt recognition, appropriate resources, and adequate response are critical for lifesaving management preventing death.

The exact definition and cut-off of PPH is not unanimous and multiple criteria are used worldwide. The world health organization (WHO) defines it as Blood loss  $\geq$  500 mL within 24 hours after birth [4]. Some advocate that the definition should not rely on volume of blood loss alone as this diagnosis is problematic because bleeding may not be visible externally or blood in collection devices may be mixed with amniotic fluid. In addition, blood loss between 500 and less than 100 is infrequently associated with morbidity [5]. Hence, the definition of American College of Obstetricians and Gynecologists (ACOG) was revised in 2017 to: cumulative blood loss  $\geq$  1000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process regardless of delivery route [6]. California Maternal Quality Care Collaborative (CMQCC) has published a management plan that described several stages of PPH [7].

Postpartum hemorrhage could be classified to primary (or early) PPH), which occur in the first 24 hours following delivery, and secondary (late, or delayed) PPH that occur from 24 hours to 12 weeks after delivery. In this review, we will outline the general principles of management of primary postpartum hemorrhage. Secondary PPH, the techniques and specific advantages of each approach and procedures will not be discussed.

**Methods**

We have conducted a thorough search of MEDLINE database between 2000 and 2020 using Medical Subject Heading (MeSH) on PubMed. Additional search was performed on google scholar search engine that yields no extra important results. The result were screened initially by the title followed by further screening of the abstract. The terms used in the search process include postpartum hemorrhage, third stage of labor, bleeding in delivery, approach, and management.

**Principles of assessment and planning**

Fibrinogen level is important measure for assessment of hemorrhage severity. A level less than 200 mg/dL is predictive of severe PPH that prompts the need for transfusion of multiple units of blood and blood products, need for angiographic embolization or surgical management of hemorrhage, or maternal death.

Marked hypotension is a late sign that is generally not manifested until substantial bleeding has occurred. About 25 percent of a patient’s blood volume (≥ 1500 mL in pregnancy) can be lost before vital signs as blood pressure and heart rate start to change [8]. Hemoglobin and hematocrit values are also poor indicators that could be relied on as indicative of acute blood loss since they may take time to decline after an acute bleed.

The California Maternal Quality Care Collaborative (CMQCC) has described a staging system in their Obstetric Hemorrhage Emergency Management Plan table chart (Table 1) [7].

Stage	Description
Stage 0	Every woman in labor/giving birth.
Stage 1	Blood loss > 500 mL vaginal delivery or > 1000 mL cesarean delivery or change in vital signs (by > 15 percent or heart rate ≥ 110 beats/minute, blood pressure ≤ 85/45 mmHg, O <sub>2</sub> saturation < 95 percent).
Stage 2	Continued bleeding with total blood loss < 1500 mL.
Stage 3	Total blood loss >1500 mL or transfusion of more than two units packed red blood cells or unstable vital signs or suspicion of disseminated intravascular coagulation.

**Table 1:** Stages of PPH proposed by CMQCC.

All women with risk factors for PPH should be identified prior to delivery and counseled according to the level of risk. Delivery planning for women at risk involves ensuring availability of resources such as experienced personnel, medication, equipment, adequate intravenous access, and blood products. It is the physician’s role to arrange for delivery in a facility that has an appropriate level of care for their need should be ensured.

During the labor, blood should be typed and screened for women at medium risk for PPH. These include a history of prior uterine surgery, multiple gestation, grand multiparity, and a history of prior PPH. The presence of large fibroids, macrosomia, overweight women (BMI > 40), anemia, chorioamnionitis, prolonged second stage, oxytocin > 24 and magnesium sulfate administration is also associated with increased risk of PPH. Women at high risk of postpartum hemorrhage should have blood units already typed and cross-matched. Ex-

amples of women at high risk include women with placental previa, placenta accreta, bleeding diathesis, and the presence of  $\geq 2$  medium risk factors for PPH.

The routine prophylactic use of uterotonic drugs as oxytocin alone or in combination with misoprostol reduces the risk of PPH by at least 30 percent in the overall obstetric population. Currently, the use of tranexamic acid (antifibrinolytic) as prophylaxis is being studied [9].

Some expert believe that knowledge of risk factors for PPH is not clinically useful for most patient as many women without risk factors may undergo PPH, and most high-risk women do not experience significant hemorrhage [10,11]. Hence, even women with low risk should be prepared with post-delivery management plan that consider not only the blood loss at delivery, but also any complications that may arise. While evidence is lacking regarding the optimal approach to medium term postpartum management in women who have experienced PPH, it seems reasonable to prolong the duration of postpartum oxytocin administration when the cause was atony. In addition, monitoring the complete blood count and coagulation profile is advisable in any woman at risk for coagulopathy or symptomatic anemia from acute blood loss.

### General principles

The best method to estimate the amount of lost blood is through a routine quantification of blood loss (QBL). QBL is strongly recommended for all births regardless of presence of risk factors. The idea is based on the fact that delayed recognition of significant blood loss is commonly associated with maternal morbidity and mortality from hemorrhage. If QBL is reserved only for cases of significant bleeding, staff may be unfamiliar with the process and thus less likely to obtain valid data. Hence, applying QBL on all deliveries enhances the staff familiarity with its use and it would require only minutes to perform in the majority of births [7].

Common methods that aid early recognition of excessive blood loss and timely initiation of life-saving interventions include collecting blood in graduated measurement containers, using visual aid that correlate the appearance of blood on specific surfaces with the volume of blood absorbed by that surface, and measuring the total weight of bloody materials and subtract the known dry weight [12-14]. There is no sufficient evidence that superior one method over the other, according to a systematic review [15]. However, the ACOG considers quantitative methods more accurate than visual methods [16].

Obstetrician should consider the cause and severity of bleeding to determine the need of laparotomy and other approaches. The “four Ts” is a mnemonic used to refer to the 4 most common causes of PPH. These are Tone: uterine atony; Trauma: laceration, hematoma, inversion, rupture; Tissue: retained tissue or invasive placenta; and Thrombin: coagulopathy [17]. Atony remains the most common cause and is influenced by both the route of delivery and severity of bleeding. The management of PPH caused by atony after a vaginal birth begins with uterotonic drugs and minimally invasive procedures such as intrauterine balloon tamponade and may progress to more invasive procedures as uterine artery embolization until hemorrhage is controlled. Laparotomy is the most invasive, but might be life-saving, measure that is usually possible and desirable to avoid. Following cesarean delivery, uterotonic drugs could be used to treat atony. However, as the abdomen is already open, surgical procedures to control bleeding as artery ligation and uterine compression sutures could be employed much sooner. The uterine artery embolization is considered if these procedure fail.

Measures to control blood loss should be initiated in sequence and care provider should promptly assess the success or failure of each measure. If an intervention does not succeed, the next treatment in the sequence must be swiftly instituted. Indecisiveness delays treatment and results in unnecessary hemorrhage, which ultimately induces dilution coagulopathy and extreme hypovolemia, hypoxia, hypothermia, and acidosis. This would make management even more complicated and increase the risk of hysterectomy, severe hemorrhagic shock morbidity, and death. For traumatic cause of postpartum hemorrhage as lacerations, surgical control is the typical approach. This could be achieved either transvaginally or through laparotomy. Early use of the antifibrinolytic tranexamic acid can reduce mortality in women with PPH related to atony or trauma. However, this promising agent is still under investigation.

Postpartum hemorrhage caused by retained tissues as placenta is best treated by removal of this tissue. Unfortunately, placenta accreta spectrum generally requires hysterectomy. Women undergoing PPH due to coagulopathy disorder is best treated medically with transfusion of blood and blood products, reversal of anticoagulation, and correction of clotting factor deficiencies.

### Conclusion

Fibrinogen level is an important measure for assessment of hemorrhage severity. A level less than 200 mg/dL is predictive of severe PPH. Marked hypotension is a late sign that is generally not manifested until substantial bleeding has occurred. About 25 percent of a patient's blood volume ( $\geq 1500$  mL in pregnancy) can be lost before vital signs as blood pressure and heart rate start to change.

The routine prophylactic use of uterotonic drugs as oxytocin alone or in combination with misoprostol reduces the risk of PPH by at least 30 percent. Some experts believe that knowledge of risk factors for PPH is not clinically useful for most patients. The best method to estimate the amount of lost blood is through a routine quantification of blood loss (QBL). QBL is strongly recommended for all births. Obstetricians should consider the cause and severity of bleeding to determine the need of laparotomy and other approaches.

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**Volume 10 Issue 1 January 2021**

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