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Definitions and Classifications

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INTRODUCTION

Conventionally, the term 'postpartum hemorrhage' (PPH) is applied to pregnancies beyond 20 weeks' gestation. Although bleeding at an earlier gestation may have a similar etiology, these are usually referred to as spontaneous miscarriages.

Despite numerous advances in medical and surgical treatment over the past 50 years, no significant changes have been made in the definitions or classification of PPH[1]. The World Health Organization (WHO) definition was proposed in 1990 and is widely used: 'any blood loss from the genital tract during delivery above 500 ml'[2] and updated in 2003 to include the first 24 hours after delivery[3].

The average blood loss during a normal vaginal delivery is widely described as 500 ml; however, approximately 5% of women lose more than 1000 ml during a vaginal birth[4–7]. On the other hand, cesarean deliveries are associated with an average estimated blood loss of 1000 ml[8]. Under these circumstances, a considerable degree of overlap exists in the acceptable range of blood loss for vaginal and cesarean deliveries. It is interesting to note that these definitions may be subject to further revision in the future when accurate studies of measured blood loss become available.

PURPOSE OF CLASSIFICATION

Classification of PPH is desirable for the following reasons. First, due to the rapidity of disease progression there is an overriding clinical need to determine the most suitable line of management. Although the urgency of intervention depends on the rate of decline or deterioration, the rate of decline or deterioration may also influence the urgency of intervention.

The second reason for classification is to assess the prognosis. This may help to determine the immediate, medium- and long-term clinical outcome. Therefore, a prognostic classification will guide the degree of aggressiveness of the intervention, especially as management may involve more than one clinical specialty. It will also help to decide on the optimal site for subsequent care, e.g. high dependency unit (HDU) or intensive care unit (ITU), if such exist in the hospital.

The third reason is to allow effective communication based on standardization of the estimate of the degree of hemorrhage, thus standardizing differing management options. The initial assessment is usually made by the staff available on site, and these are often relatively junior medical, midwifery, or nursing personnel. They in turn have to assess the severity of bleeding and summon help or assistance as required. Thus, a standardized easily applicable working classification facilitates effective communication and obviates interobserver variation.

CLASSIFICATIONS IN USE

Conventional temporal classification

Traditionally the classification of PPH has been based on the timing of the onset of bleeding in relation to the delivery. Hemorrhage within the first 24 hours of vaginal delivery is termed either early or primary PPH, whereas bleeding occurring afterwards, but within 12 weeks of delivery, is termed late or secondary PPH[9]. Secondary PPH is less common than primary PPH, affecting 1–3% of all deliveries. In both cases, the true blood loss is often underestimated due to the difficulty with visual quantitation[10,11].

Classification based on quantification of blood loss

Amount of blood lost

Blood loss at delivery is estimated using various methods. These range from the less modern methods of counting blood soaked pieces of cloth or 'kangas' used by traditional birth attendants in rural settings to more modern techniques such as using a calibrated drape that is placed under the buttocks (see Chapters 9 and 11) or calculating the blood loss by subtraction after weighing all swabs using sensitive weighing scales[12].

Change in hematocrit

The American College of Obstetrics and Gynecology advocates the definitions of PPH of either a 10% change in hematocrit between the antenatal and postpartum period, or a need for erythrocyte transfusion[13].

Rapidity of blood loss

In attempts to overcome these inconsistencies, PPH has also been classified based on the rapidity of blood

loss. *Severe hemorrhage has been classified as blood loss of more than 150 ml/min (within 20 min causing a loss of more than 50% of blood volume) or a sudden blood loss of more than 1500–2000 ml* (uterine atony; loss of 25–35% of blood volume)[14].

Volume deficit

A form of standardized classification described by Benedetti considers four classes of hemorrhage[15]. The class of hemorrhage reflects the volume deficit, and this is not necessarily the same as the volume of blood loss (Table 1).

Class 1

The average 60 kg pregnant woman has a blood volume of 6000 ml at 30 weeks' gestation. A volume loss of less than 900 ml in such a woman will rarely lead to any symptoms and signs of volume deficit and will not require any acute treatment. This has been described as class 1.

Class 2

A blood loss of 1200–1500 ml will manifest clinical signs, such as a rise in pulse and respiratory rate. There may also be recordable blood pressure changes, but not the classic cold, clammy extremities.

Class 3

Class 3 denotes patients where the blood loss is sufficient to cause overt hypotension. The blood loss is usually around 1800–2100 ml, and is accompanied by signs of tachycardia (120–160 bpm), cold clammy extremities and tachypnea.

Class 4

Class 4 is commonly described as massive obstetric hemorrhage. When the volume loss exceeds 40%, profound shock ensues, and the blood pressure and pulse are not easily recordable. Immediate and urgent volume therapy is necessary, as a fatal outcome secondary to circulatory collapse and cardiac arrest is not far away unless resuscitation is immediate and aggressive.

Classification based on causative factors

The causes of PPH can also form a basis of classification.

Causes of primary PPH

Primary PPH is traditionally considered as a disorder of one or more of the four processes: uterine atony, retained clots or placental debris, genital lesions or trauma, and disorders of coagulation. The oft quoted acronym (aide memoire) for these conditions is the 'four Ts': tone, tissue, trauma and thrombin. Uterine atony alone accounts for 75–90% of PPH (Table 2).

Table 1 Classification of hemorrhage[15]

Hemorrhage class	*Acute blood loss* (ml)	*Percentage lost*
1	900	15
2	1200–1500	20–25
3	1800–2100	30–35
4	2400	≥40

Table 2 Classification of postpartum hemorrhage (PPH) according to causative factors. Adapted from Wac *et al.*, *The Female Patient* 2005;30:19

Causes of primary PPH
Tonus (uterine atony)
Uterine overdistention: multiparity, polyhydramnios, macrosomia
Uterine relaxants: nifedipine, magnesium, beta-mimetics, indomethacin, nitric oxide donors
Rapid or prolonged labor
Oxytoxics to induce labor
Chorioamnionitis
Halogenated anesthetics
Fibroid uterus
Tissue
Impediment to uterine contraction/retraction: multiple fibroids, retained placenta
Placental abnormality: placenta accreta, succenturiate lobe
Prior uterine surgery: myomectomy, classical or lower segment cesarean section
Obstructed labor
Prolonged third stage of labor
Excessive traction on the cord
Trauma
Vulvovaginal injury
Episiotomy/tears
Macrosomia
Precipitous delivery
Thrombin (coagulopathy)
Acquired during pregnancy: thrombocytopenia of HELLP syndrome, DIC, eclampsia, intrauterine fetal death, septicemia, placenta abruptio, amniotic fluid embolism, pregnancy-induced hypertension, sepsis
Hereditary: Von Willebrand's disease
Anticoagulant therapy: valve replacement, patients on absolute bed rest
Causes of secondary PPH
Uterine infection
Retained placental fragments
Abnormal involution of placental site

HELLP, hemolysis, elevated liver enzymes, low platelets; DIC, disseminated intravascular coagulation

Classification based on clinical signs and symptoms

Any bleeding that results in or could result in hemodynamic instability, if untreated, is considered as PPH (Table 3).

PITFALLS OF CURRENT CLASSIFICATIONS

Although the WHO definition is widely used, no single definition of PPH is used worldwide. This creates problems in translation and uniformity of treatment and results in obstacles to providing management programs with the best possible outcomes. The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) describes PPH as a blood loss of 500 ml or more for a vaginal delivery and 750 ml or

more in association with cesarean delivery[16]. In the United States and Canada, on the other hand, a blood loss of 500 ml for a vaginal delivery and 1000 ml for a cesarean birth are often used[17].

The drawbacks of a classification system based solely on quantity of blood loss or decline in hematocrit include the fact that this is a retrospective assessment and may not represent the current clinical situation. Moreover, such a classification is of limited use to a clinician faced with active and continuous bleeding. For example, the change in hematocrit depends on the timing of the test and the amount of fluid resuscitation given[18]. It could also be affected by extraneous factors such as prepartum hemoconcentration, which may exist in conditions such as pre-eclampsia.

Significant underestimation impairs the diagnosis of PPH when it is made by a clinical estimate of blood loss. The WHO definition of 500 ml is increasingly becoming irrelevant as most healthy mothers in the developed world can cope with a blood loss of more than 500 ml without any hemodynamic compromise. Visually assessed bleeding is more likely than not inaccurate, and studies have shown underestimation of measured blood loss by an average of 100–150 ml[19,20]. This has been reiterated in the systematic review by Carroli *et al*. which found the prevalence of PPH to be 10.55% in studies that measured postpartum blood loss[19], compared with 7.23% in studies where blood loss was estimated visually[21]. In the clinical realm, many authorities state that underestimation generally is by a factor of two.

Classifications based on the need for blood transfusion alone are also of limited value as the practice of blood transfusion varies widely according to local circumstances and attitudes to transfusion on the part of patients as well as physicians. The clinical application of such a classification may, in addition, be limited because of inherent individual differences in response to blood loss. Hemodynamic compensation depends on the initial hemoglobin levels prior to onset of bleeding, and this varies among healthy individuals. For these reasons, reliance on a classification solely based on the amount of blood loss and without consideration of clinical signs and symptoms may lead to inconsistency of management.

NEED FOR A CLINICAL AND PROGNOSTIC CLASSIFICATION

Universally, guidelines on the management of PPH have reiterated the importance of accurate estimation of blood loss and the clinical condition of the hemorrhaging patient. This proposition was further emphasized in the 1988–1990 Confidential Enquiries into Maternal Deaths in the United Kingdom (CEMD)[22] and reiterated in the 1991–1993 report as a list of six bullet points, the first being 'accurate estimation of blood loss'[23].

In 2009, the International Postpartum Hemorrhage Collaborative Group recommended that it was fundamental that the definitions of PPH should be unified and further research should investigate how existing definitions are applied in practice to the coding of data[24]. The ideal classification of PPH should take into consideration both the volume loss and the clinical consequences of such loss. The recorded parameters should be easily measurable and reproducible. This will help in providing an accurate and consistent assessment of loss, which can readily be communicated and incorporated into most labor ward protocols.

PROPOSED CLASSIFICATION

The 500 ml limit as defined by WHO[2] should be considered as an alert line; the action line is then reached when vital functions of the woman are endangered. In healthy women this usually occurs after the blood loss has exceeded 1000 ml, but as *blood loss is notoriously underestimated it may be dangerous not to institute simple therapeutic measures as described in this volume (bimanual massage, uterotonic agents, inspection of the lower genital tract) and be ready to institute more aggressive actions should it be necessary (see below)*.

We propose a classification (Table 4) wherein the volume loss is assessed in conjunction with clinical signs and symptoms. We propose this classification is mainly useful in fully equipped hospitals and obstetric units, and it is not being proposed for full

Table 3 Symptoms related to blood loss with postpartum hemorrhage. Adapted from Bonnar J. *Baillieres Best Pract Res Clin Obstet Gynaecol* 2000;14:1

Blood loss		*Blood pressure*	
ml	%	(mmHg)	*Signs and symptoms*
500–1000	10–15	Normal	Palpitations, dizziness, tachycardia
1000–1500	15–25	Slightly low	Weakness, sweating, tachycardia
1500–2000	25–35	70–80	Restlessness, pallor, oliguria.
2000–3000	35–45	50–70	Collapse, air hunger, anuria

Table 4 Proposed classification. Adapted from Benedetti T. Obstetric haemorrhage. In: Gabbe SG, Niebyl JR, Simpson JL, eds. *A Pocket Companion to Obstetrics*, 4th edn. New York: Churchill Livingstone, 2002[5]

Hemorrhage class	*Estimated blood loss* (ml)	*Blood volume loss* (%)	*Clinical signs and symptoms*
0 (normal loss)	<500	<10	None
	ALERT LINE		
1*	500–1000	15	Minimal
	ACTION LINE		
2†	1200–1500	20–25	↓Urine output ↑Pulse rate ↑Respiratory rate Postural hypotension Narrow pulse pressure
3‡	1800–2100	30–35	Hypotension Tachycardia Cold clammy Tachypnea
4§	>2400	>40	Profound shock

*Need observation ± replacement therapy; †Replacement therapy and uterotonics; ‡Urgent active management; §Critical active management (50% mortality if not managed actively)

implementation in areas which are resource poor. In such areas, the action line should be moved forward in time and minimal therapy instituted earlier.

Our adaptation of a previously described classification[15] will fulfill most of these criteria. This guideline adopts a practical approach whereby a perceived loss of 500–1000 ml (in the absence of clinical signs of shock) prompts basic measures of monitoring and readiness for resuscitation (alert line), whereas a perceived loss of more than 1000 ml or a smaller loss associated with clinical signs of shock (hypotension, tachycardia, tachypnea, oliguria or delayed peripheral capillary filling) prompts a full protocol of measures to resuscitate, monitor and arrest bleeding.

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classification meaning: 1. the act or process of dividing things into groups according to their type: 2. a group thatâ€¦. Learn more.Â Definitions and Grammar. Clear explanations of natural written and spoken English. English. Definitions and Classifications. Human rights are commonly understood as inalienable fundamental rights to which a person is inherently entitled simply because she or he is a human being. This chapter examines the concept of human rights and its origins, explaining the different terms and classifications. A. Historical antecedents. The origins of human rights may be found both in Greek philosophy and the various world religions. In the Age of Enlightenment (18th century) the concept of human rights emerged as an explicit category. Use of the definitions should sharpen the distinction between various classifications and provide more consistent resources reporting. Definitions. The resource classification system is summarized in Figure 1 and the relevant definitions are given below. Elsewhere, resources have been defined as including all quantities of petroleum which are estimated to be initially-in-place; however, some users consider only the estimated recoverable portion to constitute a resource.