

# Learning to Treat Postpartum Hemorrhage: a Spectrum of Modern Teaching/Learning Modalities

*E. El Hamamy and C. B-Lynch*

‘Medicine is learned by the bedside and not in the classroom.’  
William Osler<sup>1</sup>

## INTRODUCTION

William Osler (1849–1919) brought forth the concept of bedside teaching/learning in the 19th century<sup>1</sup>. Although more than a century has passed since he first aired this concept, and the practice of medicine both at the bedside and in the office has changed radically, his statement remains entirely true with regard to the management of postpartum hemorrhage (PPH).

Specifically, in recent years training in emergency obstetric skills (including PPH training) has moved from the traditional clinical teaching normally conducted in the labor ward to specific, targeted skills and scenario-based courses that utilize mannequins and simulators most often away from the bedside. Such changes are currently seen as necessary, largely as a result of the limitations of traditional clinical teaching when it comes to genuine patient encounters in an emergency situation<sup>2</sup>. The authors are grateful to Professor Amr El Noury of Cairo University for designing the poster which provides a stepwise guide to the management of PPH (Figure 1).

## THE DRIVERS FOR POSTPARTUM HEMORRHAGE TRAINING

The incidence of PPH is increasing in both the developed and developing countries<sup>3,4</sup>. This circumstance preceded increasing demands for training of all caregivers who deal with parturients. Because all staff require regular training to identify and manage maternal collapse, including the identification and management of PPH, different organizations are taking the requisite initiatives to improve the accessibility of training.

The World Health Organization (WHO) set a goal to reduce maternal mortality by 75% by 2015, mainly by reducing maternal deaths related to PPH by training health workers in both developing and developed countries<sup>5</sup>. Recently, further initiatives have been undertaken by WHO in addressing the women’s

health crisis in Africa by providing a report on women’s health in the African Region<sup>6</sup>.

Prior to these efforts, the Federation of Gynecology and Obstetrics (FIGO), together with the Confederation of Midwives (ICM) advocated the Global Initiative on the Prevention of Post-partum Hemorrhage in 2004. In addition, both organizations recommend that every skilled attendant (doctors, nurses and midwives) likely to be present at birth have training in uterine massage and bimanual compression. The same document also advises that all skilled birth attendants have access to technical training in administering uterotonics and other techniques such as intravenous infusions and tamponade balloons, and that every doctor who can perform laparotomy be provided with surgical training to perform ‘simple conservative surgery’ for PPH including compression sutures and sequential devascularization<sup>7</sup>.

In the UK, successive Confidential Enquiries into Maternal Deaths have linked the increased numbers of deaths from PPH to recent changes in medical training. Specifically, the reduction in the overall length of obstetric training and in working hours during training may have reduced the amount of experience gained compared with the experiences obtainable in the past. Moreover, these reports have shown a trend towards subspecialization among consultants in the UK, and those with a special interest in obstetrics do not necessarily have highly developed surgical skills. These reports recommend regular ‘fire drills’ or ‘skills drills’ for the modern management of PPH for all grades of staff in every obstetric unit. The 2004 and 2007 Confidential Enquiry into Maternal and Child Health (CEMACH) reports repeatedly highlight the role of inadequate clinical care, as well as poor communication and teamwork within labor ward teams and suggest that as many as half of all maternal deaths might be prevented with better care<sup>8,9</sup>. Following this line of thought, the 2011 Confidential Enquiries into Maternal Deaths (CMACE) report recommended that all units should have protocols in place for the identification and management of PPH and that all clinicians responsible for the care of pregnant women,

## Postpartum Haemorrhage Guide to Management

Identify

Risk factors - Blood loss > 1000 ml or Hemodynamic compromise: R.R / pulse / systolic / signs of shock

Known Antenatal Risk			
Substantial risk	O.R	Significant Risk	O.R
Suspected or proven placental abruption	13	Previous PPH	3
Known placenta praevia	12	Asian ethnicity	2
Multiple pregnancy	5	Obesity (BMI >35)	2
Pre-eclampsia/ gestational hypertension	4	Anaemia (<9 g/dl)	2

Intra-partum / postpartum risk			
Substantial risk	O.R	Significant Risk	O.R
Delivery by emergency C.S	4	Operative vaginal delivery	2
Delivery by elective C.S	2	Prolonged labour (> 12 hours)	2
Induction of labour	2	Big baby (> 4 kg)	2
Retained placenta	5	Pyrexia in labour	2
Mediolateral episiotomy	5	Age (> 40 years, not multiparous)	1.4

Communicate

Resuscitate

Monitor & Investigate

Stop Bleeding

**1**  
**Communicate**  
Alert all staff

Midwife / Nurse  
Senior Obstetrician  
Obstetric Anaesthetic staff  
Haematologist  
Blood Bank  
Porters  
PPH emergency Box  
Member of the team to record events.

**2**  
**Resuscitate**  
**Airway**  
**Breathing**  
**Circulation**  
**Oxygen 10—15 L/ min**  
Position flat



**14 G i.v line x2**

20 ml blood sample should be taken and sent for diagnostic tests, including full blood count, coagulation screen, urea and electrolytes and cross match (4 units).

**Restore circulation**

Crystalloid. Hartmann's solution max 2 L

Colloid (e.g. hemacel) max 1.5 L

**Improve O2 carrying capacity**

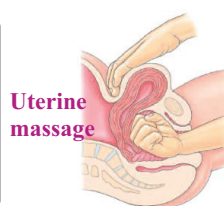
Packed Group specific or O Negative Blood

Warm - rapid- no filter



**3**  
**Monitor and investigate**  
Hemoglobin, Ht, platelets  
Clotting screen (PT, PTT, Fibrinogen)  
Foley's catheter  
O2 saturation  
Early warning chart  
Tone, Tissue, Trauma, Thrombin  
Consider ITU (when bleeding is controlled)

**4**  
**Stop Bleeding**



Uterine massage

**Syntocinon 5 units**  
by slow intravenous injection (may have repeat dose).  
(40 units in 500 ml Hartmann's solution at 125 ml/hour)  
**Ergometrine 0.5 mg**  
by slow I.V or I.M  
(contraindicated in hypertension).

**Misoprostol Rectal**  
600—1000 ug

**Carboprost**  
(if available)  
0.25 mg by intramuscular injection repeated at intervals of not less than 15 minutes to a maximum of 8 doses (contraindicated in women with asthma).

**Fresh Frozen plasma: 4 units** for every 6 units of red cells or if relentless bleeding or PT / APTT > 1.5 x normal (12—15 ml/kg or total 1 / L)

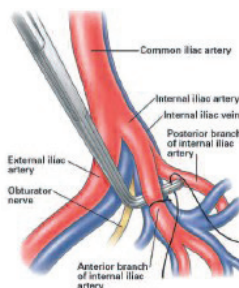
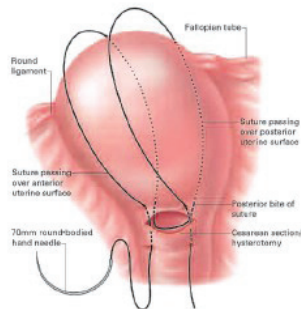
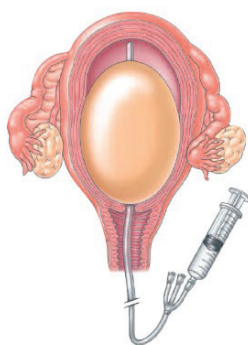
Exclude trauma to vulva, vagina, cervix and uterus

Resort to hysterectomy SOONER RATHER THAN LATER

Documentation and debriefing

To woman and family by a senior staff

**Recombinant Factor VIIa (rFVIIa)**



antenatally, postnatally and intrapartum, including those practicing in the community, should carry out regular skills training for such scenarios<sup>10</sup>.

The need for such a recommendation follows the 2007 survey among obstetric trainees in London which documented a reported decline in the numbers of individuals who could manage major PPH. Only 44.6% of respondents felt confident to perform a cesarean hysterectomy; and whereas a similar number (41.7%) could apply a B-Lynch suture, a much smaller number (27.1%) could dissect the ureter if need be. Additionally, a few respondents were less confident in performing any surgical procedure necessary in the management of major obstetric hemorrhage. This finding may have serious implications in the provision of out of hours senior cover for maternity units in the future<sup>11</sup>.

The Scottish Confidential Audit of Severe Maternal Morbidity 2008 highlighted errors and substandard care in the management of women who had sustained PPH. These included avoidable delay in diagnosis and treatment, failure to follow protocol/plan, appropriate conclusion/differential diagnosis not made, appropriate tests not performed, inadequate training/supervision of staff, inadequate history/examination, staff practicing beyond their level of competence, inadequate staffing (levels/skill mix), poor communication, inadequate service from other departments such as blood transfusion service and the laboratory, test results not obtained or ignored, lack of team work, defective equipment and inappropriate test performed. All these deficiencies could be improved with adequate and targeted training<sup>12</sup>.

The UK Obstetric Surveillance System (UKOSS) publication<sup>13</sup> echoes the growing recognition articulated in numerous chapters of this volume that prompt action is essential in managing PPH. Those who provide care should try to do so within the first 2 hours of the diagnosis and certainly not beyond a delay of 6 hours. Morbidity rises sharply after 2 hours, when it becomes much more likely that hysterectomy will be necessary.

## MODALITIES OF TRAINING

### Hands-on training

Hands-on training is a simple method for an on-the-job facilitator who works with small numbers of participants to teach them certain procedural applications. The working concept is to prepare the trainee at a workstation to mimic the procedure or scenario, let them practice it, and then review their competency.

This model of training is suitable for teaching practical skills such as the application of bimanual compression of the uterus, the uterine brace suture, uterine tamponade, etc. However, because of the small number of participants, it is not suitable to teach communication skills.

### Lecture based training

PPH is one of the catastrophic events where proper management requires a variety of hospital workers with different unique expertise. It is often difficult to get all these people together to arrange a simulation or hands-on training, and lecture based teaching may be more appropriate. All staff should attend; obstetric physicians, midwives, nurses, house staff, anesthesia providers, scrub technicians and unit secretaries participate in the same formal classroom instruction. The purpose is for all team members to hear the same material, to learn the same teamwork language and behaviors, and to feel empowered to flatten hierarchy. The participants from varying disciplines should be allowed ample opportunity for conversation and sharing of varying points of view. It is mandatory that the team should be able to understand each other's roles and competing interests that may not be self-evident.

Classroom based team training allows large numbers of clinical staff to be taught the concepts of teamwork and patient safety. Didactic lectures can be supplemented with clinical scenarios, vignettes, videos and other media to teach both the intellectual concepts and specific behaviors of team based care. The advantages of classroom based training are that it is relatively inexpensive, large numbers of staff can be trained quickly, feedback to and questions from the participants can be included, and multiple specialties can be trained simultaneously. This type of training can highlight patient safety processes that help maintain 'normalcy' on the unit to prevent adverse events (e.g. multidisciplinary meetings, preprocedure briefings, effective handoffs). This helps teach staff techniques to prevent adverse events instead of concentrating on ways to respond to them. Disadvantages include low fidelity training in the teamwork skills, and little or no practice in actual crisis management.

### Simulation

Simulation is a learner centered teaching method that mimics real world situations to meet specific learning objectives. A simulator is a generic term referring to a physical object, device, situation, or environment where a task or series of tasks can be realistically and dynamically represented<sup>14</sup>.

There are two types of simulators, those with high and low fidelities. The high fidelity type is often used to describe computer driven simulators, whereas the term low fidelity is used to describe simulators that are not computer controlled. High fidelity is desirable in simulation, because the more contextually accurate is the simulation based instruction, the more likely the learning that takes place will transfer to the reality of applied practice. The disadvantages of this type of training include cost, the need to remove clinicians from clinical care and a lack of realism compared with the clinicians' own experience<sup>15</sup>.

Simulation based training is an appropriate proactive approach for reducing errors and risk in

obstetrics, improving teamwork and communication, and giving students a multiplicity of transferable skills to improve their performances. The drivers for simulation include patient safety, limitation of current educational processes, shortening of the training period, high risk emergencies and the pressure of health care agencies in an attempt to reduce malpractice concerns<sup>16</sup>. A significant portion of hemorrhage-related maternal morbidity may be prevented through early diagnosis and rapid intervention. There is a small but growing body of literature describing the role of patient safety initiatives and simulation training in optimizing outcomes following PPH<sup>17</sup>. Rapid response teams may be used to facilitate coordination between various personnel involved in the management of PPH<sup>18</sup>. Hemorrhage drills and simulation based training may help providers achieve timely and coordinated responses<sup>19</sup>. Protocols may help to standardize management in cases of PPH, thereby minimizing unnecessary errors or delays in care<sup>20</sup>.

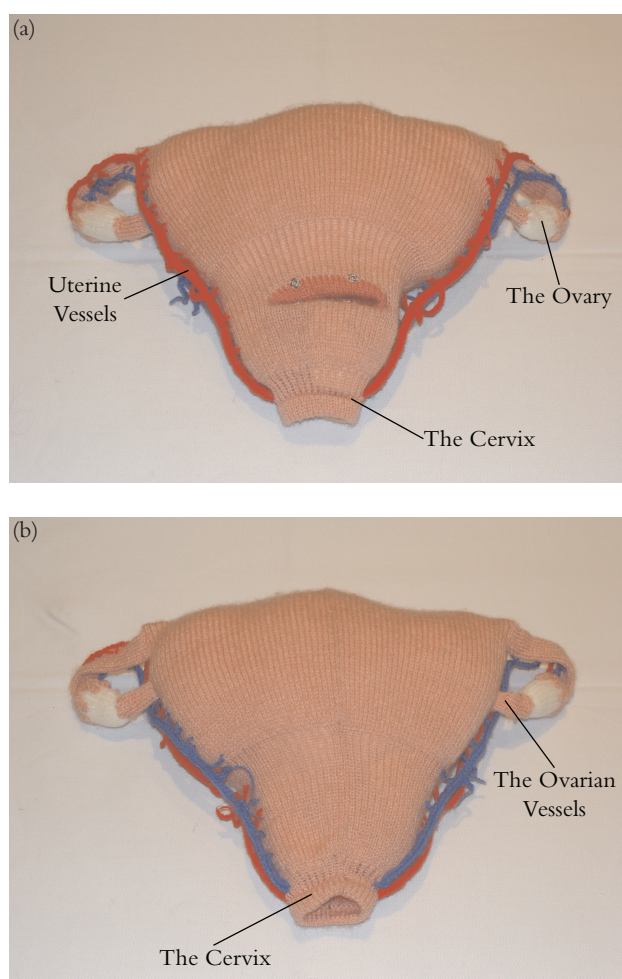
Only a few models have been used for PPH training. Deering *et al.* used a standard obstetric birthing model equipped with an inflatable uterus to simulate uterine atony. The residents were assessed upon completion of this exercise. The authors found that the majority were unable to correct the hemorrhage within 5 minutes and half made at least one error, either in the dose or the route of administration of medications used to arrest the bleeding<sup>21,22</sup>.

Teamwork training in a simulation setting resulted in improvement of knowledge, practical skills, communication and team performance in acute obstetric situations. Training in a simulation center did not further improve outcome compared with training in a local hospital<sup>20</sup>.

A simple low fidelity model has been used for the past few years by the authors. It is made of knitted wool and has an incision like opening in the lower part to give the impression of a postpartum uterus after the baby and the placenta have been expelled along with the blood supply of the uterus and the ovaries. It is a useful tool to learn the placement of a B-Lynch or other type of compression suture and it also gives one the ability to practice a form of step-wise devascularization (Figure 2).

#### INVALUABLE RESOURCES FOR POSTPARTUM HEMORRHAGE TRAINING

- (1) PPH hands on training/workshops visit <http://www.pphinternationaltraining.org/>
- (2) A short video demonstration of the B-Lynch suturing technique. This video is presented in real video format. There is a link provided to download, which is available at: [www.cblynch.com/index.html](http://www.cblynch.com/index.html)
- (3) Internet-based training. Visit *The Global Library on Women's Medicine*, launched November 2008, which is available at: [www.glowm.com](http://www.glowm.com)



**Figure 2** Uterine model (a) front view and (b) rear view

- (4) Poster of the B-Lynch suture technique to be displayed in the labor ward. This is available at: [www.sapienspublishing.com/pph\\_pdf/PPH\\_Poster.pdf](http://www.sapienspublishing.com/pph_pdf/PPH_Poster.pdf)
- (5) Pocket manual of synopsis of PPH. A special leaflet/wall chart, summarizing the immediate action that needs to be taken when PPH occurs. [www.sapienspublishing.com/pph\\_pdf/PPH-Guidelines.pdf](http://www.sapienspublishing.com/pph_pdf/PPH-Guidelines.pdf)
- (6) *A Comprehensive Textbook of Postpartum Hemorrhage*, 2nd edition, 2012. This first stand alone textbook describes a comprehensive guide to evaluation, management and surgical intervention of PPH. Available at: [www.sapienspublishing.com](http://www.sapienspublishing.com) and also from [www.glowm.com](http://www.glowm.com)
- (7) Postpartum hemorrhage issue of *Best Practice & Research Clinical Obstetrics & Gynaecology*<sup>23</sup>
- (8) The California Maternal Quality Care Collaborative Obstetric Hemorrhage Expert Task Force was created with the goal of improving readiness, recognition, response and reporting of maternal hemorrhage. In addition, this task force aimed to collect and publish PPH tools that would aid a broad spectrum of birthing units. A compendium of best practice documents for PPH has been

developed and is available on the California Maternal Quality Care Collaborative website, [www.cmqcc.org](http://www.cmqcc.org). A PPH 'tool kit' is included which contains a quick reference checklist, table and flow chart for recognition and clinical management. In this system, hemorrhage is categorized from stage 0 (risk assessment and active management of the third stage) to stage 3 (massive transfusion protocol and invasive surgical approaches for control of bleeding). Collaborative efforts such as this, which incorporate simulation and team training with evidence-based protocols, may be critical in reducing hemorrhage-related maternal morbidity and mortality.

### COURSES AND WORKSHOPS

A number of workshops to provide PPH training have been developed. These are available as either separate or part of other obstetric emergencies such as Advanced Life Support in Obstetrics (ALSO)<sup>24</sup>, Maternal Obstetrics Emergency Trauma (MOET)<sup>25</sup> and PRactical Obstetric MultiProfessional Training (PROMPT) course<sup>26</sup>. The International Training and Workshop for the Management of Massive PPH Group was set up in 2009 in London with the objective to provide hands on training and workshops in the management of PPH. The group is chaired by the senior author and includes experts who are renowned for their expertise in the management of PPH across the world.

The International Training Group has organized and run regular courses in Milton Keynes and South Wales, UK, all of which were very successful. Recently, the group has run a series of study days and workshops in both Cairo and Alexandria with successful feedback response. It seems that this training program and workshop would be beneficial to other developing countries to reduce maternal mortality rate from PPH.

### CONCLUSION

Training in the management of PPH should be mandatory for all clinical staff providing maternity care services. Regular 'fire drills' should also be organized to test the local system in real time. These help to identify problems in the system and generate solutions. Repeat drills should be performed to check the efficacy of solutions. Teams that work together should train together, ideally in their local environment. There is also a need for a nationally approved scenario-based team-training program in the management of massive obstetric hemorrhage, involving not only the obstetric staff, but also the anesthetists, theater, recovery and high-dependency teams. Simulators should be put together to give the candidate and trainees the confidence of feeling a real life situation.

Multiple training modalities are used to accomplish knowledge transfer for modern management of PPH. All are necessary, as it is clear that the traditional

methods of reading or attending a lecture are insufficient to prepare the trainee for responsible action when it is needed in an emergency situation. Like many other skills in medicine, the training necessary to attend to a patient who has a life threatening hemorrhage cannot be thought of as 'see one, do one and teach one'.

### PRACTICE POINTS

- Regular drills and skills training are essential in the management of PPH
- Trainees should be allowed dedicated and protected time for training
- Simulation of obstetric procedures and emergencies can only augment, not replace, the learning that occurs by caring for actual patients
- In-house training is cheap and associated with improved outcomes
- Funding should be available for training to reduce the cost of medical litigation as a result of substandard care
- Team work is essential for proper coordination of the management
- Above all patients and their relatives must be kept fully informed at all stages of management.

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