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Setting up a simulation workshop to assess blood loss in obstetrics

Articles in the Tips and Techniques section are personal views from experts in their field on how to carry out procedures in obstetrics and gynaecology.

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Introduction

Postpartum haemorrhage is a major cause of morbidity and mortality in obstetric practice worldwide. In 2011–2013 in the UK, it was the second most common direct cause of maternal mortality, accounting for 6.5% of all maternal deaths.[1] Poor outcomes following postpartum haemorrhage are often attributed to a delay in recognition and management of excessive blood loss. As such, the importance of identifying haemorrhage and estimating blood loss accurately to apply timely treatment has been highlighted in the 2014 report from Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK (MBRRACE-UK), *Saving Lives, Improving Mothers' Care*.[2]

However, with increased awareness, there is also the potential for overestimation of blood loss and unnecessary, potentially harmful, intervention. Clinical context should therefore be considered together with measurement of blood loss to guide management appropriately. For example, a woman's pre-delivery haemoglobin level and her weight can help anticipate the impact of a particular volume of blood lost. An approximation of circulating volume used in the Royal College of Obstetricians and Gynaecologists (RCOG) guideline for management of postpartum haemorrhage[3] is 100 ml/kg. The situation should be considered life threatening when around 40% of total volume is lost. For example, a 70 kg woman with a circulating volume approximating 7000 ml will be critically compromised after a blood loss of 2800 ml. Management should be initiated well before this stage and clinical observations should be appropriately recorded and acted upon rapidly if there are signs of deterioration.

The majority of maternity units in the UK use visual estimation of the volume of blood lost with recourse to objective measurement in cases with suspected high blood loss. This is mostly through weighing, recording of liquid volumes and use of specialist drapes/equipment to maximise collection of any blood lost. By contrast, in developing countries where the health burden of postpartum haemorrhage is high, there are far fewer resources and healthcare providers rely more on visual estimation plus simple tools for diagnosis and treatment. Studies have shown that there are limitations and inaccuracies in visual estimation, but as a commonly practised clinical skill, tips and training to improve accuracy of estimation and awareness of pitfalls are useful tools.[4]

Visual estimation can vary widely between healthcare providers and simulation training is thought to improve accuracy.[5,6] Our group has provided an interactive workshop on the visual estimation of blood loss through the RCOG and the International Federation of Gynecology and Obstetrics (FIGO) over a number of years to an international audience. In this article, the authors provide instructions on how to create this cheap and reproducible tool to provide an interactive and thought-provoking workshop with tips and tricks to aid temporary estimation of blood loss, plus a guide to objective quantification in real-life scenarios.

Setting up the blood loss workshop

Target audience

The estimation of blood loss workshop is an invaluable session for all members of the multidisciplinary team involved in the management of acute bleeding scenarios.

Examples include antepartum and postpartum haemorrhage, both in midwifery and obstetric-led units, and blood loss at caesarean section. Members of the team involved in these scenarios include doctors (obstetricians, gynaecologists and anaesthetists), midwives, theatre nurses, operating department practitioners and healthcare assistants.

Running time

While it takes longer to set up, each simulation session takes 30–60 minutes to run, depending on the number of stations and the number of candidates estimating blood loss. We recommend running the scenario alongside teaching on management of acute haemorrhage, including medical and surgical management, resuscitation and management following the blood loss.

Resources

A single room that is large enough to fit approximately 1 m of table space per scenario and a maximum of ten candidates is sufficient. We usually set up nine or ten scenarios around 10 m length of table set up in an 'L' shape. We recommend that the floor and table are either wipe-clean or covered in a protective plastic layer due to possible spillages of the 'blood' substitute mixture (Figure 1).

A mixture of clinical containers (such as kidney dishes, trays, 500 ml bowls, caesarean section drapes) and swabs/tampons/sanitary pads of varying sizes are required for the simulation scenarios. The ingredients and instructions for making the simulated blood are set out in Box 1. The scenarios will each need to be numbered – we prefer laminated numbers that can be reused. Finally, each candidate will require a worksheet to fill in their estimations prior to group discussion.

Figure 1. An example of the workshop layout.

Box 1. Recipe and method for making simulated blood.

Liquid blood
Can be made on the day of the workshop.
Equal parts corn syrup/light treacle to water; adjusted to volume and consistency required then dyed with approximately one part blue to three parts red food colouring.

Clotted blood
This will require preparation the night before the workshop.
Red coloured jelly cubes, dissolved to the volume suggested on the packet and further dyed with red and blue food colouring as above.
We suggest setting the jelly in separated containers with known volumes measured in millilitres. For example, 4 × 250 ml volumes or 10 × 100 ml volumes.

Workshop stations

Healthcare workers are asked to independently estimate the blood volume demonstrated in a variety of scenarios in the workshop. The stations can illustrate learning, and can aim to incorporate local equipment and scenarios to make the stations similar to situations encountered in common practice. We have found that, following independent estimation, group discussion of the actual volumes in each station leads to insightful and supportive interaction between peers to facilitate learning. Suggested scenarios and learning points are described below.

Scenarios 1–3

Clinical scenario: liquid blood collected while delivering the placenta from three different women (Figure 2).

Learning points:

- Be familiar with local equipment, including receiver volumes for a fast estimation of continuing blood loss.
- Demonstrate intra-observer and inter-observer variation in estimations of identical blood volumes. Spread and depth of blood can alter the perception of volume.

Scenario 4

Clinical scenario: haemorrhage occurring at caesarean hysterectomy (Figure 3).

Learning points:

- Caution is required when estimating blood loss according to the number of saturated swabs, as saturation is a subjective, and therefore variable, assessment. There are many misconceptions as to what volume of blood a 'soaked' swab holds.
- Objectively weighing wet swabs with prior knowledge of dry weights allows accurate assessment of blood loss.
- 1 g liquid or clotted blood is approximately equal to 1 ml blood, and this calculation is sufficient to gain a reasonable blood loss estimation. (Note: there will be a small discrepancy in the corresponding volume and weight of

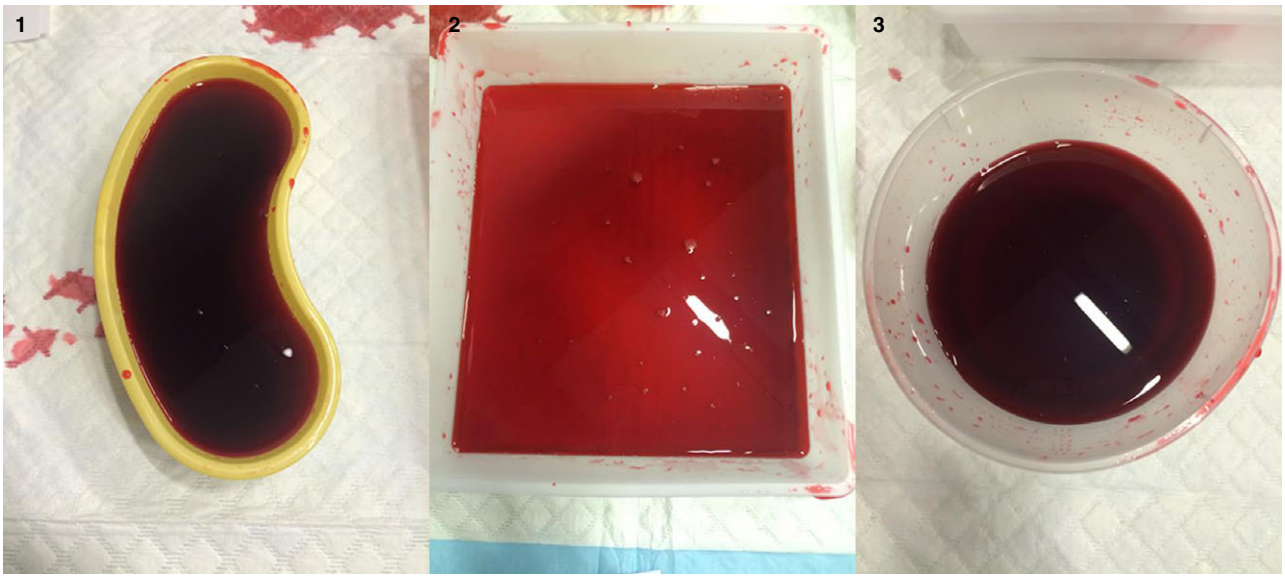

Figure 2. Scenario 1: kidney bowl holding 400 ml liquid blood. Scenario 2: tray holding 400 ml liquid blood. Scenario 3: bowl holding 400 ml liquid blood.

Figure 3. Scenario 4: seven large 45 × 45 cm surgical swabs holding a total of 1500 ml simulated blood.

the simulated blood as the density of both corn syrup and gelatine differ to that of blood.)

- Try introducing a clearly visible chart with a list of local dry swab weights, allowing quick calculation of blood loss during postpartum haemorrhage.
- Be aware of other fluids being absorbed, such as amniotic fluid or saline.

Scenarios 5 and 6

Clinical scenario: blood loss at the time of forceps delivery (scenario 5) or uncomplicated vaginal delivery (scenario 6) (Figure 4).

Learning points:

- Coagulated blood contracts in volume and can therefore be underestimated, however, the weight does not change.
- Avoid common misconceptions that assume clot can be approximated to volume such as 'a clot the size of a fist equals 500 ml' or 'the visual estimation of a clot is equal to one-third the total volume lost'. Weigh all blood lost, including clots.
- Delivery drapes with collection pockets incorporated can assist more complete and accurate measurement of blood loss.

Scenario 7

Clinical scenario: blood loss during caesarean section (Figure 5).

Learning points:

- This scenario demonstrates the need for situational awareness and vigilance to ensure that all blood loss is accounted for. When running our course, many participants miss the blood collected in the bottom of the drape.
- Allocate a team member (perhaps the scrub nurse, a non-operating doctor or theatre healthcare assistant, if present) to be responsible for blood loss measurement

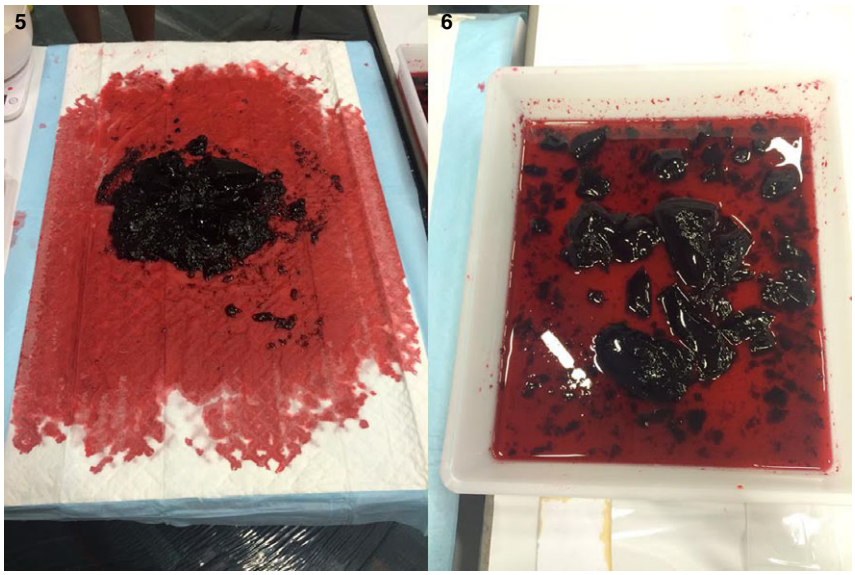

Figure 4. Scenario 5: incontinence pad holding 400 ml liquid and 500 ml coagulated blood. Scenario 6: tray holding 200 ml liquid and 300 ml clot.

during a postpartum haemorrhage who can take an overall view. For example, during caesarean section, a member of staff not directly involved in delivery can record the volume of amniotic fluid collected prior to start of significant blood loss and can check for concealed blood loss, such as any seen underneath the patient on the sheets and absorbable pads. In developing countries there may only be a single healthcare practitioner attending delivery. In these cases, while the priority will be arresting blood loss, awareness of the overall situation can guide decisions to escalate management techniques or seek help.

Figure 5. Scenario 7: caesarean section drape holding 1000 ml (part-concealed) blood within the drape.

Scenario 8

Clinical scenario: patient attending with heavy lochia after delivery, demonstrating blood loss since time of changing sanitary towel 30 minutes ago (Figure 6).

Learning points:

- A 'soaked' sanitary pad is a subjective measure.
- While one pad holds a small volume, soaking a number of towels within a short period of time can equal a significant blood loss compromising haemodynamic function.

Scenario 9

Clinical scenario: blood loss during perineal repair (Figure 7).

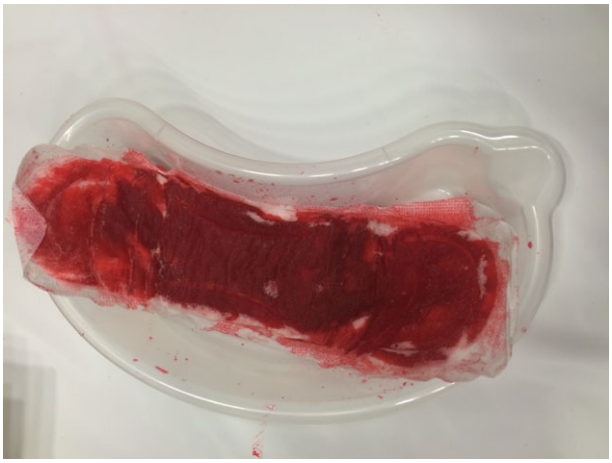

Figure 6. Scenario 8: sanitary towel soaked with 100 ml liquid blood.

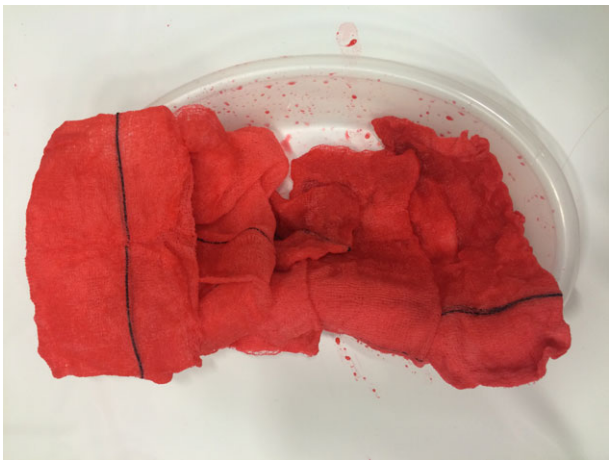

Figure 7. Scenario 9: five 10 × 7.5 cm swabs holding a total of 100 ml liquid blood.

Learning point:

- Small swabs are commonly used in room deliveries and all should be accounted for and weighed if there are concerns about blood loss.

Summary

This workshop offers an interactive tool to educate healthcare providers about the poor reliability of visual estimation of blood loss. It highlights common problems and prompts delegates to devise ways of providing a more accurate measurement of blood loss within their practice, according to local resources. As such, participants have reported increased confidence in approaching the task of estimating blood loss with greater knowledge of the pitfalls.

Reviews have suggested that training may only provide temporary improvement in estimation accuracy, likely due to the decline in visual memory over time.[7] This demonstrates the importance of objective measurement and that this workshop, in conjunction with teaching and training in the management of postpartum haemorrhage, could be provided on a regular basis to help improve clinical outcomes.

Disclosure of interests

There are no conflicts of interest.

Contribution to authorship

KK instigated, wrote and edited the article. SR, KA and TP contributed to writing and editing the article. MK revised the article. All authors approved the final version.

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