

# Managing PPH at Caesarean Section: What do we know, where do we go from here?

Arri Coomarasamy, MBChB, MD, FRCOG, University of Birmingham

John Varallo, MD, MPH, FACOG, Jhpiego

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# Conflicts of interest to declare

- Arri Coomarasamy - none
- John Varallo - none

# Outline

- Epidemiology
- Detection and diagnosis
- Management
  - Prevention at Caesarean Section (CS)
  - Treatment during and after CS
- Where do we go from here?
- Key Takeaways

# Epidemiology: Global prevalence of PPH

- Average global prevalence of **PPH ( $\geq 500$  ml)** is **6%**, and that of **severe PPH ( $\geq 1000$  ml)** is **1.86%** of deliveries<sup>1</sup>
  - Higher than global average in LMIC settings
- Risk of severe PPH is higher with CS than with vaginal birth<sup>2</sup>
- Risk of PPH is 2.9x higher with emergency CS vs elective; 5.2x higher in 2<sup>nd</sup> stage<sup>3</sup>

**Source:**

1. Carroli G, Cuesta C, Abalos E, Gulmezoglu AM. Epidemiology of postpartum haemorrhage: a systematic review. *Best Pract Res Clin Obstet Gynaecol.* 2008;22(6):999–1012

2. Al-Zirqi I, Vangen S, Forsén L, Stray-Pedersen B. Effects of onset of labor and mode of delivery on severe postpartum hemorrhage. *Am J Obstet Gynecol.* 2009;201(3):273.e1-273.e2739. doi:10.1016/j.ajog.2009.06.007

3. Sobhy S, et al. Maternal and perinatal mortality and complications associated with caesarean section in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet.* 2019;393(10184):1973-1982. doi:10.1016/S0140-6736(18)32386-9

# Epidemiology: CS Mortality

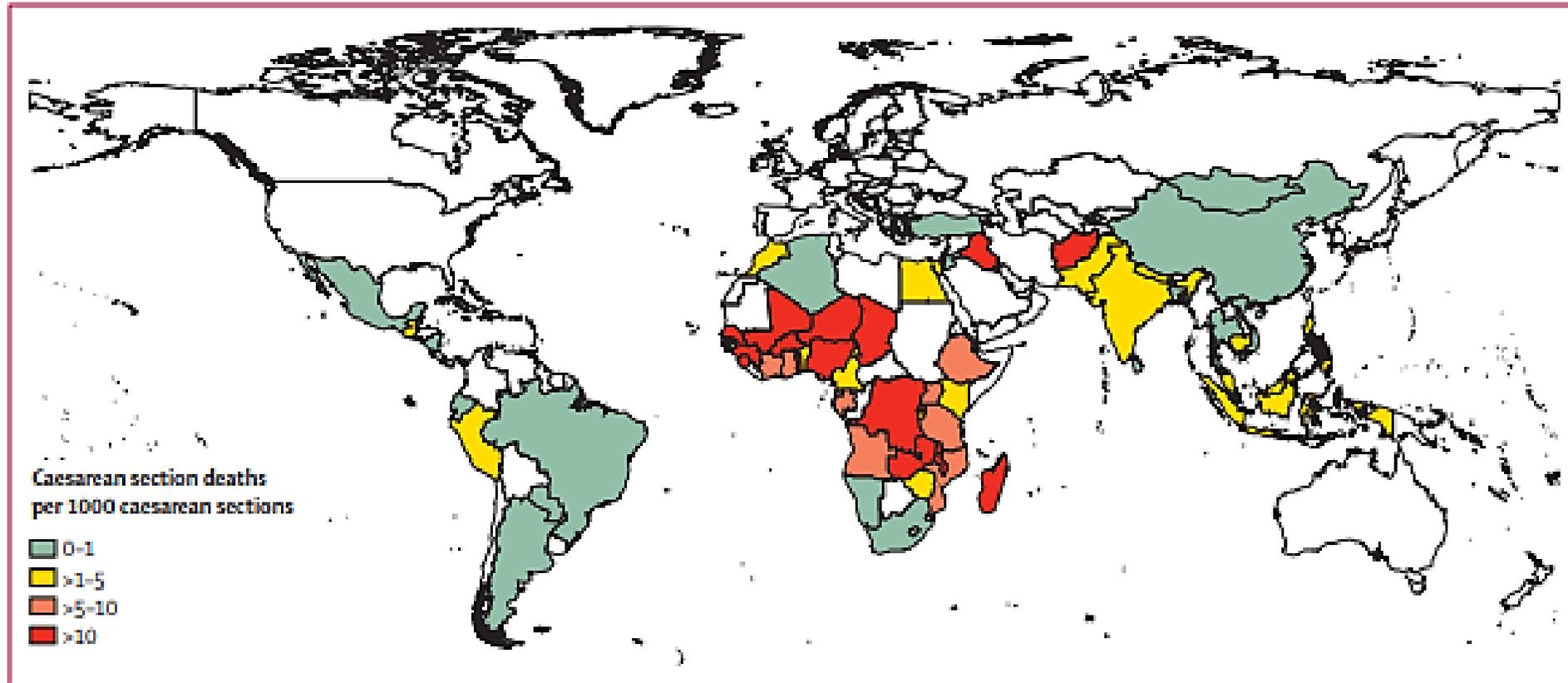


Figure 3: World map of maternal death risk following caesarean section in women from low-income and middle-income countries

## Source:

3. Sobhy S, et al. Maternal and perinatal mortality and complications associated with caesarean section in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet*. 2019;393(10184):1973-1982. doi:10.1016/S0140-6736(18)32386-9

# Epidemiology: CS Mortality

- Maternal death after cesarean delivery is 50 -100x more in LMICs than in high-income countries<sup>3,4</sup>
- Maternal deaths driven primarily by peripartum hemorrhage<sup>3,4</sup>



**Source:**

3. Sobhy S, Arroyo-Manzano D, et al. Maternal and perinatal mortality and complications associated with caesarean section in low-income and middle-income countries: a systematic review and meta-analysis. *The Lancet*. 2019

4. Bishop D, Dyer RA, Maswime S, et al. Maternal and neonatal outcomes after cesarean delivery in the African Surgical Outcomes Study: a 7-day prospective observational cohort study. *The Lancet*. 2019; 7: 513-522. doi: [10.1016/S2214-109X\(19\)30036-1](https://doi.org/10.1016/S2214-109X(19)30036-1)

# Epidemiology: CS Mortality

**Maternal and perinatal mortality and complications associated with caesarean section in low-income and middle-income countries: a systematic review and meta-analysis**

*Soha Sobhy, David Arroyo-Manzano, Nilaani Murugesu, Gayathri Karthikeyan, Vinoth Kumar, Inderjeet Kaur, Evita Fernandez, Sirisha Rao Gundabattula, Ana Pilar Betran, Khalid Khan, Javier Zamora, Shakila Thangaratinam*

- **25%** of all women who died in LMICs had undergone a CS
- **32%** of all maternal deaths following CS was attributed to PPH; 19% to pre-eclampsia/eclampsia and 22% to sepsis

**Source:**

3. Sobhy S, Arroyo-Manzano D, et al. Maternal and perinatal mortality and complications associated with caesarean section in low-income and middle-income countries: a systematic review and meta-analysis. *The Lancet*. 2019

# Detection of haemorrhage at CS

- **Measures and outcomes for detection vary** and may include: estimated or measured volume of blood loss, physiological changes and the need for intervention.<sup>5</sup>
- **Visual method** of estimating blood loss is **imprecise** and hindered by **subjectivity** and **does not** always **match** the **clinical status** of patients.<sup>6</sup>
- **Objective methods** such as measured blood loss by the use of graduated collecting drapes and weighing of swabs are increasingly being used.<sup>7</sup> Evidence on their use is evolving.

## Source:

5. Natrella M, Di Naro E, Loverro M, Benshalom-Tirosh N, Trojano G, Tirosh D, et al. The more you lose the more you miss: accuracy of postpartum blood loss visual estimation. A systematic review of the literature. J Matern Fetal Neonatal Med [Internet]. 2017/01/12. 2018 Jan;31(1):106–15. Available from:

<https://pubmed.ncbi.nlm.nih.gov/28002983>

6. ACOG. Quantitative Blood Loss in Obstetric Hemorrhage. Obstet Gynecol. 2019;134(6):1368–9.

7. Diaz V, Abalos E, Carroli G. Methods for blood loss estimation after vaginal birth. Cochrane Database Syst Rev. 2018;2018(9).

# Common Causes of Severe PPH at CS

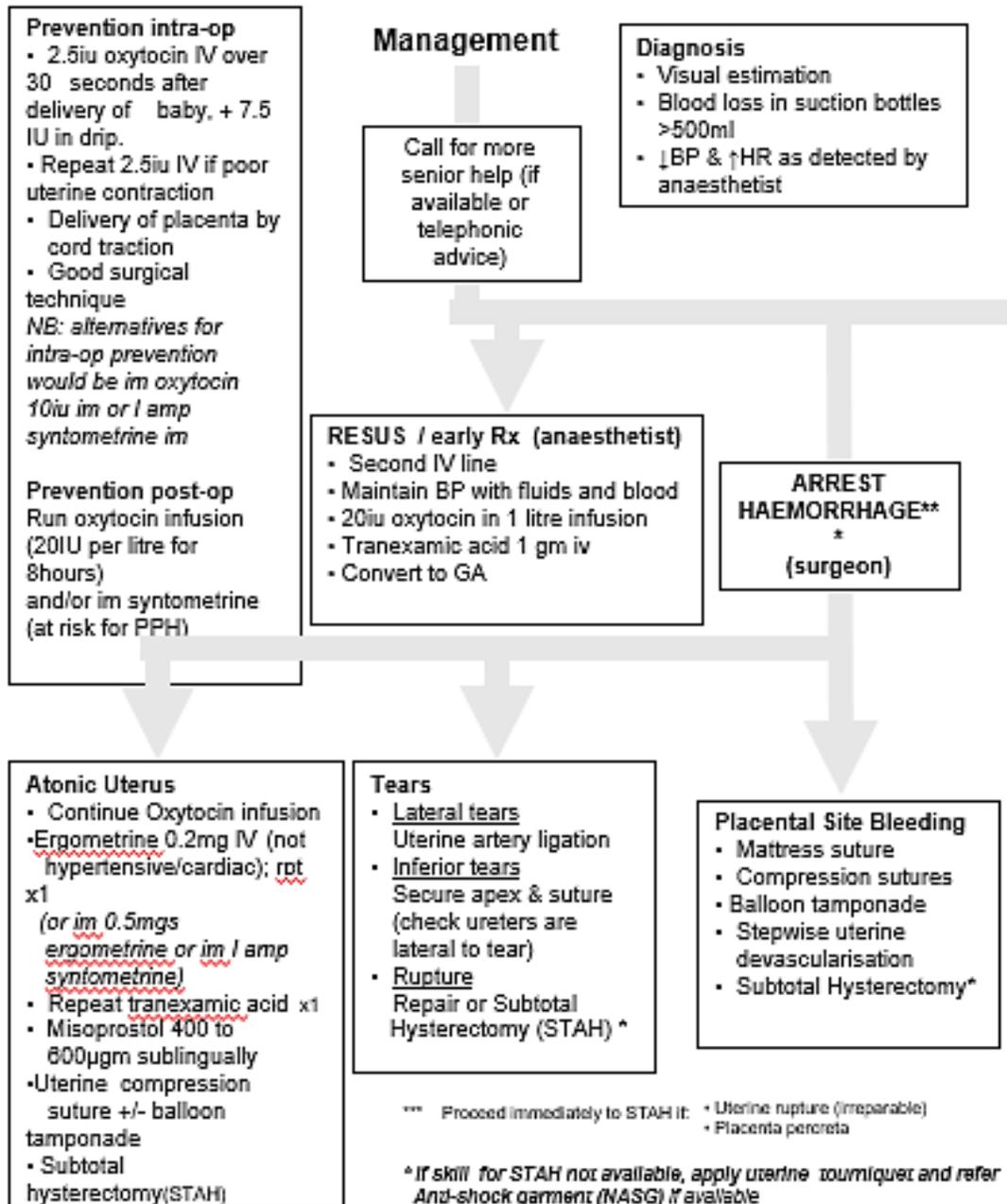
Do the **traditional 4 Ts** still apply to CS?

- **Tone - Atony** (due to, e.g., prolonged/obstructed labor, overdistended uterus, chorioamnionitis, placental abruption)
- **Tissue - Abnormal placentation** (e.g., placenta previa, placental abruption, placenta accreta/increta/percreta)
- **Trauma** (e.g., lacerations/tears, uterine rupture)
- **Thrombin - Abnormal coagulation** (e.g., severe preeclampsia/eclampsia, placental abruption, hypofibrinogenemia, DIC)



# Developing algorithms for managing haemorrhage during and after caesarean section

## Bleeding At Caesarean Section



# Bleeding After Caesarean Section

## Prevention & Early Detection

- Haemostasis at initial Caesarean Section
- Regular post-op monitoring (EWC)
- Monitoring of at risk women who bled intra-op in high care area (if available)

## Management

### Resuscitate / Early RX

- 2<sup>nd</sup> IV line + fluid resus
- Maintain BP: fluids/blood
- Oxytocin 20iu in 1 litre infusion
- Tranexamic acid 1gm iv slowly

## Diagnosis

- Excessive pv bleeding (revealed PPH)
- ↓BP + ↑HR + abdominal distension + pallor (concealed bleeding)

## Uterus Atonic

- Massage / remove clots
- 20iu oxytocin in 1 litre as infusion
- Ergometrine 0.5 mgs im (not hypertensive/ cardiac) or syntometrine 1 amp im
- Misoprostol 400 to 600µgm sublingual

## Uterus Well Contracted

If ongoing bleeding

LAPAROTOMY (Lloyd Davis position)

## Atonic Uterus

Compression sutures +/- Balloon tamponade

↓  
Subtotal Hysterectomy

## Bleeding from Uterine Incision

Single bleeding vessel

↓  
Haemostatic sutures

↓  
Stepwise uterine artery devascularisation

↓  
Subtotal Hysterectomy (STAH)

Bleeding along whole incision

↓  
Open uterine incision, explore for bleeders and resuture

↓  
Stepwise uterine artery devascularisation

↓  
Subtotal Hysterectomy

## Suspected Placental Site Bleeding

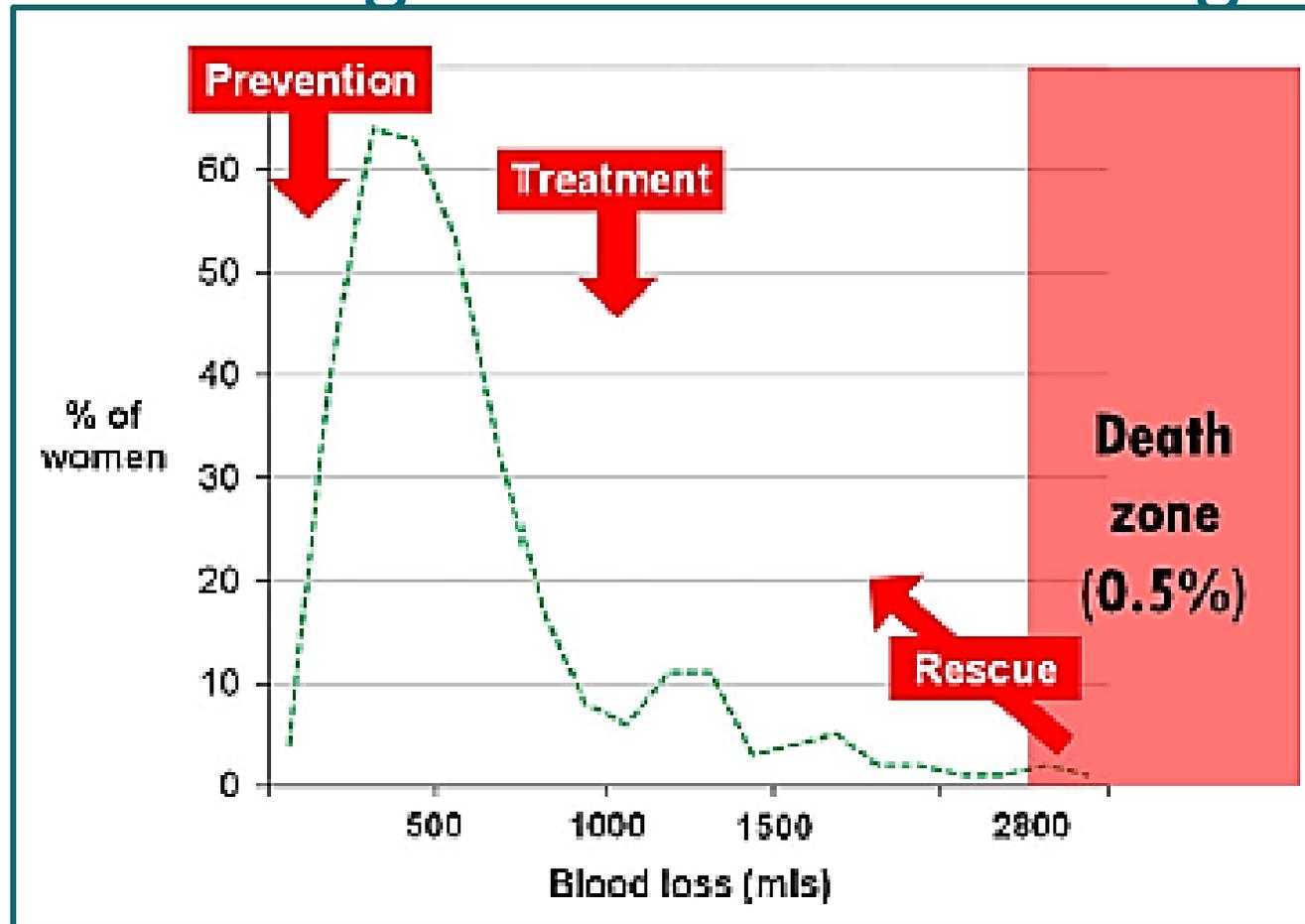
Balloon tamponade

↓  
Stepwise uterine artery devascularisation

↓  
NB: Proceed immediately to STAH if patient very unstable

\* If lack of skill for STAH, apply uterine tourniquet and refer. Anti shock garment (NASG) if available

# Importance of Anticipation, Early Recognition and Active Management of Haemorrhage



Source: Weeks A. BJOG 2015;122:202–210.

# Prevention of PPH at CS

Uterotonics for prevention of PPH at CS:<sup>8,9</sup>

- **Oxytocin**
- **Ergometrine + Oxytocin**
- Consideration for **Carbetocin**, especially where quality of oxytocin is a concern
  - more effective than oxytocin

Is there a role for **prophylactic TXA**? For all CS or for those at high risk?

- Blood loss, massive hemorrhage, transfusion requirements, and need for additional uterotonics all markedly reduced<sup>10</sup>

**Source:**

8. Gallos ID, Papadopoulou A, Man R, et al. Uterotonic agents for preventing postpartum haemorrhage: a network meta-analysis. *Cochrane Database Syst Rev*. 2018;12(12):CD011689. Published 2018 Dec 19. doi:10.1002/14651858.CD011689.pub3

9. Gallos I, Williams H, Price M, et al. Uterotonic drugs to prevent postpartum haemorrhage: a network meta-analysis. *Health Technol Assess*. 2019;23(9):1-356. doi:10.3310/hta23090

10. Wang Y, Liu S, He L. Prophylactic use of tranexamic acid reduces blood loss and transfusion requirements in patients undergoing cesarean section: A meta-analysis. *J Obstet Gynaecol Res*. 2019;45(8):1562-1575. doi:10.1111/jog.14013

# Surgical Management of PPH at CS

- When medical management of uterine atony fails
- When other causes are present (e.g., trauma - ruptured uterus/tears; abnormal placentation)

Note: Evidence for medical management of PPH at CS tends to be of higher quality than that for surgical management

# PPH at CS due to Uterine Atony

## Assess and Resuscitate

- Monitor vital signs
- Measure blood loss
- IV fluids
- Blood transfusion as needed

## Medical Treatment

- Uterotonics
- TXA
- Uterine massage



## Surgical Management

- **Uterine compression sutures** (e.g., B-Lynch)
- **Uterine devascularization**
  - Uterine artery (O'Leary stitch)
  - Utero-ovarian artery
  - Hypogastric artery
- **Hysterectomy**

# Keys to Successful Surgical Management of PPH at CS

- Anticipation
- Early identification and management according to cause
- Use of CS adapted WHO Surgical Safety Checklist
- Situational awareness in the OT, teamwork and communication
  - These non-technical skills have been shown to be essential for improved team performance and improved outcomes<sup>11,12</sup>
- Early decision to use compression sutures (e.g. B-Lynch) for uterine atony PPH
- Post-op care and monitoring

**Source:**

11. Stone JL et al. 2017. Effective Leadership of Surgical Teams: A Mixed Methods Study of Surgeon Behaviors and Functions. *Ann Thorac Surg.* 104(2):530–537.

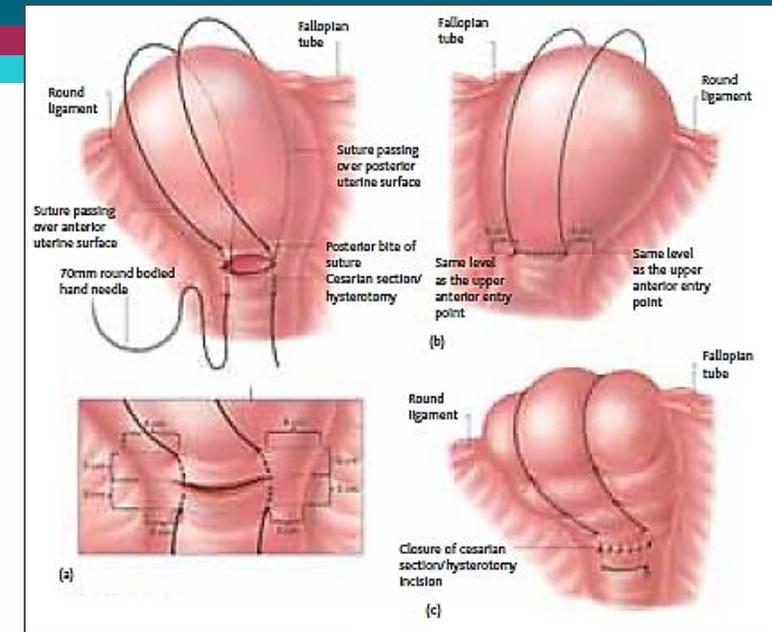
12. Brogaard L, Kierkegaard O, Hvidman L, Jensen KR, Musaeus P, Uldbjerg N, Manser T. The importance of non-technical performance for teams managing postpartum haemorrhage: video review of 99 obstetric teams. *BJOG* 2019;126:1015–1023.

# Why B-Lynch Suture?

- Fast to perform: < 2 minutes
- Easy to learn – easy to practice on simulator
- Does not require special equipment or supplies
- Effectiveness: generally **75 – 90%**<sup>13,14</sup>
- Most studied method ( compare to Cho, Hayman, other modifications)
- No apparent impact on infertility

## Considerations:

- Do *not* use permanent suture – risk of bowel herniation/strangulation
- Some concerns regarding risk of uterine necrosis if combined with devascularization sutures



## Source:

13. Kaya B, Tuten A, Daglar K, et al. B-Lynch uterine compression sutures in the conservative surgical management of uterine atony. *Arch Gynecol Obstet.* 2015;291(5):1005-1014. doi:10.1007/s00404-014-3511-2
14. El-Sokkary M, Wahba K, El-Shahawy Y. Uterine salvage management for atonic postpartum hemorrhage using "modified lynch suture". *BMC Pregnancy Childbirth.* 2016;16(1):251. Published 2016 Aug 27. doi:10.1186/s12884-016-1000-2

# Haemorrhage during and after caesarean section: Where do we go from here?

Program of work with the Gates Foundation

- E-MOTIVE study – CS arm
  - Develop a strategy for early detection and management of PPH at CS (bundles + algorithms)
  - Develop a strategy for implementation
- Where and why project
  - Developing a very powerful tool to understand the epidemiology of CS at provincial and district level

# Key Takeaways

- CS is a significant risk for haemorrhage and maternal mortality
- It is essential that PPH programs include surgical management of PPH and managing haemorrhage at CS
- Evidence is building for the most appropriate CS PPH bundles and algorithms, but more research is needed
- Successful implementation requires non-technical competencies
- B-Lynch uterine compression suture is an attractive surgical method to include in any program that provides CS services, especially where non-specialists work

Thank You!!

Questions?