

به نام خدا

## CHAPTER 12

### Postpartum Hemorrhage

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# INTRODUCTION

- 140,000 women die of **postpartum hemorrhage (PPH) each year—one every 4 minutes**
- prevalence (4%)
- Sudden, insidiously
- More than half of all maternal deaths occur within 24 hours of delivery
- In addition to death, serious morbidity may follow PPH:
- Sequelae include:
  - ARDS,
  - coagulopathy,
  - shock,
  - loss of fertility,
  - and pituitary necrosis (Sheehan syndrome).

# ACOG

(regardless of route of delivery):

a cumulative blood loss of  $\geq 1000$  mL

or

blood loss accompanied by signs and symptoms of hypovolemia within 24 hours following delivery

- (the same absolute volume loss for a patient weighing 50 kg may have vastly different effects than it would for someone weighing 75 kg or for a patient with triplets versus a singleton)

# *“primary”*

- *immediate or early*
- *within 24 hours of delivery*
- *much greater importance*

# *“secondary”*

- *delayed or late*
- *between 24 hours and (usually) 12 weeks after delivery*
- *less common and generally much less serious in nature*

# RECOGNITION AND EARLY DETECTION

- PPH is **not a diagnosis** but, a critically important **sign** that often occurs without warning and in the absence of risk factors.

Maternal hemodynamic responses to blood loss should also be monitored, *insofar as these responses are indicators of well-being, volume deficit, and prognosis*

<i>loss of blood</i>	<i>responses</i>
10% (500 mL for an average patient with a singleton pregnancy)	may be tolerated with no signs or symptoms
15% to 20%	the first signs of intravascular depletion manifest, including <b>tachycardia</b> , <b>tachypnea</b> , and <b>delayed capillary refill</b> , followed by orthostatic changes and <b>narrowed pulse pressure</b> (due to <b>elevated diastolic pressure</b> secondary to vasoconstriction with maintenance of systolic pressure)
Beyond approximately <b>30%</b>	breathing and heart rate further increase, and overt hypotension develops
<b>above 40% to 50%</b>	<b>oliguria</b> , shock, coma, and death

# Risk Factors for Postpartum Hemorrhage

- Prolonged labor
- Augmented labor
- Rapid labor
- History of postpartum hemorrhage
- Episiotomy, especially mediolateral
- Preeclampsia
- Overdistended uterus:
  - (macrosomia,
  - multiple gestation,
  - and hydramnios)
- Prior uterine surgery and other risk factors for abnormal placentation
- Operative delivery
- Asian or Hispanic ethnicity
- Chorioamnionitis



# GENERAL MANAGEMENT OF PATIENTS

- PPH is an unequivocal **emergency**
- most cases of PPH :**uterine atony**
  - uterus should be **palpated** abdominally, seeking the **soft**, “boggy” consistency of the relaxed uterus
- If this finding is **confirmed**:
  - **oxytocin** infusion should be increased
  - either **methylergonovine** maleate or **prostaglandins** administered if excessive bleeding continues.

## Other questions that may help direct assessment include the following:

- Was expulsion of the placenta spontaneous and apparently complete?
  - (Think: retained placental fragment?)
- Were forceps or other instrumentation used in delivery?
  - (Think: laceration?)
- Was the baby large or the delivery difficult or precipitous?
  - (Think: uterine atony?)
- Were the cervix and vagina inspected for lacerations?
- What was the admission or baseline hematocrit?
- Is the blood clotting?
  - (Think: coagulopathy?)

# Management of the Patient with Postpartum Hemorrhage

## General Measures

- Evaluate excessive bleeding immediately
- Assess overall patient status
- Notify other members of obstetrics team (i.e., obtain help!)
- Monitor and maintain **circulation**
  - ✓ Establish intravenous (IV) access: two large bore
  - ✓ Type and cross-match blood
  - ✓ Begin/increase crystalloid infusion
  - ✓ Assess for clotting or check coagulation profile
- **Review** clinical course for probable cause
  - Any difficulty removing placenta?
  - Were forceps used?
  - Other predisposing factors?
- Have **operating** room (OR) and personnel on standby

# Source and etiology

## **most common cause of PPH :**

- uterine atony(80%)
- Retained placenta,
- genital tract trauma,
- lacerations,
- and coagulation disorders
- Hematomas can occur (anywhere )
- Ruptured uterus and inverted uterus (rare but serious causes of PPH)

# Evaluation: Perform in Rapid Succession

- Assess hemodynamic status
- **Bimanual** examination: assess for atony
  - May palpate for **retained** placental fragments
  - May palpate uterine wall for **rupture**
- **Inspect** perineum, vulva, vagina, and cervix
  - Identify lacerations, hematomas, inversions
  - Recruit assistance for exposure
  - You or assistant may re-inspect placenta
- Assess **clotting**

# Targeted Interventions

## Atony

- **Immediate *bimanual massage***
- **Administer *uterotonics* (with requisite precautions)**
  - Oxytocin—IV: 10 to 40 units/1 L normal saline or lactated Ringer solution, continuous
  - Methylergonovine—intramuscular (IM): 0.2 mg IM; may repeat in 2 to 4 hours
  - 15-Methyl PGF 2a —IM 0.25 mg every 15 to 90 minutes for up to 8 doses
  - Dinoprostone—Suppository: rectal; 20 mg every 2 hours
  - Misoprostol—600 to 1,000 µg orally or rectally; one dose
  - Intrauterine tamponade—Bakri balloon, packing

# Uterotonic Agents

- **Oxytocin**
    - prophylactically, if uterine atony occurs, the infusion rate is increased
  - **methylergonovine** maleate
    - potent uterotonic agent ,
    - always IM,
    - *should be **avoided** or used with extreme caution in those with **cardiac, pulmonary, liver, or renal** disease, **hypertensive** disorders*
  - **misoprostol** (an analogue of prostaglandin E 1)
  - **dinoprostone** (an analogue of prostaglandin E 2) rectal suppository.
  - **prostaglandin F 2a**(IM or directly into the myometrium)
- ✓ ***Uterotonic agents are only effective for uterine atony. If the uterus is firm, the use of these agents is not necessary and other causes of bleeding should be explored.***
- ✓ if, uterine massage and uterotonic agents unsuccessful:
- ✓ intrauterine compression with in utero **packing or placement of a balloon compression device (Bakri, BTcath, and Foley catheters)** as a means of halting blood loss while preserving the uterus.

- *Operative Measures*

- Uterine **compression** sutures
- Sequential **arterial ligation** or selective **arterial embolization**
- **Hysterectomy**

- *Retained Placenta*

- Manual removal; manage atony as above
- Ultrasound assessment/guidance to assure complete removal
- Suction curettage—ideally performed with ultrasound guidance in OR
- Maintain suspicion for accreta—additional intervention required



- **Genital Tract Lacerations and Hematomas**

- Repair lacerations immediately
- Exposure critical—get assistance, move to OR
- No blindly placed sutures
- Packing may be necessary
- Observe stable, asymptomatic hematomas

- **Coagulopathy**

- Appropriate factor replacement
- Identify underlying cause
- Hemorrhage, infection, amniotic fluid embolism, other

- **periodic** assessment of **hematocrit** and **coagulation** profile
- Monitoring of urinary **output**
- the **judicious** use of **blood** component therapy: key management
- **transfusion** of blood products in the setting of **active hemorrhage**, with greater willingness to intervene earlier and prevent coagulopathy rather than to delay treatment until coagulopathy is diagnosed.
- in the setting of **severe, ongoing** hemorrhage
  - **4 or more units of PRBCs needed over 1 hour**
  - **or 10 or more units over 12–24 hours**
  - **the current recommendation is to transfuse blood products in a 1:1:1 ratio**
  - **avoid transfusion in stable, asymptomatic hospitalized patients with a hemoglobin >7 to 8 mg/dl**

# Precautionary Measures to Prevent or Minimize Postpartum Hemorrhage

## before Delivery

- Baseline hematocrit
- Blood type and screen (cross-match for very high risk)
- Intravenous access
- Obtain baseline coagulation studies and platelet count, if indicated
- Identify risk factors

## In Delivery Room

- **Avoid** excessive traction on umbilical cord
- Use forceps and vacuum judiciously
- Inspect placenta for complete removal
- Perform digital exploration of uterus (if indicated)
- Active management of the third stage
- Visualize cervix and vagina
- Remove all clots in uterus and vagina before transfer to recovery area

## In Recovery Area

- Closely observe patient for excessive bleeding
- Continue uterotonic agents
- Frequently palpate uterus with massage
- Determine vital signs frequently

# BLOOD COMPONENT THERAPY

Product	Contents	Volume (mL)	Effect
<b>Packed RBCs</b>	RBCs, WBCs, plasma	240	Increase Hct 3%/unit, hemoglobin by 1 g/dL
<b>Platelets</b>	Platelets, RBCs, WBCs, plasma	50	Increase platelet count 5,000–10,000/mm per unit
<b>Fresh frozen plasma</b>	factors V and VIII, fibrinogen, antithrombin III	250	Increase fibrinogen by 10 mg/dL
<b>Cryoprecipitate</b>	Factors VIII and XIII, fibrinogen, vWF	40	Increase fibrinogen by 10 mg/dL

# **MAJOR CAUSES OF PPH AND THEIR MANAGEMENT**

- **Uterine Atony**
- **Lacerations of the Lower Genital Tract**
- **Retained Placenta**
- **Other Causes**
  - Hematomas,
  - Coagulation Defects,
  - Amniotic Fluid Embolism,
  - Uterine Inversion

# Uterine Atony

- clinical diagnosis of atony is based largely on the tone of the uterine muscle on palpation
- Instead of the normally firm, contracted uterine corpus, a softer, more pliable—often called “boggy”—uterus is found. The cervix is usually open
- the uterine corpus contracts **promptly** after delivery of the placenta, constricting the **spiral arteries**, which prevents excessive bleeding.
- This **muscular contraction**, rather than coagulation, prevents excessive bleeding from the placental implantation site.
- When contraction does not occur as expected, the resulting **uterine atony leads to PPH.**

# predispose to uterine atony

- extraordinary enlargement of the uterus
  - hydramnios
  - multiple fetuses
- abnormal labor
  - precipitous and prolonged
  - or augmented by oxytocin
- conditions that interfere with contraction of the uterus
  - uterine leiomyomata
  - magnesium sulfate

# management of Uterine Atony

- **preventive** and **therapeutic**
- Active management of the third stage of labor :reduce the incidence of PPH by as much as 70%.
- The protocol for management of the third stage :**oxytocin** infusion (usually 20 units in 1 L of normal saline infused at 200 to 500 mL/hour) initiated **immediately** following **delivery of the infant or its anterior shoulder**, gentle cord traction, and uterine massage.

(Some physicians do not begin oxytocin infusion until after delivery of the placenta to avoid placental entrapment; there is no firm evidence that the rates of entrapment are higher with active management than with other strategies.)

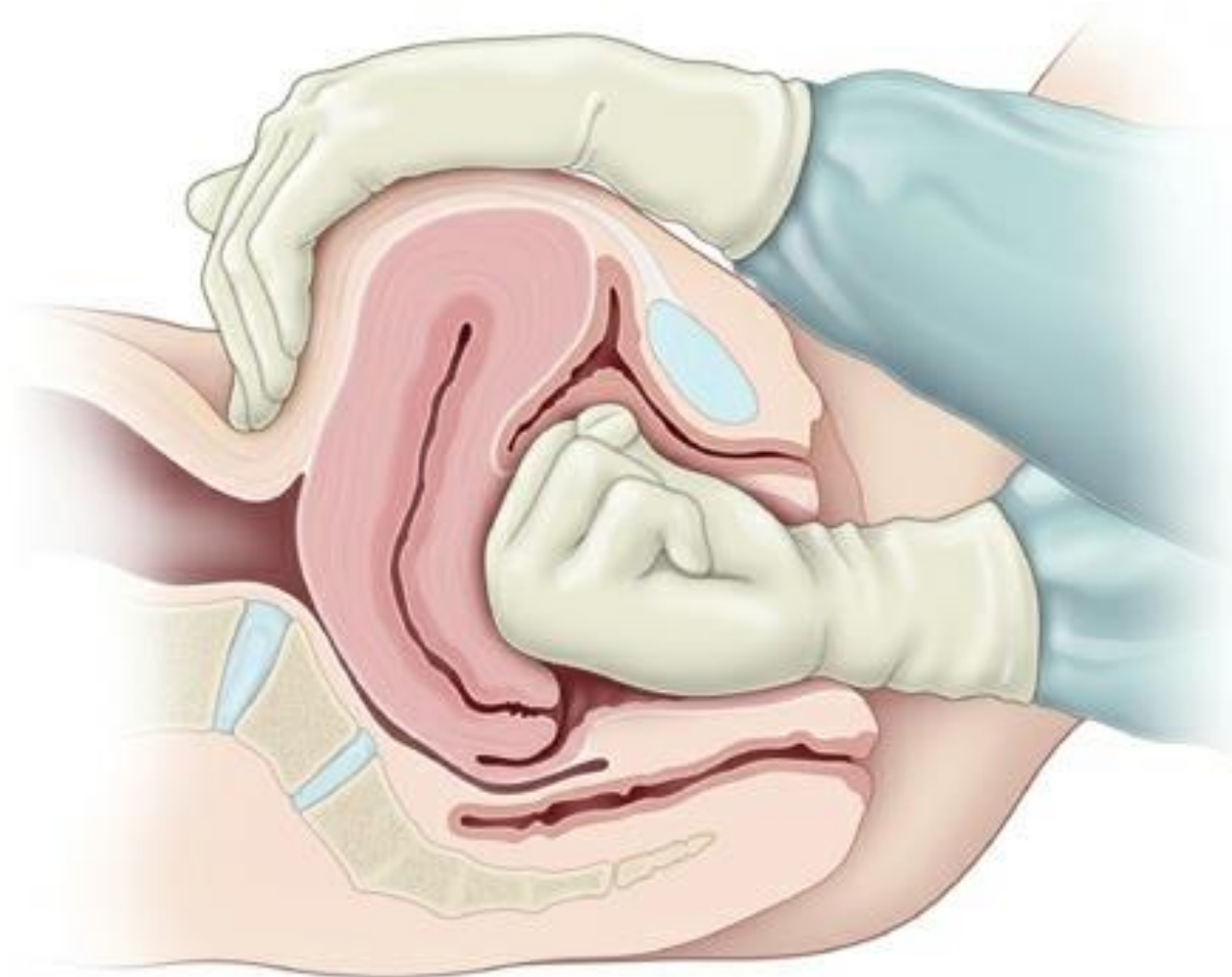
- Immediate breastfeeding
- if there is no IV access :10 units IM oxytocin or 600 µg misoprostol may be given orally (if no oxytocin is available).
- **Once uterine atony is diagnosed**, management can be categorized as medical, manipulative, or surgical.
- Management must be individualized.
- Bimanual uterine massage alone is often successful



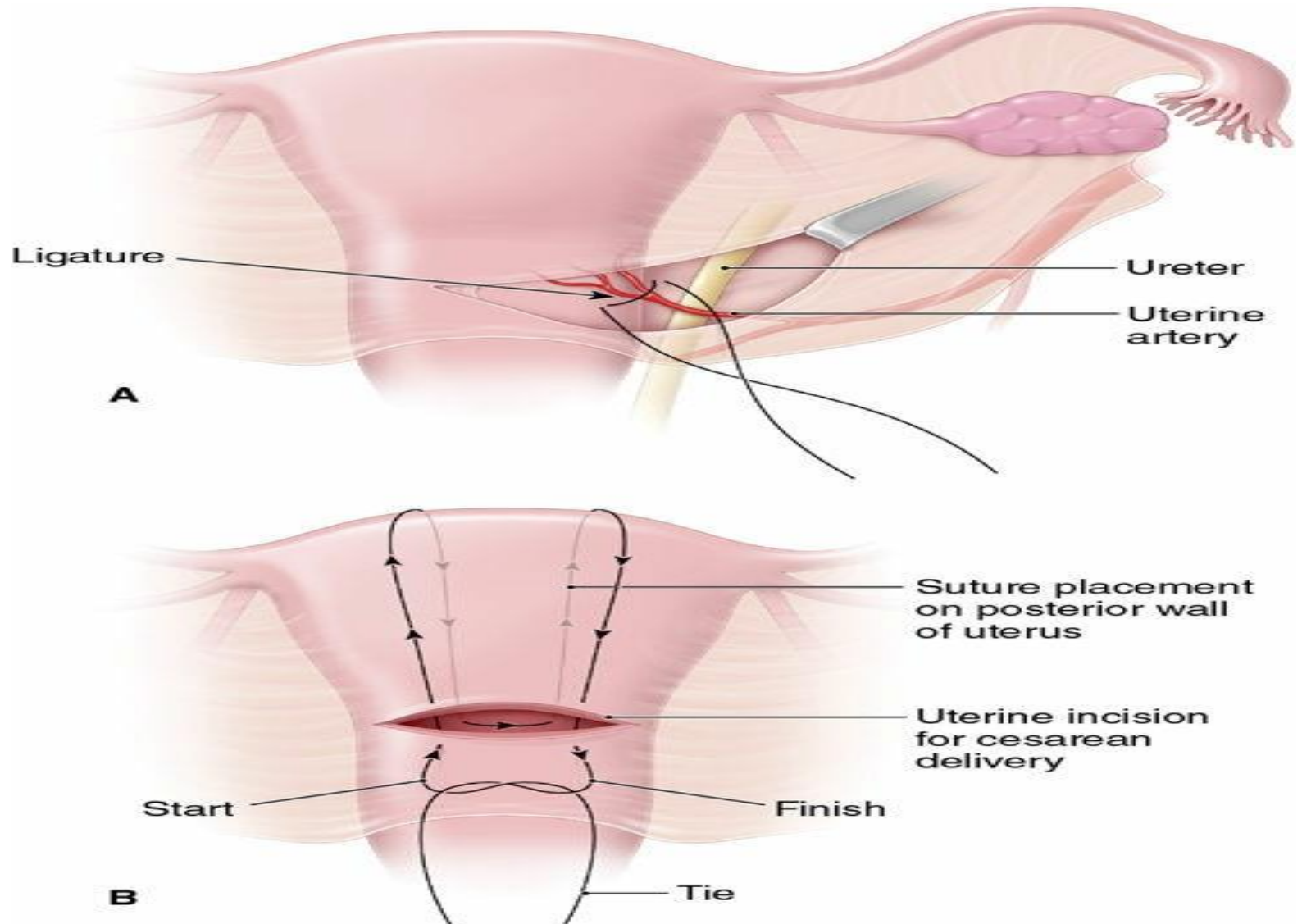
# *Surgical Management*

- **uterine compression** sutures
    - **B-Lynch**
    - **multiple squares**
  - sequential arterial ligation
    - ascending or descending branches of the uterine, utero-ovarian, then internal iliac arteries
  - selective arterial embolization
  - hysterectomy
- ✓ *Very high success rates have been noted with surgical compression techniques with consequent decreases in the use of hysterectomy and iliac artery ligations (high rates of morbidity).*

# manual massage



# Surgical treatment of atonic uterine hemorrhage



# recombinant factor VIIa

- reserved for life-threatening hemorrhage despite virtually all other therapies.
- Extremely expensive
- increases the likelihood of subsequent and serious thrombosis.

# Lacerations of the Lower Genital Tract

- less common
- Predisposing factors:
  - instrumented delivery,
  - manipulative delivery such as a breech extraction,
  - precipitous labor,
  - presentations other than occiput anterior,
  - macrosomia.
- good exposure
- **Periurethral lacerations** may be associated with sufficient edema to occlude the urethra, causing urinary retention;
  - a **Foley catheter for 12 to 24** hours usually alleviates this problem

# Retained Placenta

- Normally, separation of the placenta from the uterus occurs because of
  - cleavage between the **zona basalis** and the **zona spongiosa**
  - **facilitated by** uterine contraction.
- **Retained placenta can occur when**
  - **either the process of separation**
  - **or the process of expulsion is incomplete**
- Predisposing factors:
  - previous C/S, leiomyoma, prior uterine curettage,
  - accessory (succenturiate) placental lobe.
- ✓ After expulsion, every placenta should be inspected to detect missing placental cotyledons, which may remain in the uterus
- ✓ Sheared or abruptly ending surface vessels may indicate an accessory, or **succenturiate, placental lobe**

# Abnormal Placental Separation

- placental villi penetrate the uterine wall to varying degrees(placenta accreta)
- Risk factors for placenta accreta :
  - placenta previa with and without prior uterine surgery,
  - previous myomectomy,
  - prior cesarean delivery,
  - prior endometrial ablation,
  - Asherman's syndrome,
  - submucous leiomyomata
  - maternal age greater than 35 years
- superficial lining of the uterus is :
  - **placenta accreta,**
  - **penetration into the uterine muscle itself is :placenta increta,**
  - **complete invasion through the thickness of the uterine muscle: placenta percreta.**
- If a portion of the placenta separates and the remainder stays attached, **hysterectomy** is often required; however, an attempt to separate the placenta by curettage or other means of controlling the bleeding (such as surgical compression or sequential arterial ligation) may be appropriate in trying to **avoid a hysterectomy** in a woman who desires more children.

# Other Causes

- **A-Hematomas :**

- occur anywhere from the vulva to the upper vagina
- characterized by pain with or without signs of shock.
- Hematomas that are =5 cm in diameter and are not enlarging:
  - managed expectantly by frequent evaluation of the size of the hematoma and close monitoring of vital signs and urinary output
- ice pack
- Larger and enlarging hematomas must be managed surgically (interlocking hemostatic sutures)
- careful monitoring of hemodynamic status is important in identifying those with occult bleeding.



# B-Coagulation Defects:

- Virtually, any **congenital or acquired** abnormality in blood clotting can lead to PPH.
- **Abruptio placentae, amniotic fluid embolism, acute fatty liver, sepsis, and severe preeclampsia** are obstetric conditions associated with **DIC**.
- The treatment of **coagulation disorders involves correction of the coagulation defect with appropriate factor replacement.**
- **It also should be recalled that profuse hemorrhage itself can lead to coagulopathy, thus creating a vicious cycle of bleeding.**

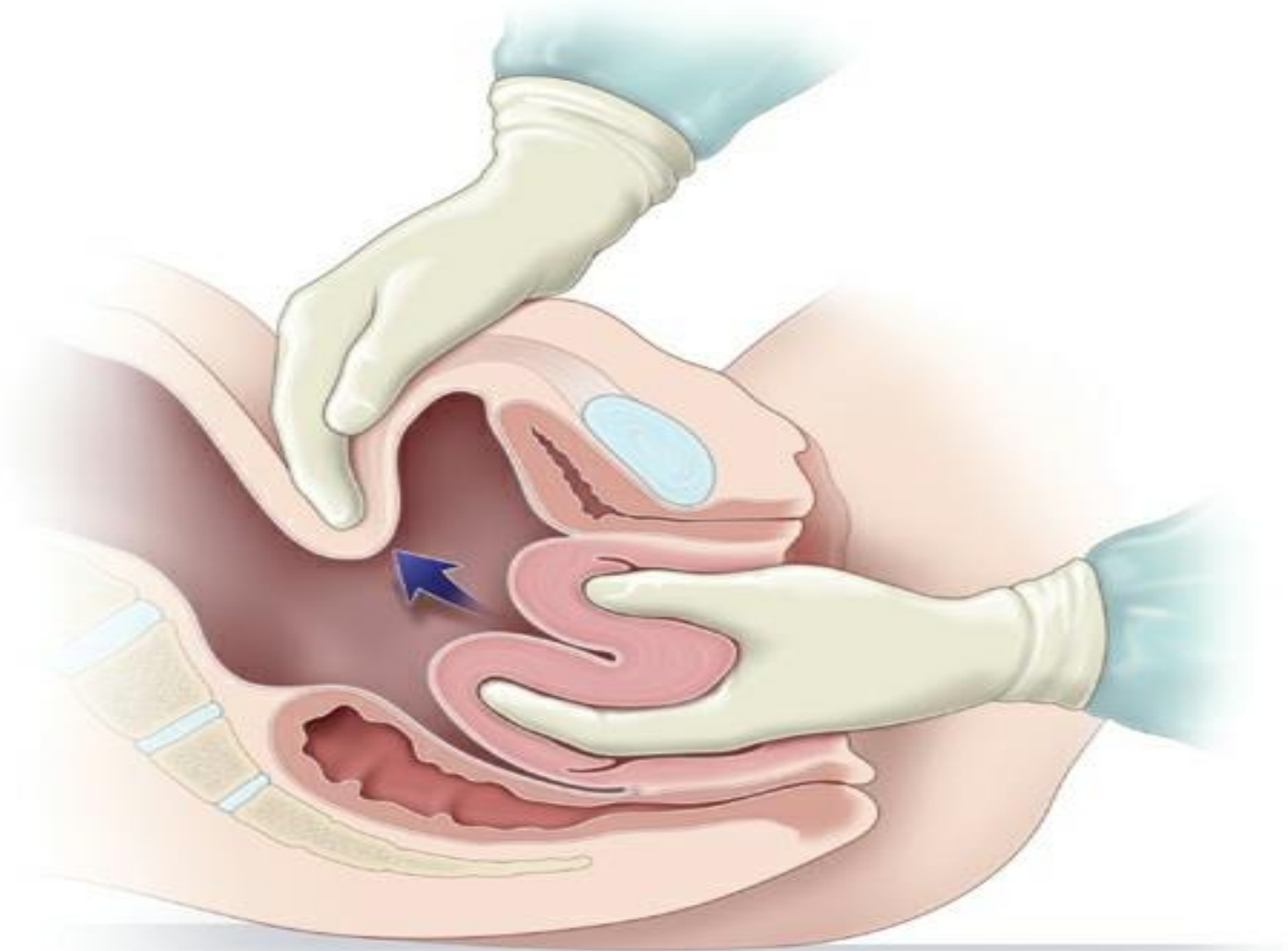
# C-Amniotic Fluid Embolism:

- entry of amniotic fluid into the maternal circulation.
- five **findings** that occur in sequence:
  - 1) respiratory distress,
  - 2) cyanosis,
  - 3) cardiovascular collapse,
  - 4) hemorrhage,
  - and 5) coma.
- results in ***severe coagulopathy***.
- Treatment is directed toward total support of the **cardiovascular** and **coagulation** systems.

# D-Uterine Inversion:

- **uterus literally turns** inside out, with the top of the uterine fundus extending through the cervix into the vagina and sometimes even past the introitus
- Hemorrhage with uterine inversion is characteristically **severe** and **sudden**.
- Treatment :
  - manual replacement
  - administration of an agent that causes **uterine relaxation** (e.g., sublingual **nitroglycerin**, **terbutaline**, **magnesium sulfate**, and halogenated general anesthetics).
- If manual replacement fails, surgery is required.

# Manual replacement of an inverted uterus.



# E-Uterine Rupture:

- Uterine rupture should be distinguished from dehiscence of a low transverse incision
- A **uterine rupture** is a **frank** opening between the uterine cavity and the abdominal cavity. A **uterine dehiscence** is a “**window**” covered by the **visceral peritoneum**.
- higher rates of maternal and fetal morbidity & mortality, occur in cases of **overt rupture**.
- Rupture can occur at the site of a previous cesarean delivery or other surgical procedure involving the uterine wall—from intrauterine manipulation or trauma, from congenital malformation (e.g., small uterine horn), or spontaneously.
- *Care depends on the extent and site of rupture*
- *Careful assessment in the face of maternal hemodynamic changes and monitoring other signs, such as*
  - *acute abdominal pain,*
  - *change in abdominal contour,*
  - *nonreassuring fetal heart patterns,*
  - *and loss of fetal station, are critical in early detection and intervention in such cases.*

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