The Miracle of Life and Overview Obstetrical Complications

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Jade Bedard, R.N.

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DESERT INSTITUTE OF CONTINUING EDUCATION, INC.
Pulmonary/Critical Care
Conference of the Desert
2024

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Learning Objectives

Title: The Miracle of Life & Overview of Obstetrical Complications

Speaker: Jade Bedard, RN

Learning Objectives:

1. Explain the role of the mother from pre-pregnancy through birth
2. Identify factors and challenges to successful fertilization
3. List and explain the risks of an unsuccessful pregnancy, including ectopic, loss, and trophoblastic
4. Describe fetal development and major factors effecting it

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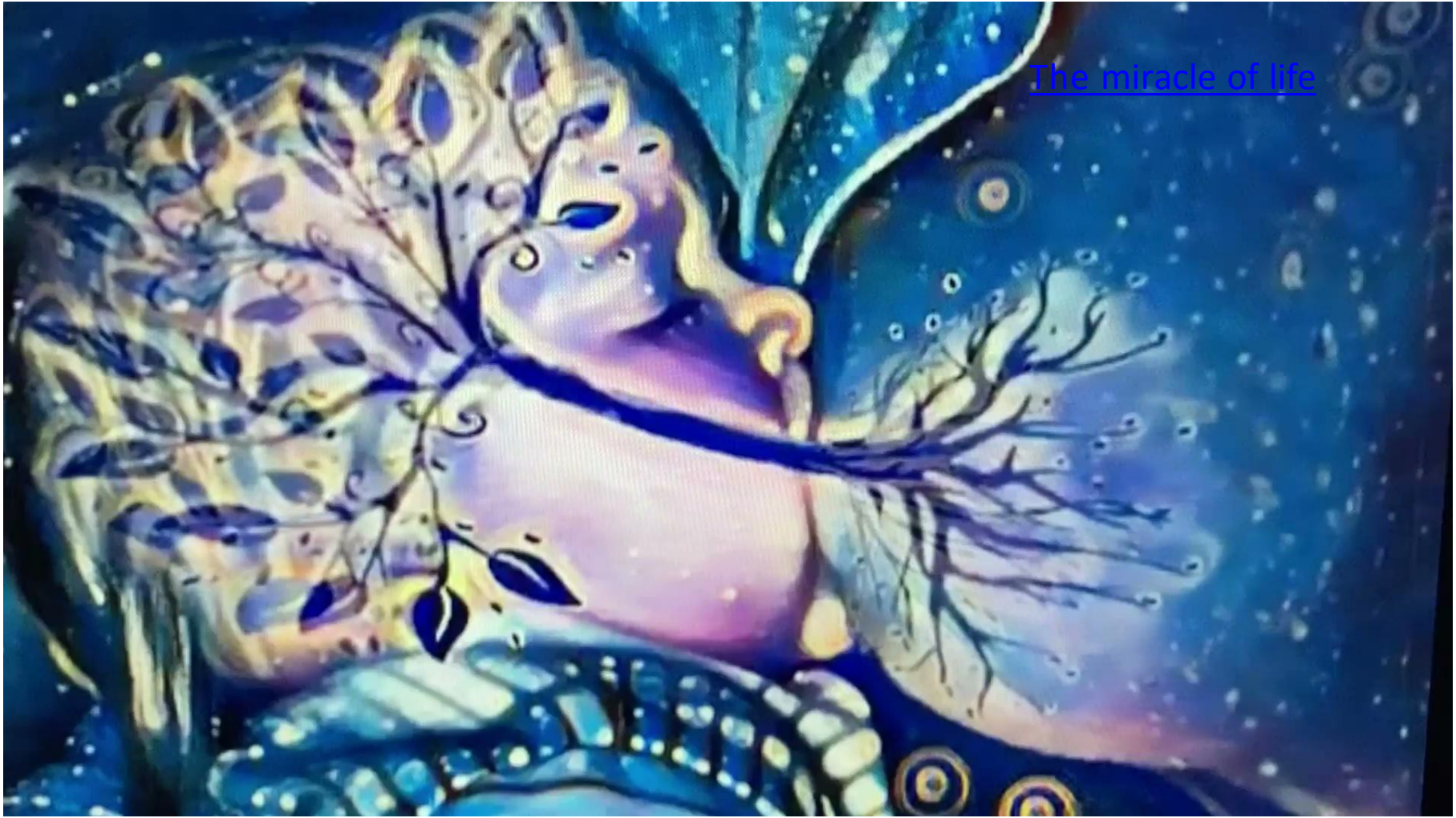
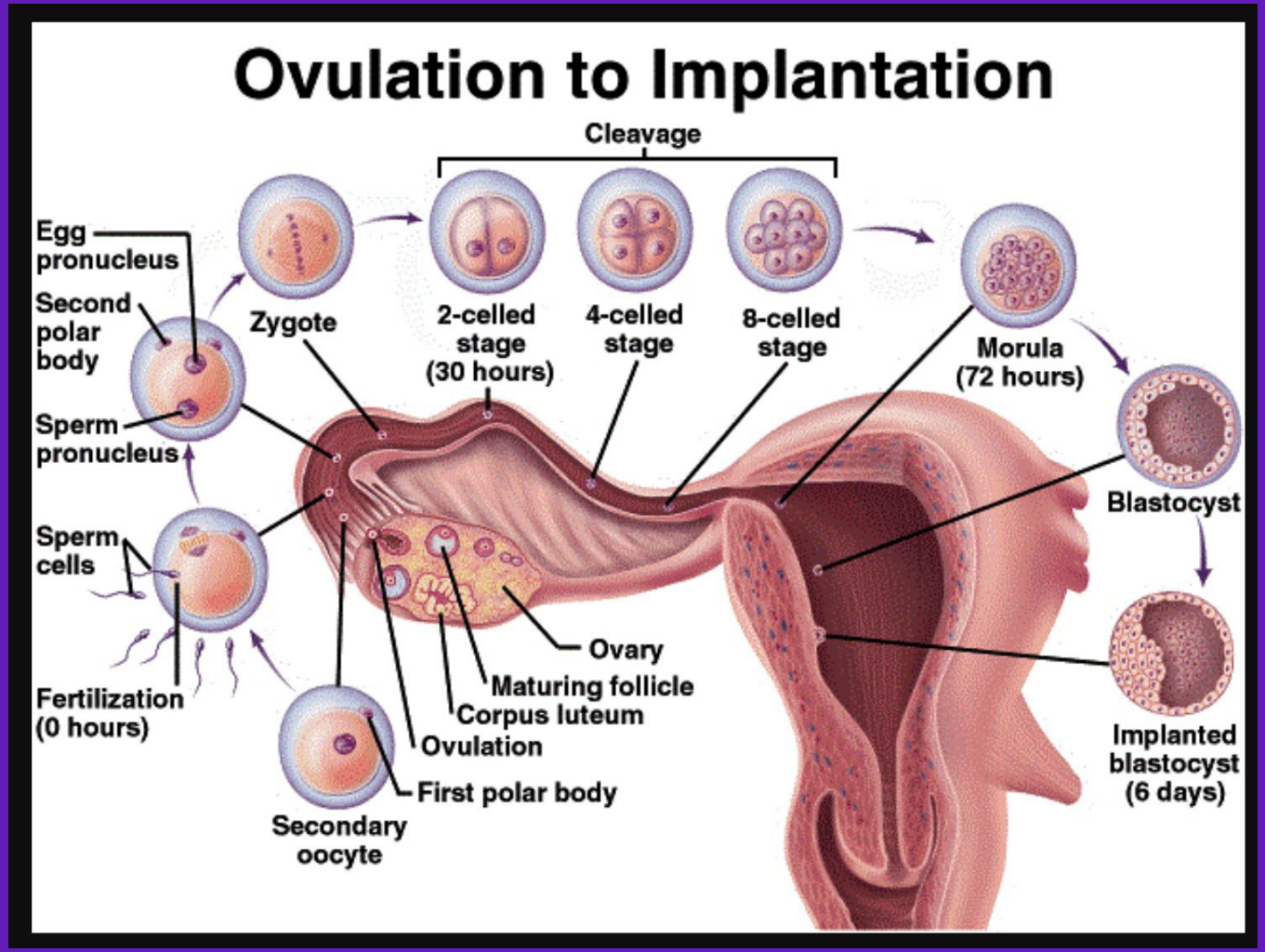
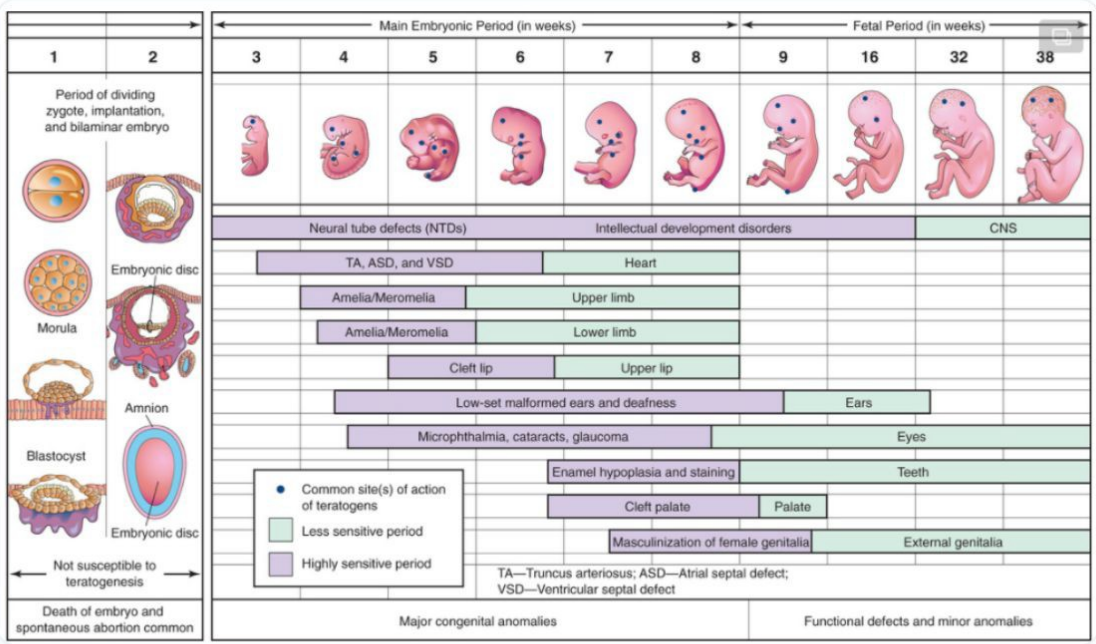
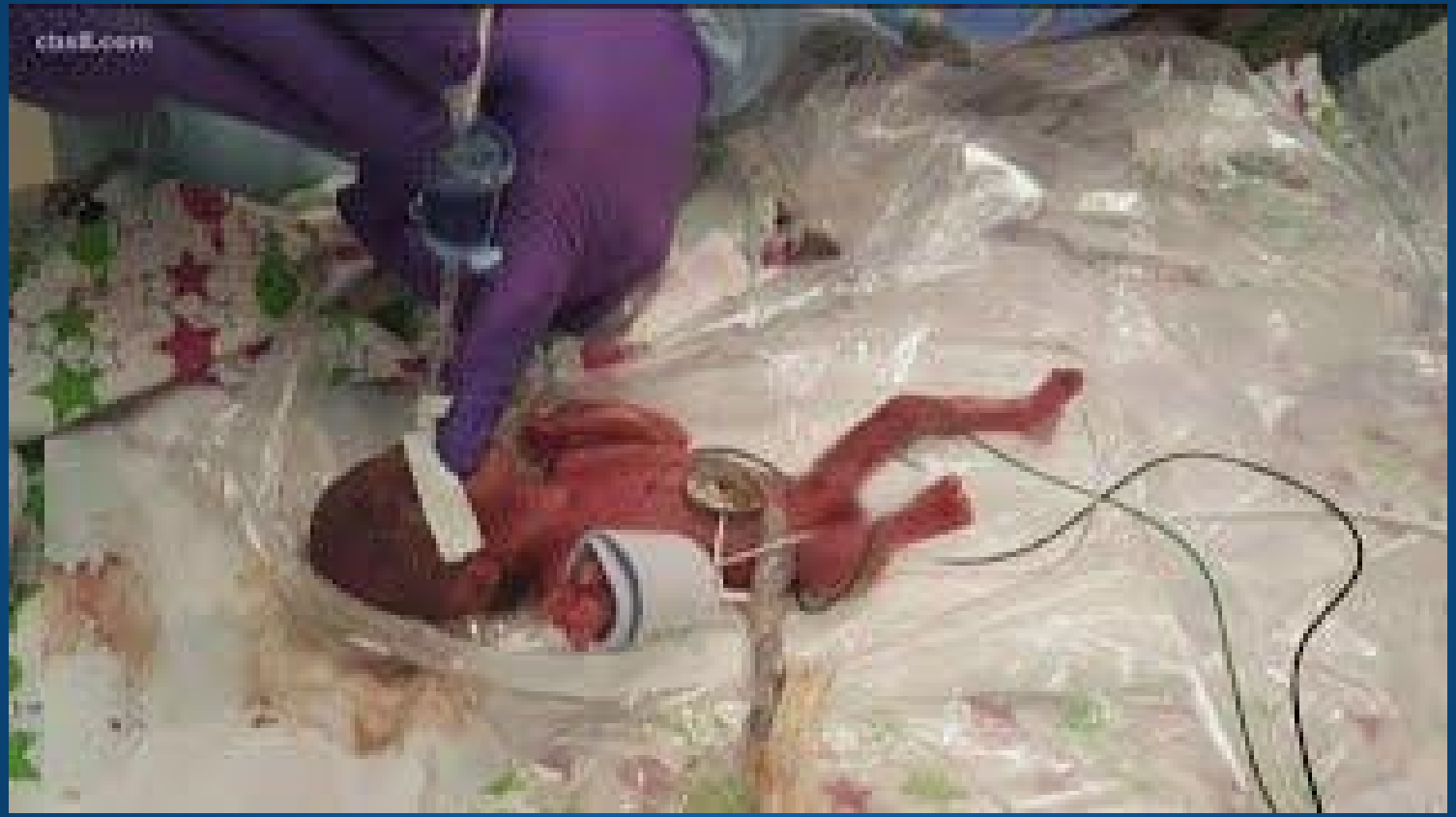

The miracle of life


Ovulation to Implantation
Cleavage
Egg pronucleus
Second polar body
Sperm pronucleus
Sperm cells
Fertilization (0 hours)
Zygote
2-celled stage (30 hours)
4-celled stage
8-celled stage
Morula (72 hours)
Blastocyst
Implanted blastocyst (6 days)
Ovary
Maturing follicle
Corpus luteum
Ovulation
First polar body
Secondary oocyte

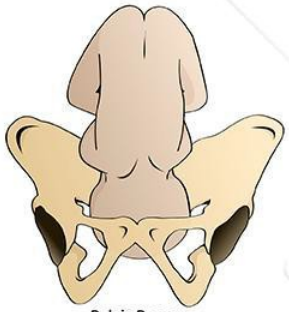
Effects of Teratogens at Various Stages of Development of the Fetus

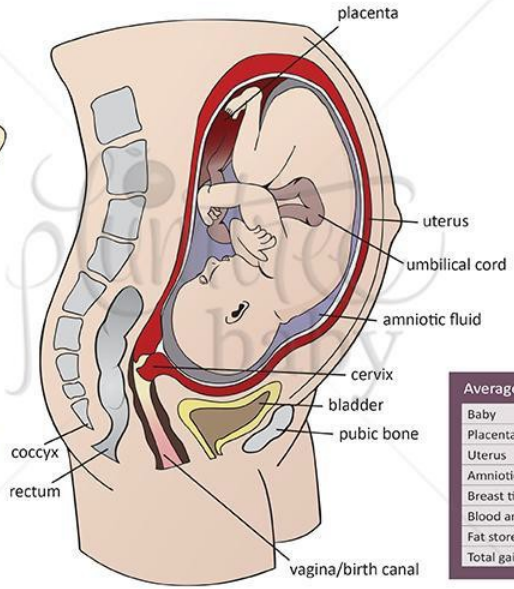


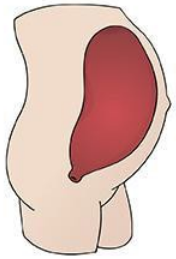


World’s smallest baby at 23 weeks in San Diego

Anatomy







Average Weight Gain Breakdown

Baby	6-9 lb (3-4 kg)
Placenta	1.5 lb (0.7 kg)
Uterus	2 lb (1 kg)
Amniotic fluid	2 lb (1 kg)
Breast tissue	1-3 lb (0.5-1.4 kg)
Blood and fluid	3-4 lb (1.4-1.8 kg)
Fat stores	6-8 lb (2.7-3.6 kg)
Total gain	25-35 lb (11.5-16 kg)

plumtreebaby.com

Pregnancy is a huge, and sometimes dangerous investment.

Biological tug of war

Unexpected complications

Seek Immediate Medical attention !!!

https://www.womans.org/our-services/mother-and-baby/new-mom/postpartum-concerns/urgent-warning-signs

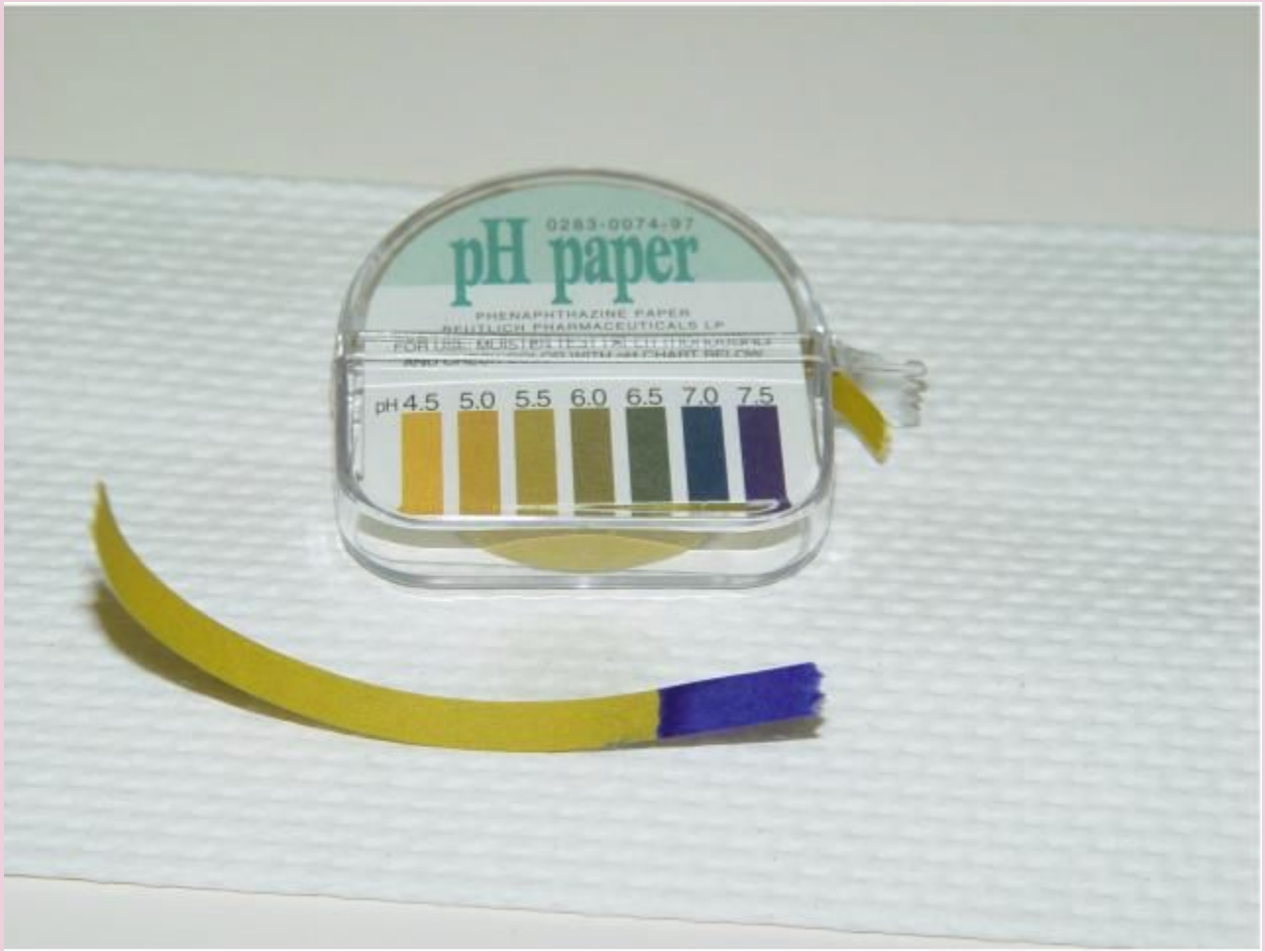
Case study

Pregnant woman comes in, has been experiencing “wet underwear”

What could it be?

How do you test?

What are the next steps? (depends on gestational age, fetal/maternal well-being)



Nitrazine positive

Normal vaginal pH is between 4.5 and 6.0.

Amniotic fluid has a higher pH of 7.1 to 7.3.

False positives: blood, infection, semen

FULL TERM VS PRETERM ROM

PROM

Prolonged Rupture of Membranes

> 6 hrs

On admission, note time of ROM

No evidence of infection

No treatment necessary initially, because most women will go into spontaneous labor within the next 6 hours

VS

PPROM

Preterm Prolonged Rupture of Membranes

<37 wks

An infection may have caused the membranes to rupture prematurely.

Wait for the fetus to mature further if you can

Bethamethasone

If labor does not begin promptly, RISK OF INFECTION (bacteria will ascend up the birth canal)!!

- induce or augment labor with Pitocin,
- start PCN for Group B strep prophylaxis if > 12 hrs and signs of infection (ie fever- otherwise not helpful)
- monitor.
- deliver if signs of distress

Case study: client comes in -stillborn

abcnews "She was my world."

Tragedy struck on March 20th, when former Kansas City Chiefs cheerleader Krystal Anderson died of cardiac arrest caused by sepsis at 40 years old after a second stillbirth, according to her husband and a death certificate.

Now, her husband is speaking out about her death and questions about maternal care he wants answered.

EMOTIONAL BIRTH VLOG* Home birth transferred to hospital |Emergency Shoulder Dystocia

Delivery of infant with shoulder dystocia vlog

What Would the Nurse Do?

A 19 years old female who is 12 weeks pregnant comes to the emergency room complaining of a sharp pain on her right lower abdomen while she moves and walks. She is worried that it might be something with the baby.

What is the nurse's concern?

What is the nurse's action?

What education should be provided to the patient?

What Would the Nurse Do?

A a 38-year-old female comes to the maternity clinic with a complaint of edema of the face and limbs for 3 days. Her vital signs are: BP 150/90 mm of Hg, Pulse rate 88 bpm, Respiratory rate is 18, and Temp. 36.9 C. She also complains of double vision and dizziness.

What is the nurse's concern?

What are the nurse's action at this time?

What education should the nurse provide to the patient?

Warning Signs of Pregnancy:

- Persistent headache
- Dizziness or fainting
- Changes in vision
- Extreme swelling of limbs & Face
- Fever
- Trouble breathing

Red Flag

Be alert to patients with a history of hypertension

Assess transportation and financial needs of clients who are high risk.

Interventions: Seek Immediate Medical attention !!!

HYPERTENSIVE DISORDERS

. Affect as many as 10% of all pregnancies worldwide.

. Heterogeneous group of conditions that include chronic hypertension, gestational hypertension, preeclampsia, and preeclampsia superimposed on chronic hypertension.

.Systolic BP of 140 mm Hg and a diastolic BP of 90 mm Hg on two separate measurements at least 4–6 hours apart.

. These disorders account for a significant proportion of perinatal morbidity and mortality, nearly 10% of all maternal deaths in the United States.

. Preeclampsia is one of the most serious pregnancy-specific medical conditions of increasing incidence.

.It remains a major cause of maternal and fetal morbidity and mortality.

.Preeclampsia is a multiorgan disease process characterized by new-onset elevated blood pressure and proteinuria or one of its severe features after 20 weeks' gestation.

Risk factors:

- previous history of preeclampsia (particularly if severe or before 32 weeks' gestation)
- antiphospholipid antibodies
- pre-existing diabetes mellitus
- multiple gestation
- Nulliparity
- family history of preeclampsia (first-generation relative)
- elevated body mass index
- maternal age greater than 40 years
- chronic hypertension or renal disease

Women with a history of eclampsia are at increased risk of eclampsia (1% to 2%) and preeclampsia (22% to 35%) in subsequent pregnancies.

ECLAMPSIA

. Uncommon in developed countries

. Still a major cause of maternal morbidity and mortality worldwide

. Severe complication of preeclampsia with generalized tonic-clonic convulsions that occurs in 0.5% of patients with mild preeclampsia, and 2% to 3% of those with severe preeclampsia

. Poses both a risk to the mother and fetus

. Disease process that needs to be emergently identified and treated promptly.

. The progression of preeclampsia to eclampsia is sudden and without prediction.

. The onset of eclamptic convulsions can be antepartum (38% to 53%), intrapartum (18% to 36%), or postpartum (11% to 44%).

. Onset is by definition after 20 weeks and although delivery usually resolves the condition, symptoms can present as late as 4-6 weeks postpartum.

The exact cause of preeclampsia is still unknown, although is thought to be due to widespread vascular endothelial malfunction and vasospasm. (Magley et al., 2023)

Eclamptic seizures are a life-threatening emergency

Incidence:

- Antepartum (53%)
- Intrapartum (19%)
- Postpartum (28%).

Signs:

It may be preceded by central nervous system symptoms such as headache (80%) and visual changes (45%)

However, seizures can occur without other severe features of preeclampsia and with a normal BP: 15% of women with eclampsia have a diastolic BP less than 90 mm Hg.

Eclamptic seizures are usually generalized tonic-clonic 60- to 90-second seizures. Postictal confusion, agitation, or combativeness may follow.

What is HELLP syndrome?

HELLP syndrome is a life-threatening pregnancy complication usually considered to be a variant of preeclampsia.

It stands for:

H (hemolysis, which is the breaking down of red blood cells)
EL (elevated liver enzymes)
LP (low platelet count)

Both conditions usually occur during the later stages of pregnancy, or sometimes after childbirth.

More information available at www.preeclampsia.org

PREECLAMPSIA foundation

Symptoms of HELLP syndrome

PREECLAMPSIA™ FOUNDATION

- Abdominal, chest or shoulder pain, especially in the right upper side
- Nausea, vomiting, or indigestion
- Headache that won't go away
- Pain when breathing deeply
- Bleeding
- Changes in vision
- Swelling, especially of the face or hands
- Shortness of breath, difficulty breathing, or gasping for air

www.preeclampsia.org/HELLP-syndrome

Medical Management of preeclampsia/eclampsia: prophylaxis with MgSO4+

Drug of choice for prevention and management is

magnesium sulfate

the risk of seizures/eclampsia and its associated complications in patients with severe preeclampsia developing intrapartum and immediately postpartum.

The goal of treatment is to prevent significant cerebrovascular and cardiovascular events in the mother without compromising fetal well-being.

The overall management of preeclampsia includes supportive treatment with antihypertensives and anti-epileptics until definitive treatment - DELIVERY

Medical management based on gestation

> 34 weeks gestation with mild preeclampsia: expectant management may be reasonable

> 34 weeks gestation w severe preeclampsia: delivery is the treatment of choice

> 36 to 37 weeks gestation, the induction of labor should be pursued

> 37 weeks gestation in preeclampsia without severe features, induction of labor with or without corticosteroids to accelerate lung maturity.

Side effects of MgSO4+

- warm feeling
- hypotension
- decreased deep tendon reflexes
- decreased respiratory rate
- decreased urine output
- paralytic ileus.

Preeclampsia

Nursing Management

- Monitor blood pressure, HR, O2 sat.
- Assess fetal heart rate.
- Send blood and urine for testing.
- Administer prescribed medications.
- Monitor reflexes on patients on magnesium sulfate.
- Neurologic checks regularly.
- Listen to lungs
- Seizure precautions if ordered.
- Minimize visitors, dim lights
- Keep her on her left side

When To Seek Help

- Seizure
- An altered state of consciousness
- Blood pressure greater than 180/110 mmHg
- Decreased urine output

https://www.ncbi.nlm.nih.gov/books/NBK570548/#

Outcome Identification

Goal Outcomes

- Delivery of a healthy neonate.
- Discharge of mother and baby home.

Adverse Outcomes

- Prolonged unconsciousness
- Acute renal failure
- Cerebrovascular accident
- HELLP syndrome
- Pulmonary edema
- Pneumonia
- Coagulopathy
- Abruptio placenta
- Cortical blindness
- Cardiomegaly
- Vesicovaginal fistula
- Death

CONCLUSION

Eclampsia is a medical condition that requires prompt diagnosis and treatment to prevent morbidity and mortality in pregnant women.

The health care team must work efficiently together to provide optimal care to both the mother and the unborn child.

Nurses or providers triaging patients in the emergency department need to be cognizant of signs and symptoms of eclampsia.

They must notify the attending physicians treating the patient as quickly as possible, especially if they are actively seizing and require medication to abort the seizure.

The communication between nursing and physicians is vital to ensure that the patients are getting proper intervention.

Cultural Considerations

- Some cultures are secretive about pregnancy
- Fear and stigma about a pregnancy outside of marriage may prevent a woman from seeking care

Are Abortion Bans an Occupational Hazard for Ob/Gyns?

— Ob/gyns in unsupportive workplaces felt amplified distress post-Roe, study finds

"We find that bans have, in many cases, placed heavy burdens on ob/gyns by asking them to choose between standard patient care and their own legal exposure.

"the state of hypervigilance we observed in several participants -- constantly worrying about potential consequences of providing care or counseling -- increases the risk for longer-term physical and mental health problems."

Some participants felt that their intuitions further harmed ob/gyns "through overly conservative interpretation of laws, prioritizing institutional protection over ethical obligations to patients."

https://www.medpagetoday.com/obgyn/abortion/108289?xid=nl_mpt_OB/GYN_update_2024-01-18&mh=94126f588d3aead2e7a383e3fee4bd39?xid%3Dnl_mpt_OB/GYN_update_2024-01-18&mh=94126f588d3aead2e7a383e3fee4bd39&utm_source=Sailthru&utm_medium=email&utm_campaign=Automated%20Specialty%20Update%20OBGYN%202024-01-18&utm_term=NL_Spec_OBGYN_Update_Active#:~:text=Are%20Abortion%20Bans,Roe%2C%20study%20finds

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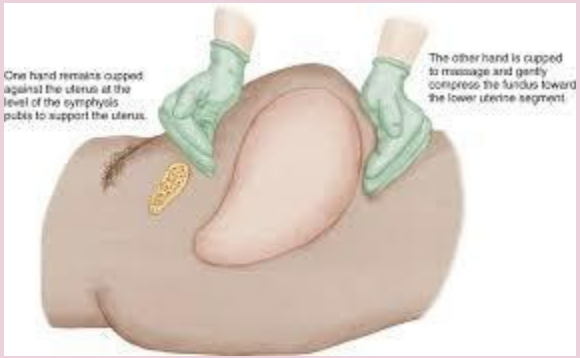
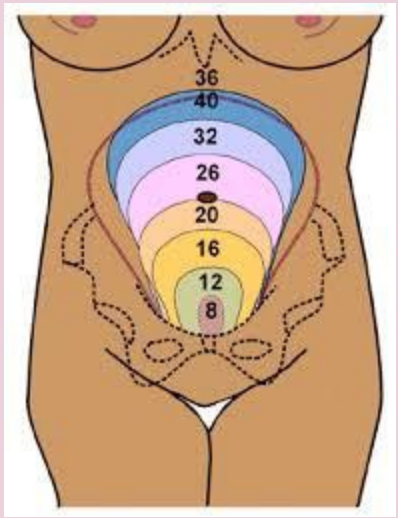
PREGNANCY COMPLICATIONS & HEART DISEASE RISK
CardioSmart
American College of Cardiology
PREGNANCY can be NATURE'S STRESS TEST ON THE HEART.
Women are at greater risk of having heart disease or a stroke if they had the following pregnancy complications:
HIGH BLOOD PRESSURE OR PREECLAMPSIA
GESTATIONAL DIABETES
PRETERM BIRTH (BEFORE 37 WEEKS OF PREGNANCY)
Many women don't get back to their pre-pregnancy weight within 12 months postpartum
THIS ALSO MAY RAISE YOUR RISK FOR CARDIAC PROBLEMS
HEALTH PROBLEMS DURING PREGNANCY — even if they disappear afterward — can signal TROUBLE FOR YOUR HEART
WHAT YOU CAN DO
Make sure your primary care doctor knows if you had these pregnancy complications.
Know your risk for heart disease now and as you age
Adopt healthy habits: exercise daily, eat a heart-healthy diet, maintain a healthy weight
Information provided for educational purposes only. Please consult your health care provider about your specific health needs.
Go to CardioSmart.org/Women to learn more about heart risk factors and tips to stay healthy.
@CardioSmart
facebook.com/CardioSmart
If you would like to download or order additional posters on various topics, visit CardioSmart.org/Posters

Postpartum hemorrhage



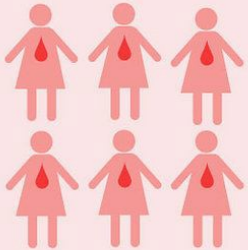


Postpartum hemorrhage is a leading cause of maternal morbidity and mortality worldwide, with uterine atony responsible in 80% of cases. In intractable cases, hysterectomy is the final treatment, but it has complications. Many doctors in developing countries with high maternal mortality rates from postpartum hemorrhage can perform cesarean deliveries but cannot perform hysterectomy. Patients with postpartum hemorrhage who need hysterectomy in these countries will die in such cases, whereas, if doctors know this simple, easily learned technique, such patients may survive[3].[7]

Postpartum Haemorrhage

52%

of maternal deaths are attributable to three leading preventable causes-haemorrhage, sepsis, & hypertensive disorders.



Postpartum bleeding

is the quickest of maternal killers; can kill even a healthy woman within two hours, if not treated.

Every year about

14M

women around the world suffer from PPH.

WHO statistics suggest that

25%

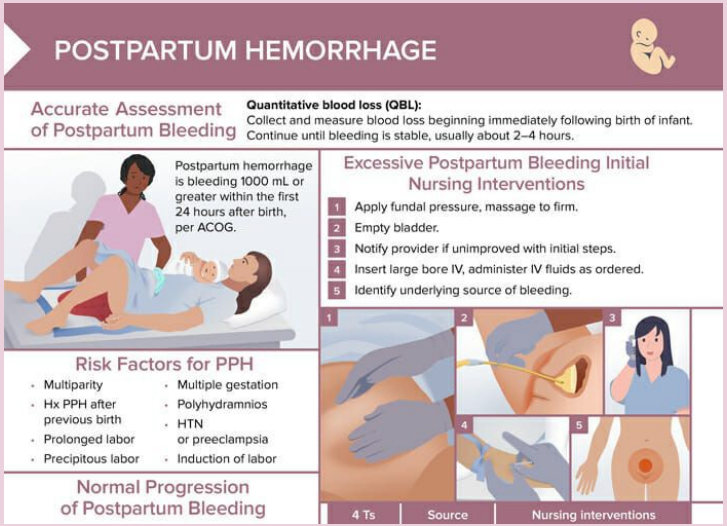
of maternal deaths are due to PPH.

GRF | Gracia Raina Foundation
There For Care

* World Health Organization & National Health Porta

Table 2. Symptoms related to blood loss with PPH.[3]

Blood loss, %(ml)	Blood pressure	Signs and symptoms
10–15 (500–1000)	Normal	Palpitations, light-headedness, slight increase in HR
15–25 (1000–1500)	Slightly low	Weakness, diaphoresis, tachycardia (100–120bpm)
25–35 (1500–2000)	70–80 systolic	Restlessness, confusion, pallor, oliguria, tachycardia (120–140bpm)
35–45 (2000–3000)	<70 systolic	Lethargy, air hunger, anuria, collapse, tachycardia (>140bpm)



https://www.ogmagazine.org.au/19/2-19/postpartum-haemorrhage/

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.lecturio.com%2Fnursing%2Ffree-cheat-sheet%2Fpostpartum-hemorrhage-nursing-interventions%2F&psig=AOvVaw0s6Cua24zqG3c7Wv8RCTGg&ust=1699521339427000&source=images&cd=vfe&opi=89978449&ved=0CBIQjRxqFwoTCNCy47-ItIIDFQAAAAAdAAAAABAR

POSTPARTUM HEMORRHAGE

DEFINITION

. Any blood loss from the uterus of more than 500ml during or after delivery. (Up to 18% of births)

. It may occur either early (within the first 24 hours after delivery), or late (anytime , up to 6 weeks after delivery)

. It is the most common maternal morbidity in developed countries, and a major cause of death worldwide

WHAT IS THE NURSE’S PRIMARY ROLE?

To assess and intervene before or during a hemorrhage to manage any further complications.

Causes

. Uterine atony is responsible for most cases and can be managed with uterine massage in conjunction with oxytocin, prostaglandins, etc. (Long labor, multiple births, large baby)

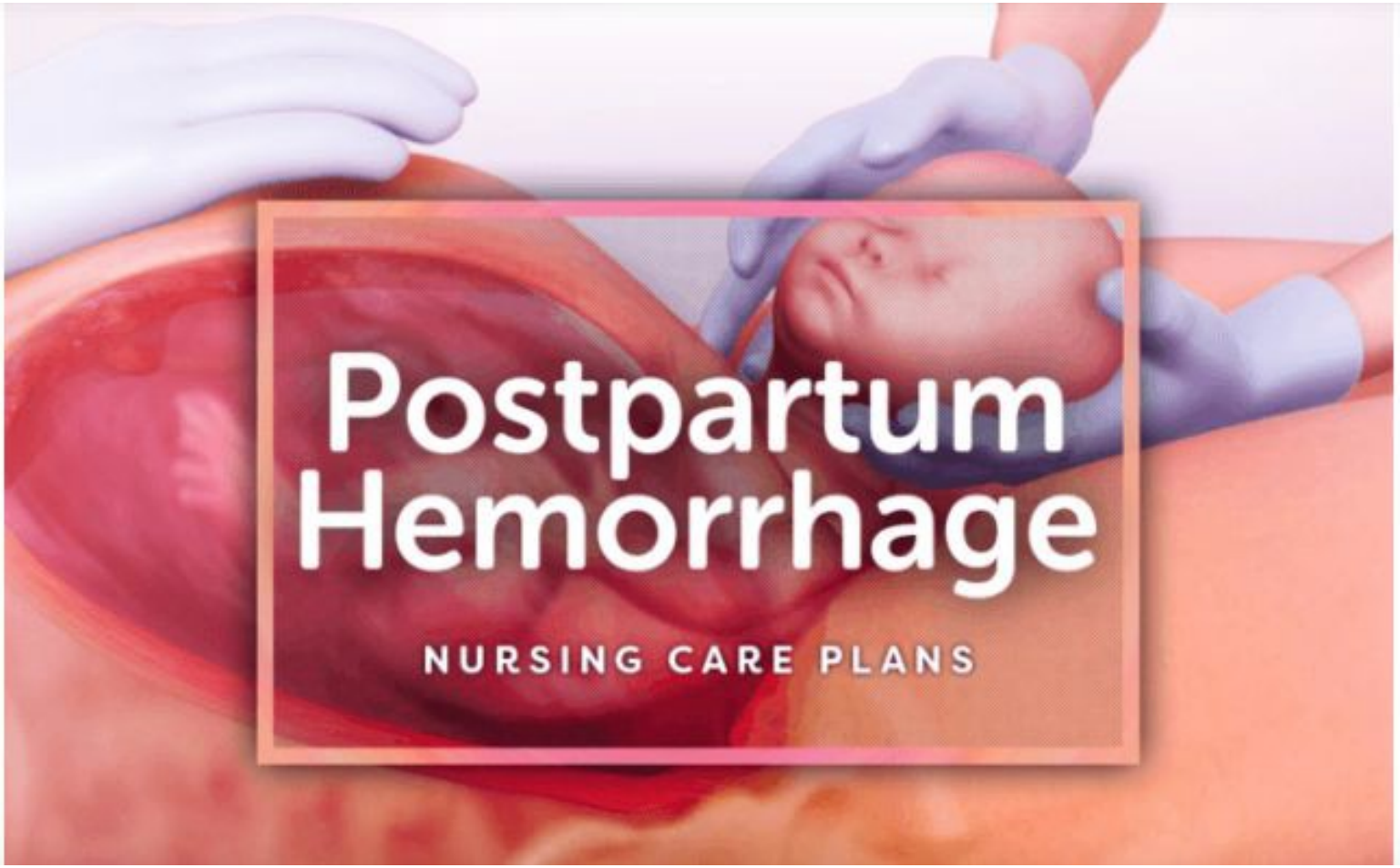
. Retained placenta is a less common cause and requires examination of the placenta, exploration of the uterine cavity, and manual removal of retained tissue.

. Rarely, an invasive placenta causes postpartum hemorrhage and may require surgical management.

. Traumatic causes include lacerations, uterine rupture, and uterine inversion, which may require surgical interventions.

Assessment: What data should be collected?

1. Amount of bleeding : How many pads/hour?
2. The condition of the uterus : Soft? Hard?
3. Checking of the maternal vital signs : BP (hypotension), HR (tachycardia), resp (Tachypnea)
4. Observing for signs of shock : Pale? LOC? Poor capillary refill? Concentrated urine? Decreased Hct? Dry mucous membranes?


Postpartum
Hemorrhage
NURSING CARE PLANS

EXAMPLES

- Fluid Volume Deficit/risk for hypovolemic shock related to vaginal bleeding
- Ineffective Tissue Perfusion related to vaginal bleeding
- Anxiety related to circumstances, or the fear of death
- Risk of infection/pain related to bleeding from traumatized tissues

DX: Fluid Volume Deficit/risk for hypovolemic shock Related to Blood Loss

GOAL:

To prevent dysfunctional bleeding and improve fluid volume

INTERVENTION AND RATIONALE

1. Assess and record the type, amount, and site of the bleeding; Count and weigh perineal pads and if possible save blood clots to be evaluated by the physician. The amount of blood loss and the presence of blood clots will help to determine the appropriate replacement need of the patient

2. Monitor vital signs including systolic and diastolic blood pressure, pulse and heart rate. Check for the capillary refill and observe nail beds and mucous membranes. Increased heart rate, low blood pressure, cyanosis, delayed capillary refill indicates hypovolemia and impending shock. A decreasing fluid volume of 30-50% will reflect changes in the blood pressure.

DX: Fluid Volume Deficit/risk for hypovolemic shock Related to Blood Loss

GOAL:

To prevent dysfunctional bleeding and improve fluid volume

INTERVENTION AND RATIONALE

3. Measure a 24-hour intake and output. Observe for signs of voiding difficulty. This will help in determining the fluid loss.A urine output of 30-50 ml/hr or more indicates an adequate circulating volume. Voiding difficulty may happen with hematomas in the upper portion of the vagina causing pressure in the urethra.

4. Assess the location of the uterus and degree of the contractility of the uterus/ Massage boggy uterus using one hand and place the second hand above the symphysis pubis.The degree of the contractility of the uterus will measure the status of the blood loss. Placing one hand just above the symphysis pubis will prevent possible uterine inversion during a massage.

DX: Ineffective Tissue Perfusion Related to Vaginal Bleeding

GOAL:

To maintain vital signs , neurological status, and blood gases within normal limits.

INTERVENTION AND RATIONALE

1. Continue to monitor V.S Q 5- 10 mins as an indicator of the body trying to compensate for poor perfusion. Administer fluids as prescribed.
2. Note the discoloration of the nails, lips , mucous membranes, gums and tongue, monitor skin temperature. As the body decompensates, the circulation in peripheral tissues is reduced, causing cyanosis and cold extremities.
3. Monitor oxygen saturation, blood gas levels and PH to evaluate the level of tissue hypoxia .Provide supplemental oxygen as indicated. Maximizes available oxygen for circulatory transport to tissues.
4. Evaluate the neurologic status and observe for any behavioral changes. Changes in the mentation is an early sign of hypoxia. Cyanosis, on the other hand, is a late sign which may not appear until the PO2 levels drop below 50 mm Hg,

DX: Anxiety related to changes in circumstances , or the fear of death

GOAL:

To allow the client to verbalize anxiety so she may identify heatlhy ways to deal w and express anxiety

INTERVENTION AND RATIONALE

1. Stay with the client by providing a calm, empathic and supportive attitude. To help in maintaining emotional control in response to the changing physiological status. Helps in lessening interpersonal transmission of feelings.
2. Provide information about the treatment regimen and effectiveness of the interventions. Giving accurate information can lessen the anxiety and to identify what is reality based.
3. Evaluate physiological response to postpartum hemorrhage (e.g. restlessness, irritability, tachypnea, tachycardia, hypotension). Changes in the vital signs may be due to physiologic responses, but they can be aggravated by psychological factors.

DX: Risk of infection/pain related to bleeding from traumatized tissues

GOAL:

To prevent an infection from occurring: no purulent odorous discharge, v.s and wbc within normal limits

INTERVENTION AND RATIONALE

1. Review the records and note certain conditions such as retained placental fragments, any laceration, abruptio placenta, etc. This will help in determining the management of the situation thus preventing further complications.
2. Note for the presence of vulvar hematoma and apply an ice pack if indicated. Small hematoma can be managed by an ice pack and rest.
3. Observe for reports of persistent perineal pain or feeling of vaginal fullness. Apply counterpressure on labial or perineal lacerations. Hematomas often result from continued bleeding from laceration of the birth canal.
4. Observe for signs of fever, chills, body malaise, anorexia, pelvic pain or uterine tenderness. These symptoms reflect systemic involvement, possibly leading to bacteremia, shock or even death if left untreated.

EVALUATION

- Patient is maintaining a blood pressure of at least 100/60 mm Hg.
- Patient is maintaining a pulse rate between 70-90 beats per minute.
- Patient has a balanced 24-hour intake and output.
- Patient has a cognitive status within expected range.
- Patient has a lochia flow of less than one saturated perineal pad per hour.
- Patient demonstrates improvement in the fluid balance as evidenced by a good capillary refill, adequate urine output, and skin turgor.

Case studies: what do these women have in common?

1. 20 wks , reports a hx of depression

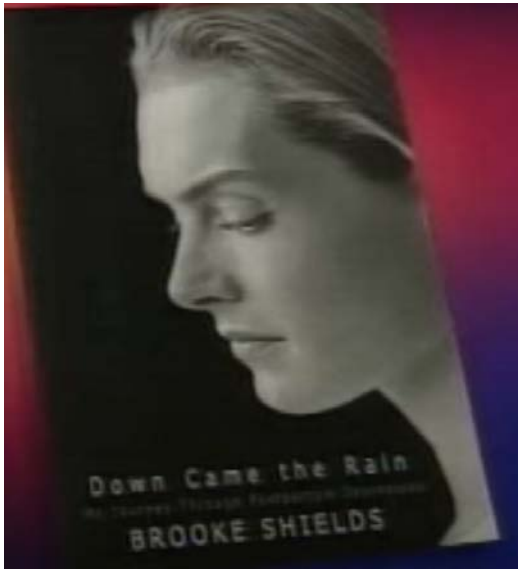
Eg: Woman jumps off the hospital window in the PP period.

2. PP woman makes no eye contact with her newborn

Eg: Brooke Shields husband asked her: “What is wrong with you? You don't sing to the baby. You don't even look at the baby.”

Be alert to patients with a history of mental health problems or depression as they are more at risk for depression in pregnancy. Assess women in the postpartum period.

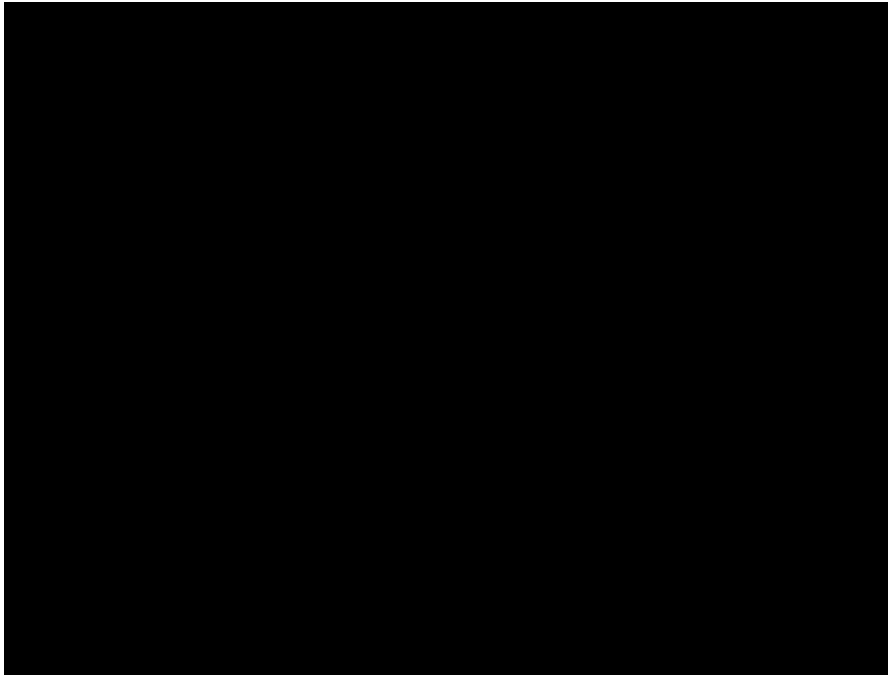
"They thought it was the baby blues”



Mental collapse, the disturbing voices she heard in her head

Brooke Shields was falling apart, descending into a downward spiral of misery and despair—a depression so strong, she says, she even considered taking her own life.

Shields said she withdrew from people, including her baby, crying and experiencing intrusive thoughts about her daughter getting hurt.



Shields believed she was going "truly insane" with fearful thoughts

A Cry In the Dark

Her crime (6/20/2001)—drowning her five children in a bathtub—was unthinkable. But was it understandable? How did a clean-living, all-American woman like Andrea Yates snap?

PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(Use "✔" to indicate your answer)*	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING 0 + _____ + _____ + _____

=Total Score: _____

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult
☐	☐	☐	☐

Pulmonary thrombo-embolism in pregnancy: diagnosis and management

Risk factors for VTE in pregnancy

Pre-existing	New onset/transient	Obstetric
Previous VTE	Early pregnancy	Antenatal
Heritable thrombophilia	Hyperemesis gravidarum	Multiple pregnancy
Acquired thrombophilia	Ovarian hyperstimulation	Assisted reproduction
Family history of VTE	syndrome	Therapy
Medical co-morbidities (including SLE, nephrotic	Throughout pregnancy	Pre-eclampsia
syndrome, sickle cell disease, cancer,	Surgical Procedures (inc. ERPC,	Delivery
inflammatory conditions)	postpartum sterilisation)	Caesarean section
Age >35 years	Admission	Prolonged labour
BMI >30 $kg \cdot m^{-2}$	Immobility (e.g. symphysis	Midcavity rotational
Parity ≥3	pubis dysfunction)	forceps delivery
Smoking	Dehydration	Postnatal
Varicose veins	Systemic Infection	Postpartum
Paraplegia	Travel of duration >4 hrs	haemorrhage (>1 litre)
		Blood transfusion

Simcox, L. E., Ormesher, L., Tower, C., & Greer, I. A. (2015). Pulmonary thrombo-embolism in pregnancy: Diagnosis and management. *Breathe*, *11*(4), 282-289. https://doi.org/10.1183/20734735.008815

VTE complicates 1 in 1000 pregnancies [9]

Approximately 10-times more common compared with the non-pregnant population [10, 11].

Risk is increased in pregancy

- the hypercoagulable state of pregnancy begins with conception,
- baseline levels of various coagulation factors that do not return to normal until beyond 8 weeks postpartum

Three components of "Virchow's triad"

- venous stasis: increased venous stasis in the pelvic and lower limb veins due to the vasodilatory effects of pregnancy hormones and physical obstruction from the gravid uterus
- hypercoagulability : pregnancy increases levels of coagulation factors in preparation for the haemostatic challenge of delivery (table 2)
- vascular damage occur in the course of pregnancy and delivery: whether it is vaginal, instrumental or by caesarean section, causes a degree of injury to pelvic vessels.

Simcox, L. E., Ormesher, L., Tower, C., & Greer, I. A. (2015). Pulmonary thrombo-embolism in pregnancy: Diagnosis and management. *Breathe*, *11*(4), 282-289. https://doi.org/10.1183/20734735.008815

A summary of the procoagulant changes that occur in the blood system during pregnancy

↔ Factors II, V IX and protein C
↑ Concentration of factors VII, VIII, X and vWF and pronounced increases in fibrinogen
↓ Protein S
Plasminogen activator inhibitor type 1 levels are ↑ five-fold
PAI-2 produced by the placenta ↑ dramatically during third trimester
Markers of the thrombin generation such as prothrombin F1 and 2 and thrombin-antithrombin complexes are also increased
Do not return to baseline until more than 8 weeks postpartum, and begin at conception

Simcox, L. E., Ormesher, L., Tower, C., & Greer, I. A. (2015). Pulmonary thrombo-embolism in pregnancy: Diagnosis and management. *Breathe*, *11*(4), 282-289. https://doi.org/10.1183/20734735.008815

VTE prenatally

The majority of VTE events occur antenatally with equal distribution across all three trimesters [12].

By 20 weeks gestation, more than half of women affected will have had their VTE event [13].

Deep vein thromboses (DVTs) comprise 75–80% of these antenatal VTE

Pelvic vein thromboses make up 10–12% of DVTs.

The majority of DVTs in non-pregant women is popliteofemoral

VS

The majority of gestational DVTs are ileofemoral = predisposition to PTE.

Overall, PTEs make up 20–25% of all pregnancy-related VTE

James AH, Jamison MG, Brancazio LR, et al.. Venous thromboembolism during pregnancy and the postpartum period: incidence, risk factors, and mortality. *Am J Obstet Gynecol* 2006; 194: 1311–1315.

VTE postnatally

The risk postnatally is increased by approximately 20-fold [15]. VTE is approximately 10-times more common in the pregnant population (compared with non-pregnant women) with an incidence of 1 in 1000 and the highest risk in the postnatal period.

Now thought to extend until at least 12 weeks postnatal [16]

Most thromboembolic events occur in the first 3 weeks after delivery [17].

In contrast with the non-pregnant population, the majority of DVTs are left-sided (90% *versus* 55%) and ileofemoral in distribution (72% *versus* 9%) [18].

This observation is partly explained by compression of the left common iliac vein which is crossed by the right common iliac artery.

Simcox, L. E., Ormesher, L., Tower, C., & Greer, I. A. (2015). Pulmonary thrombo-embolism in pregnancy: Diagnosis and management. *Breathe*, *11*(4), 282-289. https://doi.org/10.1183/20734735.008815

Risk facors for VTE

- Venous thromboembolism (VTE) in pregnancy remains a leading cause of direct maternal mortality in the developed world and identifiable risk factors are increasing in incidence.

Multiple risk factors often co-exist in women who develop VTE in pregnancy and one of the strongest risk factors is a previous pregnancy-related VTE event [7].

Other pregnancy-related risk factors include an increased BMI, increased maternal age, high parity, hyperemesis, multiple pregnancy, thrombophilias, particularly homozygous factor V Leiden, and co-existing medical morbidities.

Postnatal risk factors include caesarean section, particularly if this was associated with a prolonged hospital stay or emergency delivery, and complicated by other factors such as postpartum haemorrhage and/or sepsis.

DIAGNOSIS

Signs and symptoms of acute VTE such as leg swelling and dyspnoea in pregnancy can be difficult to distinguish from the normal physiological symptoms of pregnancy.

In general, pregnant women presenting with signs and symptoms of acute DVT such as unilateral leg swelling or pain and/or abdominal pain reflecting extension into pelvic vessels, should undergo objective testing and treatment started upon presentation.

If left untreated, DVT progresses to PTE in 15–24% of patients which, in itself, is potentially fatal in 15–30% of patients [13, 19, 20].

DIAGNOSIS of DVT

Compression duplex ultrasound is the primary diagnostic test for investigating DVT in pregnancy [6].

If ultrasonography confirms the presence of DVT → anticoagulant treatment should be continued.

If the initial scan in negative and clinical suspicion remains low → treatment can be stopped.

However, if initial scan findings are negative and clinical suspicion remains high, then a repeat scan is recommended on days 3 and 7 [21]. In this situation, anticoagulation should be withheld until the results of the repeated test are available.

If ileocaval venous thrombosis is suspected

Ultrasound testing cannot detect a thrombus

Magnetic resonance or conventional venography may be considered

References:

Greer I, Thomson AJ Green-top Guideline No. 37b - thromboembolic disease in pregnancy and the puerperium: acute management. London, Royal College of Obstetricians and Gynaecologists, 2015.

Bates SM, Jaeschke R, Stevens SM, et al.. Diagnosis of DVT: Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012; 141: 2 Suppl, e351S–e418S.

Current guidelines DO NOT recommend measurement of D-dimer in the investigation of suspected acute VTE in pregnancy (Greer & Thompson, 2015).

~~NO D-DIMER~~

Valuable in the non-pregnant population

BUT

-D-dimer levels are raised:

In normal pregnancy (particularly in the late third trimester and early puerperium [22], and also in conditions such as pre-eclampsia and placental abruption [15].

Normal values have also been reported in confirmed cases of VTE [23]

Khalafallah AA, Morse M, Al-Barzan AM, et al.. D-Dimer levels at different stages of pregnancy in Australian women: a single centre study using two different immunoturbidimetric assays. *Thromb Res* 2012; 130: e171–e177.

Greer IA. Thrombosis in pregnancy: updates in diagnosis and management. Hematology (Am Soc Hematol Educ Program) 2012; 2012: 203–207.

To MS, Hunt BJ, Nelson-Piercy C. A negative D-dimer does not exclude venous thromboembolism (VTE) in pregnancy. *J Obstet Gynaecol Res* 2008; 28: 222–223.

Pregnancy specific scoring system (the “LEFT” rule), to predict the likelihood of a diagnosis of DVT:

If none of the LEFT variables is present then the negative predictive value is 100%

1) left leg presentation

2) ≥2 cm calf circumference difference and

3) first trimester presentation.

It is more practical to proceed with bilateral lower limb Doppler ultrasound in pregnant women with suspected pulmonary embolism **ONLY** if they present with signs and symptoms of a DVT  to limit the number of negative investigations.

Treatment for both conditions (DVT and pulmonary embolism) is the same

In one study by Chan *et al.* [3], no cases of DVT were found in 67 women presenting with suspected pulmonary embolism.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4818214/#C3

1) Chest radiograph
(radiation dose from a chest radiography to the fetus is <0.1 mGy, well below the threshold dose for fetal malformations, and should not be withheld for this reason)

Abnormal features attributed to pulmonary embolism include:
-basal atelectasis,
-pulmonary oedema,
-pleural effusions and
-focal opacities [28]

2) Objective diagnostic testing: Computerized Tomography Pulmonary Angiogram (CTPA) is more reliable (but possibly poorer quality imaging and >risk breast CA) than ventilation perfusion (*V′*/*Q′*) scanning

Normal in >50% of patients with objectively proven pulmonary embolism [27]

To rule out other pathologies such as pneumonia or pneumothorax that may mimic the symptoms of pulmonary embolism

DIAGNOSIS OF PE

- If pulmonary imaging is required, ventilation perfusion scanning is usually the preferred initial test to detect pulmonary embolism within pregnancy.

Most UK hospitals will proceed with *V′*/*Q′* scanning as the initial investigation given the low incidence of comorbid pulmonary disease in pregnancy, lower breast cancer risk and similar negative predictive values/low rates of uninformative imaging (*i.e.* poor image quality on CTPA or intermediate probability on *V′*/*Q′* scanning)

- Treatment should be commenced on clinical suspicion and not be withheld until an objective diagnosis is obtained.

.The mainstay of treatment for pulmonary thromboembolism in pregnancy is anticoagulation with low molecular weight heparin for a minimum of 3 months in total duration and until at least 6 weeks postnatal. Low molecular weight heparin is safe, effective and has a low associated bleeding risk.

Reference:
Simcox, L. E., Ormesher, L., Tower, C., & Greer, I. A. (2015). Pulmonary thrombo-embolism in pregnancy: Diagnosis and management. *Breathe*, *11*(4), 282-289. https://doi.org/10.1183/20734735.008815

V′/Q′ scanning chosen as the initial investigation in most UK hospitals

- low incidence of comorbid pulmonary disease in pregnancy,
- lower breast cancer risk
- similar negative predictive values/low rates of uninformative imaging (*i.e.* poor image quality on CTPA or intermediate probability on *V′/Q′* scanning), when compared with CTPA (negative predictive value of 100% and 98%, respectively) [4, 35, 36].
- Also with *V′/Q′* scanning in pregnancy, particularly if the chest radiograph is normal, the ventilation component can often be omitted thereby minimising the radiation dose to the fetus.

The choice of whether to proceed with CTPA or *V′*/*Q′* scanning to investigate suspected pulmonary embolism in the pregnant population will depend on local guidelines, availability and clinician/patient preferences.

CTPA is prefered in these situations:
- when the chest radiography is abnormal
- in the non-pregnant population due to its high sensitivity and specificity
- may also identify alternate diagnoses, such as aortic dissection.

Drawbacks of CTPA
-may not identify peripheral PTE (up to 30% small peripheral emboli missed)
-may have a lower diagnostic yield due to the hyperdynamic circulation of pregnancy
- concerns regarding radiation exposure to maternal breast tissue from CTPA scanning when compared with *V′*/*Q′* scans (around 20 mGy with CTPA) that may influence decision making. (see slide)

Risk of teratogenesis?

Both techniques are associated with a very small increased risk of childhood cancer (0.006% per mGy of *in utero* exposure) [6, 33], and the fetal radiation dose associated with *V′/Q′* scanning is very slightly higher when compared to CTPA (around 0.5 mGy and 0.1 mGy, respectively) [12, 33].These exposures are well below thresholds associated with teratogenesis (table 3).

A summary of the estimated fetal exposures for the different types of radiological investigations used to diagnose VTE in pregnancy.

Unilateral venography (no abdominal shield)	3 mGy
Limited venography	<0.5 mGy
Perfusion scan (technetium-99m/ 1-2mCi)	<0.12 mGy
Ventilation scan (varies with isotope)	<0.35 mGy
CTPA	0.5 mGy
Chest radiography	<0.1 mGy

Chest radiography is equal to 10 days of background equivalent radiation time or 20 hours of air travel. Fetal malformations have a threshold of 100–200 mGy. A dose of >250 mGy may be associated with a 0.1% risk of fetal malformation. 1000 mGy=100 rad. Data from [30].

Data from : Eskandar OS, Eckford SD, Watkinson , 2010

Risk of breast CA?

Modelling studies suggest that the additional radiation dose to the maternal chest from CTPA scanning increases the women's lifetime risk of developing breast cancer by 13.6% against a background risk of 1 in 200 [31]. The radiation doses to the maternal breasts associated with CTPA can however be reduced by 20–40% with the use of bismuth breast shields [32]. There are also concerns with the iodinated contrast medium used in CTPA and the potential for it to affect fetal and neonatal thyroid function, although this has not been proven [34].

Other preliminary investigations

Oxygen saturation measured with:

- An electrocardiogram (somewhat useful)

- Arterial blood gas sampling (not that useful) .

One study found that electrocardiogram abnormalities were present in approximately 40% of pregnant women with acute pulmonary embolism and these included T-wave inversion, evidence of right heart strain and the classic $S_1Q_3T_3$ pattern.

In the same cohort of women, arterial blood gas analysis demonstrated that only 10% of women had oxygen levels <60 mmHg and 2.9% had oxygen saturation levels <90% [27].

Arterial blood gas sampling has limited diagnostic value in this group of patients and results will often be normal in the absence of massive pulmonary embolism.

MANAGEMENT

Initial investigations prior to commencement of anticoagulant therapy include

- full blood count
- liver function tests
- urea and electrolytes
- coagulation screen.

Performing a thrombophilia screen is not routinely recommended:

- results are unlikely to influence management
- the interpretation of results is difficult in pregnancy due to pro-thrombotic changes in several of the coagulation factors and the impact of a recent or developing thrombus

TREATMENT OF VTE IN PREGNANCY: LMWH

Involves LMWH usually for a minimum total duration of 3 months and until at least 6 weeks postnatal.

LMWH is suitable for use in pregnancy as it does not cross the placenta or enter breast milk.

Associated with lower mortality and a lower risk of bleeding

Generally safe and easy to use with either once daily or twice daily dosing and regular monitoring is unnecessary in most patients.

Platelet monitoring is unnecessary due to extremely low incidences of heparin induced thrombocytopenia (HIT)

A systematic review by Greer and Nelson-Piercy [39]

- Risk of recurrent VTE of 1.15% in women treated with LMWH.
- Compares favourably with recurrence rates of 5–8% in trials in non-pregnant patients treated with LMWH or UFH followed by warfarin followed up for 3–6 months [40].

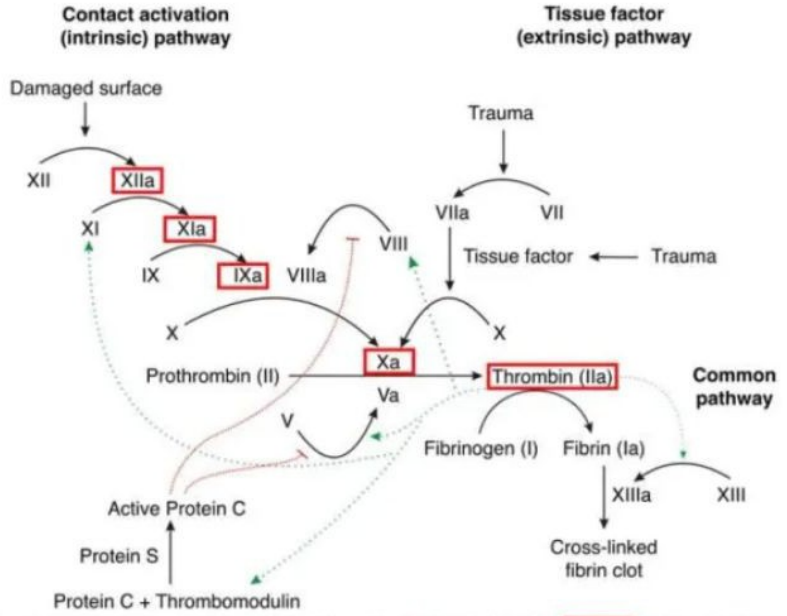
ONCE OR TWICE DOSING OF LMWH?

LMWH is prescribed based on the woman's booking weight: once-daily dose or in two divided doses

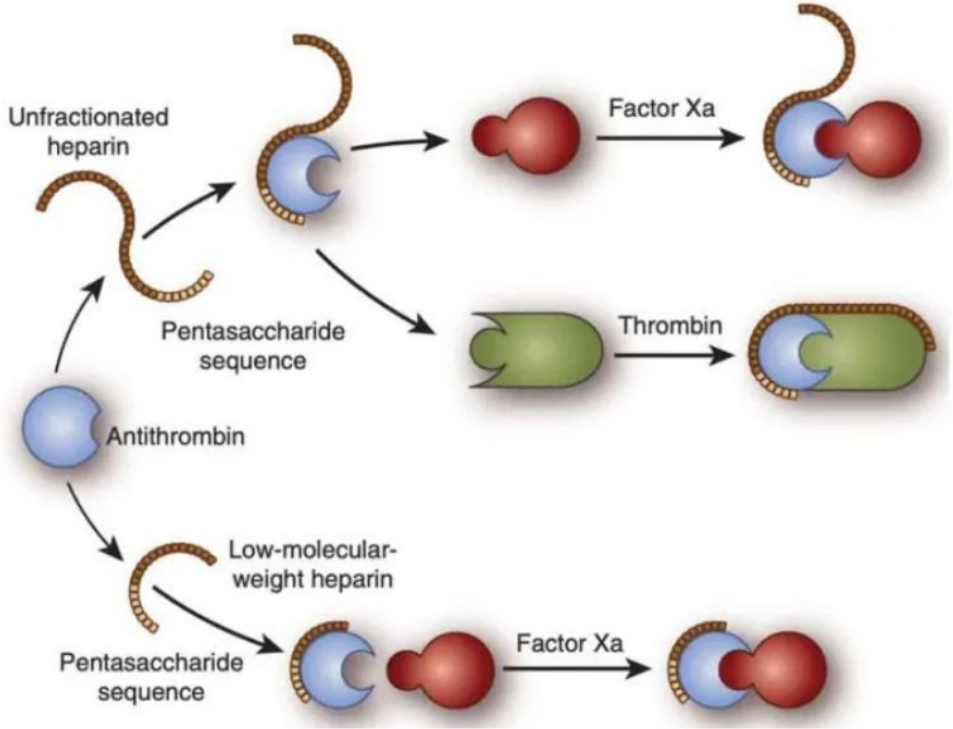
Twice-daily dosing is because of the enhanced renal clearance of LMWH in pregnancy

The increase in glomerular filtration rate = ↓ half-life of LMWH

Recent study involving 123 pregnant women found that the half-life of enoxaparin is prolonged with the progression of pregnancy, giving support for once daily dosing



Heparin activates antithrombin-3 (AT-III), which inhibits the boxed clotting factors.



Heparin functions by activating antithrombin-III to bind to serine proteases involved in coagulation, blocking their function (predominantly Factor Xa and Factor IIa a.k.a. thrombin). Low molecular heparin predominantly facilitates inhibition of Xa, whereas unfractionated heparin inhibits Xa and thrombin. This reaction *consumes* antithrombin-III (which remains permanently stuck to factor Xa and/or thrombin).

Lai S et al. Kidney International 2013

COUMARIN DERIVATIVES (COUMADIN/warfarin)- are usually avoided in pregnancy

- Cross the placenta
- Can cause embryopathy if taken in early pregnancy
- Can cause central nervous system abnormalities, such as microcephaly, if taken later on.
- Suitable for use in breast feeding women during the post-partum period
- Crosses minimally into breast milk
- Coumarins can be used in high risk pregnancy: women with artificial heart valves, in whom they have been used after embryogenesis in the first trimester
- Other newer anticoagulants, such as dabigatran, rivaroxaban, apixaban, and edoxaban, may also cross the placenta and should generally be avoided in pregnancy [7]
- Above meds can be used postnatally if the woman is not breast feeding
- Fondaparinux has been used in pregnancy and safety data suggests that it is suitable, but it is generally only prescribed in cases of severe heparin allergy or heparin induced thrombocytopenia [7]
- If fondaparinux is used in pregnancy, it is important to note that it has a longer half-life than an equivalent weight-based dose of LMWH and so delivery care plans for labour should clearly document this.

Parenteral anticoagulants used in acute care medicine

	Unfractionated Heparin (UFH)	Low molecular weight heparin	Fondaparinux	Argatroban	Bivalirudin
Source	Biological	Biological	Synthetic	Synthetic	Synthetic
Molecular weight	~15,000 Heterogeneous mixture	~5,000 Heterogeneous mixture	1,727	508	2,180
Biological targets	Factor Xa & IIa (thrombin) Some anti-platelet effect	Factor Xa >> Factor IIa (~4:1 to 2:1 ratio)	Factor Xa	Direct thrombin inhibitor (reversible)	Direct thrombin inhibitor (reversible)
Half-life	~1 hour (may increase at higher doses)	~3-6 hours with normal renal function	17-21 hours with normal renal function	45 minutes (~180 min hepatic dysfunx)	25 minutes
Metabolism/ excretion	Reticuloendothelial voodoo	~10-40% Renal	Renal	Hepatic metabolism	~80% serum proteases ~20% excreted by kidneys
Use in renal failure	Fine for renal failure	Contraindicated if GFR <30	Contraindicated if GFR <30	Fine for renal failure (no dose adjustment)	OK, but need dose reduction & careful titration
Monitoring	Anti-Xa level (optimally) PTT (less optimal)	Anti-Xa level 4 hrs post dose	Anti-Xa level 4 hrs post dose	PTT level	PTT level
Antidote?	Protamine Highly effective	Protamine; Partially effective	No antidote Long half-life 😊	No antidote (short half-life)	No antidote (very short half-life)
Risk of HIT	Highest risk (*absolute* risk usually low; depends on dose & clinical context).	Considerably *lower* than unfractionated heparin.	No risk	No risk	No risk
Typical role in ICU	Workhorse anticoagulant (especially in patients with renal insufficiency or need for procedures).	Good for patients with adequate renal function, no anticipated procedures & adequate dermal blood perfusion.	Low dose (2.5 mg QD) excellent for prophylaxis and/or acute coronary syndrome. Long half-life makes therapeutic anticoagulation awkward.	- Treatment of HIT. - Treatment of heparin resistance.	- Treatment of HIT. - Anticoagulation for ECMO, cardiothoracic surgery.

From multiple sources including Goodman & Gilman's textbook 13th edition page 589; Burstein et al. 2019.

ADDITIONAL THERAPIES

Graduated elastic compression stockings

- **reduce pain and swelling in patients with acute DVT, with no increased risk of clot progression and subsequent pulmonary embolism.**
- **National guidelines have previously recommended that compression hosiery with an ankle pressure >23 mmHg should be worn on the affected leg for at least 2 years to reduce the chances of developing post-thrombotic syndrome.**

Inferior vena cava (IVC) filters use is limited due to risks associated with:

- **insertion and removal, which include a fatality rate of 0.12–0.3%,**
- **filter migration in >20%**
- **filter fracture in 5%**
- **IVC perforation in 5% of patients**

ADDITIONAL THERAPIES (cont.)

Temporary caval filter (also known as retrievable IVC filter) may be appropriate in women who:

- **are delivering or are expected to deliver**
- **had <2 weeks of anticoagulation**
- **with recurrent VTE despite adequate treatment**
- **where anticoagulation is contraindicated.**

Acute massive PTE in pregnancy or the puerperium may present as a collapsed shocked woman and should be treated as a matter of urgency.

- Preferred initial treatment is UFH due to its rapid onset of action
- Dose adjustment can be performed if thrombolytic therapy is administered. Thrombolysis may be considered for patients with life-threatening pulmonary embolism and haemodynamic compromise.
- Intravenous UFH should be started promptly after thrombolysis
- It be converted to LMWH once stability is achieved.

The risk of bleeding complications for both mother and fetus is similar to that among non-pregnant persons and is approximately 2–3%

Reference
Greer I, Thomson AJ Green (2015). *Top Guideline No. 37b - thromboembolic disease in pregnancy and the puerperium: acute management*. London, Royal College of Obstetricians and Gynaecologists.

MANAGEMENT DURING LABOUR AND DELIVERY

Planning for delivery involves a careful discussion with both the woman and her multidisciplinary team and should be documented in the form of a “care plan” that is easily seen and accessible in the woman’s medical notes. Delivery planning involves a balance between the risk of postpartum haemorrhage in a woman on full therapeutic anticoagulation with the risk of progressive or recurrent VTE when treatment is withheld during the induction and/or labour process.

1. **ALLOW SPONTANEOUS LABOUR**

2. **PLAN THE DELIVERY**, either by induction of labour for logistical and/or obstetric reasons, or by caesarean section for obstetric reasons

1. Allow spontaneous labour in women on treatment:

- The woman should be advised not to inject any further heparin once there are signs of labour, and seek review as soon as possible at the delivery unit.
- The cervical ripening and induction process can be long (up to 3 days), especially in a primigravida, and so if treatment has been stopped 24 h prior to the induction date then this can leave a long period of time without therapeutic anticoagulation.
- Induction of labour also increases the need for additional analgesia during labour and the requirement for an assisted delivery but does not increase the risk of caesarean section if delayed until after 38 weeks gestation.

2. Elective induction of labour close to term for logistical and/or obstetrical reasons if the woman lives a considerable distance away from the delivery unit as these women are often cared for in tertiary units and not their local hospitals, or by C/S for obstetric reasons:

Therapeutic anticoagulation is usually stopped 24 h prior to the procedure.

In a primigravid woman with an unfavourable cervix, the last dose of treatment LMWH could be given 12 h before the first dose of prostaglandin inducing agent.

High risk cases

If there are specific concerns with prolonged interruption of anticoagulation for high-risk cases such as recurrent VTE, thrombophilias such as homozygous factor V Leiden, and VTE close to term then there are two possible management options.

1) These women can be managed with intravenous unfractionated heparin which is more easily manipulated, minimises the duration without anticoagulant therapy and can be easily reversed with protamine sulphate.

2) Alternative management plan :

- stop the therapeutic dose LMWH prior to induction of labour as described above

- reduce to a prophylactic dose during the induction and labour process, given the extremely low incidence of bleeding complications with LMWH.

The risk of LMWH for women receiving neuraxia anaesthesia may be a concern.

The actual incidence of spinal haematoma following epidural or spinal anaesthesia in pregnant women is unknown, but undoubtedly rare.

The incidence is expected to be higher for those women on therapeutic and prophylactic LMWH.

For women in labour on a therapeutic dose of LMWH, regional techniques should not be administered until 24 h following the last dose.

Following delivery, LMWH should not be given for at least 4 h after spinal anaesthesia or removal of an epidural catheter

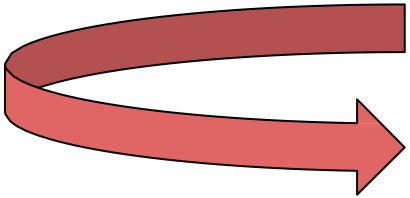
The catheter should not be removed within 12 h of the most recent injection.

It is reasonable to recommence therapeutic anticoagulation 6–12 h after vaginal delivery and 12–24 h following caesarean section and once haemostasis has been achieved and the risk of primary PPH is low.

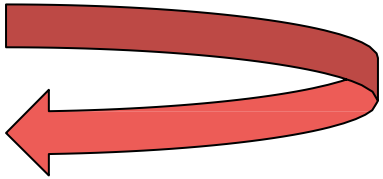
There is an increased incidence of wound complications following caesarean section in women receiving both therapeutic and prophylactic LMWH compared with women not on LMWH (30% *versus* 8%, p<0.001) [43].

UK guidelines therefore suggest that both wound drains and interrupted skin sutures may be used at the time of caesarean section to allow drainage of any haematoma [6].

Postpartum management



LMWH or warfarin, as these have proven safety in breast feeding women



The newer anticoagulants are suitable to use postnatally but only in non-breastfeeding women

Therapy should be continued for at least 6 weeks postnatal and for a minimum of 3 months in total. There should ideally be a 6 week postnatal review in these women to assess the ongoing risk of thrombosis including a full personal and family history and possible thrombophilia screening. Management of any subsequent pregnancies will usually involve prophylactic LMWH from the point of conception until at least 6 weeks postnatal and this should also be discussed.

Conclusion

Recommendations and guidance on the diagnosis and management of VTE in pregnancy is based on evidence gathered from studies in the non-pregnant population.

This in turn creates several areas of controversy in management, and often a reluctance from clinicians to pursue an objective diagnosis.

Although LMWH has largely replaced UFH in the management of VTE in pregnancy, the correct dosing schedule has not been established and the value of monitoring LMWH activity (anti Xa activity), has not been determined.

The newer oral anticoagulants continue to be used in non-pregnant individuals, but the risks of their use in pregnancy remains to be established.

Regarding diagnosis, there is insufficient data to inform maternal and fetal risks associated with *V′*/*Q′* and CTPA scanning to detect pulmonary embolism in pregnancy. As a consequence of this, it remains unclear on how best to manage a pregnant woman who has had an intermediate probability *V′*/*Q′* scan who then does not go on to have a follow-up CTPA.

These questions are clearly best answered with evidence obtained from adequately powered randomised controlled trials in the pregnant population.

1)

. Hydatidiform moles are benign but have a malignant potential, typically treated via suction evacuation and curettage

vs

. GTN are malignant lesions with a tendency to metastasize, especially to the lungs. GTN treatment typically starts with chemotherapy.
Typical symptoms of GTD: vaginal bleeding and pelvic tenderness.

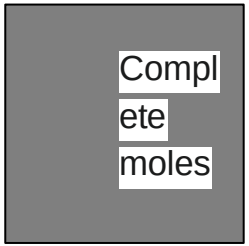
Additional features of complete moles include: enlarged uterus, hyperemesis gravidarum, and preeclampsia.
Diagnosis of GTD is established on the basis of significantly elevated serum β-HCG and ultrasound findings.

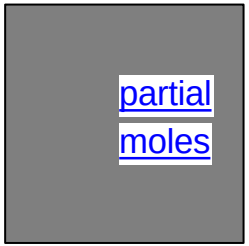
If GTN is suspected, workup must include x-ray of the chest to screen for lung metastases.

https://www.amboss.com/us/knowledge/gestational-trophoblastic-disease

Gestational trophoblastic disease (GTD)
A class of neoplastic conditions characterized by abnormal trophoblast-cell growth in the uterus.
GTD is classified into:

1) Hydatidiform moles (molar pregnancy), which are subclassified:



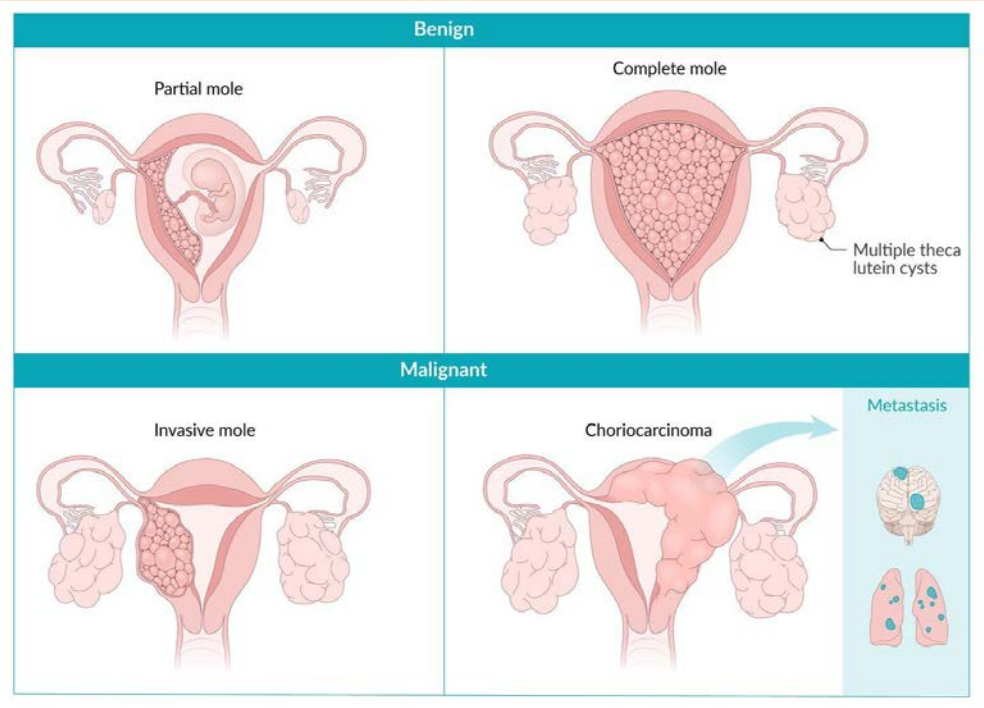


2) Gestational trophoblastic neoplasia (GTN), which is subclassified into:

A- Choriocarcinoma,
B- Invasive moles,
C- Placental site trophoblastic tumors, and
D- Epithelioid trophoblastic tumors

Hydatidiform mole

A benign tumor of the uterus that develops following abnormal fertilization of the ovum. Can be **partial** (fertilization of a normal egg with two sperms; tumor contains fetal or embryonic parts), or **complete** (fertilization of an empty egg that does not carry any chromosomes; tumor does not contain any fetal or embryonic parts).



Choriocarcinoma (GTN):

Postpartum vaginal bleeding (and tenderness)

- Inadequate uterine regression after delivery
- Dyspnea or hemoptysis with lung metastases

https://www.amboss.com/us/knowledge/Vaginal_bleeding#Z0ca9c918dda5e628509d7adc8e404c8f95

The symptoms of GTD may resemble those of a normal pregnancy. They may also be similar to a spontaneous abortion, also called a miscarriage, or to an ectopic pregnancy. However, the following symptoms could signal a potential problem:

- Abnormal vaginal bleeding during or after pregnancy
- A uterus that is larger than expected at a given point in the pregnancy
- Severe nausea or vomiting during pregnancy
- High blood pressure at an early point in the pregnancy, which may include headaches and/or swelling of the feet and hands
- A pregnancy where the baby has not moved at the expected time
- Pain or pressure in the pelvic area
- Abdominal swelling
- Anemia, which is a low red blood cell count that can cause fatigue, dizziness, shortness of breath, or an irregular heartbeat

https://www.cancer.net/cancer-types/gestational-trophoblastic-disease/symptoms-and-signs#:~:text=Abnormal%20vaginal%20bleeding%20during%20or,of%20the%20feet%20and%20hands

Lupus During Pregnancy Carries Higher Maternal, Fetal Morbidity Risks

— Patients four times as likely to need blood, 15 times as likely to experience acute renal failure

by Rachael Robertson, Enterprise & Investigative Writer, MedPage Today April 25, 2023

Women with systemic lupus erythematosus (SLE) had higher risks for maternal and fetal morbidity compared to those without the chronic autoimmune disorder, according to a nationwide analysis of U.S. data.

The 10-year study showed that patients with SLE had higher intrauterine growth restriction versus people without SLE (8.0% vs 2.7%) and more frequent preterm delivery (14.5% vs 7.3%), reported researchers led by Bella Mehta, MD, of Weill Cornell Medical College and Hospital for Special Surgery in New York City.

Their study looked at 40 million delivery-related hospital admissions, including over 50,000 involving women with SLE. During delivery, mothers with SLE were almost four times as likely to require a blood transfusion or develop a cerebrovascular disorder and 15 times as likely to develop acute renal failure compared with those without SLE.

Morbidity for this population remains "exceedingly high," the researchers stated in *RMD Open*.

Mehta told *MedPage Today* that the study quantified the actual risk to pregnant women with SLE. "Maternal and fetal mortality in lupus patients has been decreasing over the past two decades or so," she said. "Now that we know that, and we can tell patients that, we wanted to also look into maternal morbidity as well as fetal morbidity and see what happens to those two indicators."

Mehta urged clinicians to collaborate across disciplines to care for patients with SLE who want to bear children.

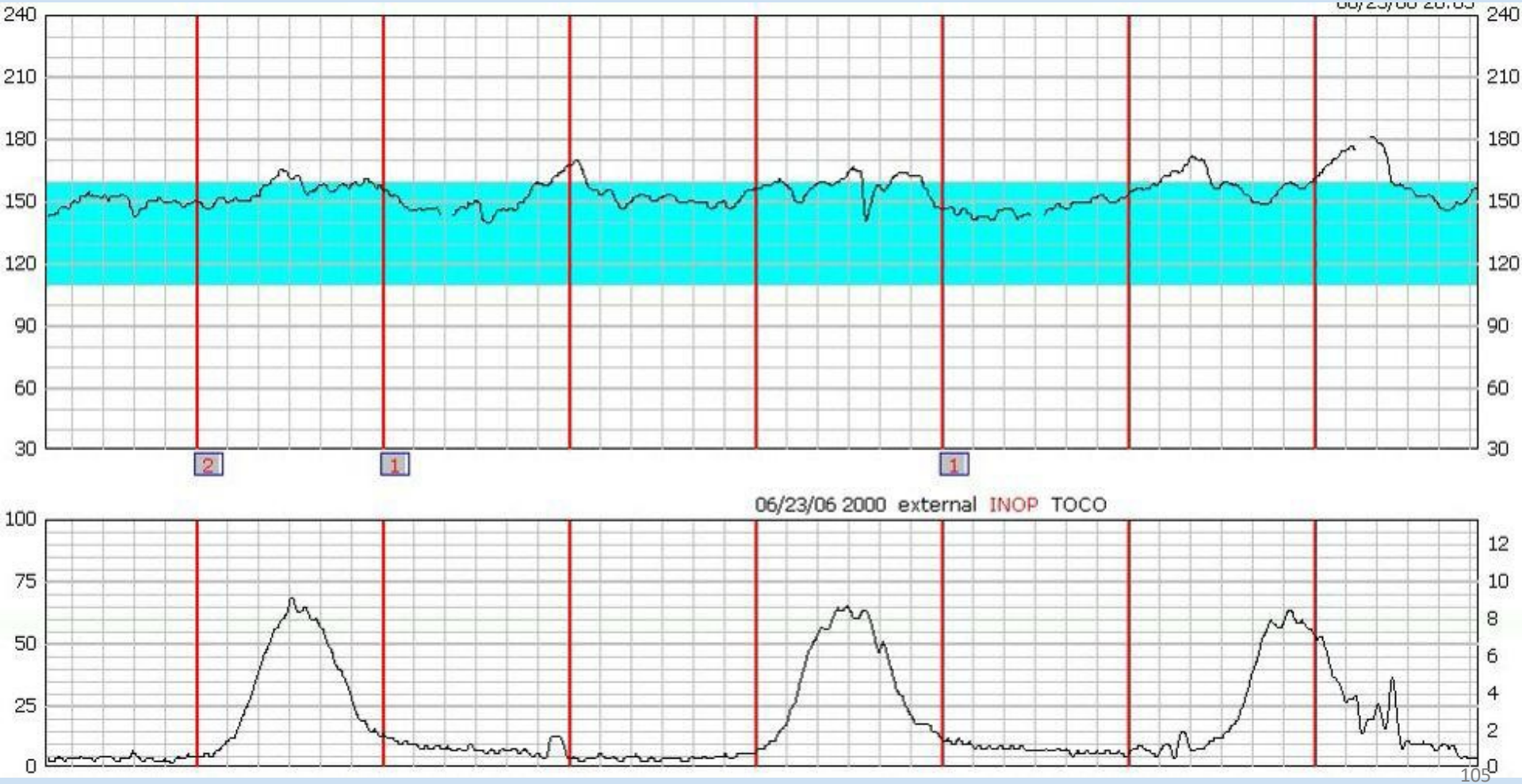
"I don't want people to look at this [study] and counsel patients against pregnancies," Mehta said. "This is only to spark a conversation, saying these risks exist, but we need to manage these patients better and work in a multidisciplinary fashion so that we can just mitigate this."

She said future research will look at the risk differences in patient subgroups and racial demographics, which were not assessed in the current study.

Veronica Gillispie-Bell, MD, of Ochsner Health Center in Kenner, Louisiana, told *MedPage Today* that generally speaking, "for every case of mortality, there's thousands of cases of severe maternal morbidity," which makes research on maternal and fetal morbidity particularly important.

Gillispie-Bell, who was not involved in the study, agreed with Mehta that multidisciplinary care is key for SLE patients during pregnancy and beyond.

"We tend to operate in silos in medicine, which is something that I'm advocating for us to change," she said. "We take care in our silos, we take care of our medical condition, and we don't think about the other ways that those medical conditions are going to affect other things."


240
210
180
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120
90
60
30
2
1
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06/23/06 2000 external INOP TOCO
100
75
50
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12
10
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2
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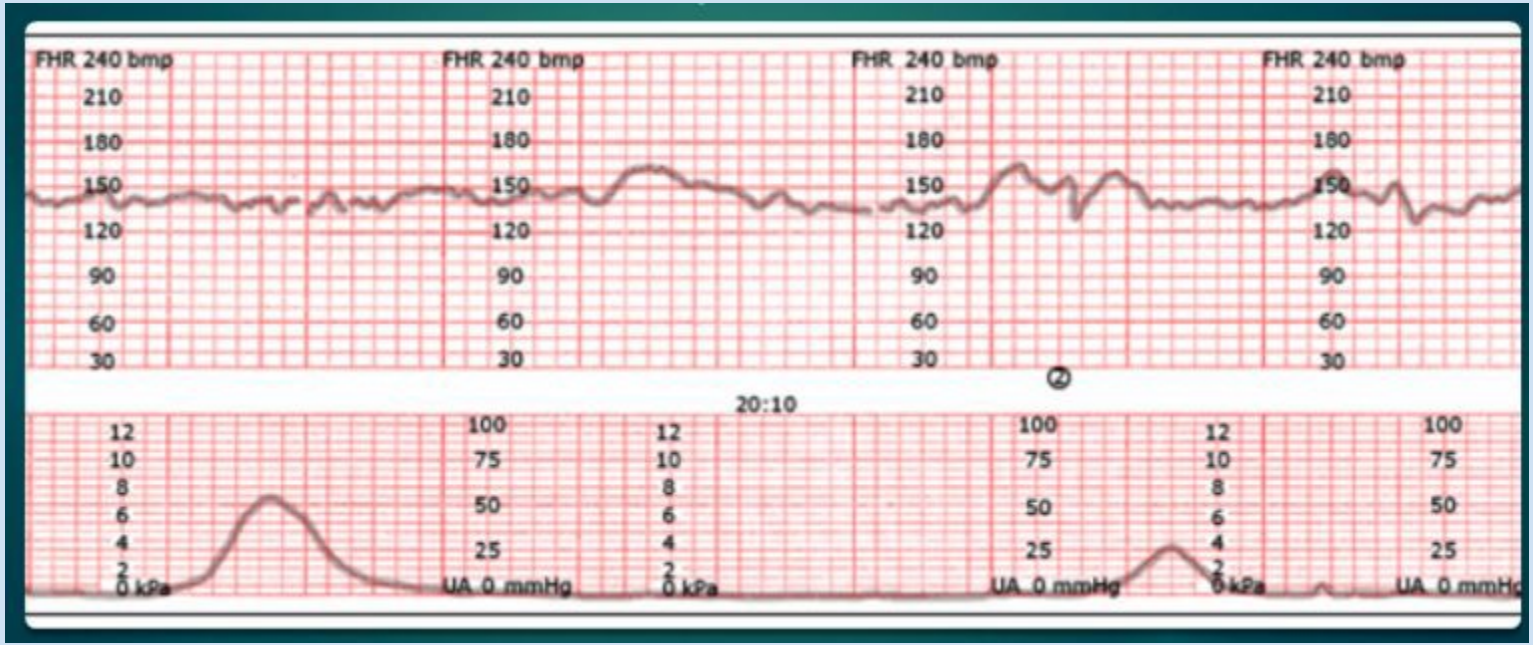
FHR 240 bmp
210
180
150
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30
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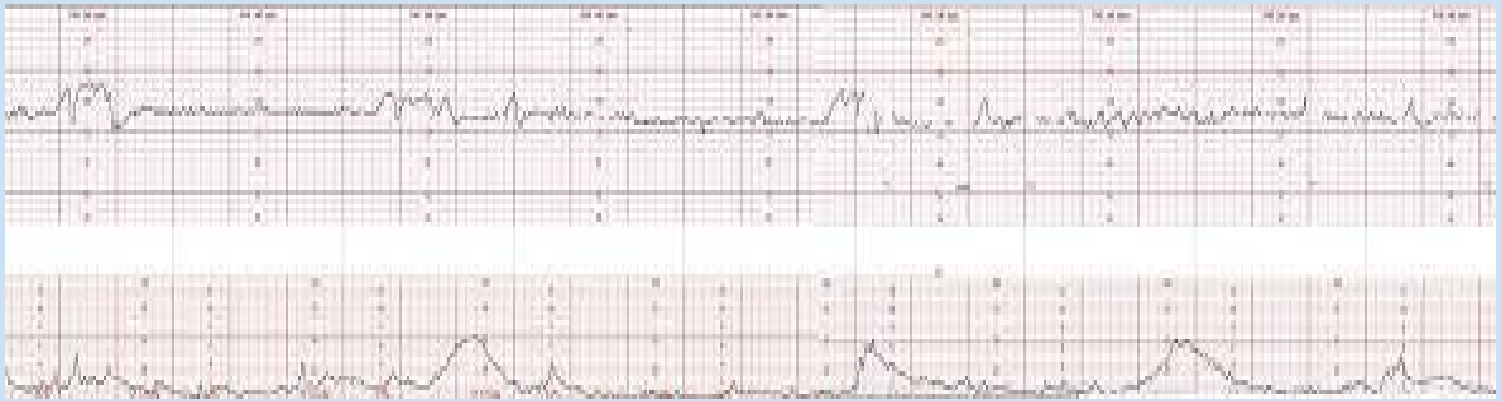
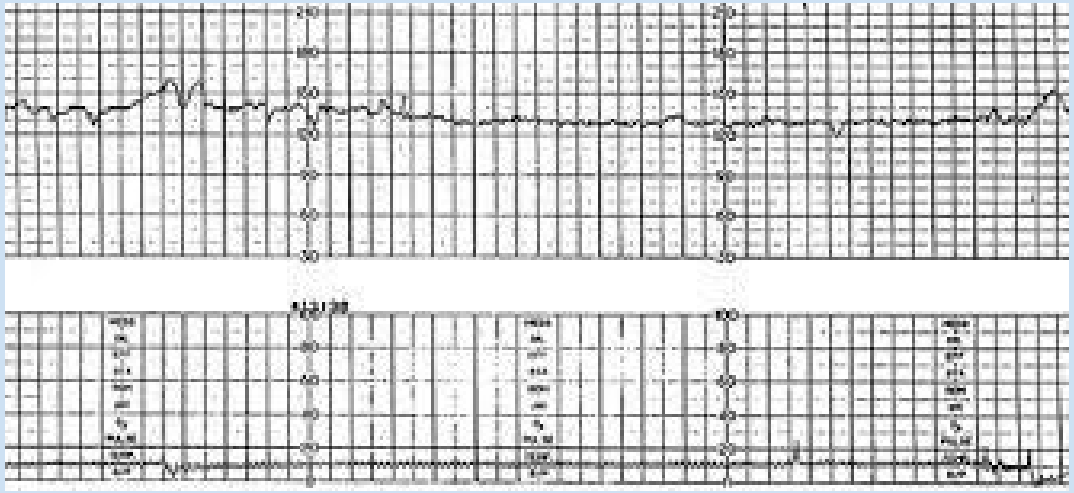
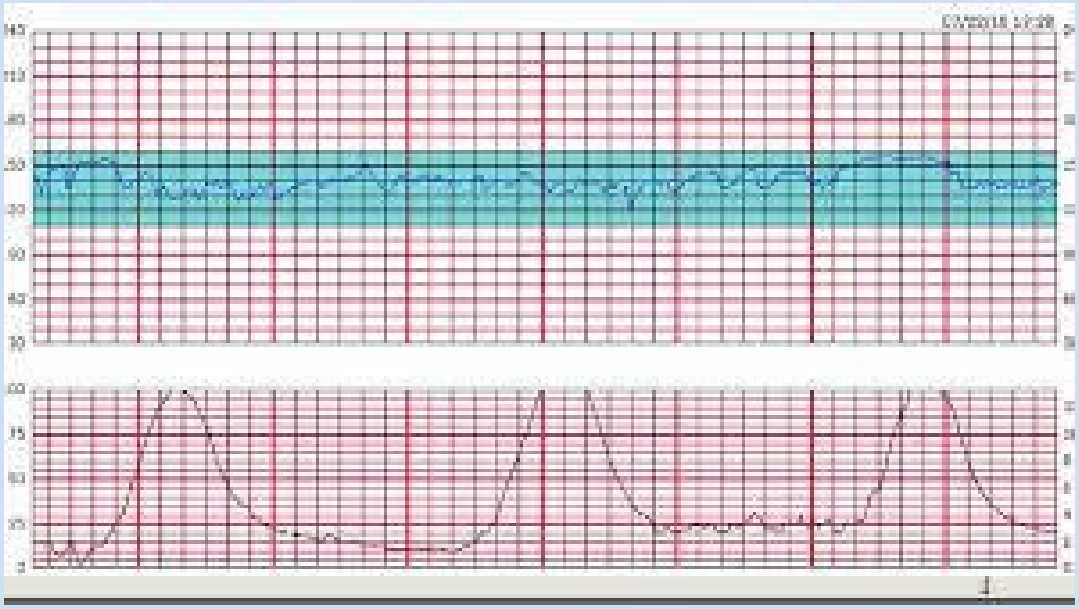
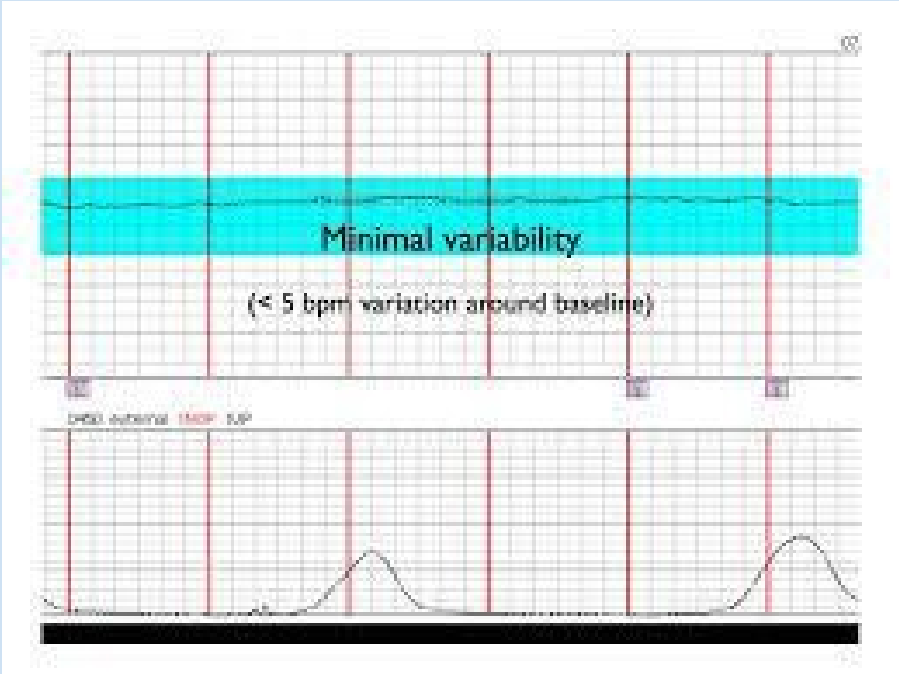
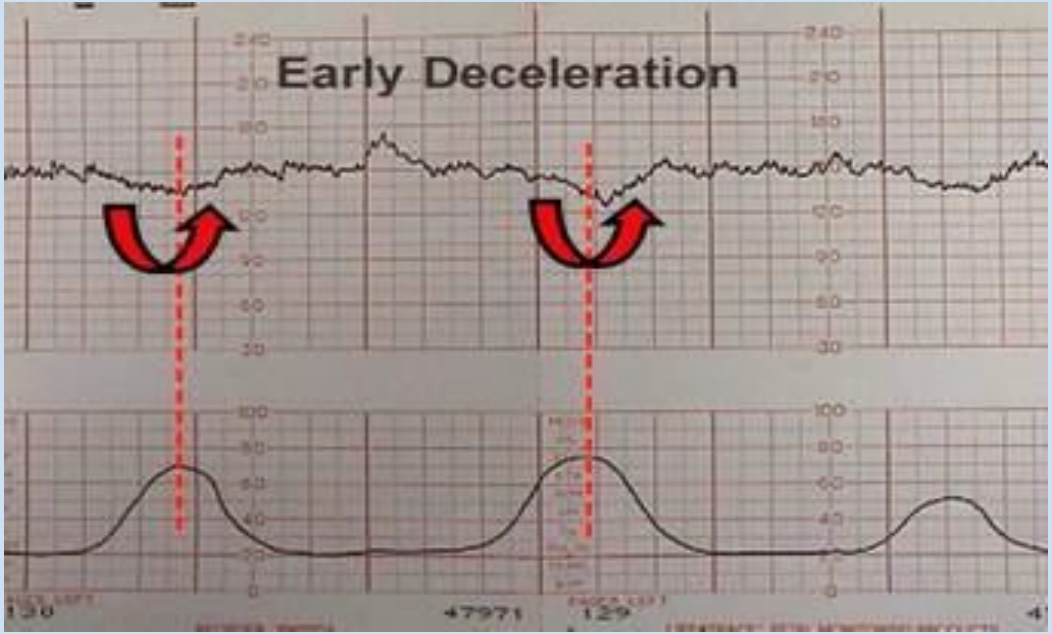
12
10
8
6
4
2
0 kPa
100
75
50
25
UA 0 mmHg





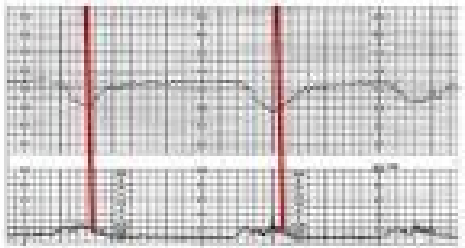


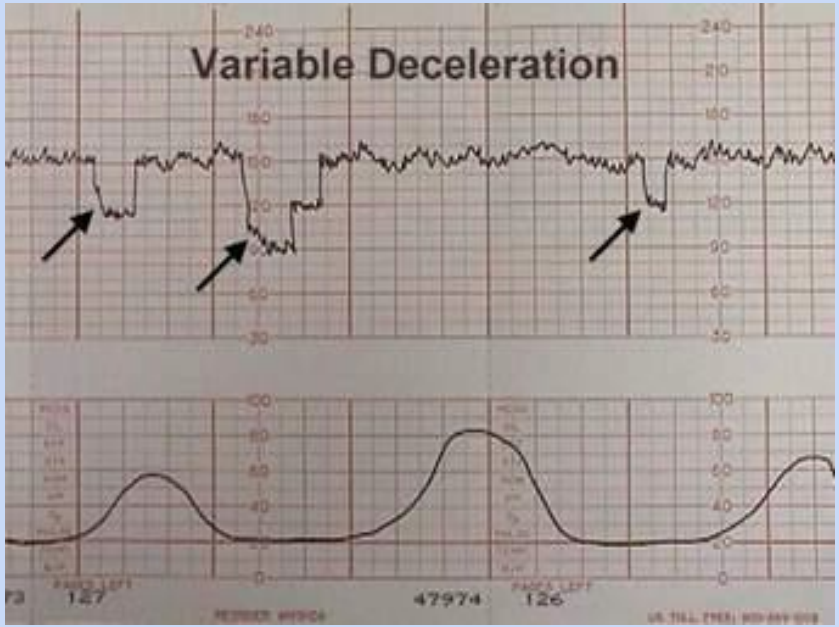

Minimal variability
(< 5 bpm variation around baseline)

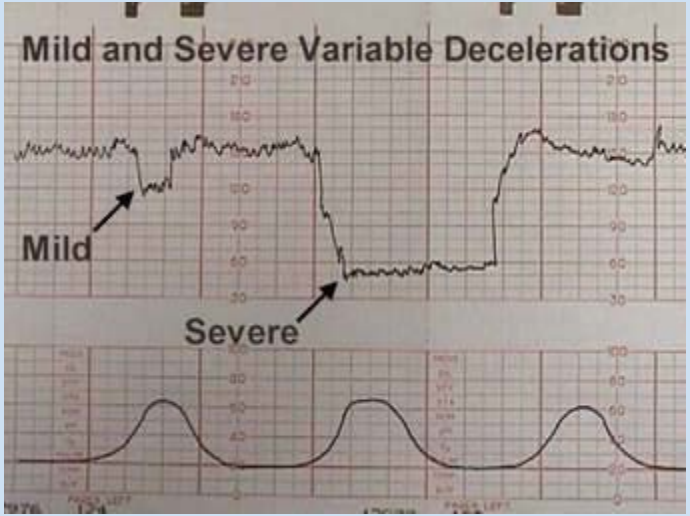

Early Deceleration

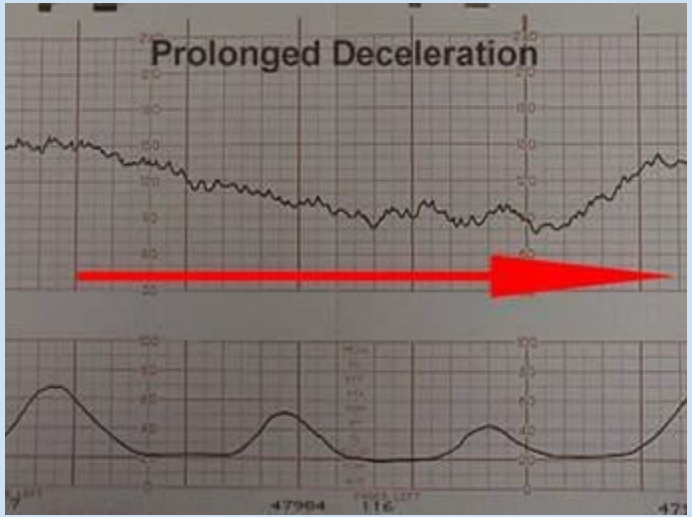
2. Early decelerations:

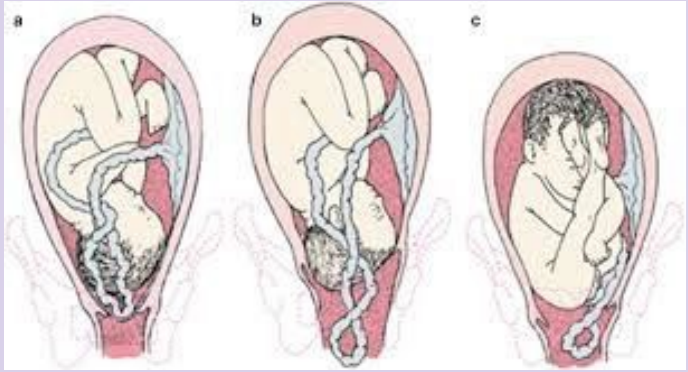
Gradual decreases in FHR beginning and ending *simultaneously* with contractions. They occur in response to **fetal head compression.**

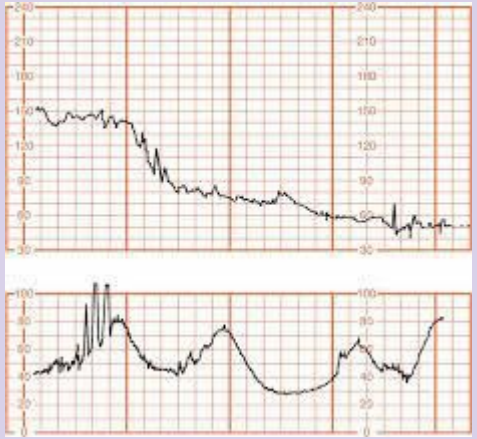


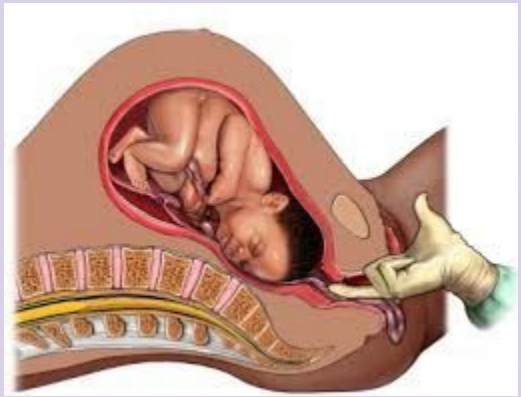

Variable Deceleration
240
210
180
150
120
90
60
30
100
80
60
40
20
0
127
47974
126

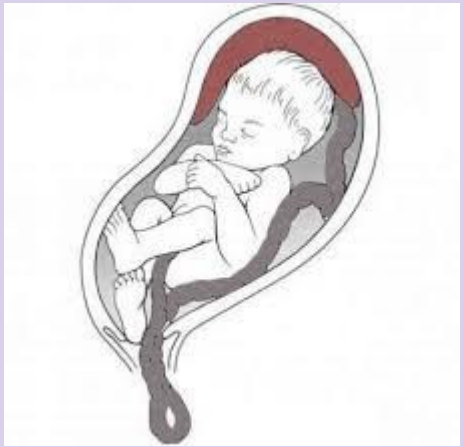

Mild and Severe Variable Decelerations
Mild
Severe


Prolonged Deceleration


a
b
c

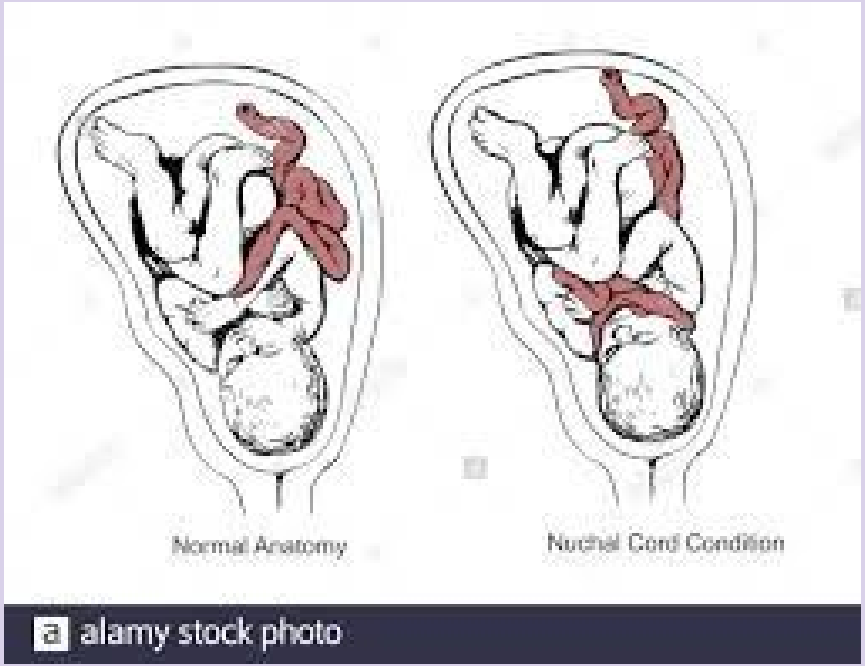




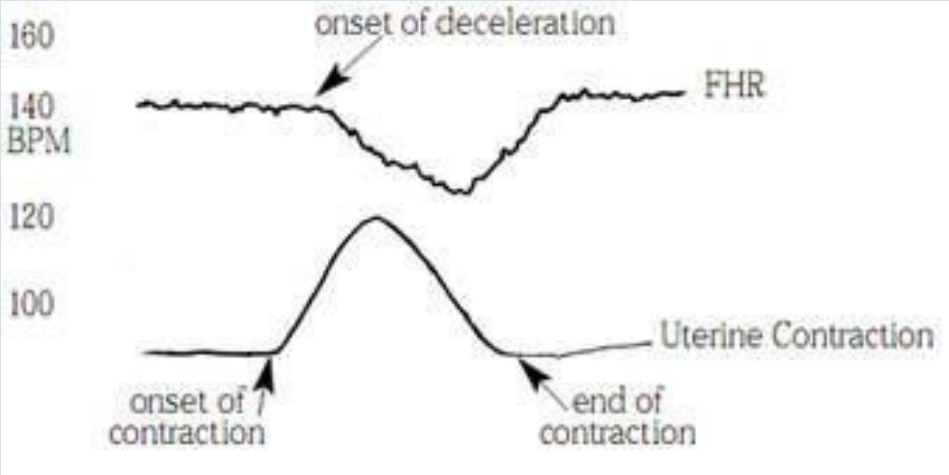


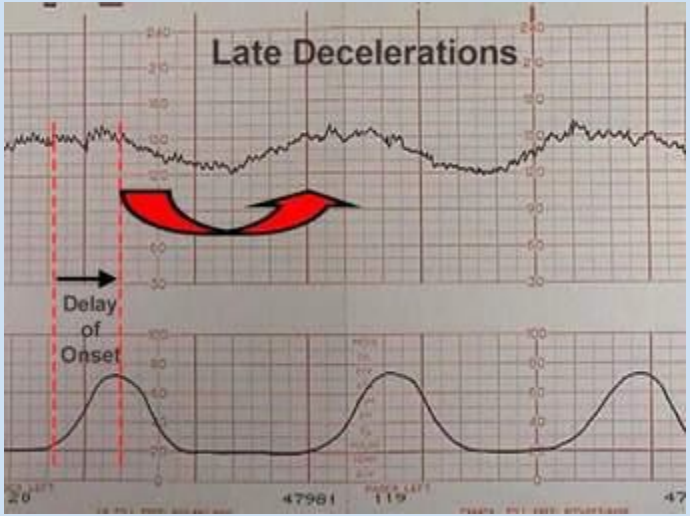
Umbilical cord prolapse

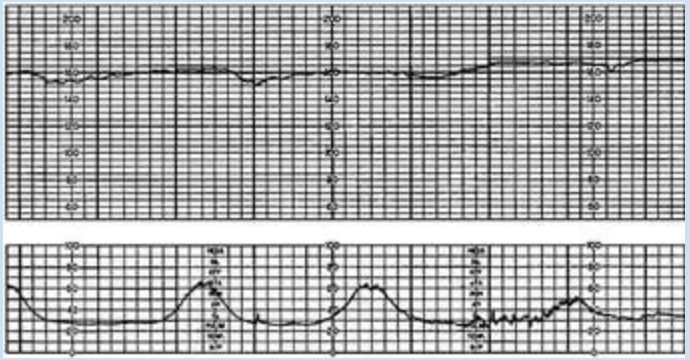
https://www.youtube.com/watch?v=ni621ZlVxUE

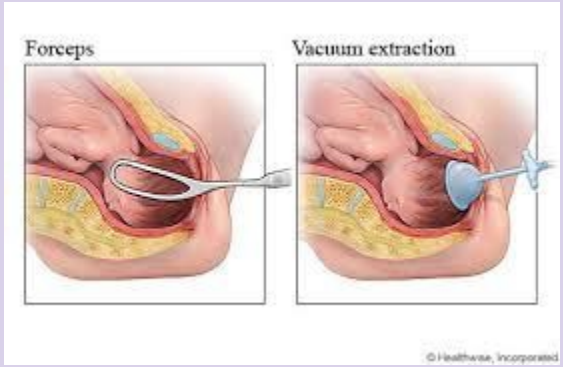

Normal Anatomy
Nuchal Cord Condition
alamy stock photo

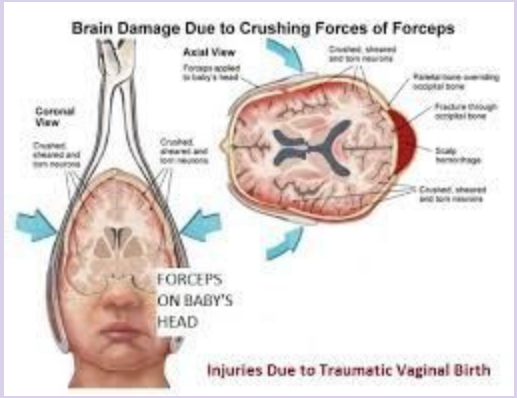

Nuchal Cord
Umbilical cord wrapped around neck of fetus


160
140
BPM
120
100
onset of deceleration
FHR
Uterine Contraction
onset of contraction
end of contraction

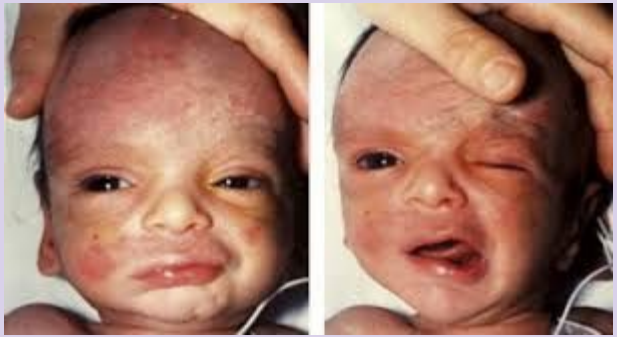

Late Decelerations
Delay
of
Onset



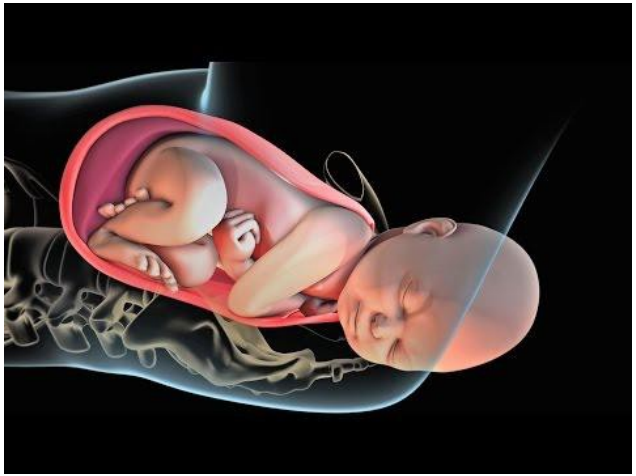

Forceps
Vacuum extraction
© Healthwise, Incorporated


Brain Damage Due to Crushing Forces of Forceps
Axial View
Coronal View
FORCEPS ON BABY'S HEAD
Injuries Due to Traumatic Vaginal Birth

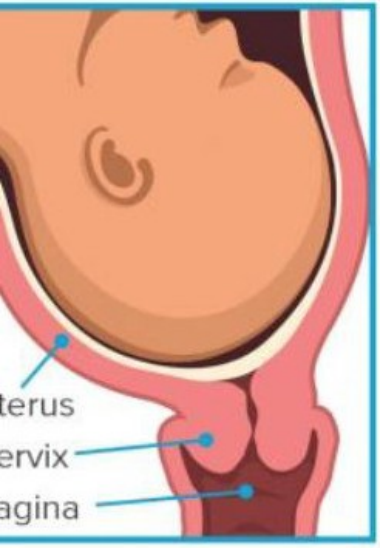

alamy stock photo



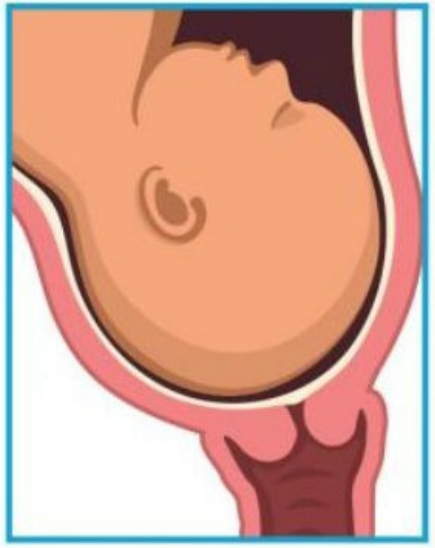
VE: 4/50/-2



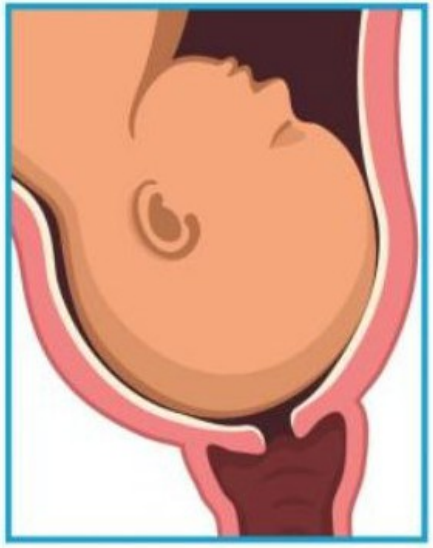
Cervical Effacement



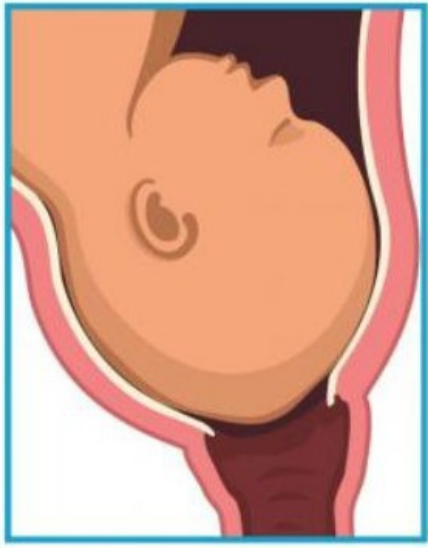
Cervix is not effaced or dilated



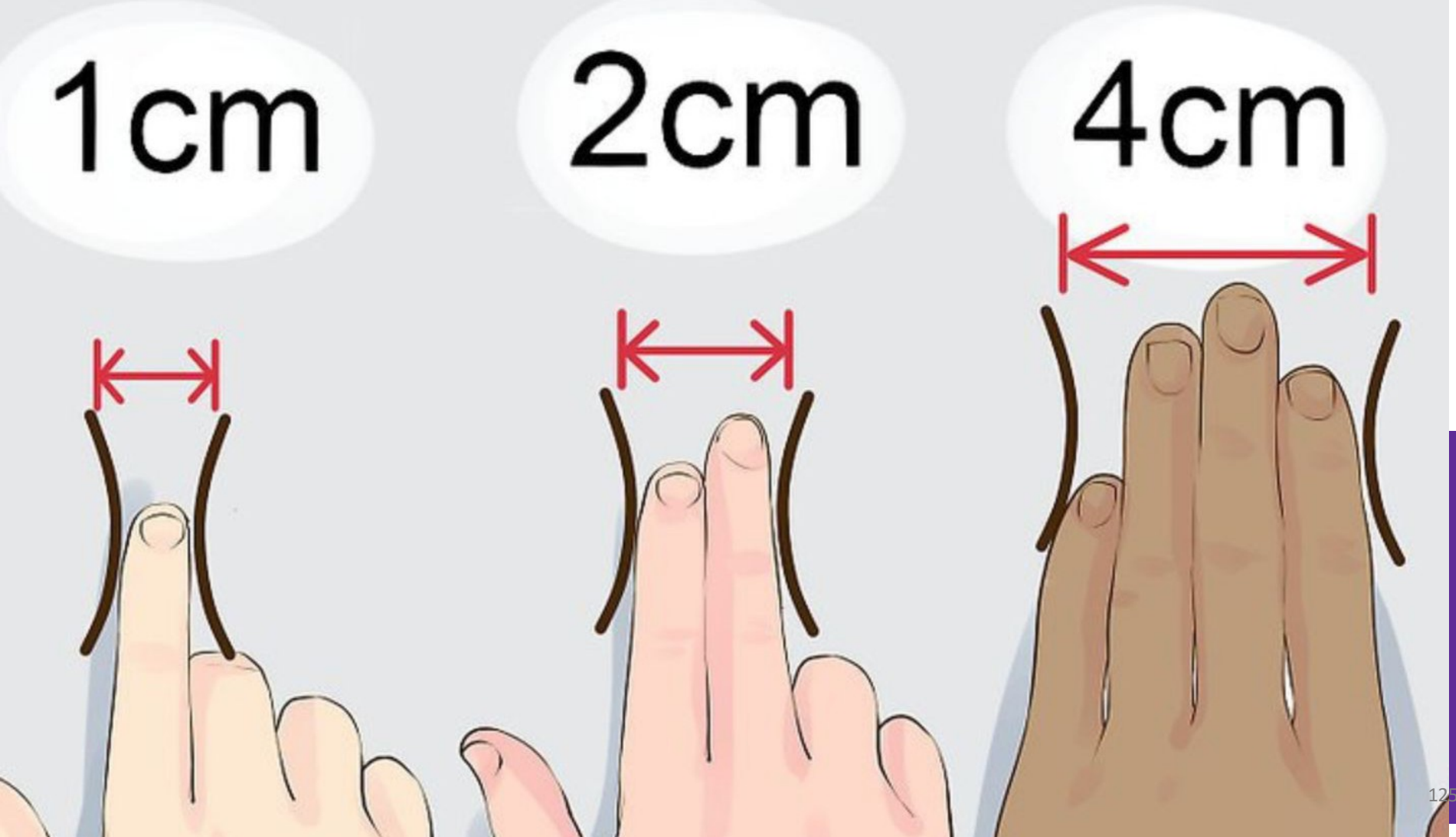
Cervix is 50% effaced and not dilated



Cervix is 100% effaced and dilated to 3 cm



Cervix is fully dilated to 10 cm


1cm
2cm
4cm

Cervical Dilation

- a visual guide -

Cheerio®

1 cm

Slice of Banana

3 cm

Cracker

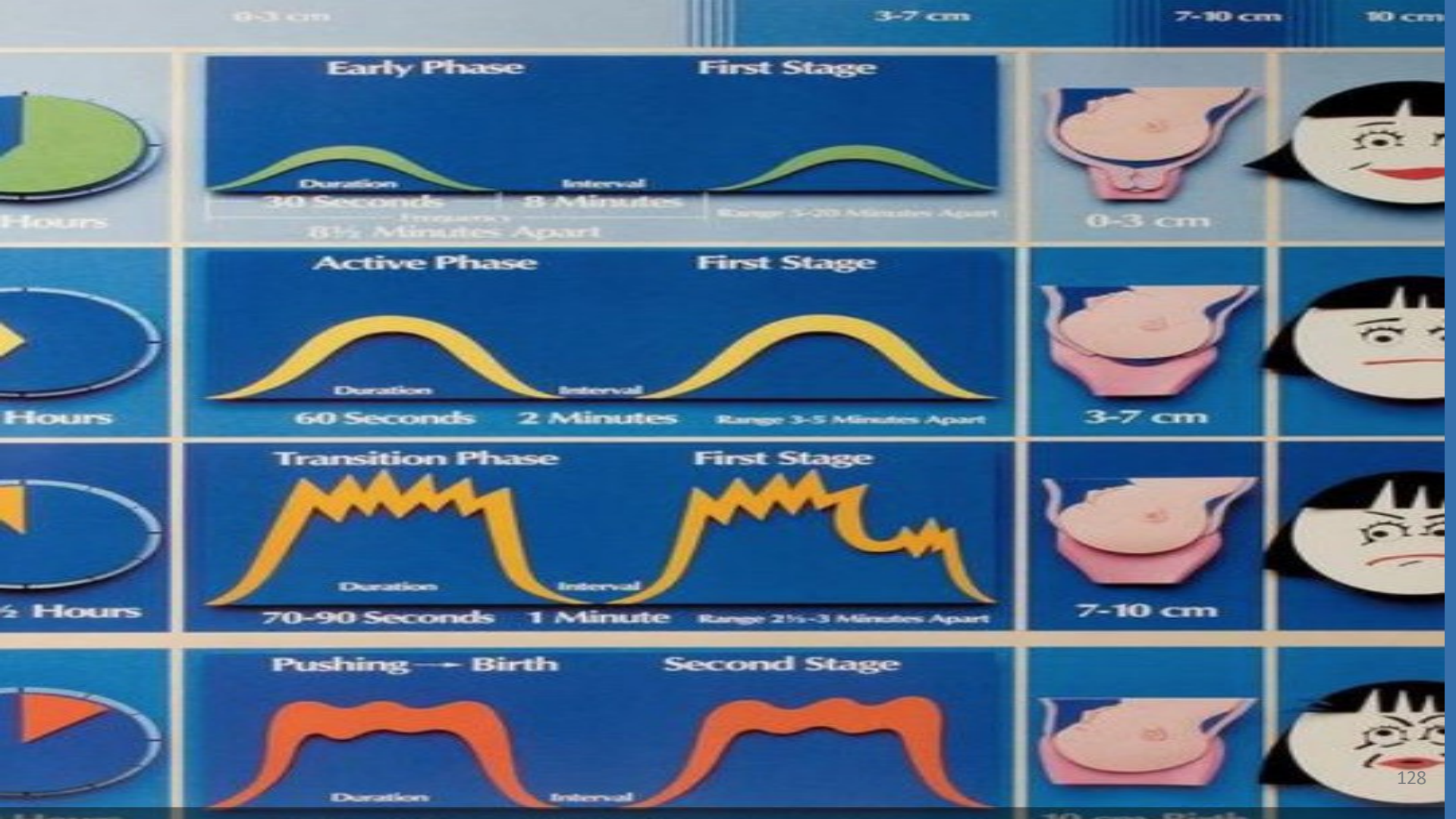
4 cm

Soda Can

7 cm

Bagel

10 cm


0-3 cm
3-7 cm
7-10 cm
10 cm
Hours
Early Phase
First Stage
Duration
Interval
30 Seconds
8 Minutes
Frequency
8½ Minutes Apart
Range 5-20 Minutes Apart
0-3 cm
Hours
Active Phase
First Stage
Duration
Interval
60 Seconds
2 Minutes
Range 3-5 Minutes Apart
3-7 cm
½ Hours
Transition Phase
First Stage
Duration
Interval
70-90 Seconds
1 Minute
Range 2½-3 Minutes Apart
7-10 cm
Pushing — Birth
Second Stage
Duration
Interval

Term	Definition
Gravida	# of pregnancies
Term	# of infants born at 37 weeks or after
Preterm	# of infants born between 20-36 weeks
Abortion	# of losses before 20 weeks
Living	# of living children
Para	# of pregnancies that have reached viability, regardless of whether the infants were born alive
Primigravida	Woman who is pregnant for the first time
Primipara	Woman who has given birth to one child past age of viability
Multigravida	Woman who has been pregnant previously
Grand multipara	Woman who has carried five or more pregnancies to viability
Multipara	Woman who has carried two or more pregnancies to viability
Nulligravida	Woman who has never been and is not currently pregnant

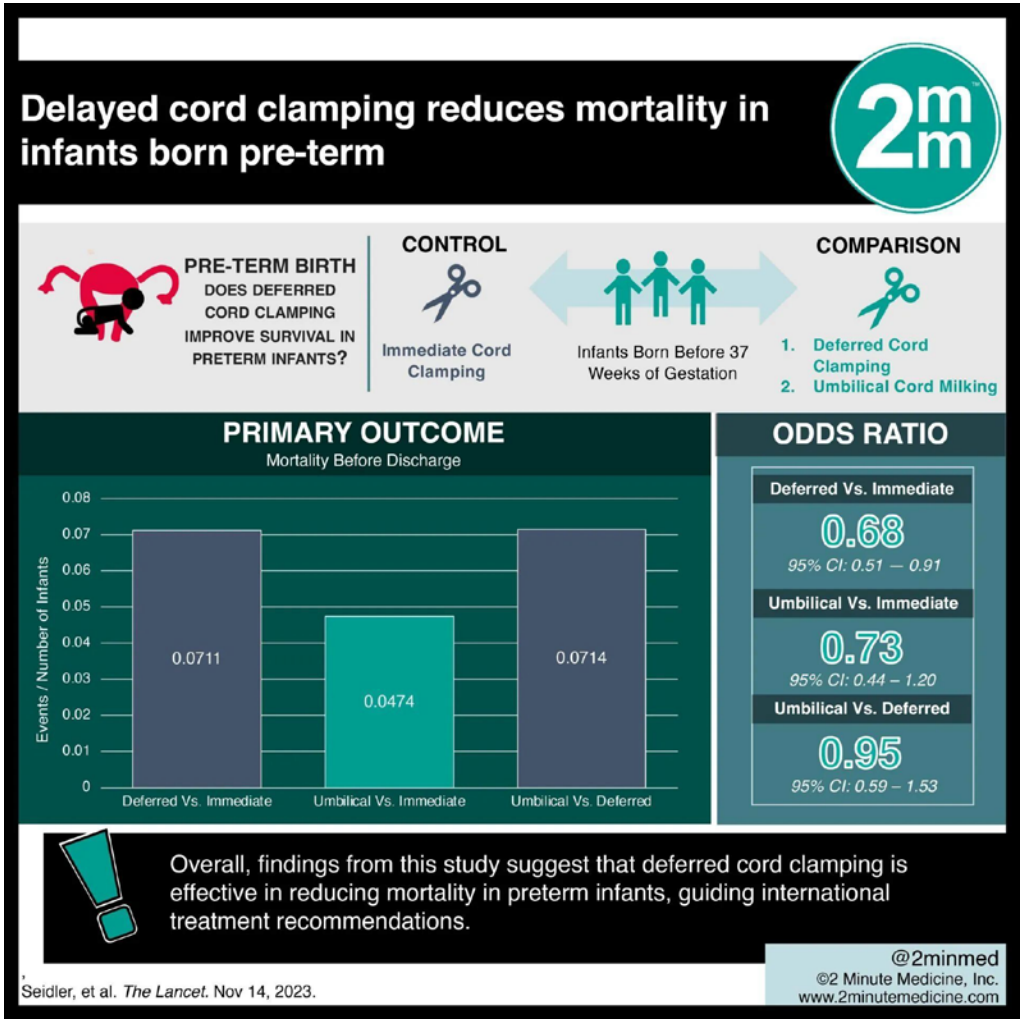
What is GTPAL?

GTPAL is an acronym used to evaluate a woman's complete obstetric history. The GTPAL system, which stands for Gravida (G), Term (T), Preterm (P), Abortions (A), and Living children (L).

Eg: G2P1

G5P3= G5T2P1A1L2

Case study: Whittier hospital



https://www.2minutemedicine.com/visualabstract-delayed-cord-clamping-reduces-mortality-in-infants-born-pre-term/

https://youtu.be/jcTI05-bj5Y
https://youtu.be/jCu4sW-Q-R8

The youngest donor
https://youtu.be/67XWUc-CXrM

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Are Abortion Bans an Occupational Hazard for Ob/Gyns?
https://www.ncbi.nlm.nih.gov/books/NBK570548/#

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https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.lecturio.com%2Fnursing%2Ffree-cheat-sheet%2Fpostpartum-hemorrhage-nursing-interventions%2F&psig=AOvVaw0s6Cua24zqG3c7Wv8RCTGg&ust=1699521339427000&source=images&cd=vfe&opi=89978449&ved=0CBIQjRxqFwoTCNCy47-ItIIDFQAAAAAdAAAAABAR

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Questions

1. Fetal development can be affected at any gestational stage

   A- True

   B- False

2. A pregnant client comes in reporting “wetness” in her underwear. What could it be?

   A- Urine

   B- Amniotic fluid

   C- Infection

   D- All of the above

Questions (cont.)

3. Woman just delivered her infant 6 hrs ago, has showed no interest in holding her infant, has not chosen a name yet, and does not make eye contact. What do you do?

A- Ignore it, assume she is really tired from the labor and delivery

B- Assess her PHQ-9

Questions (cont.)

4. On the fetal monitor, you notice that the fetal tracing shows dips that are shaped like the letter “V”. What are they called and what do they mean? Select all that apply.

A- Early deceleration

B- Acceleration

C- Late deceleration

D- Head compression

E- Utero-placental deficiency

F- Variable deceleration

G- Cord compression

Questions (cont.)

5. You pregnant client is on MgSO4+ for pre-eclampsia. You have to monitor the following (select all that apply):

A- DTRs

B- Lung sounds

C- Respiratory rate

D- BP