A&E PROTOCOLS

VOLUME OBGYN

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Contents

Gynaecologic Disorders

1. Adnexal Torsion:

- Always consider adnexal torsion in patients with known risk factors, even if symptoms are subtle or atypical.
- Perform a thorough clinical assessment and medical history to identify risk factors.
- Order Doppler ultrasound as the preferred initial imaging study for suspected adnexal torsion.
- If adnexal torsion is confirmed, consult a gynaecologist or surgeon for prompt intervention, which may involve detorsion or surgical removal of the affected ovary and/or fallopian tube.

2. Ovarian Cysts:

- Utilize ultrasound examination to differentiate between various types of ovarian cysts and to identify potential complications like torsion, haemorrhage, or malignancy.
- Simple follicular cysts usually resolve without intervention, but closely monitor larger or complex cysts.
- Surgical or pharmacologic intervention might be required for cysts causing severe pain, rapid growth, or suspicious features.

3. Abnormal Uterine Bleeding (AUB):

- Perform a comprehensive history and physical examination to determine potential causes of AUB, including structural, hormonal, and coagulopathic factors.
- Tailor laboratory tests and imaging based on clinical findings to identify the underlying cause of AUB.
- Consider combined oral contraceptive pills to regulate menstrual cycles and manage AUB in cases where no underlying pathology is found.

4. Emergency Contraception:

- Provide education on safe and effective emergency contraception options for preventing undesired pregnancy.
- Offer levonorgestrel or ulipristal as oral medication options, considering fewer side effects compared to traditional combined contraceptive methods.
- Discuss the suitability of intrauterine devices (IUDs) as a long-term contraceptive option, including for emergency contraception.

5. General Recommendations:

- Collaborate with a multidisciplinary team involving gynaecologists, surgeons, radiologists, and other specialists as needed.
- Ensure patient counselling and informed consent before any procedures or treatments.
- Stay updated with the latest clinical guidelines and research in gynaecologic disorders.

- Promote patient education and empowerment by explaining their condition, treatment options, and possible outcomes.

6. Follow-up and Monitoring:

- Schedule follow-up appointments based on the severity of the condition and the recommended treatment plan.
- Monitor patients for treatment efficacy, potential side effects, and any signs of complications.
- Adjust the treatment plan as needed based on patient response and further diagnostic findings.

Adnexal Torsion

1. Introduction:

Adnexal torsion is the twisting of the ovary and/or fallopian tube on their ligaments, leading to obstruction of blood supply and potential ischemia. It is a gynaecologic emergency that requires prompt diagnosis and management.

2. Risk Factors:

- Known risk factors for adnexal torsion include an ovarian mass, recent assisted reproductive treatments, pregnancy (especially in the first and early second trimesters), and a history of tubal ligation.

- Torsion is more common in the reproductive years due to the regular development of a corpus luteal cyst during the menstrual cycle.
- Premenarchal patients may experience torsion due to excessive adnexal mobility.

3. Clinical Presentation:

- Classic symptoms include severe, sharp, unilateral lower abdominal pain, nausea, and vomiting. However, these symptoms may not always be present.
- Patients may report pain lasting from hours to days, sometimes with intermittent resolution due to spontaneous detorsion.
- Nausea, vomiting, and fever (late in the course) can be associated symptoms.
- Unilateral tenderness on abdominal palpation is common; peritoneal signs are rare, especially in early presentations.

4. Diagnostic Evaluation:

- Clinical assessment is crucial in guiding management decisions.
- Ultrasound is the preferred initial imaging modality for suspected adnexal torsion.
- Ultrasound findings may include asymmetric ovarian enlargement, twisted vascular pedicle, abnormal blood flow on Doppler ultrasound, and presence of an ovarian mass.

- Computed tomography (CT) or magnetic resonance imaging (MRI) may be considered in atypical presentations or to rule out alternative diagnoses.
- Laparoscopy is indicated in cases of high clinical suspicion despite negative imaging or when surgical intervention is required.

5. Management:

- Prompt surgical intervention is essential once the diagnosis of adnexal torsion is suspected.
- Attempts at ovarian salvage are warranted even if the adnexal structures appear ischemic, as they often recover.
- Adnexal torsion left untreated can lead to complications such as haemorrhage, peritonitis, and infection.
- Diagnostic laparoscopy allows for both diagnosis and potential treatment.

6. Follow-Up:

- Close postoperative monitoring is necessary to assess recovery and potential complications.
- Patient education on preventive measures, risk factors, and early recognition of symptoms can help prevent delayed diagnosis and improve outcomes.

7. Multidisciplinary Collaboration:

- Collaborate with gynaecologists, surgeons, radiologists, and other specialists as needed for accurate diagnosis and appropriate management.

8. Patient Counselling:

- Educate patients about the signs and symptoms of adnexal torsion, especially those with known risk factors.
- Encourage timely reporting of symptoms to ensure prompt diagnosis and treatment.

9. Patient Empowerment:

- Empower patients with information about adnexal torsion and its risk factors to promote early detection and informed decision-making.

10. Update and Review:

- Regularly review and update the clinical protocol based on the latest guidelines and research in gynaecologic emergencies.

Ovarian Cysts and Masses

1. Introduction:

Ovarian cysts and masses are common gynaecologic conditions that can occur at any stage of life. Most are benign and resolve without intervention, but some may be malignant or associated with complications.

2. Types of Cysts and Masses:

- Simple follicular cysts arise from failed follicle rupture and are typically thin-walled and filled with clear fluid.
- Corpus luteal cysts may contain haemorrhagic fluid and can be associated with pain and rupture.
- Other types include endometriomas, benign cystic teratomas, cystadenomas, fibromas, and malignant neoplasms.

3. Clinical Presentation:

- Pelvic pain is the most common symptom, with different cyst types causing varying degrees of pain.
- Rupture of cysts can lead to sudden pelvic pain, dyspareunia, and haemorrhage.
- Some cysts may be asymptomatic and discovered incidentally during routine pelvic examinations.

4. Differential Diagnoses:

- Urgent conditions causing pelvic pain, such as ectopic pregnancy, pelvic inflammatory disease, and urinary tract infections, should be considered.
- Gastrointestinal conditions and tumours can mimic adnexal masses.

5. Diagnostic Evaluation:

- Exclude pregnancy with urine or serum β-hCG test.
- Ultrasound is the primary imaging modality, differentiating between various cyst types and detecting associated complications.
- Computed tomography (CT) or magnetic resonance imaging (MRI) may be used in atypical presentations or to rule out alternative diagnoses.
- Haematocrit may help assess blood loss in cases of cyst rupture.

6. Management and Disposition:

- Most uncomplicated simple cysts will resolve without intervention; manage pain with NSAIDs and provide follow-up for resolution.
- Complex cysts concerning for malignancy require gynaecologic consultation.
- Malignancy suspicion necessitates further evaluation and timely gynaecologic intervention.

7. Patient Counselling:

- Educate patients about different cyst types, their typical symptoms, and the importance of seeking medical attention if symptoms worsen or persist.

8. Pain Management:

- Use NSAIDs as first-line pain relief; oral opioids should be reserved for severe cases.

9. Avoid Routine Oral Contraceptives:

- Oral contraceptives are not recommended for routine management of ovarian cysts, as studies show no significant difference in resolution compared to expectant management.

10. Multidisciplinary Collaboration:

- Collaborate with gynaecologists for timely intervention and management of complex cysts or suspected malignancies.

11. Patient Follow-Up:

Ensure proper referral and follow-up arrangements for patients with unresolved or complex cysts.

12. Empowerment and Education:

- Empower patients with information about ovarian cysts, their management, and the importance of follow-up care.

13. Review and Update:

- Regularly review and update the clinical protocol based on the latest guidelines and research in gynaecologic disorders.

Abnormal Uterine Bleeding in the Nonpregnant Patient

1. Introduction:

An understanding of the normal menstrual cycle is essential to diagnose and manage abnormal uterine bleeding (AUB). The PALM-COEIN classification system helps categorize the causes of AUB.

2. Menstrual Cycle and PALM-COEIN Classification:

- Menstrual cycle involves hormonal changes, ovulation, and withdrawal of hormones leading to menstruation.
- PALM-COEIN classification system categorizes causes of AUB: PALM for structural causes and COEIN for non-structural causes.

3. Clinical Presentation:

- AUB is defined as any change in frequency, regularity, duration, or volume of bleeding.
- Assess patient history, menstrual cycle pattern, volume and frequency of bleeding, and any associated symptoms.
- Consider age-related causes of AUB, such as puberty, perimenopause, or post menopause.

4. Physical Examination:

- Perform a systematic physical examination focused on signs of hypovolemia, anaemia, and underlying conditions.

- Evaluate for structural lesions, coagulopathy, thyroid dysfunction, and genital tract pathology.

5. Diagnostic Evaluation:

- Perform a urine or serum pregnancy test in reproductive-age patients.
- Haemoglobin or haematocrit should be measured in cases of excessive bleeding or anaemia suspicion.
- Screen for coagulopathies, thyroid dysfunction, and sexually transmitted infections.
- Transvaginal ultrasound (TVUS) may be used to evaluate structural causes, endometrial thickness, and more in-depth assessment of the uterus.

6. Management:

- Hemodynamically unstable patients with uncontrolled bleeding require standard resuscitation measures and may need surgical interventions.
- Intrauterine tamponade, oestrogen therapy, or medical options like tranexamic acid can be considered for acute management.
- Oral contraceptives and hormonal IUDs can help regulate the menstrual cycle and treat AUB caused by hormonal imbalance.

7. Nonhormonal Medications:

- NSAIDs and tranexamic acid can be used to manage pain and bleeding associated with AUB.

8. Disposition:

- Most patients with AUB can be managed on an outpatient basis, with referral to a gynaecologist for further evaluation and management.
- Severe cases of acute AUB with hemodynamic instability require urgent gynaecologic consultation and may necessitate hospitalization.

9. Patient Counselling:

- Educate patients about the potential causes of AUB, available treatment options, and the importance of follow-up care.

10. Multidisciplinary Collaboration:

- Collaborate with gynaecologists for timely intervention and management of AUB cases that require further evaluation.

11. Empowerment and Education:

- Empower patients with information about AUB, its potential causes, and the importance of seeking medical attention for significant changes in menstrual bleeding.

12. Review and Update:

- Regularly review and update the clinical protocol based on the latest guidelines and research in gynaecologic disorders.

Emergency Contraception

1. Introduction:

Emergency contraception, often referred to as the "morning-after pill," is a time-sensitive medical therapy designed to prevent pregnancy following unprotected or inadequately protected sexual intercourse. It includes various oral formulations and the copper intrauterine device (IUD).

2. Available Options:

- Three oral formulations: ulipristal acetate, levonorgestrel, and combined oral contraceptives.
- Copper IUD, which inhibits sperm function, fertilized egg transport, and implantation.

3. Levonorgestrel:

- Most common regimen: single dose of 1.5 mg or two doses of 0.75 mg spaced 12 hours apart.
- One-time dose of 1.5 mg recommended due to simplicity and effectiveness.
- Effectiveness up to 72 hours after intercourse.

- Consider potential decreased effectiveness in obese individuals with higher BMI.

4. Ulipristal Acetate:

- Single prescription tablet of 30 mg.
- Effective up to 120 hours after intercourse.
- Preferred choice beyond the 72-hour window.
- Maximal effectiveness within 24 hours.

5. Combined Oral Contraceptives:

- Consisting of 100 µg ethinyl oestradiol and 0.5 to 1.0 mg levonorgestrel.
- Less favoured due to simplicity and success of levonorgestrel alone.

6. Adverse Effects:

- Common adverse effects include nausea and headache.
- Combined oral contraceptive regimen may cause higher rates of nausea.
- Irregular menstrual bleeding can occur but resolves without intervention.

7. Copper IUD:

- Highly effective when placed within 5 days of intercourse, possibly effective up to 10 days.

- Carries a risk of uterine perforation but provides ongoing contraceptive benefit.
- Barrier: Requires clinic appointment or visit with a qualified provider within the specified timeframe.

8. Mechanisms of Action:

- Levonorgestrel and ulipristal delay or inhibit ovulation.
- Copper IUD prevents fertilization.
- Emergency contraception is not equivalent to medical abortion and does not terminate preexisting pregnancies.

9. Follow-Up and Alternative Contraception:

- Emergency contraception does not affect an established pregnancy.
- Patients should use alternative contraception and consider a pregnancy test if menstruation is delayed for over 3 weeks.

10. Patient Counselling:

- Educate patients on the available options, their mechanisms of action, and the importance of timely use.
- Encourage consideration of the copper IUD for ongoing contraceptive benefit.

11. Multidisciplinary Collaboration:

- Collaborate with gynaecologists and healthcare providers to ensure timely access to emergency contraception.

12. Empowerment and Education:

- Empower patients with information about emergency contraception and the importance of prompt use after unprotected intercourse.

13. Review and Update:

- Regularly review and update the clinical protocol based on the latest guidelines and research in emergency contraception.

Clinical Protocol: Management of Early Pregnancy Loss (Miscarriage)

Background: Miscarriage is defined as the spontaneous termination of pregnancy before 20 weeks of gestational age. Early pregnancy loss is common and often presents with vaginal bleeding, pain, or cramps. It's crucial to assess the patient's condition, provide appropriate treatment, and offer support during this emotionally challenging time.

Step 1: Initial Assessment and Evaluation:

1. Obtain a detailed medical history, including gestational age, last menstrual period, and symptoms.

2. Perform a physical examination, including abdominal and pelvic exams to assess bleeding, tenderness, and cervical status.
3. Consider Rh typing and administer anti-D immune globulin to Rh-negative patients.

Step 2: Diagnostic Testing:

1. Order an ultrasound to determine gestational age, foetal viability, and identify any anatomical abnormalities.
2. Measure quantitative β-hCG levels to assess viability and guide management in cases of uncertain viability or gestational age.

Step 3: Classification and Management:

1. Threatened Miscarriage:
    - Provide patient education and support.
    - Advise on rest and activity modification.
    - Instruct the patient to return if bleeding or pain worsens or if fever occurs.
2. Incomplete Miscarriage:
    - Evaluate hemodynamic stability and manage bleeding.
    - If significant bleeding, manually remove foetal tissue or consider uterine aspiration.
    - Discuss options: expectant management, medical management (misoprostol), or surgical evacuation.
3. Completed Miscarriage:
    - Assess tissue passed for pathology.

- Consider expectant management if minimal intrauterine tissue and gestational age <8 weeks.
- Medical management (misoprostol) is an option with patient consent.
- Follow-up in 1-2 weeks to ensure miscarriage completion.

Step 4: Patient Education and Counselling:

1. Provide emotional support and counselling to help the patient cope with the loss.
2. Address any misconceptions about causes of miscarriage and reassure the patient that they are not responsible.
3. Educate on symptoms of infection, uncontrolled bleeding, and the need for prompt follow-up if any concerning symptoms arise.

Step 5: Follow-up:

1. Schedule a follow-up appointment with a gynaecologist in 1-2 weeks to assess completion of miscarriage and emotional well-being.
2. Encourage open communication with healthcare providers and offer resources for additional support if needed.

Step 6: Discharge and Return Precautions:

1. Provide written instructions for the patient to manage symptoms and know when to seek urgent care.
2. Emphasize the importance of returning for evaluation if symptoms worsen or if there's a change in bleeding, pain, or fever.

Step 7: Documentation:

1. Document all assessments, diagnostic tests, treatments, and patient education provided.
2. Include follow-up instructions and recommended appointments in the medical records.

Step 8: Multidisciplinary Collaboration:

1. Collaborate with obstetricians, gynaecologists, and mental health professionals to ensure comprehensive care.

Step 9: Patient Support:

1. Offer emotional support and resources for grief counselling.
2. Provide information about local support groups and mental health services.

This clinical protocol outlines the key steps in managing patients with early pregnancy loss (miscarriage) and emphasizes the importance of proper assessment, accurate diagnosis, appropriate treatment options, patient education, and emotional support throughout the process.

Ectopic Pregnancy

1. Risk Factors for Ectopic Pregnancy:
    - Tubal surgery, pelvic inflammatory disease, smoking, advanced age, prior spontaneous abortion, medically induced abortion,

history of infertility, intrauterine device use, and assisted reproduction techniques are all known risk factors.

- These risk factors can help healthcare providers identify individuals who are at a higher risk for ectopic pregnancy and require closer monitoring.

2. Clinical Presentation and Symptoms:
    - Ectopic pregnancy can be challenging to diagnose due to its variable and sometimes nonspecific symptoms.
    - Classic symptoms include delayed menses, abdominal pain, and vaginal bleeding, but not all patients present with the same combination of symptoms.
    - Patients with known risk factors should be evaluated carefully, even if their symptoms are not typical.
3. Diagnostic Tools:
    - Transvaginal ultrasonography is a sensitive method for diagnosing ectopic pregnancies, especially in stable patients.
    - Serial measurement of serum hCG levels can help track the progression of pregnancy and determine the likelihood of viable intrauterine pregnancy.
    - Laparoscopy is an accurate diagnostic and therapeutic procedure, especially for unstable patients or those with unclear ultrasound results.
4. Management and Treatment:
    - The management of ectopic pregnancy depends on the patient's stability and the characteristics of the pregnancy.

- Unstable patients require immediate intervention, including surgery or medical management.
- Stable patients with a confirmed ectopic pregnancy can be managed medically with methotrexate, a drug that stops the growth of the abnormal pregnancy tissue.
- Regular monitoring and follow-up are essential to ensure that the hCG levels return to normal and the ectopic pregnancy resolves.

5. Complications and Follow-Up:
    - Medical management with methotrexate has a success rate of around 85% to 93%, but close monitoring is necessary to detect any signs of treatment failure.
    - Surgical intervention, whether through laparoscopy or laparotomy, may be needed in cases of severe ectopic pregnancy, rupture, or methotrexate failure.
6. Preventive Measures:
    - Early prenatal care and regular check-ups can help detect ectopic pregnancies in their early stages.
    - Educating individuals about the risks associated with certain contraceptives and reproductive procedures can help reduce the incidence of ectopic pregnancies.
7. Patient Education:
    - Patients should be educated about the symptoms of ectopic pregnancy, the importance of early medical attention, and the need for follow-up care after any form of treatment.
8. Advancements in Diagnosis and Treatment:

- Advances in ultrasound technology and serum hCG level monitoring have improved the accuracy and efficiency of diagnosing ectopic pregnancies.
- Laparoscopic techniques have become more common, leading to less invasive surgical interventions.

It's crucial to emphasize that ectopic pregnancy is a serious medical condition that requires prompt diagnosis and appropriate management. Early detection and intervention can significantly improve outcomes for affected individuals.

Molar Pregnancy

1. Types of Molar Pregnancy:
    - Molar pregnancy is classified into two main types: Complete Hydatidiform Mole (CHM) and Partial Hydatidiform Mole (PHM).
    - CHM occurs when an egg without maternal DNA is fertilized and the duplicated haploid genome results in abnormal trophoblastic proliferation.
    - PHM arises from the fertilization of a normal egg by two sperm, leading to triploid karyotype and some foetal tissue along with trophoblastic hyperplasia.
2. Clinical Presentation and Symptoms:

- Early molar pregnancies may not show significant clinical signs.
- Risk factors for molar pregnancy include extreme maternal age.
- Symptoms can include abdominal pain, nausea, vomiting, vaginal bleeding, and respiratory distress.
- The absence of foetal heart tones during the second trimester may raise suspicion of molar pregnancy.

3. Diagnosis and Sonographic Appearance:
    - Ultrasonography plays a crucial role in diagnosing molar pregnancy.
    - The classic "snowstorm appearance" of hydropic vesicles in the uterus is highly suggestive of molar pregnancy.
    - Partial molar pregnancies can also display cystic changes.
    - Ovarian theca lutein cysts and ovarian torsion may be present due to hormonal stimulation.
4. Complications and Diagnostic Challenges:
    - Molar pregnancies can lead to complications like pre-eclampsia, respiratory distress from trophoblastic embolization, hyperemesis gravidarum, and uterine bleeding.
    - Ultrasonography is valuable, but diagnosis might require histopathologic examination of abortion specimens, especially in partial molar pregnancies.
5. Management and Follow-Up:
    - The primary management approach is uterine dilation and curettage (D&C) to remove molar tissue.
    - After D&C, patients require close monitoring for potential trophoblastic sequelae.

- Patients are at risk of developing invasive moles or choriocarcinoma, which require specialized oncologic treatment involving chemotherapy, radiation, and surgery.

6. Oncologic Implications:
    - A subset of molar pregnancies can progress to gestational trophoblastic neoplasia (GTN), including invasive moles and choriocarcinoma.
    - GTN necessitates vigilant follow-up, often involving specialized oncology care and close surveillance of hCG levels.
7. Patient Counselling and Education:
    - Patients diagnosed with molar pregnancy should receive comprehensive counselling about the condition, potential complications, and the need for vigilant follow-up and monitoring.
8. Collaborative Care:
    - Molar pregnancies often require a multidisciplinary approach involving obstetricians, gynaecologic oncologists, pathologists, and radiologists to ensure accurate diagnosis and optimal management.
9. Research and Advances:
    - Ongoing research aims to improve the early diagnosis, prognosis, and management of molar pregnancies, especially in the context of potential malignant progression.

Understanding the intricacies of molar pregnancies is essential for healthcare professionals to provide appropriate care, counselling, and timely interventions to affected individuals.

Complications of Late Pregnancy:

Vaginal Bleeding

Late pregnancy is a critical period where any complications demand prompt evaluation and management. Vaginal bleeding in later pregnancy, often resulting from conditions like abruptio placentae, necessitates careful assessment and intervention. Here's an in-depth exploration of the provided information:

1. Vaginal Bleeding in Later Pregnancy:
    - Bleeding after the first trimester occurs in approximately 4% of pregnancies.
    - Causes of late vaginal bleeding include abruptio placentae, placenta previa, early labour, cervical/vaginal lesions, genital tract infections, and haemorrhoids.
    - Second-trimester bleeding (14 to 24 weeks) carries a 33% risk of foetal loss, and management focuses on supportive and expectant care due to foetal immaturity.

- Third-trimester bleeding remains significant, often requiring urgent delivery consideration.

Abruptio Placentae:

- Abruptio placentae involves the separation of the placenta from the uterine wall and occurs in around 1% of pregnancies.
- Spontaneous haemorrhage into the decidua basalis leads to placental separation and compression.
- Clinical features include vaginal bleeding, dark blood, uterine tenderness, pain, uterine irritability, and contractions.
- Maternal hypertension, preeclampsia, advanced maternal age, parity, smoking, thrombophilia, prior miscarriage, and trauma are associated risk factors.
- Placental separation may be acute or gradual throughout late pregnancy.

2. Severity and Diagnosis:
    - Placental separation severity varies, with symptoms ranging from occult bleeding to significant uterine contractions, foetal distress, and DIC.
    - Diagnosis is often clinical, based on signs of bleeding, uterine contractions, foetal distress, and coagulation parameters.
    - Ultrasonography may not always be definitive due to similar echogenicity of fresh blood and placenta.
3. Foetal and Maternal Risks:

- Foetal distress and death can result from interrupted placental blood and oxygen supply.
- Risk increases with the extent and speed of placental separation.
- Maternal risks include coagulopathy, exsanguination, feto-maternal transfusion, and amniotic fluid embolism.

4. Differential Diagnoses:
    - Placenta previa is the main alternative diagnosis for late-pregnancy bleeding, characterized by painless, bright red bleeding, distinguishable with ultrasonography.
    - Abdominal pain without vaginal bleeding should differentiate abruptio placentae from other causes like preeclampsia, pyelonephritis, liver diseases, gallbladder disease, appendicitis, and ovarian torsion.
5. Clinical Management:
    - Timely diagnosis and appropriate intervention are crucial for managing complications like abruptio placentae.
    - Management approaches may include supportive care, monitoring for foetal distress, and consideration of urgent delivery.
6. Multidisciplinary Care:
    - Treating complications in late pregnancy often requires collaboration among obstetricians, radiologists, anaesthesiologists, and other specialists to ensure the best outcomes for both the mother and the foetus.

Understanding the nuances of complications in late pregnancy is essential for healthcare providers to make informed decisions and provide comprehensive care to pregnant individuals experiencing such issues.

Placenta Previa:

Placenta previa, a condition where the placenta implants over the cervical os, is a significant cause of bleeding in the latter half of pregnancy. Understanding its pathophysiology, clinical features, and management is crucial for ensuring the well-being of both the mother and the foetus:

1. Pathophysiology:
    - Placenta previa occurs when the placenta is located over the cervical os, increasing the risk of bleeding episodes during the second half of pregnancy.
    - Risk factors include maternal age, smoking, multiparity, previous caesarean section, prior miscarriages or induced abortions, and preterm labour.
    - Bleeding occurs due to the tearing of marginal placental vessels in the lower uterine segment during cervical dilation or uterine wall elongation.

- Early bleeding episodes are usually self-limited, but iatrogenic cervical probing or the onset of labour can exacerbate placental separation.

2. Clinical Features:
    - Painless, fresh vaginal bleeding is the hallmark symptom of placenta previa.
    - Around 20% of cases may involve some uterine irritability, but this is generally minor.
    - Vaginal examination reveals bright red blood from the cervical os.
    - All cases of painless, second-trimester vaginal bleeding should be initially treated as placenta previa until proven otherwise.
    - Probing of the cervix should be avoided until placenta previa is excluded via ultrasound to prevent severe haemorrhage.
3. Diagnostic Testing:
    - Ultrasonography is the gold standard for diagnosing placenta previa and determining placental location.
    - Transvaginal ultrasonography is even more accurate for visualizing placental relationships and the internal os.
    - Emptying the bladder before examination helps prevent overdiagnosis of placenta previa.
4. Management:
    - Immediate obstetric consultation is necessary when vaginal bleeding occurs in late pregnancy.

- Maternal stabilization involves establishing large-bore intravenous lines, fluid resuscitation, and continuous foetal monitoring.
- Baseline haemoglobin level, blood type, and coagulation studies are determined.
- Blood loss may require transfusion, and Rh-negative patients need Rh immune globulin.
- Stable patients are transferred to the obstetric unit, while unstable patients undergo expedited transfer or resuscitation before transfer.
- Foetal monitoring continues, and ultrasonography helps locate the placenta.
- In cases of suspected placenta previa, vaginal examination is performed in the delivery suite, where an emergency caesarean section can be carried out if needed.

5. Further Management:
    - Patients with significant abruptio placentae may require early delivery, either vaginal or surgical, based on foetal status.
    - If placenta previa is diagnosed or abruptio placentae is mild, the patient is closely monitored and ideally supported until foetal maturity is attained for a successful delivery.

The comprehensive management of placenta previa requires a multidisciplinary approach involving obstetricians, radiologists, and other specialists, as the condition can lead to severe bleeding and complications for both the mother and the foetus.

Pregnancy-Induced Hypertension (Preeclampsia and Eclampsia): Foundations, Pathophysiology, Clinical Features, and Management

Foundations: Hypertension affects around 8% of pregnancies and is categorized into several types:

- Gestational Hypertension: Occurs during pregnancy, resolves postpartum, and is characterized by blood pressure ≥ 140/90 mm Hg.
- Preeclampsia: Gestational hypertension with proteinuria (>300 mg/24 hr).
- Eclampsia: Seizures in a patient with preeclampsia.
- Pregnancy-Aggravated Hypertension: Chronic hypertension with superimposed preeclampsia/eclampsia.
- Chronic or Coincidental Hypertension: Preexisting hypertension before pregnancy or persisting > 6 weeks postpartum.

Pathophysiology:

- Preeclampsia is a unique vasospastic disorder in pregnant women.
- Vasospasm, ischemia, thrombosis in preeclampsia cause organ injury, placental infarction, abruption, foetal hypoxia, and prematurity.
- Eclampsia cause remains unknown; vascular responsiveness to endogenous vasopressors is implicated.

- Gestational hypertension has elevated cardiac output and abnormal peripheral resistance.

Clinical Features:

- Gestational Hypertension: Mild BP elevation, no proteinuria, normal reflexes, weight, organ function.
- Preeclampsia: Proteinuria, end-organ symptoms, visual disturbances, headache, hyperreflexia, oliguria, elevated creatinine, liver tenderness.
- Severe Preeclampsia: Diastolic BP > 110 mm Hg, severe proteinuria, signs of organ damage.
- Eclampsia: Seizures, visual disturbances, headache, hyperreflexia, thrombocytopenia, elevated liver enzymes, CNS effects.

Complications:

- HELLP Syndrome: Severe preeclampsia variant with haemolysis, elevated liver enzymes, low platelet count.
- Other complications: Hepatic and splenic haemorrhage, abruptio placentae.
- Eclampsia: Seizures, coma, maternal CNS damage, renal insufficiency, maternal/foetal death.

Diagnostic Testing:

- Assess organ injury: complete blood count, renal/liver function, platelet count, coagulation profile, magnesium level.

- In severe cases, CT scan of head to exclude cerebral thrombosis or haemorrhage.

Management:

- Mild Preeclampsia: Bed rest, close monitoring, expectant management if <34 weeks.
- Severe Preeclampsia: Hospitalization, foetal age assessment, organ function testing, BP control.
- Fulminant Preeclampsia: Same as eclampsia management.
- Eclampsia: Control seizures with magnesium sulphate, antihypertensives if BP remains elevated.
- Antihypertensives: Hydralazine, labetalol, nifedipine.
- Fluid Management: Avoid diuretics, hyperosmotic agents; IV fluids may worsen vasospasm.
- Magnesium Sulphate: Prevents seizures, maintains uterine/foetal blood flow.
- Goals: Prevent seizures, organ damage; achieve BP control.

Preeclampsia and eclampsia can have severe consequences for both mother and foetus. Effective management involves close monitoring, BP control, prevention of seizures, and prompt delivery when necessary. Magnesium sulphate remains a critical intervention for preventing and treating eclamptic seizures, while antihypertensive therapy should be considered with caution to maintain uteroplacental blood flow. Comprehensive care and a multidisciplinary approach are essential for optimal outcomes in these conditions.

Amniotic Fluid Embolus: Foundations, Clinical Features, Diagnostic Testing, and Management

Foundations: Amniotic fluid embolus is the release of amniotic fluid into maternal circulation, often during labour or uterine manipulation.

- Can occur during labour, induced abortions, miscarriages, second/third trimesters, amniocentesis, or abruptio placentae.
- Rare but leading cause of cardiovascular collapse during labour, with high maternal mortality.

Clinical Features:

- Suspect during second/third trimester, especially with uterine manipulation.
- Sudden hypotension, hypoxia, coagulopathy due to immunologic response.
- Triggers include histamine, endothelin, leukotrienes; leads to DIC, respiratory distress, ventricular dysfunction.
- Initial seizure in 20% of cases, bleeding diathesis and DIC in 50%.

Differential Diagnoses: Consider pulmonary embolus, drug-induced anaphylaxis, septic shock.

- Seizures also occur in eclampsia but present with hypertension, not cardiovascular collapse.

Diagnostic Testing:

- Obtain complete blood cell count, coagulation studies, arterial blood gas, chest radiograph.
- Monitor urine output after urinary catheter placement.
- Definitive diagnosis often at autopsy, detecting foetal hairs, squamous cells, debris in maternal circulation.
- Clinical syndrome matches typical diagnosis along with characteristic findings.

Management: Due to rarity, treatment based on anecdotal evidence and animal studies.

- Administer high-flow oxygen, intubation for ventilation/oxygenation support.
- Aggressive fluid resuscitation, inotropic cardiovascular support.
- Manage consumptive coagulopathy.
- Invasive hemodynamic monitoring often required in intensive care unit.

Amniotic fluid embolus is a rare but life-threatening event during pregnancy, leading to rapid cardiovascular collapse. Recognizing the clinical features and promptly providing supportive measures is crucial for improving maternal outcomes.

Rh (Anti-D) Immunization in Pregnancy: Foundations and Management

Foundations: Rh immunization occurs when Rh-negative woman is exposed to Rh-positive foetal blood.

- Sensitization can occur in up to 15% of Rh-negative women carrying Rh-positive foetuses.
- As little as 0.1 mL of foetal-maternal haemorrhage can trigger maternal immune response.
- Foetal-maternal haemorrhage occurs during threatened abortions (3-11% in first trimester) and birth (45% in third trimester).
- Anti-D immune globulin (RhoGAM) administered at around 28 weeks of gestation to prevent sensitization.
- Also administered after events like uterine manipulation, miscarriage, ectopic pregnancy surgery, or amniocentesis.

Management:

- Administer RhoGAM to Rh-negative mothers to prevent sensitization.
- For events before 12 weeks of gestation, use 50 µg dose; after 12 weeks, use 300 µg dose.
- Immune globulin needs to be given within 72 hours of event to prevent antibody development.

- Kleihauer-Betke test detects foetal cells in maternal circulation but has limitations.
- Routine immune globulin administration recommended in situations likely to cause sensitization.
- Third-trimester bleeding doesn't increase sensitization risk; RhoGAM needed if prophylactic dose missed at 28 weeks.
- Consider Kleihauer-Betke test after blunt uterine trauma to detect large foetal transfusions requiring additional therapy.

Preventing Rh immunization is crucial to ensure the health of both mother and foetus. Administering RhoGAM at the appropriate times can significantly reduce the risk of maternal sensitization and its potential complications.

Abdominal Pain and Appendicitis in Pregnancy: Foundations and Management

Foundations:

- Appendicitis is the most common surgical emergency in pregnant patients.
- Delays in diagnosis contribute to increased perforation rate and complications.

- Atypical symptoms and clinical findings in pregnancy can lead to misdiagnosis.
- Right-sided abdominal pain is common, but its reliability diminishes as pregnancy progresses.
- Diagnostic findings similar in first half of pregnancy; atypical in second half.
- Ultrasound, CT, and MRI are valuable diagnostic tools for appendicitis in pregnancy.

Clinical Features:

- Gastrointestinal symptoms of appendicitis (anorexia, nausea) mimic pregnancy symptoms.
- Right-sided abdominal pain is a common finding, especially early in pregnancy.
- Peritoneal signs more common in the first trimester.
- Lack of classic clinical findings in pregnant patients due to elevated steroids affecting inflammation response.
- Leucocytosis and pyuria may be present but can be confused with pregnancy-related changes.

Differential Diagnoses:

- Conditions like pyelonephritis, cholecystitis, nephrolithiasis, ectopic pregnancy, etc., may cause similar symptoms.
- Urine typically bacteria-free in appendicitis (distinguishing from pyelonephritis).

Diagnostic Testing:

- Leucocytosis, greater than 18,000, can suggest appendicitis.
- Ultrasonography with compression technique can reveal non-compressible tubular structure.
- CT and MRI are useful for diagnosis, especially when ultrasound findings are inconclusive.
- Laparoscopy or laparotomy recommended if diagnosis is unclear or confirmed.

Management:

- Hospitalize patient after consulting surgeon and obstetrician.
- NPO (nothing by mouth) status with IV fluid hydration for intravascular volume maintenance.
- Prompt surgery for clear diagnosis; observation with empirical IV antibiotics for unclear cases.
- Antibiotics like piperacillin/tazobactam or ceftriaxone plus metronidazole are used for empirical treatment during observation.

Appendicitis in pregnancy requires careful consideration due to its potential complications for both the mother and the foetus. The challenges in diagnosis necessitate a thorough evaluation using imaging techniques and clinical expertise to ensure appropriate management and minimize risks.

Gallbladder Disease in Pregnancy: Foundations and Management

Foundations:

- Cholelithiasis (gallstones) affects about 5% of pregnant women and is the second most common non-obstetric surgical condition.
- Pregnancy-related hormonal changes can lead to gallbladder hypomotility and increased risk of stone formation.
- Symptoms of acute cholecystitis during pregnancy are like those in non-pregnant women.
- Increased alkaline phosphatase levels and slightly elevated amylase levels can occur due to pregnancy.

Clinical Features:

- Acute cholecystitis presents with epigastric or right upper quadrant pain, tenderness, and nausea.
- Leucocytosis and enzyme level changes should be interpreted considering the physiological changes in pregnancy.
- History of previous self-limited pain episodes associated with food intake can be indicative of cholecystitis.

Differential Diagnoses:

- Consider pyelonephritis, appendicitis, hepatitis, fatty liver, preeclampsia, and liver bleeding.

- Diagnostic studies are needed to differentiate symptomatic cholelithiasis and cholecystitis from other diseases.

Diagnostic Testing:

- Ultrasonography is reliable for detecting gallstones, but differentiation of symptomatic from asymptomatic stones may be difficult.
- Simultaneous sonographic evaluation of the liver can be challenging, especially during the third trimester.

Management:

- If fever, leucocytosis, prolonged pain, or cholecystitis symptoms are present, NPO status, IV fluid hydration, antibiotics, and pain control are recommended.
- Some cases of uncomplicated cholecystitis can be managed medically.
- Surgery is considered for obstructive jaundice, gallstone pancreatitis, sepsis, or failure to respond to conservative management.
- Around 40% of pregnant patients with symptomatic cholelithiasis may require cholecystectomy during pregnancy.
- Discharge is possible for uncomplicated and sonographically proven cholelithiasis after consultation with an obstetrician.
- Follow-up and clear instructions are crucial due to high rate of symptomatic relapse.

Liver Disorders in Pregnancy: Foundations and Management

Foundations:

- Liver metabolism increases during pregnancy, but hepatic blood flow remains unchanged.
- Hepatitis is the most common liver disease during pregnancy.
- Hepatitis E can have a more aggressive course in pregnancy.
- Acute fatty liver of pregnancy is a rare disorder that can lead to hepatic failure, seizures, and complications during labour.

Clinical Features:

- Acute fatty liver presents with nausea, vomiting, malaise, and jaundice during the third trimester.
- Right upper quadrant tenderness is common.
- Disease can progress to coagulopathy, jaundice, seizures, DIC, and hepatic encephalopathy.
- Haemorrhage from coagulopathy is a common complication during delivery.

Differential Diagnoses:

- Liver tenderness and coagulopathy suggest preeclampsia during the third trimester.
- Acute fatty liver can be distinguished from viral hepatitis and HELLP syndrome by specific features.

- Drug-induced hepatic failure should be excluded by history and toxicologic screening.
- Ultrasound examination can help differentiate from cholecystitis.

Diagnostic Testing:

- Leucocytosis, low platelet count, elevated bilirubin, AST, ALT, and uric acid levels may be seen.
- Hypoglycaemia and dehydration are common.
- Liver biopsy may be needed for definitive diagnosis.

Management:

- Acute stabilization may be required for seizures or coma.
- Hypoglycaemia should be corrected with dextrose.
- Fluid resuscitation and clotting factor replacement may be needed.
- Rapid delivery is usually advisable when acute fatty liver is diagnosed.
- Fresh-frozen plasma, platelet transfusions, and glucose may be necessary.
- Intrahepatic cholestasis of pregnancy presents with pruritus and mild jaundice.
- Exclusion of more serious conditions is required, and symptomatic treatment is used.
- Close obstetric follow-up is necessary for monitoring and managing the condition.

Managing liver disorders in pregnancy requires careful evaluation, differentiation from other conditions, and appropriate treatment to ensure the well-being of both the mother and the foetus.

Nausea and Vomiting in Pregnancy:

Normal Pregnancy:

- Nausea and vomiting are common during pregnancy, especially from 6 to 20 weeks of gestation.
- Prevalence rates of nausea and vomiting can be as high as 50% to 80%.
- Lifestyle changes like diet modification and avoiding triggers can help alleviate symptoms.
- Ginger (250 mg QID) has been found effective in several randomized trials.
- For more severe cases, pharmacologic therapy like doxylamine-pyridoxine (Diclegis) is recommended.
- Other antiemetics like metoclopramide, promethazine, and ondansetron may be considered if needed.

Hyperemesis Gravidarum:

- Hyperemesis gravidarum occurs in about 1% of pregnant patients and is characterized by severe nausea and vomiting.

- It causes weight loss, dehydration, and prolonged ketonemia and ketonuria.
- There's an increased risk of micronutrient deficiency for both the patient and foetus.
- Potential causes include increasing oestradiol, hCG levels, maternal cytokines, and Helicobacter pylori infection.
- Lab tests assess volume status, electrolytes, and presence of ketosis.
- Initial management involves rehydration with IV fluids, antiemetics (Diclegis), and oral hydration demonstration.
- Thiamine is administered before dextrose to prevent Wernicke encephalopathy.
- Dextrose-containing IV fluids are continued until ketones clear from urine or oral intake is possible.
- Consideration of enteral nutrition via nasogastric tube is an option for those who cannot maintain weight.

Thromboembolic Disease in Pregnancy: Foundations and Management

Foundations:

- Pregnancy is a hypercoagulable state with increased coagulation factors, stasis, and vascular trauma during delivery.
- Risk factors for venous thrombosis include smoking, obesity, advanced age, hypercoagulable states, varicose veins, and more.

- Thromboembolic disease is associated with increased mortality in pregnancy.

Clinical Features:

- Clinical signs like pain, tenderness, and swelling are poor predictors of deep venous thrombosis (DVT) in pregnancy.
- Diagnosis of pulmonary embolism (PE) is challenging due to nonspecific symptoms.

Diagnostic Testing:

- Doppler ultrasonography is the first-line test for DVT diagnosis.
- Doppler may require additional imaging like magnetic resonance venogram (MRV) or CT venogram (CTV) for equivocal cases.
- D-dimer tests lack sensitivity in pregnancy to exclude PE.
- Chest radiography may be performed to exclude other disease processes.
- Imaging options for PE include magnetic resonance angiography (MRA), lung scintigraphy (V/Q scan), or CT angiography (CTA).

Management and Disposition:

- Warfarin is contraindicated during pregnancy; heparinoids like unfractionated heparin or low-molecular-weight heparin are used.
- Acute anticoagulation with IV heparin followed by subcutaneous heparin is common.

- Low-molecular-weight heparin (enoxaparin) is preferred due to its safety and advantages.
- Patients receiving heparin require regular laboratory testing.
- Oral direct thrombin inhibitors and anti-Xa inhibitors should be avoided in pregnancy.
- Prophylaxis for subsequent gestations may be recommended for those with a history of DVT or PE.

Genitourinary Infections

Key Concepts:

- Asymptomatic bacteriuria in pregnancy can lead to symptomatic genitourinary infections.
- Treating asymptomatic bacteriuria is cost-effective and important to prevent complications.
- Bacterial vaginosis and vulvovaginal candidiasis require management for symptomatic relief.
- Genital herpes during pregnancy poses risks for foetal transmission, and suppressive therapy can reduce caesarean section needs.
- Chlamydia trachomatis infection is common and treated with azithromycin or amoxicillin during pregnancy.

Urinary Tract Infection (UTI):

- Asymptomatic bacteriuria screening is recommended at 12 to 16 weeks' gestation or at the first prenatal visit.
- Uterine pressure, poor bladder emptying, and hormonal changes contribute to increased infection risk in pregnancy.
- Up to 30% of untreated asymptomatic bacteriuria cases can progress to pyelonephritis.
- Pregnant patients with lower or upper tract symptoms should have a pelvic exam and uncontaminated urine specimen evaluation.
- Acute pyelonephritis in pregnancy can lead to sepsis, renal injury, and premature labour.
- Differential diagnosis includes vaginitis, herpes, chlamydial infection, and other conditions.
- Management involves antibiotics effective against common urinary pathogens; cephalosporins, nitrofurantoin, amoxicillin, or sulphonamides are common choices.
- Patients with acute pyelonephritis are often admitted for IV antibiotic treatment, hydration, and obstetric consultation.
- IV ceftriaxone is commonly used for acute pyelonephritis treatment.
- Follow-up cultures and observation are important after treatment.

This information provides an overview of key concepts related to genitourinary infections during pregnancy, including the importance of treating asymptomatic bacteriuria, management strategies for different infections, and the risks associated with untreated infections during pregnancy.

Vaginitis and Genital Infections

Bacterial Vaginosis:

- Bacterial vaginosis is characterized by an overgrowth of vaginal bacteria causing excessive discharge and malodour.
- Prevalence in pregnancy is 15% to 20%, associated with increased risk of complications like chorioamnionitis and premature rupture of membranes.
- Treatment aims at relieving symptoms, not necessarily improving foetal outcomes.
- Management involves a 7-day oral course of metronidazole (500 mg BID) or clindamycin (300 mg BID).
- Intravaginal treatment is not recommended during pregnancy.

Candida Albicans Vaginitis:

- Pregnancy increases vulvovaginal candidiasis incidence due to hormonal changes.
- Candida colonization isn't associated with adverse outcomes, so treatment focuses on symptom relief.
- Oral azoles are avoided during pregnancy; vaginal azoles (clotrimazole, miconazole) for 7 days are safe with an 80% cure rate.
- Recurrent cases might need further investigation and partner treatment.

Trichomonas Vaginitis:

- Trichomoniasis is a sexually transmitted infection caused by Trichomonas vaginalis.
- 50% of patients are asymptomatic; symptoms include itching, discharge, and irritation.
- Diagnosis involves direct visualization of protozoans on a wet mount.
- Symptomatic pregnant women are tested and treated with metronidazole (500 mg BID for 7 days).

Sexually Transmitted Diseases:

- CDC guidelines are followed for treating STDs in pregnant patients.
- Tetracyclines and quinolones are generally avoided in pregnancy.
- Treating genital infections is crucial to prevent preterm labour and transmission to the infant.
- Gonococcal infection, including arthritis and PID, is treated with cephalosporins or azithromycin.
- PID is rare in pregnancy and requires hospitalization and IV antibiotics.
- Chorioamnionitis, placenta and foetal membrane infection, is diagnosed by fever, tachycardia, and uterine tenderness after 16 weeks.
- Treatment involves IV ampicillin and gentamicin.
- Chlamydia trachomatis is the most common STD, diagnosed through urine sampling.

- Chlamydia screening during pregnancy prevents preterm labour and postpartum endometritis.
- Treatment during pregnancy is azithromycin or a 7-day course of amoxicillin.
- Neisseria gonorrhoeae infection is uncommon during pregnancy; treatment includes cephalosporins or azithromycin.
- Herpes simplex virus (HSV) poses risks in pregnancy; treatment involves acyclovir or valacyclovir for first-episode genital herpes.
- Suppressive therapy reduces caesarean needs for first-episode genital herpes during pregnancy.
- PID is rare in pregnancy and occurs only in the first trimester; suspected cases require hospitalization and IV antibiotics.
- Chorioamnionitis, infection of the placenta and foetal membranes, is diagnosed by fever, tachycardia, and uterine tenderness after 16 weeks. It's treated with IV ampicillin and gentamicin.

Endocrine Disorders During Pregnancy

Thyroid Disorders:

- Pregnancy-related thyroid changes impact maternal and foetal outcomes.

- Normal pregnancy increases thyroid size, iodine requirement, and hormone production.
- Hyperthyroidism (0.1%-0.4% of pregnancies) can result from Graves disease or hCG-mediated activity.
- Hypothyroidism (2%-3% of pregnancies) is often due to Hashimoto thyroiditis.
- Postpartum thyroiditis causes transient hyper- or hypothyroidism, with long-term effects.
- Diagnosis involves assessing TSH and thyroid hormone levels according to pregnancy stages.

Hyperthyroidism:

- Common causes: Graves disease, hCG-mediated hyperthyroidism.
- Associated with adverse outcomes; treatment is crucial.
- Thyroid ablation with radioactive iodine is contraindicated during pregnancy.
- Propylthiouracil (PTU) is preferred; methimazole is effective but associated with foetal anomalies.
- Thyroid storm management includes PTU, beta blockers, and intensive care.

Hypothyroidism:

- Common cause: Hashimoto thyroiditis.
- Can lead to adverse pregnancy effects; requires treatment.
- Levothyroxine supplementation (1.6 µg/kg/day) manages hypothyroidism during pregnancy.

- Postpartum thyroiditis requires levothyroxine if TSH is elevated or if symptoms are present.

Disorders of Hypothalamic-Pituitary Axis:

- Pregnancy affects hypothalamic-pituitary axis, impacting cortisol, adrenocorticotropic hormone, growth hormone levels.
- Rare disorders like adrenal insufficiency, Cushing syndrome, acromegaly, diabetes insipidus, and prolactinomas can occur.
- Symptoms can mimic normal pregnancy, making diagnosis challenging.
- Diabetes insipidus, caused by pituitary infarction from severe haemorrhage (Sheehan syndrome), is rare but important to consider.
- Diagnosis involves hormone level assessments and imaging (MRI).

Management:

- Stabilization addresses severe manifestations.
- Outpatient management is suitable for stable patients with follow-up.

These endocrine disorders during pregnancy can have significant implications for both the mother and the foetus. Careful monitoring, timely diagnosis, and appropriate management are essential to ensure optimal outcomes.

Medical Emergencies During Pregnancy

I. Introduction

Medical emergencies during pregnancy require specialized management to ensure the well-being of both the mother and the foetus. This clinical protocol provides guidance on the assessment and treatment of various medical emergencies that may occur during pregnancy. It is essential to consider the unique physiological changes and potential risks associated with pregnancy when managing these emergencies.

II. Asthma

1. Assessment: a. Assess maternal oxygen saturation; maintain levels above 95%. b. Evaluate the severity of the exacerbation using clinical symptoms, respiratory rate, and peak flow measurements.
2. Treatment: a. Administer inhaled beta-agonists (e.g., Albuterol) for bronchodilation. b. Administer corticosteroids (e.g., prednisone) to reduce inflammation. c. Monitor foetal well-being through continuous foetal heart rate monitoring.

III. Cardiac Disease

1. Hypertensive Emergency: a. Define hypertensive emergency as persistent systolic BP > 160 mm Hg or diastolic BP > 110 mm Hg for > 15 minutes. b. Administer antihypertensive therapy within 30 to 60 minutes, targeting systolic BP of 140 to 150 mm Hg and diastolic BP

of 90 to 100 mm Hg. c. Preferred drugs: oral nifedipine, IV hydralazine, IV labetalol.

2. Acute Coronary Syndrome (ACS): a. Recognize increased ACS risk in pregnant women. b. Investigate possible spontaneous coronary artery dissection. c. Manage ACS similarly to non-pregnant patients, avoiding P2Y12 receptor inhibitors. d. Carefully consider fibrinolytic therapy in near-term pregnant women.

IV. Anaemia

1. Diagnosis: a. Define anaemia as haemoglobin < 11 g/dL. b. Assess iron deficiency with serum ferritin levels.
2. Treatment: a. Mild iron deficiency: Initiate daily iron supplementation. b. Severe iron deficiency (second and third trimester): Refer for IV iron infusion.

V. Sickle Cell Disease

1. Complications: a. Recognize increased risks: more pain crises, venous thromboembolism, preeclampsia. b. Manage pain crises similarly to non-pregnant patients, avoiding hydroxyurea due to teratogenicity.

VI. Epilepsy

1. Risk Assessment: a. Acknowledge a tenfold risk of mortality in pregnant patients with epilepsy. b. Choose antiepileptic drugs (AEDs) with known safety during pregnancy (e.g., levetiracetam, lamotrigine).

2. Status Epilepticus: a. Treat with benzodiazepines initially. b. Use phenytoin as first-line AED and levetiracetam as second-line AED.

VII. Endocrine

1. Diabetes Mellitus (T1DM): a. Transition to insulin during pregnancy to achieve HbA1C < 6%.
2. Hypoglycaemia: a. Recognize higher incidence in the first trimester. b. Manage promptly.
3. Comorbid Obesity: a. Acknowledge increased risks of caesarean section and venous thromboembolism.
4. Graves Disease: a. Monitor for thyrotoxicosis rebound postpartum. b. Avoid radioiodine treatment during pregnancy.
5. Nephrolithiasis: a. Screen for hypercalcemia in gravid patients with new-onset nephrolithiasis. b. Do not use bisphosphonates for hypercalcemia in pregnancy.

VIII. Psychiatric Disorders

1. Substance Use: a. Encourage prenatal discontinuation of stimulants while closely monitoring for depression and psychosis. b. Consider specialized addiction treatment if needed.
2. Opioid Agonist Therapy: a. Use in pregnant women may reduce rates of neonatal abstinence syndrome.

IX. Inflammatory Disorders

1. Antiphospholipid Syndrome (APS): a. Recognize characteristics: deep vessel clotting, pregnancy-related morbidity, positive anticoagulant markers. b. Be aware of catastrophic APS with rapid-onset small vessel thrombosis.

X. Renal Disease

1. Chronic Kidney Disease (CKD): a. Consider intensified haemodialysis (increased duration or frequency) to improve foetal outcomes.
2. Post Renal Transplantation: a. Acknowledge normal fertility rates within 6 months.

XI. Infectious Disorders

1. HIV Infection: a. Investigate moderate to severe anaemia in pregnant HIV-infected mothers for tuberculosis.
2. Congenital Syphilis: a. Administer penicillin as the only effective treatment during pregnancy. b. Desensitize and treat penicillin-allergic pregnant patients with penicillin.
3. HBV Infection: a. Consider lamivudine in late pregnancy for women with high HBV viral loads, in conjunction with HBV vaccine and immune globulin.
4. HCV Infection: a. Monitor for obstetric haemorrhagic complications, including DIC and shock, which are more common in HCV-infected pregnant women.

XII. Conclusion Management of medical emergencies during pregnancy requires prompt recognition, appropriate interventions, and a

multidisciplinary approach to ensure optimal maternal and foetal outcomes. Healthcare providers should be familiar with the unique considerations and treatment options for pregnant patients in emergency situations.

Asthma During Pregnancy

I. Introduction

Asthma exacerbations can occur in pregnant individuals, and their management is crucial to prevent adverse maternal and foetal outcomes. This section provides further details on the assessment and treatment of asthma during pregnancy.

II. Maternal Respiratory Function Changes During pregnancy, significant changes in respiratory function occur, making it challenging to recognize a decompensating asthmatic patient:

- Tidal volume and minute ventilation increase by approximately 45%.
- Average Pco2 levels decrease to around 32 mm Hg.
- Kidneys compensate, maintaining an average bicarbonate level of 19 mEq/mL, resulting in a compensated respiratory alkalosis with a serum pH between 7.40 and 7.45.

III. Treatment Goals

The primary goal of asthma treatment during pregnancy is to maintain maternal oxygen saturation levels above 95% to prevent foetal hypoxia.

Both the American College of Obstetrics and Gynaecology (ACOG) and the National Asthma Education and Prevention Program emphasize the importance of using asthma medications to manage pregnant women with asthma to prevent severe symptoms and exacerbations.

IV. Treatment

Approach The standard treatment for a pregnant asthmatic patient is like that for nonpregnant patients experiencing an asthma exacerbation. Key steps include:

- Conducting a thorough history and physical examination.
- Measuring peak expiratory flow (PEF) or forced expiratory volume in 1 second (FEV1).
- Monitoring foetal well-being, including assessing foetal heart tones and considering continuous electronic foetal monitoring.
- Administering supplemental oxygen to mothers with oxygen saturation below 95%.

V. Medications

1. First-Line Treatment:
    - Inhaled short-acting β2-agonists (e.g., Albuterol) are the first-line treatment and can be administered continuously for severe exacerbations.
    - Adjunctive anticholinergic medications may be considered.
    - Inhaled corticosteroids and long-acting selective β2-agonists can be added as controller medications after discharge from

the emergency department (ED). Budesonide is the preferred agent during pregnancy.

2. Oral Corticosteroids:
    - Indicated for moderate to severe asthma exacerbations.
    - Prescribed for the same indications as in nonpregnant individuals.
    - The benefits of oral corticosteroid use in preventing foetal hypoxia outweigh the risks of adverse perinatal outcomes. Expert guidelines recommend their use.
3. Second-Line Agents:
    - Medications such as cromolyn sodium are considered safe during pregnancy.
    - Limited studies suggest that magnesium can improve respiratory function in pregnant individuals with severe asthma exacerbations without adverse foetal outcomes.

VI. Discrepancy in Medication Use Studies have shown variations in the amount of dispensed asthma medications before and during pregnancy. It is essential to ensure that pregnant individuals receive appropriate medications to manage their asthma effectively and prevent exacerbations.

VII. Conclusion

Effective management of asthma during pregnancy is crucial to minimize the risk of adverse maternal and foetal outcomes. Healthcare providers should be aware of the unique physiological changes in pregnancy and adhere to established guidelines for asthma treatment during this period.

Timely and appropriate interventions can significantly improve outcomes for pregnant individuals with asthma.

Emergency Department Management of Acute Asthma Exacerbation in Pregnancy:

I. Initial Assessment:

a. Promptly evaluate the pregnant patient presenting with an acute asthma exacerbation.

b. Assess the severity of the exacerbation based on clinical symptoms, respiratory rate, and oxygen saturation.

c. Obtain a detailed medical history, including the patient's asthma history, prior exacerbations, and current medications.

d. Assess the gestational age of the pregnancy, as management may vary depending on trimester.

II. Airway and Breathing:

a. Ensure a patent airway and assess for signs of respiratory distress.

b. Administer supplemental oxygen to maintain maternal oxygen saturation above 95%.

III. Continuous Foetal Monitoring:

a. Initiate continuous electronic foetal monitoring (EFM) when the pregnancy has reached viability.

b. Monitor foetal heart rate to assess foetal well-being.

IV. Pulmonary Function Testing:

a. Measure peak expiratory flow (PEF) or forced expiratory volume in 1 second (FEV1) to assess lung function.

b. Decline in PEF or FEV1 is of concern, and a significant decrease may classify the exacerbation as severe.

V. Medications:

a. First-Line Treatment: - Administer inhaled short-acting β2-agonists (e.g., Albuterol) as first-line therapy for bronchodilation. - Continuous administration may be necessary for severe exacerbations.

b. Adjunctive Medications: - Consider the use of anticholinergic medications (e.g., ipratropium) as adjunctive therapy in severe cases. - Albuterol can be used in pregnancy as it has a well-established safety profile.

c. Corticosteroids: - Oral corticosteroids (e.g., prednisone) are indicated for moderate to severe exacerbations. - Despite potential risks, the benefits of oral corticosteroid use in preventing foetal hypoxia outweigh the risks of adverse perinatal outcomes.

d. Controller Medications: - Initiate or adjust long-acting selective β2-agonists and inhaled corticosteroids as controller medications for ongoing management after ED discharge.

VI. Monitoring:

a. Continuously monitor the patient's response to treatment, including respiratory rate, oxygen saturation, and clinical symptoms.

b. Repeat PEF or FEV1 measurements to track improvement.

VII. Foetal Assessment:

a. Regularly assess foetal heart tones to ensure foetal well-being during treatment.

b. Consider performing a biophysical profile (BPP) if the pregnancy has reached viability.

VIII. Consideration of Tocolysis:

a. Be aware that β-agonists used in asthma treatment are tocolytic and may halt labour, especially in preterm pregnancies.

IX. Follow-Up and Education:

a. Provide clear instructions for at-home management and controller medication use.

b. Schedule follow-up appointments to monitor asthma control during pregnancy.

X. Consultation:

a. Consider consultation with obstetrics and a pulmonologist for complex cases or if the exacerbation is not responding to initial treatment.

XI. Discharge Planning:

a. Ensure that the patient is stable and has appropriate medications for ongoing asthma management.

b. Educate the patient on recognizing worsening symptoms and the importance of regular follow-up with healthcare providers.

XII. Multidisciplinary Care:

a. Collaborate with obstetricians, pulmonologists, and neonatologists to provide comprehensive care for pregnant patients with asthma.

Emergency department management of acute asthma exacerbation in pregnancy requires a coordinated and multidisciplinary approach to ensure the safety of both the mother and the foetus. Close monitoring, appropriate medications, and patient education are essential components of effective care in this setting.

Hypertension in Pregnancy and Hypertensive Emergencies:

I. Chronic Hypertension in Pregnancy:

a. Definition: Chronic hypertension in pregnancy is diagnosed when blood pressure is consistently elevated (>140 mm Hg systolic or >90 mm Hg diastolic) before pregnancy or before 20 weeks' gestation.

b. Complications: Chronic hypertension increases the risk of complications such as superimposed preeclampsia, preterm delivery, intrauterine growth restriction, and caesarean section.

c. Classification: Chronic hypertension of pregnancy is categorized as mild (systolic 140-159 mm Hg or diastolic 90-109 mm Hg) or severe (systolic >160 mm Hg or diastolic >110 mm Hg).

d. Blood Pressure Control: Tight control of blood pressure (goal diastolic BP <85 mm Hg) may reduce the frequency of severe maternal hypertension, although it does not significantly impact pregnancy loss or maternal complications.

e. Treatment Initiation: ACOG recommends initiating antihypertensive treatment when blood pressure is consistently greater than 160 mm Hg systolic and/or greater than 110 mm Hg diastolic. Other guidelines suggest treatment initiation at different thresholds.

II. Risk of Severe Chronic Hypertension:

a. Progression to Preeclampsia: Severe chronic hypertension poses a significant risk of progressing to preeclampsia, occurring in approximately 25% of these pregnancies.

b. Adverse Outcomes: It is associated with adverse outcomes such as low birth weight, preterm delivery, elevated liver enzymes, and prolonged hospital stays compared to pregnancies with chronic hypertension but without severe hypertension.

III. Antihypertensive Treatment:

a. First-line Agents: Common first-line oral antihypertensive agents for treating chronic hypertension in pregnancy include: - Labetalol (dose range: 200 to 1200 mg/day in 2 to 3 divided doses) - Nifedipine XL (dose range: 30 to 120 mg/day) - Methyldopa (dose range: 500 to 3000 mg/day in 2 divided doses)

IV. Hypertensive Emergencies:

a. Definition: Hypertensive emergencies are characterized by acute-onset persistent hypertension with systolic BP >160 mm Hg or diastolic BP >110 mm Hg that persists for >15 minutes.

b. Immediate Treatment: Antihypertensive therapy should be administered as soon as reasonably possible and no later than 30 to 60 minutes after diagnosis to prevent complications.

c. Goal Blood Pressure: The target BP is within the range of 140 to 150 mm Hg systolic and 90 to 100 mm Hg diastolic to prevent loss of cerebral autoregulation.

d. First-Line Treatment: IV labetalol, IV hydralazine, and oral nifedipine are considered first-line treatments for hypertensive emergencies. Oral nifedipine may be used when IV access has not been established.

V. Diagnostic Criteria for Preeclampsia:

a. Changes in Criteria: In 2013, ACOG modified its diagnostic criteria for preeclampsia and no longer requires the presence of proteinuria.

b. Diagnosis Without Proteinuria: Preeclampsia can be diagnosed in the absence of proteinuria if hypertension is accompanied by other symptoms such as thrombocytopenia, impaired liver function, pulmonary oedema, visual disturbances, or renal insufficiency.

Hypertension in pregnancy poses unique challenges and requires careful monitoring and management to minimize the risk of complications for both the mother and the foetus. Different guidelines may offer varying recommendations regarding treatment thresholds and approaches, necessitating individualized care and consultation with specialists when necessary.

Acute Coronary Syndromes in Pregnancy:

I. Maternal Mortality and Risk Factors:

a. Maternal mortality: Cardiac disease is a significant indirect cause of maternal death, with ischemic heart disease accounting for over one-fifth of cardiac mortality in pregnant women.

b. Mortality rate after acute myocardial infarction (AMI): The mortality rate in pregnant women who experience AMI ranges from 5% to 7%.

c. Increased risk: Pregnant women are two to four times more likely to experience an AMI compared to age-matched nonpregnant individuals.

d. Advanced maternal age: Pregnant women aged 40 years or older face a 30-fold greater risk of acute coronary syndrome (ACS) than those aged 20 years or younger.

e. Timing of AMI: The incidence of AMI is highest during the last trimester and the peripartum period, with 21% of pregnancy-related MIs occurring in the antepartum period.

II. Risk Factors for Pregnancy-Associated AMI:

a. Hypothesized risk factors: Several factors are hypothesized to increase the risk of AMI in pregnancy, including: - Prothrombotic state - Increased myocardial oxygen demand due to elevated cardiac

output and heart rate - Decreased oxygen-carrying capacity due to physiologic anaemia.

b. Contributing factors: Other factors that increase the risk of pregnancy-associated AMI include hypertension, thrombophilia, anaemia, diabetes, advanced maternal age, multiparity, and smoking.

III. Causes of ACS in Pregnancy:

a. Common causes: Most cases of ACS in pregnancy are attributed to causes other than atherosclerosis.

b. Spontaneous coronary artery dissection (SCAD): SCAD is the most common cause of ACS during pregnancy, accounting for a significant percentage of cases.

c. Timing of SCAD: SCAD-related AMIs can occur postpartum, with most cases presenting after childbirth.

IV. Diagnosis of ACS in Pregnancy:

a. Electrocardiographic changes: Normal pregnancy and delivery can lead to electrocardiographic changes, including T wave flattening, T wave inversion, nonspecific ST changes, and ST depression during labour induction.

b. Diagnostic challenges: The presentation of AMI symptoms, such as chest pain and shortness of breath, can overlap with normal physiological changes during pregnancy.

c. Echocardiography: Echocardiography can help correlate suspicious electrocardiographic findings with wall motion abnormalities.

d. Enzymatic diagnosis: The enzymatic diagnosis of myocardial infarction remains unchanged during pregnancy, and a serial rise in troponin suggests myocardial ischemia, even in cases of preeclampsia.

V. Treatment of AMI During Pregnancy:

a. Goal: The primary goal in treating AMI during pregnancy is to ensure the survival of the mother.

b. Standard treatments: Standard treatments for AMI, including antiplatelet agents, nitro-glycerine, and beta-blockers, are considered safe during pregnancy but require consultation with a cardiologist and obstetrician.

c. Medications to avoid: Angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers, aldosterone antagonists, and statins should be avoided until the postpartum period.

d. Antiplatelet therapy: Aspirin is the first-line antiplatelet agent, while clopidogrel may be cautiously considered, primarily after stenting.

e. Thrombolytic therapy: Thrombolytic therapy should be carefully considered, especially in cases of coronary artery dissection, as it carries a risk of maternal haemorrhage.

VI. Cardiac Catheterization and Stenting:

a. Treatment of choice: Cardiac catheterization with stenting is the preferred treatment for AMI in pregnant patients.

b. Radiation exposure: With appropriate shielding, cardiac catheterization exposes the foetus to minimal radiation.

c. Conservative approach: In cases of potential coronary artery dissection, a conservative approach is recommended.

VII. Peripartum AMI and Delivery:

a. Labor management: Continuous monitoring of the mother's hemodynamic status and foetal well-being is essential in cases of peripartum AMI.

b. Mode of delivery: Assisted vaginal delivery is preferred unless there is a specific indication for caesarean section, as it minimizes maternal exertion.

c. Anaesthesia considerations: The use of antithrombotic agents may impact anaesthesia options, and general anaesthesia may be required for caesarean delivery in such cases.

Managing AMI during pregnancy requires a careful balance between ensuring maternal survival and considering the safety of the foetus. Collaboration between obstetricians, cardiologists, and other specialists is crucial for providing appropriate care in these challenging situations.

Valvular Heart Disease and Pulmonary Hypertension in Pregnancy:

I. Valvular Heart Disease:

a. Impact on pregnancy: Valvular heart disease, both native and mechanical valves, can lead to acute heart failure during pregnancy and is associated with increased maternal and foetal mortality.

b. Tolerance of pregnancy: The ability to tolerate pregnancy without significant adverse effects depends on the type and severity of the valvular lesion.

c. Lesion severity: Mild to moderate lesions (NYHA classes I and II) are generally associated with good maternal and foetal outcomes, while severe lesions, including mitral stenosis (beyond class I), advanced aortic stenosis, aortic and mitral lesions with ventricular dysfunction, and mechanical prosthetic valves requiring anticoagulation, pose higher risks.

d. Maternal complications: Heart failure is the most common maternal complication in pregnancy with valvular heart disease. The highest risk is observed in women with cardiomyopathy, NYHA class III or higher, pre-pregnancy heart failure, and pulmonary hypertension.

II. Diagnosis and Challenges:

a. Diagnostic challenges: Diagnosing heart failure in pregnant women can be challenging due to overlapping symptoms with normal late pregnancy.

b. B-type natriuretic peptide (BNP): Normal BNP levels can rule out heart failure, but interpreting mildly elevated BNP levels can be difficult due to the physiological increase in pregnancy.

III. Pulmonary Hypertension:

a. Poor tolerance: Pregnancy is poorly tolerated by patients with pulmonary hypertension due to the inability of the pulmonary circulation to handle increased stroke volume and cardiac output.

b. Complications: Elevated pulmonary pressures during pregnancy can lead to dyspnoea, heart failure, and syncope, with mortality rates approaching 30%.

c. Contraindication: Pregnancy is contraindicated in patients with pulmonary hypertension, and early pregnancy termination should be discussed.

IV. Treatment of Pulmonary Hypertension in Pregnancy:

a. Focus of treatment: Management of pregnant patients with pulmonary hypertension primarily involves diuresis and pulmonary vasodilation.

b. Diuretics: Diuretics are used for managing volume overload, and most diuretics (except spironolactone) are considered safe.

c. Pulmonary vasodilators: Specific agents for treating pulmonary hypertension include endothelin receptor agonists (ERAs), phosphodiesterase inhibitors, and prostanoids.

d. Use of phosphodiesterase inhibitors and prostacyclin derivatives: These agents, such as sildenafil, tadalafil, epoprostenol, and Treprostinil, are used despite potential foetal risks due to the benefits they offer.

e. ERAs: ERAs like bosentan and ambrisentan are teratogenic and should be avoided.

V. Mitral Stenosis:

a. Mitral stenosis in pregnancy: Mitral stenosis is common but typically well tolerated during pregnancy unless it is moderate to severe.

b. Symptoms and arrhythmias: Increased heart rate and stroke volume in normal pregnancy can worsen mitral stenosis, leading to left heart failure symptoms and atrial arrhythmias.

c. Management: Beta-blockers are the mainstay of treatment to prevent tachycardia, and diuretics may be used for heart failure symptoms. Surgical intervention may be necessary for refractory symptoms or pulmonary hypertension.

VI. Aortic and Mitral Regurgitation:

a. Causes and tolerance: Chronic regurgitation lesions are usually well tolerated during pregnancy, and some may even improve due to reduced systemic vascular resistance.

b. Heart failure risk: About 20% to 25% of women with moderate or severe mitral regurgitation may develop heart failure.

c. Medical therapy: Treatment for regurgitation may include diuresis, digoxin, and vasodilators when necessary.

VII. Aortic Stenosis:

a. Symptomatic aortic stenosis: Occurs predominantly in the setting of congenital bicuspid valves, and management depends on the severity of stenosis.

b. Management: Mild to moderate aortic stenosis can be conservatively managed if the aortic valve area is greater than 1.0 cm2. Symptomatic patients may respond to bed rest or diuretics, while severe cases may require percutaneous valvotomy or surgical replacement.

VIII. Prosthetic Heart Valves:

a. High-risk classification: Pregnant women with mechanical heart valves are classified as high risk (WHO risk classification III) for complications.

b. Maternal and foetal outcomes: Pregnancies in women with mechanical heart valves have lower live birth rates and increased thrombotic event risk compared to those without.

c. Anticoagulation strategies: Anticoagulation recommendations involve using warfarin until pregnancy is achieved. Choices for anticoagulation during pregnancy include warfarin if INR can be maintained at 2.5-3.5 with a low dose, or UFH or LMWH in the first trimester followed by warfarin in the second and third trimesters, with transition back to UFH or LMWH before delivery.

The management of valvular heart disease and pulmonary hypertension during pregnancy requires careful assessment, individualized treatment plans, and close monitoring to optimize maternal and foetal outcomes. Collaboration between cardiology and obstetric teams is essential for successful management.

Hematologic Disorders in Pregnancy:

I. Anaemia:

a. Prevalence: Anaemia is the most common medical complication during pregnancy and is associated with various adverse outcomes for both the mother and the foetus.

b. Clinical presentation: Classic symptoms of anaemia include pallor, fatigue, and shortness of breath, but many cases are asymptomatic.

c. Diagnostic criteria: Anaemia of pregnancy is defined by the WHO as a haemoglobin level less than 11 g/dL, with severe anaemia requiring transfusion generally defined as haemoglobin less than 7 g/dL for pregnant patients.

d. Types of anaemia: Predominant types include dilutional anaemia, iron deficiency anaemia, folate deficiency anaemia, and sickle cell hemoglobinopathy.

II. Dilutional Anaemia:

a. Pregnancy-induced blood volume increase: Blood volume increases by almost 50% between weeks 6 and 34 of pregnancy, leading to dilutional anaemia.

b. Haemoglobin threshold: The threshold for diagnosing anaemia in pregnant patients is typically lower (11 g/dL) than in non-pregnant individuals (12 g/dL).

c. Implications: Failure to adequately expand plasma volume in pregnant patients can result in outcomes like low birth weight and premature birth.

III. Iron Deficiency Anaemia:

a. Prevalence: Approximately 5% of pregnancies in the United States experience iron deficiency anaemia, with 18% of pregnancies having iron deficiency.

b. Adverse outcomes: Severity of anaemia correlates with adverse pregnancy outcomes, including preterm birth, low birth weight, foetal mortality, and maternal complications.

c. Diagnosis challenges: Diagnosis of iron deficiency is challenging due to maternal physiological changes affecting serum biomarkers.

d. Diagnostic tests: Ferritin is a sensitive test for iron deficiency in pregnancy, but it may be influenced by increased plasma volume. Mean corpuscular volume, total iron-binding capacity, and transferrin are less sensitive.

IV. Management of Iron Deficiency Anaemia:

a. Treatment: Mild iron deficiency anaemia (haemoglobin 9–10.5 g/dL) is treated with non–enteric-coated supplemental iron. Intravenous iron is preferred for severe anaemia in the second and third trimesters.

b. Prophylactic supplementation: Prophylactic iron supplementation is recommended for all women before conception and during pregnancy.

c. Recommendations: Health authorities recommend at least 30 mg of ferrous iron daily during pregnancy, with intermittent dosing to reduce side effects.

V. Folate Deficiency Anaemia:

a. Folate requirements: Folate requirements increase during pregnancy, making pregnant women susceptible to folate deficiency.

b. Causes: Increased risk factors include multiple gestations, short interpregnancy intervals, malnutrition, hyperemesis gravidarum, malabsorption syndromes, alcoholism, and dietary factors.

c. Adverse outcomes: Folate deficiency is linked to neural tube defects, placental abruption, preterm birth, low birth weight, preeclampsia, and spontaneous abortion.

d. Supplementation: Routine folate supplementation is recommended before and during pregnancy, with higher doses for women at increased risk for neural tube defects.

VI. Sickle Cell Anaemia (SCD):

a. Maternal complications: Pregnant women with SCD face risks such as preterm labour, premature rupture of membranes, infections, pain crises, thrombosis, preeclampsia, and caesarean delivery.

b. Foetal complications: Foetal complications include placental infarction, premature labour, small-for-gestational-age infants, and low birth weight.

c. Treatment considerations: Management involves addressing Vaso occlusive crises, anaemia, and thromboembolisms. Hydroxyurea is not recommended during pregnancy. Regional anaesthesia is preferred for caesarean delivery.

d. Transfusions: Therapeutic transfusions aim to lower haemoglobin S levels and achieve haemoglobin values of around 10 g/dL. Prophylactic transfusions may be used to reduce vaso-occlusive pain episodes but have controversial benefits.

Hematologic disorders during pregnancy require a multidisciplinary approach, close monitoring, and individualized treatment to optimize maternal and foetal outcomes. Management should consider the specific type and severity of the hematologic disorder.

Neurologic Disorders in Pregnancy:

I. Epilepsy:

a. Prevalence: Epilepsy is the most common neurologic complication during pregnancy, affecting less than 1% of all pregnancies.

b. Risks: Pregnant women with epilepsy face increased risks of maternal and foetal complications, including death, caesarean section, postpartum haemorrhage, and hypertensive disorders.

c. Seizure frequency: Approximately 15% of patients experience an increase in seizure frequency during pregnancy, with delivery and the first 24 hours postpartum being high-risk periods.

d. Pharmacokinetic changes: Pregnancy leads to altered drug concentrations of antiepileptic medications due to factors such as increased volume of distribution and hepatic metabolism.

e. Monitoring: Maternal plasma drug levels should be monitored and compared to pre-pregnancy levels to optimize seizure control.

f. Teratogenic risks: Antiepileptic drugs pose a risk of congenital malformations, particularly older generation agents and some newer ones.

g. Monotherapy: Recent studies suggest that monotherapy with lamotrigine and levetiracetam does not have a higher risk of major congenital malformations.

h. Folate supplementation: Women taking certain AEDs should receive oral folate supplementation to prevent neural tube defects.

II. Multiple Sclerosis (MS):

a. Prevalence: MS primarily affects women and often presents during childbearing years.

b. Disease course during pregnancy: MS exacerbations may improve during the third trimester but can increase in the postpartum period.

c. Relapse factors: Higher disability at the time of pregnancy onset and specific treatments may increase the risk of relapses during and after pregnancy.

d. Treatment during pregnancy: Immunomodulators and steroids may be used to manage MS exacerbations.

e. Safety of treatments: Studies suggest the safe use of intravenous immune globulin (IVIG), corticosteroids, and glatiramer acetate during pregnancy.

III. Spinal Cord Injury (SCI):

a. UTI risk: Pregnant women with SCI are at an increased risk of urinary tract infections (UTIs), which can have serious consequences for both mother and foetus.

b. Thromboembolic risk: Pregnancy combined with immobilization in SCI patients increases the risk of venous thromboembolism.

c. Autonomic dysreflexia: SCI patients, especially those with high lesions, are at risk of autonomic dysreflexia during pregnancy and labour.

d. Management: Autonomic dysreflexia is managed by relieving triggering stimuli and restoring normal blood pressure. Regional anaesthesia is recommended for labour pain.

IV. Myasthenia Gravis:

a. Disease course during pregnancy: Myasthenia gravis can be unpredictable during pregnancy, with some patients experiencing exacerbations.

b. Treatment: Immunomodulatory treatments like IVIG, corticosteroids, and cholinesterase inhibitors are considered safe during pregnancy.

c. Neonatal myasthenia syndrome: Neonates born to mothers with myasthenia gravis may develop transient neonatal myasthenia syndrome, which typically responds to cholinesterase inhibitors.

d. Myasthenia crises: Myasthenia crises during pregnancy require similar treatments as in nonpregnant patients, with acetylcholine esterase inhibitors, corticosteroids, and other options.

e. Magnesium sulphate: Magnesium sulphate is contraindicated for eclampsia treatment in myasthenia gravis due to its neuromuscular blocking effects.

Neurologic disorders in pregnancy require specialized care and monitoring to manage the condition while minimizing risks to both the mother and the developing foetus. Treatment strategies should be individualized based on the specific neurologic disorder and the patient's needs. A multidisciplinary approach involving neurologists, obstetricians, and other healthcare providers is essential for optimal outcomes.

Renal Disorders in Pregnancy:

I. Chronic Kidney Disease (CKD):

a. Diagnosis challenges: CKD can be challenging to diagnose during pregnancy due to expected decreases in blood urea nitrogen (BUN) and creatinine levels.

b. Conception rates: Women with known renal disease, including end-stage renal disease (ESRD), on haemodialysis may have improved conception rates, albeit plateaued at around 10%.

c. Risk factors: CKD itself is an independent risk factor for both maternal and foetal complications during pregnancy.

d. Impact of renal dysfunction: The severity of underlying renal dysfunction strongly influences pregnancy-related morbidity, including preeclampsia, placental abruption, foetal loss, preterm

delivery, low birth weight, polyhydramnios, and the need for caesarean section and neonatal intensive care.

e. Risk factors for worsening renal function: Patients with a decreased glomerular filtration rate (GFR) who also have proteinuria or hypertension are more likely to experience worsening renal function during pregnancy.

f. Differentiating from preeclampsia: Distinguishing worsening renal function from preeclampsia can be challenging; treatment for presumed preeclampsia is recommended in such cases.

II. Management of Chronic Renal Failure in Pregnancy:

a. Blood pressure control: Close control of blood pressure and monitoring for proteinuria are crucial aspects of CKD management during pregnancy.

b. Initiation of haemodialysis (HD): The threshold for starting HD in pregnant patients is lower than in non-pregnant individuals. Intensified HD, involving longer and more frequent dialysis sessions, can improve maternal and neonatal outcomes.

c. Adverse outcomes: Pregnant women with chronic renal failure may experience adverse outcomes such as miscarriage, placental detachment, anaemia, infections, premature rupture of membranes, polyhydramnios, preterm birth, uncontrolled arterial hypertension,

preeclampsia/eclampsia, haemorrhage, the need for caesarean section, and maternal death.

III. Post-Renal Transplantation Pregnancy:

a. Fertility rates: Fertility rates typically return to pre-renal failure levels within 1 to 6 months post-transplantation, making pregnancy common among women of childbearing age who have undergone renal transplantation.

b. Obstetric outcomes: Women who have received renal transplants often have live birth rates exceeding 70%. Adverse outcomes are primarily associated with preterm births and infants being small for gestational age (SGA).

Pregnancy in women with renal disorders requires specialized care to optimize both maternal and foetal outcomes. Monitoring renal function, controlling blood pressure, and managing associated complications such as preeclampsia are critical components of care. Renal transplantation can lead to improved fertility, but careful monitoring and management are essential to ensure successful pregnancies.

Metabolic and Endocrine Disorders in Pregnancy:

I. Diabetes:

a. Types of diabetes: Three types of diabetes commonly affect pregnant individuals—type 1 diabetes (T1DM), type 2 diabetes (T2DM), and gestational diabetes mellitus (GDM). Glycaemic control considerations for GDM are like those for T1DM and T2DM.

b. Prevalence and challenges: Both T1DM and T2DM are increasing in prevalence among pregnant patients, posing significant management challenges, especially given the tight glycaemic control recommended by ACOG.

c. Pregnancy complications in T2DM: Despite being considered a milder form of diabetes, T2DM still carries risks of pregnancy complications, including foetal malformations and elective caesarean sections due to neonatal macrosomia. Ideally, HbA1c levels should not exceed 6%, and T2DM patients are often transitioned to insulin therapy for tighter glycaemic control during pregnancy.

d. Risks in T1DM: T1DM is associated with a higher risk of complications, including preeclampsia, maternal mortality, premature delivery, neonatal hypoglycaemia, congenital abnormalities, and stillbirths. Preconception planning and tight glycaemic control are crucial for T1DM patients.

e. Cardiovascular concerns: Pregnancy is not advised for diabetic patients with coronary artery disease due to the cardiovascular demands of pregnancy and the elevated risk of acute myocardial infarction (AMI). Atypical or vague symptoms of angina or MI should be evaluated carefully.

f. Diabetic nephropathy: Patients with diabetic nephropathy are at an increased risk of developing preeclampsia and may require preterm delivery. Close monitoring of nephropathy progression, along with aggressive blood pressure control and optimized protein intake, is recommended.

g. Diabetic retinopathy: Diabetic retinopathy can worsen acutely during pregnancy, especially in patients with high HbA1c levels, hypertension, nephropathy, and active retinopathy. Laser therapy before conception is recommended for patients with preexisting retinopathy.

h. Autonomic neuropathy: Autonomic neuropathy generally does not worsen during pregnancy, except for a possible increase in the symptomatic severity of gastroparesis.

II. Hyperglycaemia:

a. Physiological changes: Insulin sensitivity increases in the first trimester but reverses in the second and third trimesters, leading to increased insulin requirements. Diabetic ketoacidosis (DKA) risk is elevated during pregnancy due to various factors.

b. DKA screening: Pregnant diabetic patients with vague symptoms like headache, nausea, vomiting, or fatigue should be screened for DKA using serum acetone or beta-hydroxybutyrate levels.

c. DKA treatment: The treatment of DKA during pregnancy is like non-pregnant patients. However, fluid resuscitation and insulin therapy should be continued in the presence of normoglycemia until bicarbonate levels return to normal. Foetal viability and well-being must be assessed during maternal DKA, as foetal mortality can be high.

III. Hypoglycaemia:

a. Risk periods: Hypoglycaemia risk is highest in the first trimester and peripartum period. In the first trimester, insulin needs decrease, and hormonal counter-regulation to hypoglycaemia is blunted. Some patients with gastroparesis may experience worsening of hyperemesis gravidarum (HG) due to hypoglycaemia. b. Impact of hypoglycaemia: Even subclinical hypoglycaemia can lead to low-birth-weight neonates, so maintaining tight glycaemic control within ideal ranges (90 to 120 mg/dl) is essential.

IV. Foetal Effects:

a. Congenital anomalies risk: Infants of diabetic mothers (IDMs) have a higher risk of congenital anomalies, particularly when maternal glycaemic control is poor. Macrosomia increases the risk of caesarean section and shoulder dystocia.

b. Placental complications: Preeclampsia and placental infarction due to vascular disease can impair foetal development and result in stillbirth.

c. Neonatal complications: IDMs are at an increased risk of neonatal complications, including transient tachypnoea of the newborn, neonatal hypoglycaemia, hypocalcaemia, hyperbilirubinemia, polycythaemia, cardiomyopathy, and respiratory distress due to foetal hyperinsulinemia. Elective delivery may be necessary in cases of poor metabolic control, significant diabetic complications, and suspected foetal macrosomia.

Obesity in Pregnancy:

I. Prevalence and Impact:

- **Increasing Incidence:** Obesity is on the rise and has become the most common medical condition among women of childbearing age.
- **Independent Risk Factor:** Obesity is an independent risk factor for adverse pregnancy outcomes, even in the absence of other comorbid conditions like diabetes, vascular disease, or hypertension.

II. Early Gestation:

- **Spontaneous Pregnancy Loss:** Obesity in early pregnancy is associated with an increased risk of spontaneous pregnancy loss and congenital anomalies.

III. Late Gestation:

- **Insulin Resistance:** Obese pregnant individuals often experience increased insulin resistance, leading to glucose intolerance and foetal overgrowth.
- **Risk of Caesarean Section:** At term, obesity is associated with a threefold increase in the risk of caesarean section. This increased risk is attributed to inadequate contraction patterns during labour, resulting in failure to progress. Obesity can independently affect myometrial activity and is compounded by foetal macrosomia.

IV. Peripartum and Postpartum:

- **Venous Thromboembolism:** Obese women have a significantly increased risk of venous thromboembolism (VTE) in the peripartum and postpartum periods.
- **Depression:** Obesity is associated with a higher risk of postpartum depression compared to nonobese individuals.

V. Neonatal Outcomes:

- **Infant Death:** Meta-analysis has demonstrated that obesity is an independent risk factor for infant death. The risk increases proportionally with higher body mass index (BMI).

- **Neonatal Asthma:** Obesity is also associated with an increased risk of neonatal asthma in offspring.

VI. Other Outcomes:

- **Postpartum Haemorrhage:** There is no significant correlation between obesity and postpartum haemorrhage requiring intervention.
- **Severe Maternal Morbidity/Mortality:** Obesity does not appear to be correlated with severe maternal morbidity or maternal mortality.
- **Spontaneous Preterm Delivery:** Obesity is not significantly associated with spontaneous preterm delivery before 32 weeks of gestation.

Thyroid Disorders in Pregnancy:

Hyperthyroidism:

- **Prevalence:** Hyperthyroidism affects less than 0.5% of all pregnancies, with approximately 85% of cases being due to Graves' disease.
- **Symptoms in Pregnancy:** The symptoms of worsening hyperthyroidism can mimic the normal physiological changes of pregnancy, making diagnosis challenging. In the first trimester, many women with Graves' disease experience transient exacerbation, with

improvement in later pregnancy. Postpartum exacerbation is also common.

- **Thyroid Storm:** This is the most severe manifestation of hyperthyroidism, often precipitated by stressors such as infection or delivery. It presents with fever, dysrhythmias, myocardial dysfunction, and circulatory collapse. Thyroid storm symptoms can be like those of eclampsia, necessitating thyroid function testing in eclamptic patients.
- **Complications:** Complications of hyperthyroidism in pregnancy include early (spontaneous abortion) and late (stillbirth) foetal loss, often due to placental abruption. Neonates of hyperthyroid mothers can develop transient hyperthyroidism.

Treatment of Hyperthyroidism:

- **Thyreostatic Drugs:** The primary treatment for hyperthyroidism consists of thyreostatic drugs. Propylthiouracil is recommended in the first trimester, while methimazole is used in the second and third trimesters.
- **Surgical Options:** Thyroidectomy may be considered in severe cases where antithyroid medication is not tolerated or is ineffective. Radioiodine treatment is contraindicated during pregnancy.
- **Supportive Care:** Beta blockade may be necessary to manage hemodynamic effects of sympathetic stimulation.
- **Iodide Use:** Iodide use is limited to severe cases due to foetal thyroid sensitivity, and therapy duration should be brief.

Graves' Disease and Offspring Risk:

- Graves' disease can put the foetus at risk for autoimmune-mediated thyroid dysfunction due to placental transfer of maternal thyroid-stimulating immunoglobulins. Up to 20% of neonates born to mothers with Graves' disease may have transient hyperthyroidism lasting 3 to 12 weeks, with various manifestations.

Hypothyroidism:

- **Prevalence:** Overt hypothyroidism is less common in pregnancy, often associated with infertility. Subclinical forms may also be seen, and subclinical hypothyroidism can become clinically apparent during pregnancy due to increased metabolic demands.
- **Optimizing Therapy:** Patients with hypothyroidism should have their treatment optimized before conception, with an increased dosage of levothyroxine often required during pregnancy, especially in the first trimester.
- **Complications:** Subclinical hypothyroidism during pregnancy is associated with a higher risk of gestational hypertension, premature rupture of membranes, intrauterine growth restriction, and low birth weight infants.

Adrenal Insufficiency:

- Addison's disease is the most common cause of adrenal insufficiency in pregnancy. Symptoms in early pregnancy may resemble

hyperemesis gravidarum. Complications are most significant in the third trimester when increased cortisol replacement is needed.

Electrolyte Abnormalities:

- **Hypercalcemia:** Primary hyperparathyroidism can lead to hypercalcemia in pregnant patients, often presenting as nephrolithiasis. New-onset nephrolithiasis in pregnancy should prompt screening for hypercalcemia. Maternal hyperparathyroidism can lead to neonatal hypocalcaemia, characterized by intrauterine growth restriction, low birth weight, and neonatal tetany.
- **Treatment:** Management of hyperparathyroidism in pregnancy is like that in non-pregnant individuals, with the exception that bisphosphonates are contraindicated during pregnancy.

Inflammatory Disorders in Pregnancy:

Inflammatory Autoimmune Diseases (IAIDs):

- IAIDs primarily affect women during their childbearing years.
- Pregnancy can influence the course of IAIDs, with some conditions improving (e.g., rheumatoid arthritis), remaining stable (e.g., Sjögren's syndrome), or worsening (e.g., systemic lupus erythematosus, or SLE).
- Active maternal disease during pregnancy is associated with adverse outcomes, emphasizing the importance of optimizing disease management before conception and during pregnancy.

Systemic Lupus Erythematosus (SLE):

- SLE is a common IAID associated with pregnancy emergencies.
- Maternal complications of SLE during pregnancy include lupus flares, hypertension (exacerbation of preexisting disease), nephritis, preeclampsia, and eclampsia.
- Lupus anticoagulant and antiphospholipid antibodies are markers of disease activity and predictors of adverse pregnancy outcomes.
- Optimal pre-pregnancy disease management and low-dose aspirin therapy before 16 weeks' gestation have reduced rates of SLE-associated preeclampsia and eclampsia.
- Cerebral venous sinus thrombosis is a neurological complication of SLE in pregnancy, often associated with antiphospholipid antibodies.
- Antiphospholipid syndrome (APS) can lead to deep vessel clotting during pregnancy and pregnancy-related morbidity, with confirmatory laboratory tests.
- APS may manifest as deep venous thrombosis (DVT) and, rarely, catastrophic APS (CAPS) with multiorgan dysfunction.
- Adverse pregnancy outcomes related to IAIDs include foetal death, neonatal death, preterm delivery, and small-for-gestational-age (SGA) neonates.
- Baseline predictors of adverse outcomes in lupus-related pregnancies include lupus anticoagulant presence, antihypertensive use, elevated Pregnancy Disease Activity Index score, and low platelet count.
- Corticosteroids are the primary therapy for rheumatologic complications or exacerbations during pregnancy.

- Aspirin is recommended for lupus-related pregnancies after 16 weeks' gestational age, and other nonsteroidal anti-inflammatory drugs (NSAIDs) can be useful for inflammatory flares.
- Cytotoxic agents like cyclophosphamide and methotrexate are teratogenic and abortifacient and should be avoided during pregnancy, particularly in the first trimester. Azathioprine is a better-tolerated cytotoxic agent in pregnancy.

Inflammatory autoimmune diseases during pregnancy require careful monitoring, optimized treatment strategies, and a multidisciplinary approach to minimize complications and ensure favourable maternal and foetal outcomes.

Psychiatric Disorders in Pregnancy:

Schizophrenia, Bipolar Disorder, and Depression:

- Both schizophrenia and bipolar disorder require continuous medication management during pregnancy to prevent relapse, as abrupt discontinuation can lead to high relapse rates.
- Untreated bipolar disorder and schizophrenia are independent risk factors for congenital malformations.
- Polypharmacy should be avoided in pregnant individuals with these disorders, and treatment with second-generation antipsychotics is

recommended, aiming to control symptoms with the lowest effective dose.

- Depression and anxiety during pregnancy are associated with adverse outcomes, including preeclampsia, instrument-assisted delivery, and emergency C-section.
- Neonatal outcomes of maternal depression can include low birth weight, preterm delivery, and long-term effects on the child's neurodevelopment.

Eating Disorders:

- Eating disorders, such as anorexia nervosa (AN) and bulimia nervosa (BN), can complicate pregnancy, with a 7% prevalence of eating disorders in pregnant individuals.
- Pregnancy may trigger subclinical eating disorders or exacerbate remitted conditions due to body image and weight concerns.
- Adverse pregnancy outcomes related to eating disorders include miscarriage, low birth weight, preterm birth, congenital malformations, and an increased likelihood of caesarean section.
- Mothers with a history of eating disorders have an increased risk of postpartum depression.

Substance Dependence/Use Disorder:

- The prevalence of substance use disorder in pregnancy is rising, with significant societal and personal costs.

- The impact of substance use on pregnancy depends on specific factors, including the type of substance used, gestational timing, duration, dosing, and maternal comorbid conditions.
- Substance use disorder often co-occurs with psychiatric conditions, such as depression and psychosis.
- Alcohol use during pregnancy is linked to a range of adverse outcomes, including low birth weight, miscarriage, developmental delay, and foetal alcohol spectrum disorders.
- Smoking during pregnancy can lead to complications such as miscarriage, intrauterine foetal demise, preterm birth, and sudden infant death syndrome (SIDS).
- Cannabis use during pregnancy is associated with neonatal tremulousness, exaggerated startle responses, and high-pitched cries.
- Cocaine and methamphetamine use in pregnancy increase the risk of adverse outcomes, including IUGR, preterm birth, preeclampsia, and more.
- Opioid use in pregnancy has been increasing and can result in neonatal opioid withdrawal syndrome (NOWS), characterized by withdrawal symptoms in infants.
- Neonates with NOWS often require admission to neonatal intensive care units.

Pregnant individuals with psychiatric disorders and substance use disorders require comprehensive care and support to minimize risks to both maternal and foetal health. Treatment should be individualized, and a multidisciplinary approach is often necessary to ensure the best outcomes.

Drug Therapy in Pregnancy

Objective: To provide guidelines for the safe and effective use of medications during pregnancy while minimizing potential risks to both the mother and foetus.

I. Introduction

1. Pregnancy Medication Use:
    - More than 90% of women use medications during pregnancy.
    - Medication use during pregnancy has increased in recent decades.
2. Importance of Pregnancy Medication Management:
    - Limited research on medication safety during pregnancy.
    - Foetal age at exposure is crucial for assessing risks.
    - Major birth defects affect a small percentage of live births.
    - Teratogens can disrupt conceptus development.

II. Classification of Teratogenic Risk

1. FDA Pregnancy and Lactation Labelling Rule (PLLR):
    - Removed letter categories (A, B, C, D, and X).
    - Requires detailed risk information in drug labelling.
    - Updated labels as new data become available.
2. Clinical Teratology Resources:

- Utilize resources such as Clinical Pharmacology, TERIS, and Micromedex Reprotox for risk assessment.

III. Drug Transfer Across the Placenta

1. Factors Affecting Drug Transfer:
    - Molecular size, ionic state, lipid solubility, and protein binding.
    - Drugs with a molecular mass < 5 kDa diffuse more readily.
    - Anionic substances diffuse more readily than ionized forms.
2. Foetal Exposure:
    - Foetal pH is slightly more alkalotic than maternal pH.
    - Weak organic acids may become ion-trapped in the foetal circulation.

IV. Drug Transfer During Lactation

1. Factors Affecting Drug Transfer:
    - Lipid-soluble and non-ionic substances diffuse more readily.
    - Highly protein-bound substances diffuse less readily.
2. Neonatal Safety:
    - Most drugs in breast milk are detoxified by neonates.
    - Only a few drugs pose serious dangers to breast-feeding infants.

V. Drug Therapy During Pregnancy

1. Foetal Health and Maternal Medication:
    - The health of the foetus is linked to the health of the mother.

- Lifesaving medications should not be withheld from pregnant patients.
- Resuscitation should follow advanced life support guidelines.

2. Medication Prescribing Considerations:
    - Benefits vs. Risks:
        - Prescribe medications when maternal benefits outweigh foetal risks.
    - Selection:
        - Choose drugs with the lowest known toxicity.
        - Use the lowest effective dose.
3. Examples of Medications to be Cautious with During Pregnancy:
    - Anticonvulsants
    - Warfarin derivatives
    - NSAIDs
    - Sulphonamides
    - Fluoroquinolones
    - ACE inhibitors

VI. Conclusion

- Medication management during pregnancy requires careful consideration of benefits and risks.
- Healthcare providers should stay updated with the latest information on drug safety in pregnancy.
- Individual patient assessment and counselling are essential for making informed decisions.

Analgesic Medications Use During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of analgesic medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Pregnancy and Medication Use:**
    - Over 90% of pregnant women may require analgesic medications at some point.
    - Medication safety during pregnancy is a crucial concern.
2. **Breastfeeding and Medication Transfer:**
    - Some analgesic medications can be excreted into breast milk.
    - Evaluate the risks associated with breastfeeding while using these medications.

II. Analgesic Medications

For each medication, assess compatibility, potential risks, and recommended actions.

A. Acetaminophen

- **Breastfeeding Compatibility:** Compatible, excreted in breast milk.

- **Clinical Risk Summary:** Studies suggest an increased risk of neurodevelopmental problems such as attention-deficit/hyperactivity (hyperkinetic disorder), cryptorchidism, and childhood asthma/wheezing.
- **Recommended Actions:** Consider alternative pain relief options if possible. Monitor infants for potential adverse effects.

B. Ibuprofen

- **Breastfeeding Compatibility:** Compatible, excreted in breast milk.
- **Clinical Risk Summary:** Increased risk of spontaneous abortion at the time of conception, association with structural cardiac defects, and gastroschisis. Risk in the third trimester of premature closure of the ductus arteriosus and subsequent primary pulmonary hypertension. Potential increased risk of asthma with use in pregnancy.
- **Recommended Actions:** Use with caution during pregnancy, especially in the third trimester. Evaluate the risk-benefit ratio for each patient.

C. Aspirin

- **Breastfeeding Compatibility:** Potential toxicity, excreted in breast milk.
- **Clinical Risk Summary:** Increased risk of spontaneous abortion at the time of conception. Avoid chronic or high doses in pregnancy. High doses may increase perinatal mortality, teratogenic effects, and risk of gastroschisis in the first trimester. Increased risk of intrauterine

growth restriction (IUGR) and foetal and maternal haemorrhage in the third trimester. Risk of premature closure of the ductus arteriosus and subsequent primary pulmonary hypertension.

- **Recommended Actions:** Minimize aspirin use during pregnancy, especially during the first and third trimesters. Weigh potential risks and benefits carefully.

D. Codeine

- **Breastfeeding Compatibility:** Potential toxicity, excreted in breast milk, metabolized to morphine.
- **Clinical Risk Summary:** Congenital malformation data in humans are inconsistent. Avoid prolonged use or high doses near term. Infants may develop respiratory depression and/or withdrawal symptoms (neonatal abstinence syndrome).
- **Recommended Actions:** Use codeine with caution during pregnancy. Monitor newborns for potential adverse effects, especially if the mother has used codeine during pregnancy.

E. Oxycodone

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Use during organogenesis associated with a low absolute risk of congenital birth defects. May result in preterm birth, poor foetal outcomes, and neonatal opioid withdrawal syndrome (NOWS).

- **Recommended Actions:** Use oxycodone with caution during pregnancy, especially during organogenesis. Weigh the potential risks and benefits for each patient.

F. Morphine

- **Breastfeeding Compatibility:** Potential toxicity, usually compatible for short-term use.
- **Clinical Risk Summary:** Use during organogenesis associated with a low risk of congenital birth defects. May result in preterm birth and poor foetal outcomes. Prolonged maternal use during pregnancy may result in neonatal opioid withdrawal syndrome (NOWS).
- **Recommended Actions:** Use morphine with caution during pregnancy, particularly during organogenesis. Monitor newborns for potential adverse effects.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique situation and medical history.
- **Risk-Benefit Analysis:** Weigh the potential benefits of pain relief against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Monitor infants for potential adverse effects when mothers use medications during breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding analgesic medication use during pregnancy and breastfeeding.

Rapid Sequence Intubation Medications Use During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of rapid sequence intubation (RSI) medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Rapid Sequence Intubation (RSI) Medications:**
    - Essential for securing the airway in emergency situations.
    - Safety and risks of medication use during pregnancy are critical concerns.
2. **Breastfeeding and Medication Transfer:**
    - Evaluate potential transfer of medications into breast milk.
    - Assess risks associated with breastfeeding while using these medications.

II. RSI Medications

For each medication, assess compatibility, potential risks, and recommended actions.

A. Fentanyl

- **Breastfeeding Compatibility:** Compatible; may cause sedation or respiratory depression.

- **Clinical Risk Summary:** Associated with congenital birth defects. May cause neonatal respiratory depression, transient neonatal muscular rigidity, and neonatal opioid withdrawal syndrome (NOWS).
- **Recommended Actions:** Use with caution during pregnancy, especially during the first trimester. Monitor neonates for potential adverse effects if exposed to fentanyl.

B. Etomidate

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Animal studies show no teratogenicity. Transient decrease in newborn cortisol levels of unknown clinical significance. LHS when used as an induction agent.
- **Recommended Actions:** Consider etomidate as a suitable induction agent during pregnancy. Monitor maternal and neonatal conditions.

C. Propofol

- **Breastfeeding Compatibility:** Probably compatible, but not recommended.
- **Clinical Risk Summary:** Animal studies show no malformations. Limited human studies, especially in the first and second trimesters. Use at term appears to be safe, but high doses may be associated with neonatal central nervous system (CNS) and respiratory depression.
- **Recommended Actions:** Use propofol cautiously during pregnancy, especially during the first and second trimesters. Assess the risk-benefit ratio and consider alternatives.

D. Thiopental

- **Breastfeeding Compatibility:** Probably compatible; use with caution.
- **Clinical Risk Summary:** Animal studies show no congenital defects, even with high doses. May cause respiratory depression. LHS.
- **Recommended Actions:** Use thiopental with caution during pregnancy, monitoring maternal and foetal conditions.

E. Ketamine

- **Breastfeeding Compatibility:** Probably compatible; plasma levels undetectable after 12 hours.
- **Clinical Risk Summary:** Frequently used in obstetrics; not associated with foetal developmental malformations. Dose-dependent oxytocic effect. High doses (>2 mg/kg) associated with uterine tetany. May affect maternal blood pressure, heart rate, neonatal muscle tone, or cause apnoea and depression in the newborn, usually dose related.
- **Recommended Actions:** Consider ketamine for induction in obstetric emergencies. Monitor maternal and neonatal conditions closely.

F. Midazolam

- **Breastfeeding Compatibility:** Use with caution; avoid with other CNS depressants.
- **Clinical Risk Summary:** Animal studies show no congenital effects, even with high doses. Limited human data, especially in the first and

second trimesters. Use near term may result in adverse neonatal neurobehavior and neonatal respiratory depression.

- **Recommended Actions:** Use midazolam cautiously during pregnancy, especially in the first and second trimesters. Assess maternal and neonatal outcomes.

G. Succinylcholine

- **Breastfeeding Compatibility:** Probably compatible because of rapid hydrolysis.
- **Clinical Risk Summary:** Not embryotoxic or teratogenic in animals. May result in neonatal apnoea and partial or complete newborn paralysis in neonates with pseudocholinesterase deficiency.
- **Recommended Actions:** Consider succinylcholine for rapid sequence intubation, especially in emergencies. Monitor neonates for potential adverse effects.

H. Rocuronium

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited human data, but animal data suggest low risk. Potential complication of newborn neuromuscular blockade, although probably rare. May have prolonged blockade when used with magnesium.
- **Recommended Actions:** Use rocuronium cautiously during pregnancy. Monitor neonatal conditions, especially in the case of prolonged blockade.

I. Vecuronium

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited human data. Use late in gestation appears to carry little if any risk to the newborn. Use lower doses if administering magnesium sulphate.
- **Recommended Actions:** Consider vecuronium as an option, especially late in gestation. Monitor maternal and neonatal conditions.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique situation, medical history, and the urgency of the situation.
- **Risk-Benefit Analysis:** Weigh the potential benefits of securing the airway against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and neonatal conditions when using RSI medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding RSI medication use during pregnancy and breastfeeding.

Anticoagulant and Thrombolytic Medications Use During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of anticoagulant and thrombolytic medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Anticoagulant and Thrombolytic Medications:**
    - Essential for managing thrombotic disorders during pregnancy.
    - Safety and risks of medication use during pregnancy and breastfeeding are critical concerns.
2. **Breastfeeding and Medication Transfer:**
    - Evaluate potential transfer of medications into breast milk.
    - Assess risks associated with breastfeeding while using these medications.

II. Anticoagulant Medications

For each medication, assess compatibility, potential risks, and recommended actions.

A. Warfarin

- **Breastfeeding Compatibility:** Compatible; caution advised when breastfeeding premature infants due to an increased risk of intraventricular haemorrhage.

- **Clinical Risk Summary:** Known dose-dependent teratogen affecting 4%–5% of exposed foetuses. Greatest risk at gestational weeks 6–9. Associated with foetal warfarin syndrome, including various congenital abnormalities. Also associated with foetal osteogenesis, CNS malformations, intraventricular haemorrhage, stillbirths, and spontaneous abortions.
- **Recommended Actions:** Use with caution during pregnancy, especially during the first trimester. Assess the risk-benefit ratio and consider alternative anticoagulant therapies.

B. Heparin (UFH)

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Associated with maternal osteopenia, immune-mediated thrombocytopenia, maternal haemorrhage at delivery, requiring careful monitoring. Reduced bioavailability, shorter half-life, lower peak plasma concentrations during pregnancy. Risk of antepartum bleeding is approximately 1%.
- **Recommended Actions:** Consider heparin therapy during pregnancy, especially in cases of thrombotic disorders. Monitor maternal and foetal conditions closely.

C. Low-Molecular-Weight Heparin

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Lower risk of osteoporosis compared to UFH. Reduced bioavailability, shorter half-life, lower peak plasma concentrations during pregnancy. Lower rate of bleeding and

heparin-induced thrombocytopenia (HIT) compared to heparin. Recommended over UFH for venous thromboembolism (VTE).

- **Recommended Actions:** Consider low-molecular-weight heparin as a preferred option for managing thrombotic disorders during pregnancy. Monitor maternal and foetal conditions closely.

III. Thrombolytic Medications

For each medication, assess compatibility, potential risks, and recommended actions.

A. Alteplase

- **Breastfeeding Compatibility:** Compatible; unknown if excreted in breast milk.
- **Clinical Risk Summary:** Embryocidal but not teratogenic in animal studies. Limited human data but use if benefits to the mother outweigh risks. Has been used in human pregnancy with normal foetal outcomes. Risk of haemorrhage at any time in gestation.
- **Recommended Actions:** Use with caution during pregnancy when indicated for thrombolysis. Assess the risk-benefit ratio for each patient.

B. Streptokinase

- **Breastfeeding Compatibility:** Use with caution; unknown safety.
- **Clinical Risk Summary:** Use with caution during pregnancy, as it is excreted in minimal amounts in breast milk. No foetal abnormalities

reported in animal studies. Anti-streptokinase antibodies cross the placenta.

- **Recommended Actions:** Consider streptokinase with caution, when necessary, with careful monitoring during pregnancy.

C. Reteplase

- **Breastfeeding Compatibility:** Probably compatible; use with caution; unknown if excreted in breast milk.
- **Clinical Risk Summary:** Limited data available. Potential risk of bleeding during labour and delivery. No teratogenicity in animals.
- **Recommended Actions:** Use reteplase cautiously during pregnancy when indicated. Monitor maternal and foetal conditions.

D. Tenecteplase

- **Breastfeeding Compatibility:** Hold breastfeeding; unknown safety.
- **Clinical Risk Summary:** Limited data available. Unknown if excreted in breast milk. Potential risk of bleeding during labour and delivery. Toxicity to the mother in animal studies.
- **Recommended Actions:** Avoid Tenecteplase during pregnancy. Consider alternative treatments. Monitor maternal condition closely if used.

E. Urokinase

- **Breastfeeding Compatibility:** Probably compatible; unknown if excreted in breast milk.

- **Clinical Risk Summary:** Probably acceptable in pregnancy. Not fetotoxic or teratogenic in animal studies. Unknown if excreted in breast milk. Placental haemorrhage and separation may occur. Increased risk of bleeding.
- **Recommended Actions:** Consider urokinase with caution during pregnancy when indicated. Monitor maternal and foetal conditions closely.

IV. Conclusion

- **Individualized Approach:** Assess each patient's unique situation, medical history, and the urgency of the situation.
- **Risk-Benefit Analysis:** Weigh the potential benefits of thrombolytic and anticoagulant therapies against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and foetal conditions when using these medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding anticoagulant and thrombolytic medication use during pregnancy and breastfeeding.

Antidote Use During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of antidotes during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Antidotes:**
    - Essential for reversing the toxic effects of various substances.
    - Safety and risks of antidote use during pregnancy are critical concerns.
2. **Breastfeeding and Medication Transfer:**
    - Evaluate potential transfer of antidotes into breast milk.
    - Assess risks associated with breastfeeding while using these antidotes.

II. Antidotes

For each antidote, assess compatibility, potential risks, and recommended actions.

A. N-Acetylcysteine

- **Breastfeeding Compatibility:** Probably compatible; unknown if excreted in milk so consider waiting 30 hours for elimination.
- **Clinical Risk Summary:** Not teratogenic or embryotoxic in animal studies. Limited human studies, but no adverse foetal outcome when

administered intravenously as an antidote in acetaminophen overdose.

- **Recommended Actions:** Consider N-acetylcysteine, when necessary, especially in overdose situations. Monitor maternal and infant conditions.

B. Deferoxamine

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited human data, but no adverse toxic or teratogenic effects seen. Animal studies show delayed ossification and skeletal anomalies.
- **Recommended Actions:** Consider deferoxamine when necessary for iron poisoning. Monitor maternal and infant conditions.

C. Digoxin Immune Fragment

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited data available, but no adverse outcomes in the foetus or newborn reported.
- **Recommended Actions:** Consider digoxin immune fragment when necessary to reverse digoxin toxicity. Monitor maternal and infant conditions.

D. Dimercaprol

- **Breastfeeding Compatibility:** Contraindicated.

- **Clinical Risk Summary:** Animal studies show teratogenicity. Safety in pregnancy unknown. Chelates essential elements, including zinc, copper, and iron, which may alter foetal development.
- **Recommended Actions:** Avoid dimercaprol during pregnancy and breastfeeding.

E. Flumazenil

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited data available, but animal studies show no teratogenicity or impaired fertility.
- **Recommended Actions:** Consider flumazenil when necessary to reverse benzodiazepine overdose. Monitor maternal and infant conditions.

F. Fomepizole

- **Breastfeeding Compatibility:** Hold breastfeeding.
- **Clinical Risk Summary:** No animal or human studies available. Safety unknown.
- **Recommended Actions:** Avoid fomepizole during breastfeeding. Consider alternative treatments.

G. Hydroxocobalamin

- **Breastfeeding Compatibility:** Probably compatible but monitoring of the infant is recommended.
- **Clinical Risk Summary:** Animal studies showed no teratogenicity. Limited human data, but safety is unknown.

- **Recommended Actions:** Consider hydroxocobalamin when necessary for cyanide poisoning. Monitor maternal and infant conditions.

H. Methylene Blue

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Epidemiologic evidence of teratogenicity. Diagnostic intraamniotic injection resulted in haemolytic anaemia, hyperbilirubinemia, methemoglobinemia, and jejuno-ileal atresia's.
- **Recommended Actions:** Consider methylene blue with caution when necessary. Monitor maternal and infant conditions.

I. Naloxone

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Limited human studies, but animal studies show no teratogenicity. No adverse foetal outcomes in human studies.
- **Recommended Actions:** Consider naloxone when necessary to reverse opioid overdose. Monitor maternal and infant conditions.

J. Physostigmine

- **Breastfeeding Compatibility:** Probably compatible but safety is unknown.
- **Clinical Risk Summary:** Rarely used in pregnancy, and no reports link it with teratogenicity. Safety is unknown.

- **Recommended Actions:** Consider physostigmine with caution when necessary and monitor maternal and infant conditions.

K. Pralidoxime

- **Breastfeeding Compatibility:** Hold breastfeeding for 6 to 7 hours after the dose.
- **Clinical Risk Summary:** Rarely used in pregnancy, and safety is unknown. Limited human case reports with no adverse outcomes.
- **Recommended Actions:** Avoid pralidoxime during breastfeeding. Consider alternative treatments.

L. Pyridoxine

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** High doses appear to pose little risk to the foetus. No increased risk of malformations reported in the first trimester in human trials.
- **Recommended Actions:** Consider pyridoxine, when necessary, especially for the treatment of isoniazid toxicity. Monitor maternal and infant conditions.

M. Succimer

- **Breastfeeding Compatibility:** Contraindicated.
- **Clinical Risk Summary:** Teratogenic and fetotoxic in animals. Avoidance in the first trimester is recommended for pregnant women unless severe symptoms are present.

- **Recommended Actions:** Avoid succimer during pregnancy and breastfeeding.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique situation, medical history, and the urgency of the situation.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using antidotes against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and infant conditions when using antidotes during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding antidote use during pregnancy and breastfeeding.

Use of Anti-Infective Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of anti-infective medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Anti-Infective Medications:**
    - Essential for the treatment of infections during pregnancy and postpartum.
    - Safety and risks of anti-infective medication use during pregnancy and breastfeeding are critical concerns.
2. **Breastfeeding and Medication Transfer:**
    - Evaluate potential transfer of anti-infective medications into breast milk.
    - Assess risks associated with breastfeeding while using these medications.

II. Anti-Infective Medications

For each type of anti-infective medication, assess compatibility, potential risks, and recommended actions.

A. Aminoglycosides

- **Breastfeeding Compatibility:** Probably compatible; excreted in breast milk; oral absorption is poor.
- **Clinical Risk Summary:** No definable structural risk of any aminoglycoside when exposed in utero. Some potential ototoxicity with streptomycin.
- **Recommended Actions:** Consider aminoglycosides when necessary. Monitor maternal and infant conditions.

B. Cephalosporins

- **Breastfeeding Compatibility:** Generally compatible; some cephalosporins are excreted into breast milk.
- **Clinical Risk Summary:** First- to fourth generation cephalosporins appear safe during pregnancy, although no controlled studies exist. Possible interference with culture results in neonatal sepsis evaluation.
- **Recommended Actions:** Consider cephalosporins when necessary. Monitor maternal and infant conditions.

C. Chloramphenicol

- **Breastfeeding Compatibility:** Potential toxicity (limited human studies); excreted in breast milk.
- **Clinical Risk Summary:** May cause "Gray baby syndrome" at birth. Not recommended during lactation.
- **Recommended Actions:** Avoid chloramphenicol during pregnancy and breastfeeding.

D. Clindamycin

- **Breastfeeding Compatibility:** Compatible; excreted in breast milk.
- **Clinical Risk Summary:** No reports of foetal toxicity or malformations.
- **Recommended Actions:** Consider clindamycin when necessary. Monitor maternal and infant conditions.

E. Fluoroquinolones

- **Breastfeeding Compatibility:** Compatible; excreted in breast milk.
- **Clinical Risk Summary:** Caution during the first trimester due to a potential risk of cardiac defects. Few reports of arthrotoxicity.
- **Recommended Actions:** Use fluoroquinolones with caution when necessary. Monitor maternal and infant conditions.

F. Linezolid

- **Breastfeeding Compatibility:** Potential toxicity (limited human studies); excreted in breast milk.
- **Clinical Risk Summary:** No studies in pregnancy. Use with caution.
- **Recommended Actions:** Consider linezolid with caution when necessary. Monitor maternal and infant conditions.

G. Macrolides

- **Breastfeeding Compatibility:** Compatible; excreted in low concentrations in breast milk.
- **Clinical Risk Summary:** No risk of congenital heart malformations or pyloric stenosis, but erythromycin use in infancy associated with pyloric stenosis.
- **Recommended Actions:** Consider macrolides when necessary. Monitor maternal and infant conditions.

H. Metronidazole

- **Breastfeeding Compatibility:** Compatible; excreted in breast milk. AAP recommends cessation of breastfeeding during use.

- **Clinical Risk Summary:** In vitro mutagen; no human teratogenicity.
- **Recommended Actions:** Consider metronidazole when necessary. Monitor maternal and infant conditions.

I. Nitrofurantoin

- **Breastfeeding Compatibility:** Compatible; caution advised with G6PD deficiency.
- **Clinical Risk Summary:** Limit use in later pregnancy. Potential for haemolytic anaemia in G6PD-deficient individuals.
- **Recommended Actions:** Consider nitrofurantoin with caution when necessary. Monitor maternal and infant conditions.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique situation, medical history, and the urgency of the infection.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using anti-infective medications against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and infant conditions when using anti-infective medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding anti-infective medication use during pregnancy and breastfeeding.

Antidysrhythmic Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of antidysrhythmic medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Antidysrhythmic Medications:**
    - Vital for managing cardiac arrhythmias during pregnancy and postpartum.
    - Consideration of safety and risks of antidysrhythmic medication use during pregnancy and breastfeeding is crucial.
2. **Breastfeeding and Medication Transfer:**
    - Assess potential transfer of antidysrhythmic medications into breast milk.
    - Evaluate risks associated with breastfeeding while using these medications.

II. Antidysrhythmic Medications

For each type of antidysrhythmic medication, assess compatibility, potential risks, and recommended actions.

A. Adenosine

- **Breastfeeding Compatibility:** Compatible; many reports show compatibility during pregnancy.
- **Clinical Risk Summary:** Limited human studies, but teratogenicity or malformations not expected.
- **Recommended Actions:** Consider adenosine when necessary. Monitor maternal and infant conditions.

B. Amiodarone

- **Breastfeeding Compatibility:** Contraindicated; excreted in breast milk.
- **Clinical Risk Summary:** Linked to congenital abnormalities and hypothyroidism. Use only in refractory tachydysrhythmias.
- **Recommended Actions:** Avoid amiodarone during pregnancy and breastfeeding.

C. Digoxin

- **Breastfeeding Compatibility:** Compatible; excreted in breast milk.
- **Clinical Risk Summary:** Generally considered one of the safest antiarrhythmics during pregnancy.
- **Recommended Actions:** Consider digoxin when necessary. Monitor maternal and infant conditions.

D. Quinidine

- **Breastfeeding Compatibility:** Probably compatible (limited human studies); excreted in breast milk.

- **Clinical Risk Summary:** No reported teratogenic effects in humans.
- **Recommended Actions:** Consider quinidine with caution when necessary. Monitor maternal and infant conditions.

E. Lidocaine

- **Breastfeeding Compatibility:** Compatible; excreted in breast milk.
- **Clinical Risk Summary:** Animal studies show no harm. High doses near term associated with neonatal CNS depression.
- **Recommended Actions:** Consider lidocaine when necessary. Monitor maternal and infant conditions.

F. Procainamide

- **Breastfeeding Compatibility:** Probably compatible (limited human studies); excreted in breast milk.
- **Clinical Risk Summary:** Limited human studies.
- **Recommended Actions:** Consider procainamide with caution when necessary. Monitor maternal and infant conditions.

G. Flecainide

- **Breastfeeding Compatibility:** Compatible; concentrated in breast milk.
- **Clinical Risk Summary:** Limited human studies; animal data suggest possible teratogenicity.
- **Recommended Actions:** Consider flecainide when necessary. Monitor maternal and infant conditions.

H. Ibutilide

- **Breastfeeding Compatibility:** Probably compatible (limited human studies).
- **Clinical Risk Summary:** Limited human studies; animal studies show teratogenicity and Embryocidal events.
- **Recommended Actions:** Consider Ibutilide with caution when necessary. Monitor maternal and infant conditions.

I. Sotalol

- **Breastfeeding Compatibility:** Potential toxicity (limited human studies); concentrated in breast milk. Conflicting reports.
- **Clinical Risk Summary:** May cause foetal bradycardia and/or intrauterine growth restriction.
- **Recommended Actions:** Consider sotalol with caution when necessary. Monitor maternal and infant conditions.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique medical history, cardiac condition, and the urgency of arrhythmia management.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using antidysrhythmic medications against the risks of medication use during pregnancy and breastfeeding.

- **Close Monitoring:** Continuously monitor maternal and infant conditions when using antidysrhythmic medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding antidysrhythmic medication use during pregnancy and breastfeeding.

Antihypertensive Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of antihypertensive medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Antihypertensive Medications:**
    - Crucial for managing hypertension during pregnancy and postpartum.
    - Consideration of safety and risks of antihypertensive medication use during pregnancy and breastfeeding is vital.
2. **Breastfeeding and Medication Transfer:**
    - Assess potential transfer of antihypertensive medications into breast milk.

- Evaluate risks associated with breastfeeding while using these medications.

II. Antihypertensive Medications

For each type of antihypertensive medication, assess compatibility, potential risks, and recommended actions.

A. Angiotensin-Converting Enzyme Inhibitors and Angiotensin II Receptor Antagonists

- **Breastfeeding Compatibility:** Probably compatible, but variable safety.
- **Clinical Risk Summary:** Use in second and third trimesters may cause teratogenicity, severe foetal/neonatal toxicity, and associated complications.
- **Recommended Actions:** Avoid during pregnancy. Caution during breastfeeding. Monitor maternal and infant conditions.

B. Esmolol

- **Breastfeeding Compatibility:** Safety unknown.
- **Clinical Risk Summary:** Appears to be low risk. Not thought to cause structural anomalies.
- **Recommended Actions:** Consider esmolol when necessary, during pregnancy. Monitor maternal and infant conditions.

C. Labetalol

- **Breastfeeding Compatibility:** Probably compatible. Low excretion in breast milk.
- **Clinical Risk Summary:** Little risk to the foetus except possibly in the first trimester.
- **Recommended Actions:** Consider labetalol when necessary. Monitor maternal and infant conditions, especially near delivery.

D. Metoprolol

- **Breastfeeding Compatibility:** Conflicting reports. Concern for toxicity.
- **Clinical Risk Summary:** Excreted in breast milk. May cause intrauterine growth restriction (IUGR) and persistent beta blockade in newborns.
- **Recommended Actions:** Consider metoprolol with caution when necessary. Monitor maternal and infant conditions.

E. Propranolol

- **Breastfeeding Compatibility:** Conflicting reports. Concern for toxicity.
- **Clinical Risk Summary:** Crosses placenta. Foetal and neonatal toxicity may occur.
- **Recommended Actions:** Consider propranolol with caution when necessary. Monitor maternal and infant conditions.

F. Amlodipine

- **Breastfeeding Compatibility:** Probably compatible, but safety unknown.
- **Clinical Risk Summary:** Neonatal myocardium sensitive to changes in calcium status. Caution during breastfeeding.
- **Recommended Actions:** Use with caution during breastfeeding. Monitor maternal and infant conditions.

G. Diltiazem

- **Breastfeeding Compatibility:** Probably compatible, but safety unknown.
- **Clinical Risk Summary:** Neonatal myocardium sensitive to changes in calcium status. Caution during breastfeeding.
- **Recommended Actions:** Use with caution during breastfeeding. Monitor maternal and infant conditions.

H. Nicardipine

- **Breastfeeding Compatibility:** Probably compatible but safety unknown.
- **Clinical Risk Summary:** Dose-related embryonic toxicity but not teratogenicity in animals. Caution advised during breastfeeding.
- **Recommended Actions:** Use with caution during breastfeeding. Monitor maternal and infant conditions.

I. Nifedipine

- **Breastfeeding Compatibility:** Probably compatible but safety unknown.
- **Clinical Risk Summary:** Safety unknown; advised to delay breastfeeding for 3-4 hours.
- **Recommended Actions:** Use with caution during breastfeeding. Monitor maternal and infant conditions.

J. Verapamil

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Crosses placenta. Animal studies show adverse effects on foetal growth.
- **Recommended Actions:** Use with caution during any stage of pregnancy. Monitor maternal and infant conditions.

III. Conclusion

- **Individualized Approach:** Assess each patient's unique medical history, hypertension severity, and the urgency of treatment.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using antihypertensive medications against the risks of medication use during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and infant conditions when using antihypertensive medications during pregnancy and breastfeeding.

- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding antihypertensive medication use during pregnancy and breastfeeding.

Vasopressors, Diabetic Medications, and Thyroid Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of vasopressors, diabetic medications, and thyroid medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Vasopressors, Diabetic Medications, and Thyroid Medications:**
    - Crucial for managing various medical conditions during pregnancy and postpartum.
    - Consideration of safety and risks of medication use during pregnancy and breastfeeding is vital.
2. **Breastfeeding and Medication Transfer:**
    - Assess potential transfer of medications into breast milk.

- Evaluate risks associated with breastfeeding while using these medications.

II. Vasopressors

Assess compatibility, potential risks, and recommended actions for vasopressor medications.

A. Dobutamine

- **Breastfeeding Compatibility:** Probably compatible (Limited Human Studies).
- **Clinical Risk Summary:** Low risk based on animal studies; no adverse effects on human foetuses found.
- **Recommended Actions:** Consider dobutamine when necessary, during pregnancy. Monitor maternal and foetal conditions.

B. Dopamine

- **Breastfeeding Compatibility:** Probably compatible (Limited Human Studies).
- **Clinical Risk Summary:** Low-dose dopamine can be used for specific conditions; animal studies suggest maternal toxicity, but no foetal teratogenicity found.
- **Recommended Actions:** Use with caution when necessary, during pregnancy. Monitor maternal and foetal conditions.

C. Epinephrine

- **Breastfeeding Compatibility:** Potential toxicity (Limited Human Studies).
- **Clinical Risk Summary:** Preferred treatment agent for specific conditions; associated with foetal anoxic injury and other complications.
- **Recommended Actions:** Consider epinephrine when necessary, during pregnancy. Monitor maternal and foetal conditions closely.

D. Norepinephrine

- **Breastfeeding Compatibility:** Potential toxicity (Limited Human Studies).
- **Clinical Risk Summary:** Animal studies demonstrate malformation; decreased placental flow and foetal anoxia, but overall effects unknown.
- **Recommended Actions:** Use with caution when necessary, during pregnancy. Monitor maternal and foetal conditions.

E. Ephedrine

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Effective in treatment but associated with specific side effects.
- **Recommended Actions:** Use with caution when necessary, during pregnancy. Monitor maternal and foetal conditions.

F. Phenylephrine

- **Breastfeeding Compatibility:** Probably compatible (Limited Human Studies).
- **Clinical Risk Summary:** Preferred agent for specific conditions; malformations when used in the first trimester; potential risks during late pregnancy.
- **Recommended Actions:** Use with caution when necessary during pregnancy. Monitor maternal and foetal conditions closely.

III. Diabetic Medications

Assess compatibility, potential risks, and recommended actions for diabetic medications.

A. Insulin

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Maternal hypoglycaemia may occur, but no observable effects on the infant.
- **Recommended Actions:** Continue insulin therapy during pregnancy as needed. Monitor maternal and neonatal glucose levels.

B. Sulfonylureas

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Minimal amounts found in foetal circulation. No greater risk of adverse effects compared with insulin therapy.
- **Recommended Actions:** May be used with caution during pregnancy. Monitor maternal and neonatal glucose levels. Stop ≈2 weeks before birth to prevent neonatal hypoglycaemia.

C. Metformin

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Less likely to experience maternal and neonatal hypoglycaemia.
- **Recommended Actions:** Continue metformin therapy during pregnancy as needed. Monitor maternal and neonatal glucose levels. Monitor breastfeeding infants.

IV. Thyroid Medications

Assess compatibility, potential risks, and recommended actions for thyroid medications.

A. Levothyroxine

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Minimal transfer across placenta. Minimal side effects.
- **Recommended Actions:** Continue levothyroxine therapy during pregnancy as needed. Monitor maternal thyroid function.

B. Potassium Iodide

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Reserved for specific conditions. Easily taken up by foetal thyroid, resulting in prolonged foetal hypothyroidism and goitre.
- **Recommended Actions:** Use with caution when necessary during pregnancy. Monitor maternal and foetal thyroid function.

C. Propylthiouracil (PTU)

- **Breastfeeding Compatibility:** Compatible.

- **Clinical Risk Summary:** Causes foetal goitre, hypothyroidism, hepatic injury, and death. Preferred drug in the first trimester for hyperthyroidism.
- **Recommended Actions:** Use with caution when necessary during pregnancy, especially in the first trimester. Monitor maternal and foetal thyroid function.

D. Methimazole

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** May cause a methimazole embryopathy with specific defects. Preferred drug in the second and third trimesters.
- **Recommended Actions:** Use with caution when necessary during pregnancy. Monitor maternal and foetal thyroid function.

V. Conclusion

- **Individualized Approach:** Assess each patient's unique medical history and the specific condition.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using these medications against the risks during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and neonatal conditions when using these medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding medication use during pregnancy and breastfeeding.

Gastrointestinal Medications and Antiemetic Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of gastrointestinal medications and antiemetic medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Gastrointestinal Medications and Antiemetic Medications:**
    - Essential for managing gastrointestinal issues and nausea/vomiting during pregnancy.
    - Consideration of safety and risks of medication use during pregnancy and breastfeeding is vital.
2. **Breastfeeding and Medication Transfer:**
    - Assess potential transfer of medications into breast milk.
    - Evaluate risks associated with breastfeeding while using these medications.

II. Gastrointestinal Medications

Assess compatibility, potential risks, and recommended actions for gastrointestinal medications.

A. Famotidine

- **Breastfeeding Compatibility:** Probably compatible.

- **Clinical Risk Summary:** Considered low risk with no foetal toxicity or teratogenicity in animal studies.
- **Recommended Actions:** Famotidine can be used with caution during pregnancy. Monitor maternal and foetal conditions.

B. Ranitidine

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Considered low risk with no toxicity or teratogenicity in animal studies. Preferred choice due to efficacy and safety.
- **Recommended Actions:** Ranitidine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

C. Cimetidine

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** Generally safe with no toxicity in animal studies. Some weak anti-androgenic activity.
- **Recommended Actions:** Cimetidine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

D. Omeprazole

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Low risk of foetal harm or teratogenicity, but slightly higher rates of congenital malformations and stillborn reported in some studies.

- **Recommended Actions:** Use omeprazole with caution during pregnancy. Monitor maternal and foetal conditions.

E. Esomeprazole

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Limited human studies; some changes in bone morphology observed in animal studies.
- **Recommended Actions:** Use esomeprazole with caution during pregnancy. Wait 5–7.5 hours after a dose for breastfeeding to limit exposure.

F. Lansoprazole

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Carcinogenic in animals; should be avoided in the first trimester.
- **Recommended Actions:** Avoid lansoprazole during pregnancy. Monitor maternal and foetal conditions.

G. Pantoprazole

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Low risk in pregnancy based on animal and human data.
- **Recommended Actions:** Pantoprazole can be used during pregnancy with caution. Monitor maternal and foetal conditions.

III. Antiemetic Medications

Assess compatibility, potential risks, and recommended actions for antiemetic medications.

A. Pyridoxine

- **Breastfeeding Compatibility:** Compatible.
- **Clinical Risk Summary:** High doses pose little risk to the foetus; important for maternal and foetal health.
- **Recommended Actions:** Continue pyridoxine during pregnancy as needed. Monitor maternal and foetal conditions.

B. Doxylamine and Pyridoxine Combination

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Safe in pregnancy, including the first trimester; no increased risk of malformations or foetal abnormalities.
- **Recommended Actions:** Use doxylamine and pyridoxine combination with caution during pregnancy. Monitor maternal and foetal conditions.

C. Metoclopramide

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** No association with adverse foetal and neonatal outcomes; safe during all stages of pregnancy.
- **Recommended Actions:** Consider metoclopramide when necessary during pregnancy. Monitor maternal and foetal conditions.

D. Prochlorperazine

- **Breastfeeding Compatibility:** Potential toxicity.
- **Clinical Risk Summary:** Low risk for the mother and foetus if used occasionally in low doses; may cause sedation and lethargy in infants.
- **Recommended Actions:** Use prochlorperazine with caution during pregnancy. Monitor maternal and foetal conditions.

E. Promethazine

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Low risk for the embryo and foetus; theoretical increased risk of respiratory depression in the newborn if given close to delivery.
- **Recommended Actions:** Use promethazine with caution during pregnancy. Monitor maternal and foetal conditions.

F. Ondansetron

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Low risk of birth defects; inconsistent data on increased risk of specific anomalies.
- **Recommended Actions:** Consider ondansetron when necessary during pregnancy. Monitor maternal and foetal conditions.

IV. Conclusion

- **Individualized Approach:** Assess each patient's unique medical history and the specific condition.

- **Risk-Benefit Analysis:** Weigh the potential benefits of using these medications against the risks during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and neonatal conditions when using these medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding medication use during pregnancy and breastfeeding.

Antipsychotic Medications, Antihistamine Medications, and Asthma Medications During Pregnancy and Breastfeeding

Objective: To provide guidelines for the safe and effective use of antipsychotic medications, antihistamine medications, and asthma medications during pregnancy and breastfeeding while minimizing potential risks to both the mother and foetus/infant.

I. Introduction

1. **Antipsychotic Medications, Antihistamine Medications, and Asthma Medications:**
    - Crucial for managing psychiatric conditions, allergies, and asthma during pregnancy.

- Consideration of safety and risks of medication use during pregnancy and breastfeeding is vital.

2. **Breastfeeding and Medication Transfer:**
    - Assess potential transfer of medications into breast milk.
    - Evaluate risks associated with breastfeeding while using these medications.

II. Antipsychotic Medications

Assess compatibility, potential risks, and recommended actions for antipsychotic medications.

A. First Generation

Haloperidol

- **Breastfeeding Compatibility:** Potential toxicity (LHS).
- **Clinical Risk Summary:** Extrapyramidal symptoms in infants exposed in utero in the third trimester; limb defects seen with first-trimester exposure but data inconsistent.
- **Recommended Actions:** Consider haloperidol with caution during pregnancy. Monitor maternal and foetal conditions.

Droperidol

- **Breastfeeding Compatibility:** Potential toxicity (LHS).
- **Clinical Risk Summary:** No effect on respiratory drive when given perinatally; no observed foetal or maternal serious

adverse reactions (SAR); risk of extrapyramidal signs with exposure in the third trimester.

- **Recommended Actions:** Droperidol can be used with caution during pregnancy. Monitor maternal and foetal conditions.

B. Second Generation

Olanzapine

- **Breastfeeding Compatibility:** Potential toxicity (LHS).
- **Clinical Risk Summary:** No teratogenicity or mutagenicity in animal studies; extrapyramidal effects noted in infants exposed in the third trimester.
- **Recommended Actions:** Use olanzapine with caution during pregnancy. Monitor maternal and foetal conditions.

Risperidone

- **Breastfeeding Compatibility:** Potential toxicity (LHS).
- **Clinical Risk Summary:** Extrapyramidal effects noted in infants exposed in the third trimester.
- **Recommended Actions:** Consider risperidone with caution during pregnancy. Monitor maternal and foetal conditions.

III. Antihistamine Medications

Assess compatibility, potential risks, and recommended actions for antihistamine medications.

A. Chlorpheniramine

- **Breastfeeding Compatibility:** Probably compatible; use with caution.
- **Clinical Risk Summary:** Low risk with no known congenital defects; recommended antihistamine in pregnancy, especially in the first trimester.
- **Recommended Actions:** Chlorpheniramine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

B. Diphenhydramine

- **Breastfeeding Compatibility:** Probably compatible; use with caution.
- **Clinical Risk Summary:** Safe in pregnancy, including the first trimester; association with cleft palate in one study.
- **Recommended Actions:** Consider diphenhydramine when needed during pregnancy. Monitor maternal and foetal conditions.

C. Hydroxyzine

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** Lower risk in the 2nd and 3rd trimesters; teratogenic in animals but low potential risk for humans.
- **Recommended Actions:** Use hydroxyzine with caution during pregnancy if necessary. Monitor maternal and foetal conditions.

D. Meclizine

- **Breastfeeding Compatibility:** Probably compatible.

- **Clinical Risk Summary:** Teratogenic in animals but not in humans; considered low risk in pregnancy.
- **Recommended Actions:** Meclizine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

E. Cetirizine

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** No teratogenicity in animal studies; low risk in pregnancy.
- **Recommended Actions:** Cetirizine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

F. Fexofenadine

- **Breastfeeding Compatibility:** Probably compatible; excreted in breast milk.
- **Clinical Risk Summary:** Embryonic and foetal toxicity in animal studies; limited human studies available.
- **Recommended Actions:** Use fexofenadine with caution during pregnancy. Monitor maternal and foetal conditions.

G. Loratadine

- **Breastfeeding Compatibility:** Probably compatible; considered antihistamine of choice in breastfeeding.
- **Clinical Risk Summary:** No teratogenicity in animals or humans.
- **Recommended Actions:** Loratadine can be used during pregnancy with caution. Monitor maternal and foetal conditions.

IV. Asthma Medications

Assess compatibility, potential risks, and recommended actions for asthma medications.

A. Ipratropium

- **Breastfeeding Compatibility:** Probably compatible, LHS.
- **Clinical Risk Summary:** No teratogenicity in animals; recommended for use in severe asthma as additional therapy.
- **Recommended Actions:** Consider ipratropium when needed during pregnancy. Monitor maternal and foetal conditions.

B. Albuterol

- **Breastfeeding Compatibility:** Probably compatible, LHS.
- **Clinical Risk Summary:** May act as a tocolytic; drug of choice for asthma treatment; association with functional and neurobehavioral toxicity with prolonged use.
- **Recommended Actions:** Use Albuterol with caution during pregnancy. Monitor maternal and foetal conditions.

C. Epinephrine

- **Breastfeeding Compatibility:** Potential toxicity, LHS.
- **Clinical Risk Summary:** Teratogenic in animals; avoid during active labour and delivery; may lead to decreased uterine blood flow.
- **Recommended Actions:** Avoid epinephrine during active labour and delivery. Monitor maternal and foetal conditions.

D. Terbutaline

- **Breastfeeding Compatibility:** Probably compatible.
- **Clinical Risk Summary:** May act as a tocolytic; association with autism spectrum disorders (if used >2 weeks); cardiac defects in the first trimester.
- **Recommended Actions:** Avoid terbutaline in early gestation and continuous use in the second and third trimesters. Monitor maternal and foetal conditions.

V. Conclusion

- **Individualized Approach:** Assess each patient's unique medical history and the specific condition.
- **Risk-Benefit Analysis:** Weigh the potential benefits of using these medications against the risks during pregnancy and breastfeeding.
- **Close Monitoring:** Continuously monitor maternal and neonatal conditions when using these medications during pregnancy and breastfeeding.
- **Consultation:** Collaborate with healthcare providers to make informed decisions regarding medication use during pregnancy and breastfeeding.

Labor and Delivery in the Emergency Department

I. Introduction and Background A. Births in the ED are rare but may occur in cases of obstetric service unavailability. B. EDs may lack specialized equipment and resources for complicated deliveries. C. High perinatal mortality rates in the ED emphasize the need for preparedness.

II. Epidemiology of Emergency Delivery A. Perinatal mortality rate in the US: 8% to 10% in ED. B. Common complications in ED deliveries: Psychosocial factors, antepartum haemorrhage, PROM, eclampsia, premature labour, abruptio placentae, malpresentation, and umbilical cord emergencies.

III. Patient Assessment A. Initial evaluation: Assess gestational age, vital signs, and presenting symptoms. B. Consider external electrical monitoring for uterine activity. C. Use ultrasonography for crucial information on foetal viability, lie, and presentation.

IV. Stages of Labor and Delivery A. First stage of labour: Average 8 hours in nulliparous women, 5 hours in multiparous women. B. Continuous assessment of foetal well-being is essential. C. The fourth stage of labour: First hour after delivery; risk of postpartum haemorrhage.

V. Complications of Delivery A. Dystocia, malpresentation, or multiple gestations are life-threatening emergencies. B. Management strategies: Refer to specialized resources and manoeuvres. C. Prolapsed cord: Immediate caesarean section if viable infant; maintain umbilical circulation. D. Uterine atony: Administer uterotonic and massage to control bleeding. E. Retained placental tissue: Manual removal required. F. Pelvic bleeding postpartum: Consider embolization if available.

VI. Maternal Complications A. Obstetric trauma, uterine inversion, rupture, amniotic fluid embolism, coagulation disorders, and infections may occur. B. Initial management in the ED; consult obstetrics as needed.

VII. Patient Transfer A. High-risk ED deliveries should be transferred to facilities with obstetric and neonatal resources. B. Risks and benefits of transfer should be carefully evaluated. C. Consider neonate's level of care, especially in preterm deliveries.

VIII. Equipment and Staffing A. Ensure basic equipment for cutting/clamping umbilical cord, drying, and suctioning. B. Trained staff should be available for newborn resuscitation. C. Maintain communication with obstetric specialists for consultations.

IX. Documentation A. Thoroughly document patient history, assessments, interventions, and consultations. B. Follow institutional protocols for record-keeping.

X. Education and Training A. Regular training for ED staff on labour and delivery protocols. B. Familiarity with emergency obstetric procedures and manoeuvres.

XI. References A. Reference guidelines and resources for ongoing education and updates.

Labor and Delivery in the Emergency Department

1. Introduction

Births in the emergency department (ED) are infrequent but can occur, especially in cases where obstetric coverage is lacking, such as in rural areas or due to hospital closures. This protocol aims to guide healthcare providers in managing labour and delivery situations within the ED, focusing on both normal and complicated deliveries.

2. Limitations of the Emergency Department

The ED may lack specialized resources and equipment necessary for complicated deliveries. Caesarean sections may be required in dire circumstances to ensure successful delivery.

3. Epidemiology of Emergency Delivery

Perinatal mortality rates in the United States are high, particularly in the ED, where they range from 8% to 10%. ED deliveries often involve unexpected complications due to psychosocial factors, lack of prenatal care, and high-risk conditions.

4. Patient Transfer Considerations

Whenever possible, patients with impending high-risk deliveries should be transported to facilities with obstetric and neonatal resources. Transfer decisions should consider the risks and benefits, as transport can be hazardous for both the mother and foetus.

5. Normal Delivery

5.1 Initial Presentation

- Consider the possibility of labour in any pregnant woman in the third trimester presenting to the ED.
- Assess both the mother and foetus, as foetal viability is established after 24 weeks.
- Be aware of risk factors for preterm labour, even in cases of non-pregnancy-related complaints.

5.2 Distinguishing False from True Labor

- Differentiate between Braxton Hicks contractions (false labour) and true labour.
- True labour is characterized by increasing frequency, duration, and strength of contractions, leading to cervical dilation.
- False labour can usually be relieved with mild analgesia, ambulation, or activity change.

5.3 Bloody Show

- Understand that a slight bloody show may occur at the onset of labour due to cervical vascularity changes.
- Differentiate it from more severe bleeding, which may indicate conditions like placenta previa or placental abruption.

5.4 Stages of Labor

5.4.1 First Stage of Labor

- Recognize the two phases of the first stage: latent and active.
- Assess cervical dilation, effacement, position, station, and presentation.
- Use Leopold manoeuvres and ultrasound to determine foetal position and presentation.
- Monitor foetal well-being and perform continuous external electrical monitoring.

5.4.2 Second Stage of Labor

- Recognize the fully dilated cervix and encourage the urge to push.
- Be aware that prolonged second stage labour is associated with maternal complications.
- Prepare for delivery, ensure a radiant warmer, neonatal resuscitation equipment, and a nurse are available.

5.5 Episiotomy

- Perform episiotomy only for specific indications, such as shoulder dystocia or breech delivery.
- Preferably use mediolateral incisions to reduce the risk of perineal tears.

5.6 Third Stage of Labor

- Be alert for signs of placental separation, such as uterine firmness, cord lengthening, or a gush of blood.
- Consider active management, including uterotonic administration, gentle traction of the clamped cord, and uterine massage.

5.7 Fourth Stage of Labor

- Inspect the cervix and vaginal fornixes for lacerations and repair if necessary.
- Administer oxytocin to promote uterine contraction and prevent haemorrhage.

6. Conclusion

This clinical protocol serves as a guideline for managing labour and delivery in the ED, emphasizing the importance of differentiating between true and false labour, monitoring foetal well-being, and taking appropriate actions during each stage of labour. Healthcare providers should be prepared to handle both normal deliveries and complications within the ED, ensuring the safety of both the mother and newborn.

Third-Trimester Complications Associated with Delivery:

Premature Labor:

- Premature labour, also known as preterm labour, is defined as uterine contractions with cervical changes occurring before 37 weeks of gestation.
- It is a leading cause of neonatal mortality and is associated with 5% to 18% of all pregnancies.
- Various factors can contribute to premature labour, including substance abuse, a history of previous preterm delivery, multiple gestations (twins or more), placental anomalies, infections, and lifestyle or psychosocial stressors.
- Common signs and symptoms of premature labour include an increase or change in vaginal discharge, uterine contractions, pelvic pressure, vaginal bleeding, and fluid leakage.
- Diagnosis involves identifying uterine activity and cervical changes, often through electrical monitoring and other diagnostic tests such as urinalysis, complete blood count, and pelvic ultrasonography.
- Treatment aims to prolong pregnancy when the foetus is viable, and the mother is healthy. It involves tocolytics (medications to inhibit contractions), foetal maturation therapy, bed rest, and hydration.
- Tocolytics should be used in coordination with an obstetric consultant, and patients should be transferred to a perinatal centre when possible.
- Medical management of preterm labour may not be advisable in cases of foetal compromise, major congenital anomalies, intrauterine infection, placental abruption, eclampsia, significant cervical dilation, or premature rupture of membranes (PROM).

Premature Rupture of Membranes (PROM):

- PROM is characterized by the rupture of the amniotic and chorionic membranes before the onset of labour.
- It affects 3% of all pregnancies and can occur at various gestational ages.
- When PROM occurs before 37 weeks, it is referred to as preterm PROM, which is associated with significant foetal morbidity and mortality.
- The period from PROM to the onset of labour can vary, with shorter latency periods as gestational age increases.
- Diagnosis of PROM is based on the patient's history and physical examination, often accompanied by tests to confirm the diagnosis, such as Nitrazine testing, ferning, and microscopic evaluation.
- Management of PROM depends on factors like gestational age, foetal maturity, infection status, placental abruption, and foetal well-being.
- Foetal heart rate monitoring, obstetric consultation, and admission are recommended for all cases of PROM.
- Treatment decisions may include the administration of corticosteroids to promote foetal lung maturation and the timing of delivery, which varies based on gestational age and other considerations.
- Patients with PROM between 31- and 33-weeks' gestation are often managed expectantly, while those at or beyond 34 weeks are generally delivered.

Chorioamnionitis:

- Chorioamnionitis occurs when bacteria from the vaginal or cervical region ascend into the uterus, leading to inflammation of the chorion and amnion layers of the amniotic sac.
- Risk factors for chorioamnionitis include prolonged labour, PROM, excessive vaginal examinations, and recent amniocentesis.
- Prompt treatment of chorioamnionitis is essential, even before clinical signs of infection appear, to reduce neonatal morbidity and allow more time for foetal maturation.
- Vertical transmission of Human Immunodeficiency Virus (HIV) during childbirth can occur, but appropriate antiretroviral therapy significantly reduces this risk.

- Testing for HIV in pregnant patients, especially those with unclear HIV status, is recommended. Emergent interventions can be initiated based on the preliminary bedside test result.
- Antiretroviral therapy during labour can help decrease vertical HIV transmission, particularly for patients with high viral loads, prolonged rupture of membranes, or other risk factors.

Complicated Delivery: Dystocia, Malpresentation, and Multiple Gestations

Deliveries involving dystocia, malpresentation, and multiple gestations pose significant challenges and are considered potentially life-threatening emergencies. The emergency clinician faces the prospect of high-risk vaginal deliveries since caesarean section might not be immediately available. Consequently, these abnormal deliveries increase the risk of foetal and maternal complications, necessitating aggressive attempts to obtain obstetric, neonatal, and anaesthesia support. If the delivery occurs in the emergency department (ED), proactive preparations for maternal and neonatal resuscitation must be made.

Dystocia and Malpresentation

Dystocia, characterized by abnormal labour progression, accounts for a significant proportion of caesarean sections, particularly primary ones. In emergency settings where immediate surgical solutions are unavailable, the management of intrapartum complications becomes essential.

Dystocia can be categorized into three main causative factors:

1. Problems related to the pelvic architecture (the passage).
2. Foetal size or presentation problems (the passenger).
3. Inadequate uterine expulsive forces.

Dystocia is often caused by a combination of these factors. Presentation problems are particularly critical because they become evident during the second stage of labour and necessitate immediate action.

The most common malpresentations in order of increasing incidence are brow, face, shoulder, and breech presentations. True foetopelvic disproportion is relatively rare, and caesarean section is typically indicated when labour arrest or cord prolapse coexists with these malpresentations.

Breech Delivery

Breech presentations are the most common malpresentation, occurring in approximately 4% of all deliveries. They can be categorized as frank, incomplete, or complete breech presentations. Risk factors for breech presentations include prematurity, multiparity, foetal abnormalities, prior breech presentation, polyhydramnios, and uterine abnormalities.

While scheduled caesarean sections are recommended for certain breech presentations, emergency clinicians should be prepared for vaginal breech deliveries, especially in cases of premature or unforeseen labour when immediate surgical services are unavailable. The mechanics of breech presentations can be challenging, primarily due to the relatively larger head and the risk of umbilical cord prolapse.

Successful vaginal breech delivery involves allowing time for cervical dilation, supporting but not pulling the presenting part, and carefully managing the after-coming head.

Shoulder Dystocia

Shoulder dystocia is the second most common malpresentation, occurring in 1.4% of all deliveries. Unlike breech presentations, shoulder dystocia develops during the intrapartum period and is associated with both maternal and foetal factors. Maternal factors include diabetes, obesity, and precipitous or protracted labour, while foetal factors include macrosomia, post maturity, and erythroblastosis fetalis.

Shoulder dystocia can have severe consequences, with infant complications being more common and severe than maternal complications. These complications include brachial plexus injuries, clavicular fractures, and hypoxic brain injury. Maternal complications may include vaginal, perineal, and anal sphincter tears, as well as urinary incontinence.

Diagnosis of shoulder dystocia is clinical, characterized by the inability to deliver either shoulder. The "turtle sign," where the foetal head appears to retract toward the maternal perineum, is a common indicator.

Management involves a series of manoeuvres, including the McRoberts manoeuvre, suprapubic pressure, and the Rubin manoeuvre, to resolve the dystocia and facilitate delivery. If these manoeuvres fail, further techniques such as the Wood corkscrew manoeuvre or delivery of an arm may be considered.

The HELPER mnemonic (Help, Episiotomy, Legs flexed, Pressure, enter vagina, remove posterior arm) is a useful tool for guiding the sequential approach to shoulder dystocia management.

Face, Brow, and Compound Presentations

Face and brow presentations have larger engaging aspects of the foetal head and can lead to labour arrest. However, most cases resolve spontaneously. Persistent mentum posterior face and brow presentations may require caesarean section.

Compound presentations, where an extremity enters the birth canal with the head or breech, can result in cord prolapse, labour arrest, and should generally be managed with caesarean section.

Multiple Gestations

The increasing use of fertility treatments has led to a rise in the incidence of multiple gestation pregnancies. Twins, particularly vertex-vertex presentations, can often be delivered vaginally. However, the presentation of the second twin is crucial, with nonvertex presentations often requiring caesarean section. Close monitoring and assessment of foetal well-being between the delivery of twin A and twin B are essential.

In cases of precipitous or out-of-hospital deliveries, consideration of the possibility of twins should not be overlooked during postpartum evaluation.

These guidelines are crucial for emergency clinicians dealing with complicated deliveries, ensuring that they can respond effectively to a range of obstetric emergencies.

Umbilical Cord-Related Emergencies

Umbilical cord-related complications can pose significant risks to both the foetus and the mother during labour and delivery. These emergencies require immediate intervention to prevent foetal morbidity and mortality. A range of cord-related complications can occur, including prolapsed cord, nuchal loops of the umbilical cord, body coils, cord knots, and entangled cords in monoamniotic twins. The length of the umbilical cord is believed to be proportional to foetal activity during the first and second trimesters, with excess cord length increasing the potential for complications. Interruption of cord circulation before foetal respiration is established constitutes a life-threatening emergency, making early recognition and intervention crucial to prevent foetal asphyxia.

Umbilical Cord Prolapse

Clinical Features

Umbilical cord prolapse is a condition where the umbilical cord precedes the foetal presenting part or when the presenting part does not entirely fill the birth canal. Most cases of cord prolapse occur unexpectedly during the second stage of labour.

The rate of umbilical cord prolapse varies with different foetal presentations. Compound, shoulder, and breech presentations result in gaps and a relatively poor dilating wedge, increasing the likelihood of cord prolapse. Malpresentations account for 50% of all cord prolapse cases, and in some instances, the prolapsed cord may be the first indication of a malpresentation. The reported incidence of cord prolapse ranges from 1.4

to 6.2 per 1000 deliveries, with an associated perinatal mortality rate estimated to be just below 10%.

Diagnostic Testing

Umbilical cord prolapse can be either overt or occult, necessitating a pelvic examination to reveal the umbilical cord lying alongside the presenting part. Diagnosis can also be confirmed with Doppler ultrasonography. In most cases, the diagnosis is evident when the cord is encountered at the perineum or introitus.

Management

In cases of viable infants, a prolapsed cord necessitates caesarean section as the preferred method of delivery. If surgical delivery is available, immediate measures to preserve umbilical circulation are initiated. This involves placing the mother in the knee-chest position, elevating the bed in the Trendelenburg position, and advising the mother not to push to prevent further cord compression. The presenting part is manually elevated off the cord, and this elevation is maintained until the baby can be surgically delivered. The time from prolapse to surgical intervention is a critical factor in foetal outcome, with perinatal mortality rates being higher for out-of-hospital cases.

If timely surgical delivery is not possible, manoeuvres such as funic reduction (manual replacement of the cord into the uterus) and rapid vaginal delivery may be necessary. These manoeuvres aim to decrease cord compression, and gentle pressure is applied to the cord in a retrograde fashion, above the presenting part. Minimizing manipulation and cord trauma is essential, as cord vasospasm resulting from trauma can lead to foetal hypoxia. After funic reduction, the development of umbilical cord body coils or nuchal loops should be anticipated.

Cord Entanglement

The umbilical cord can become entangled with itself, forming spontaneous knots, which are often related to foetal movements during early pregnancy. Approximately 5% of stillbirths are associated with knots believed to have

caused foetal demise. However, cord knots can persist without issues as long as perfusion is maintained.

During delivery, loose umbilical cord knots can tighten and cause foetal distress. Rapid delivery, without further cord traction, is essential to prevent foetal asphyxia. No specific interventions are identified to address this problem.

Long umbilical cords are associated with true knots, entanglements, and prolapse. Cord loops can be single or multiple and may occur around the neck or body. Although generally benign, umbilical cord loops may lead to foetal complications, including non-reassuring foetal status and respiratory distress.

During delivery, loose nuchal cords should be reduced at the perineum, while loose body coils typically disentangle spontaneously. Reduction can be assisted by slipping loops over the extremities or forward over the head. In cases where loops are too tight to be reduced, clamping, and cutting the cord followed by rapid delivery of the infant is necessary. Given the relatively high frequency of nuchal loops (one in five births), emergency clinicians should be prepared to manage this situation.

Understanding and promptly addressing umbilical cord-related complications are essential for ensuring the best possible outcomes for both the mother and the foetus during labour and delivery.

Maternal Complications of Labor and Delivery

Maternal complications during labour and delivery can pose significant risks to the health and well-being of the mother. These complications require timely and appropriate management, with some cases necessitating surgical intervention. This section outlines several important maternal complications and their clinical features, diagnostic methods, and management strategies.

Postpartum Haemorrhage

Clinical Features

Postpartum haemorrhage (PPH) is the most common complication of labour and delivery. It is defined as excessive bleeding of more than 500 mL following vaginal delivery and accounts for up to 11% of obstetric deaths. PPH is categorized into primary, occurring within the first 24 hours, and secondary, occurring from 24 hours to 6 weeks post-delivery. Maternal adaptations during pregnancy may delay the onset of shock, even after substantial blood loss.

Differential Diagnosis and Management

Primary PPH can result from various causes, including uterine atony (the most common cause), genital tract trauma, retained placental tissue, and coagulopathies. Management of PPH due to uterine atony involves uterotonic agents, such as oxytocin, to stimulate uterine contractions. If bleeding persists, additional interventions, such as vascular embolization or surgical exploration, may be necessary. Coagulopathies should be evaluated and treated with tranexamic acid as indicated.

Uterine Inversion

Foundations

Uterine inversion is a rare but serious complication that occurs during the fourth stage of labour, affecting approximately 1 in 2000 deliveries. It can result in severe haemorrhage and has a maternal mortality rate of up to 15%. Risk factors include excessive fundal pressure during delivery, traction on the umbilical cord, placenta accreta, and uterine anomalies.

Clinical Features and Management

Symptoms of uterine inversion include sudden, severe abdominal pain, uterine tenderness, and haemorrhage. Immediate diagnosis and management are crucial. Initial efforts should focus on fluid resuscitation. Repositioning the inverted uterus through the introitus is the primary goal, ideally within 30 minutes to maximize foetal and maternal outcomes.

Medications to relax cervical rings may be used, and surgical repair may be necessary in some cases.

Uterine Rupture

Foundations

Uterine rupture is a rare but potentially life-threatening complication, particularly in vaginal birth after caesarean (VBAC) deliveries, with an approximate incidence of 1% following a single caesarean section. Risk factors include previous uterine surgery, multiple gestation, trauma, and prostaglandin use.

Clinical Features and Management

Uterine rupture can lead to significant foetal and maternal morbidity and mortality. Clinical presentation varies from abnormal foetal heart rate patterns to maternal haemorrhagic shock. Immediate delivery via emergency caesarean section is essential, with a narrow window of opportunity for optimal outcomes. Uterotonic agents should be avoided, as they can exacerbate the rupture.

Amniotic Fluid Embolism

Foundations

Amniotic fluid embolism (AFE) is a rare but catastrophic complication of labour and delivery, with an estimated incidence of 1 to 12 cases per 100,000 pregnancies. Its precise mechanism is not fully understood but involves the entry of amniotic fluid into the maternal vasculature, leading to severe maternal and foetal complications.

Clinical Features and Management

AFE is characterized by sudden-onset hypoxia, coagulopathy, seizures, foetal distress, or cardiovascular collapse. Treatment is primarily supportive, including assisted ventilation, hemodynamic monitoring, vasopressors, and blood product administration. DIC occurs in about 50% of cases, and maternal and foetal mortality rates are high.

Postpartum Venous Thromboembolism

Foundations

Pregnancy increases the risk of venous thromboembolism (VTE) significantly, with the highest risk occurring in the postpartum period. Diagnosis of pulmonary embolism (PE) in pregnancy can be challenging but can be aided by adjusted D-dimer levels and imaging.

Clinical Features and Management

Prompt diagnosis and management of VTE, including PE, are essential to prevent complications. CT pulmonary angiogram is the gold standard for diagnosis. Recent clinical trials suggest the use of adjusted D-dimer levels in low-risk patients. Treatment involves anticoagulation therapy.

Postpartum Endometritis

Foundations

Postpartum endometritis is a common puerperal infection, affecting 5% of vaginal deliveries and 10% of caesarean sections. Risk factors include operative delivery, prolonged rupture of membranes, lack of prenatal care, and vaginal examinations.

Clinical Features and Management

Endometritis typically presents with foul-smelling lochia, abdominal pain, and elevated white blood cell count. Severe cases may involve fever and haemorrhage. Inpatient care and intravenous antibiotics are often required. Diagnostic evaluation may include searching for retained products of conception. Treatment is directed at gram-positive, gram-negative, and anaerobic organisms, commonly using clindamycin and an aminoglycoside.

Maternal complications during labour and delivery require a multidisciplinary approach, with early recognition and appropriate interventions to ensure the well-being of both the mother and the baby.

POSTPARTUM PROBLEMS

The postpartum period is a critical time for maternal health and well-being, and it can bring about various medical and psychological challenges. This section discusses two significant postpartum problems: peripartum cardiomyopathy (PPCM) and postpartum depression.

Peripartum Cardiomyopathy (PPCM)

Peripartum cardiomyopathy is a rare condition characterized by the sudden onset of heart muscle weakness during the peripartum period in previously healthy women without prior cardiac disease. The exact cause of PPCM is unknown, but certain risk factors have been identified, including advanced maternal age, preeclampsia, gestational hypertension, multiparity, and African American ethnicity.

Clinical Features

PPCM typically manifests days to weeks after delivery. Symptoms can vary in severity, ranging from mild fatigue to severe pulmonary oedema. Unfortunately, milder cases often go unrecognized, leading to potential underreporting of the condition. Symptoms such as dyspnoea on exertion, orthopnoea (difficulty breathing while lying down), and fatigue can be mistakenly attributed to normal postpartum changes.

Management

Early diagnosis and treatment are crucial for managing PPCM effectively. Treatment options may include:

1. **Diuretics**: To alleviate fluid retention and reduce the workload on the heart.
2. **Vasodilators**: Medications that relax blood vessels and reduce the heart's workload.
3. **Oxygen**: Administered to improve oxygen supply to the body.
4. **Angiotensin-Converting Enzyme (ACE) Inhibitors**: These are considered a mainstay of treatment postpartum, although they are contraindicated if PPCM occurs during the last month of pregnancy due to potential teratogenic effects.

5. **Hydralazine**: Sometimes used before delivery to reduce afterload on the heart.
6. **Bromocriptine and Pentoxifylline**: These medications may also play a role in PPCM treatment.

It's worth noting that cardiac function can return to normal in up to 30% of PPCM patients within six months. However, complications can result in a mortality rate of approximately 15% worldwide.

Postpartum Depression

Postpartum depression is a common but often underdiagnosed condition that affects new mothers, with an estimated prevalence of 10% to 15%. While it can be self-limited, postpartum depression has significant consequences for the mother, infant, and family.

Clinical Features

Symptoms of postpartum depression resemble those of other major depressive disorders and may include:

- Depressed mood
- Anhedonia (loss of interest or pleasure)
- Loss of appetite
- Insomnia
- Fatigue
- Difficulty concentrating
- Feelings of guilt and worthlessness
- Suicidal ideation

These symptoms often peak around 10 to 12 weeks postpartum, but some cases may be diagnosed up to a year after delivery. Failure to recognize postpartum depression can lead to a heightened risk of suicide, self-harm, and even infanticide.

Management

Early identification and referral are crucial for effective management. Dismissing postpartum fatigue as normal can have severe consequences.

Postpartum depression not only affects maternal mental health but can also impact the child's development. Children of depressed mothers may experience delayed cognitive, psychological, neurologic, and motor development.

Addressing postpartum depression may involve a combination of psychotherapy, pharmacotherapy, and support systems. It is essential for healthcare providers to be vigilant in screening and addressing postpartum depression to ensure the well-being of both mother and child.

Management of Trauma in Pregnant Patients

Objective: To provide a standardized approach to the evaluation, resuscitation, and management of trauma in pregnant patients, acknowledging the unique anatomical and physiological considerations of pregnancy.

1. Initial Assessment:

- All female trauma patients of reproductive age should be screened for pregnancy.
- If pregnancy status is unknown, conduct a rapid pregnancy test.
- Management of life- and limb-threatening injuries in the mother comes first.

2. Secondary Survey and Monitoring:

- Ensure foetal monitoring for a minimum of 4 hours after any trauma if the foetus is between 22 to 24 weeks' gestation or has an estimated foetal weight of >500 grams.
- Monitor maternal vitals continuously, considering the physiological changes of pregnancy.

3. Positioning:

- Pregnant patients of 20 weeks' gestation or more should be tilted 15-30 degrees to the left or the uterus manually displaced leftward to relieve compression on the inferior vena cava.

4. Respiratory Management:

- Be prepared for potential difficulty with intubation due to altered maternal anatomy.
- Employ rapid sequence intubation if required.
- Use a ramped, head-up, or reverse Trendelenburg position for preoxygenation and apnoeic oxygenation.

5. Cardiovascular Management:

- Recognize the cardiovascular changes in pregnancy, including increased blood volume and decreased blood pressure.
- Be alert for delayed signs of hypotension despite significant blood loss.
- Employ a systematic approach given the potential for masking of injuries due to physiological changes.

6. Gastrointestinal Management:

- Be aware of the increased risk of aspiration due to decreased gastroesophageal sphincter tone and gastrointestinal motility.
- Perform early gastric decompression in patients with altered consciousness.

7. Imaging:

- Minimize exposure to ionizing radiation.
- Opt for ultrasound, MRI, or a period of observation where possible.
- If radiography or CT scans are essential, use lead shielding to protect the foetus.

8. Counselling:

- Counsel on proper seatbelt usage, alcohol/drug use, and screen for interpersonal violence.
- Educate patients about the importance of rapid maternal resuscitation for favourable foetal outcomes.

9. Resuscitative Hysterotomy:

- If the mother experiences cardiopulmonary arrest with no return of spontaneous circulation, consider a resuscitative hysterotomy for potentially viable foetuses.
- Initiation should occur within 4 minutes and completion within 5 minutes post-onset of arrest.

10. Consultations:

- Involve obstetrics and gynaecology early in the management of pregnant trauma patients.
- Additional consultations (e.g., surgery, anaesthesia) should be based on the nature and severity of injuries.

11. Disposition:

- Admit to an appropriate level of care based on maternal and foetal status.
- Consider the transfer to a tertiary care centre with specialized obstetric and neonatal care if not already at such a facility.

12. Documentation:

- Clearly document all findings, interventions, consultations, and discussions with the patient and family.
- Ensure the involvement of social services if interpersonal violence is identified.

Conclusion: Managing trauma in pregnant patients requires a comprehensive, systematic, and multidisciplinary approach. Given the unique challenges presented by the gravid state, it's crucial to adhere to these protocols to optimize outcomes for both the mother and foetus. Regular training and review of this protocol will ensure that all healthcare providers are well-equipped to manage these complex patients.

Management of Specific Traumatic Disorders in Pregnancy

Objective: To offer a comprehensive approach to specific traumatic injuries encountered in pregnant patients.

Blunt Trauma:

1. Initial Assessment:

Objective: To evaluate and determine the extent of injuries sustained by pregnant patients after a blunt trauma.

Steps:

a. **History Taking:** Immediately obtain a brief history focusing on the mechanism of injury, any immediate symptoms experienced, last menstrual period, and any known pregnancy-related complications.

b. **Primary Survey:** Follow the ABCs (Airway, Breathing, Circulation) of trauma care. Address life-threatening injuries immediately.

c. **Physical Examination:** While physical examination alone isn't definitive, certain signs, such as abdominal tenderness, uterine contractions, or vaginal bleeding, can provide critical clues about the nature and extent of injuries.

d. **Adjuncts to Physical Examination:** Due to the unreliability of a physical examination alone, consider adjuncts like ultrasound (e.g., FAST - Focused Assessment with Sonography in Trauma) to check for free fluid in the abdomen, which may indicate internal bleeding or injury to the foetus.

e. **Lab Investigations:** Obtain necessary blood work, including CBC, coagulation profile, Rh status, and baseline biochemistry. Consider adding beta-HCG to confirm pregnancy if not already known.

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2. Foetal Monitoring:

Objective: To assess the health and wellbeing of the foetus following maternal blunt trauma.

Steps:

a. **Immediate Foetal Heart Rate (FHR) Monitoring:** If the foetus is beyond the age of viability (usually >22-24 weeks), initiate continuous electronic foetal monitoring to detect any signs of foetal distress.

b. **Duration:** Given the risk factors associated with trauma, such as placental abruption, monitor the foetus for a minimum of 4 hours post-injury. Extend monitoring if abnormalities are detected or if the patient experiences contractions, pain, or bleeding.

c. **Ultrasound Evaluation:** Conduct an ultrasound examination to assess placental position, amniotic fluid volume, foetal anatomy, and any potential injuries.

d. **Tocolysis:** If contractions ensue post-trauma and are non-resolving, consider administering tocolytic agents after ruling out contraindications such as placental abruption.

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3. Restraint Guidance:

Objective: To educate pregnant patients about the importance and correct method of using seat belts to prevent trauma during motor vehicle collisions.

Steps:

a. **Education on Risk:** Inform patients about the increased risk of foetal mortality in unbelted or improperly restrained pregnant women during collisions.

b. **Demonstration:** Using models or illustrations, show the correct positioning of seat belts. The lap belt should be positioned below the gravid abdomen and snugly across the thighs, and the shoulder strap should be placed between the breasts and to the side of the uterus, away from the neck.

c. **Airbag Safety:** Advise patients that airbags provide additional protection when combined with seat belts. They should not rely solely on airbags. Also, ensure they know the importance of sitting as far back from the dashboard or steering wheel as is comfortably possible.

d. **Post-collision Assessment:** Advise patients to always seek medical evaluation after any collision, even if they feel fine, as internal injuries might not present immediately.

e. **Continuous Follow-up:** During prenatal visits, reiterate the importance of proper seatbelt usage, and ensure that patients are following guidelines.

Conclusion: The management of blunt trauma in pregnant patients requires a thorough and systematic approach. This expanded protocol aims to provide a comprehensive guide to assessing and managing such scenarios, ensuring optimal outcomes for both the mother and the foetus. Regular updates based on latest clinical guidelines and research are essential.

Interpersonal Violence:

1. Screening:

Objective: To identify pregnant women who may be victims of interpersonal violence, thereby enabling early intervention and support.

Steps:

a. **Universal Screening:** Ensure every pregnant woman, irrespective of her background, is screened for signs of interpersonal violence during prenatal visits, recognizing the pervasive nature of the issue.

b. **Private Environment:** Conduct screenings in a private setting, ensuring the woman is alone without her partner or other family members, to encourage open communication.

c. **Standardized Questions:** Use non-judgmental, open-ended questions such as:

- "Has anyone ever hurt or threatened you?"
- "Do you feel safe in your current relationship?"
- "Is there anything else you'd like to discuss regarding your personal safety or well-being?"

d. **Observation:** Be vigilant for signs of physical abuse (bruises, fractures, burns) or emotional distress that may be indicative of interpersonal violence.

e. **Documentation:** Maintain meticulous records of the patient's responses, physical findings, and any interventions provided.

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2. Counselling and Intervention:

Objective: To offer emotional support, medical care, and necessary resources to pregnant women identified as victims of interpersonal violence.

Steps:

a. **Immediate Safety Assessment:** Determine the immediate safety needs of the victim. If there is an immediate threat, consider contacting law enforcement or taking necessary measures to ensure the patient's safety.

b. **Medical Care:** Address and treat any physical injuries. Depending on the extent of the injuries, this might involve coordinating with other medical specialties.

c. **Mental Health Assessment:** Given the emotional and psychological trauma associated with interpersonal violence, consider a mental health assessment, and provide necessary interventions such as counselling or therapy.

d. **Referral to Support Services:** Connect victims with local resources such as:

- Domestic violence shelters
- Hotlines (e.g., National Domestic Violence Hotline)
- Counselling services tailored for domestic violence victims.
- Legal services and advocacy groups

e. **Empowerment:** Ensure the victim feels empowered in the decision-making process. Avoid making decisions for them, but rather provide information, options, and support.

f. **Follow-Up:** Schedule follow-up visits to monitor the victim's situation, ensuring her safety and well-being. This also ensures continuous medical care and support throughout the pregnancy.

g. **Confidentiality:** Ensure all discussions and interventions are handled with the utmost confidentiality to protect the victim's safety and privacy.

h. **Staff Training:** Regularly train medical staff on the importance of recognizing signs of interpersonal violence, conducting screenings, and providing appropriate care and interventions.

Conclusion: Addressing interpersonal violence in pregnancy requires a delicate balance of sensitivity, support, and action. This expanded protocol aims to guide healthcare professionals in identifying and assisting victims, ensuring their safety, health, and well-being. Continuous education and

updates on resources available are crucial for the effective management of these complex scenarios.

Falls:

1. Evaluation:

Objective: To swiftly identify and evaluate the potential injuries and complications sustained by a pregnant woman following a fall.

Steps:

a. **Immediate Assessment:** On presentation, quickly evaluate the ABCs (Airway, Breathing, Circulation) to ensure the mother's vital functions are intact.

b. **History Taking:** Obtain a concise history of the fall - how it happened, the height of the fall, the surface she landed on, and any immediate symptoms like pain, vaginal bleeding, or fluid leakage.

c. **Physical Examination:** Conduct a thorough examination focusing on:

- Abdominal assessment for tenderness, contractions, or deformities.
- Vaginal examination (if indicated) for signs of bleeding, ruptured membranes, or imminent labour.

- Musculoskeletal evaluation for fractures or sprains, especially given the changes in centre of gravity and ligamentous relaxation in pregnancy.

d. **Foetal Assessment:** If beyond the age of viability (usually >22-24 weeks), use cardiotocography or handheld Doppler to assess foetal heart rate and rhythm. If resources allow, perform an ultrasound to evaluate foetal well-being, position, amniotic fluid volume, and placental attachment.

e. **Adjunct Investigations:** Based on the mechanism and force of the fall and the findings of the primary evaluation:

- Consider pelvic X-rays (with abdominal shielding) if pelvic fracture is suspected.
- Lab investigations, including CBC, coagulation profile, and Kleihauer-Betke test if significant trauma is suspected to assess foetal blood in maternal circulation.

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2. Intervention:

Objective: To address the immediate complications of the fall, provide necessary treatment, and offer guidance to prevent future incidents.

Steps:

a. **Immediate Management:** Depending on the evaluation:

- Administer pain management, if needed, using pregnancy-safe analgesics.
- If contractions are noted, monitor their pattern and frequency. Consider tocolytics if preterm labour is suspected, after ruling out contraindications.
- For any detected fractures or injuries, provide appropriate orthopaedic care, ensuring interventions are safe for pregnant individuals.

b. **Patient Education:**

- Educate the patient about the physiological changes in pregnancy, such as ligament relaxation and the shift in the centre of gravity, which increase the risk of falls.
- Discuss common causes of fatigue in pregnancy, emphasizing the importance of adequate rest.

c. **Preventive Measures:**

- Recommend suitable footwear with good grip and support.
- Advise against carrying heavy objects or reaching out for items on high shelves.
- Discuss the importance of ensuring living spaces are free of trip hazards like loose rugs, cords, or clutter.
- Suggest regular exercises, under the guidance of a physical therapist if possible, to improve balance and strength.

- If relevant, discuss the use of assistive devices like handrails in bathrooms or non-slip mats.

d. **Referrals:**

- Consider referring to physical therapy for balance and strength exercises tailored for pregnancy.
- If the fall is suspected to be related to domestic violence or other external factors, consider referring the patient to appropriate counselling or support services.

e. **Follow-Up:** Schedule a follow-up visits to ensure both maternal and foetal well-being, and to reassess any injuries or concerns post-fall.

Conclusion: Falls in pregnancy, especially in the emergency department setting, require a meticulous approach to evaluation and management. By ensuring immediate care and preventive education, we can enhance the safety and well-being of both the mother and the foetus. Regular updates based on current clinical guidelines and continuous patient education are fundamental.

Penetrating Trauma:

1. Initial Assessment:

Objective: To swiftly and efficiently evaluate both maternal and foetal well-being following a penetrating trauma in a pregnant woman.

Steps:

a. **Immediate Assessment:** Upon presentation, prioritize the ABCs (Airway, Breathing, Circulation) to ensure the mother's vital functions are stable.

b. **History Taking:** Obtain a detailed account of the trauma event - type of weapon or object involved, depth of penetration, location of injury, and any immediate symptoms such as pain, vaginal bleeding, or fluid leakage.

c. **Physical Examination:**

- Inspect and palpate the site of injury for entry and exit wounds.
- Examine the abdomen for tenderness, contractions, or deformities.
- If viable gestation, evaluate for foetal movements and, if any signs of labour are present, conduct a gentle vaginal examination.

d. **Foetal Assessment:** If the pregnancy is beyond the age of viability (usually >22-24 weeks):

- Employ cardiotocography or handheld Doppler to determine foetal heart rate and rhythm.

- Utilize ultrasound to appraise foetal well-being, position, amniotic fluid volume, and placental attachment, especially to check for signs of placental abruption or foetal injury.

e. **Adjunct Investigations:** Depending on the severity and location of the trauma:

- Lab investigations, including CBC, coagulation profile, and Kleihauer-Betke test, to evaluate foetal blood in maternal circulation.
- As necessary, perform imaging tests like abdominal X-rays (with foetal shielding) or focused assessment with sonography for trauma (FAST) to assess fluid collections or organ injuries.

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2. Management:

Objective: To address the maternal injuries caused by penetrating trauma and to ensure foetal well-being, with a heightened cognizance of potential foetal implications.

Steps:

a. **Immediate Interventions:**

- Employ standard trauma protocols, which may involve IV access, oxygenation, fluid resuscitation, or transfusion. Ensure all interventions are safe for pregnant individuals.

- For injuries warranting surgical exploration, ensure prompt consultation with a surgeon. Simultaneously, involve an obstetrician for the potential delivery of a distressed foetus.

b. **Monitoring:**

- Continuously monitor maternal vital signs and foetal heart rates. Fluctuations in either can signify worsening maternal status or foetal distress.

c. **Surgical Intervention:**

- In situations where emergency surgery is mandated, incorporate both trauma surgeons and obstetricians in the decision-making process. Depending on the gestational age and foetal well-being, an emergency caesarean section may be needed in tandem with addressing maternal injuries.

d. **Foetal Considerations:**

- Recognize that the gravid uterus can protect or expose certain maternal organs to injury, while simultaneously making the foetus more vulnerable.
- For cases where foetal distress is detected, a multidisciplinary approach involving obstetrics should be prioritized to evaluate the need for delivery or further foetal interventions.

e. **Post-stabilization:**

- Admit the patient to a setting where both she and the foetus can be closely monitored, ideally with capabilities for emergency caesarean delivery if needed.

f. **Psychological Support:**

- Recognize that penetrating traumas, especially when intentional like stab wounds, have significant psychological impacts. Consider a referral for counselling or psychiatric consultation.

g. **Follow-Up:**

- Schedule a comprehensive follow-up to evaluate the continued well-being of both mother and foetus, reassess any healing injuries, and provide continued psychological support.

Conclusion: Penetrating trauma in pregnancy presents unique challenges in the emergency department setting, necessitating a keen balance between standard trauma care and the specialized needs of pregnant individuals. By ensuring immediate intervention, continuous monitoring, and collaborative decision-making, we can optimize outcomes for both the mother and foetus. Regular training and multidisciplinary collaboration are paramount for effective management.

Foetal Injury:

1. Evaluation:

Objective: To assess foetal well-being after a maternal trauma or injury and determine the extent of any harm to the foetus.

Steps:

a. **Immediate Assessment:** Prioritize maternal ABCs (Airway, Breathing, Circulation) first, as maternal well-being directly impacts foetal health.

b. **History Taking:** Inquire about the nature and mechanism of the trauma, time since injury, any immediate symptoms like decreased foetal movements, vaginal bleeding, or fluid leakage.

c. **Physical Examination:**

- Palpate the abdomen to assess for contractions, tenderness, or uterine deformities.
- If indicated and without contraindications, perform a vaginal examination to check for any signs of preterm labour or rupture of membranes.

d. **Foetal Monitoring:**

- If the pregnancy is beyond the age of viability (usually >22-24 weeks), employ continuous cardiotocography to assess foetal heart rate and its patterns.
- In the absence of continuous monitoring capabilities, use handheld Doppler at regular intervals (e.g., every 15-30 minutes).

e. **Ultrasound Assessment:** Utilize ultrasound to:

- Assess foetal well-being, position, and amniotic fluid volume.
- Evaluate the placenta for potential abruption.
- Check for any direct foetal injuries, especially after penetrating traumas or high-impact blunt traumas.

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2. Interventions:

Objective: To address and manage the implications of maternal trauma on the foetus, considering both the maternal and foetal statuses.

Steps:

a. **Immediate Interventions:**

- Prioritize stabilizing the mother using standard trauma protocols, which may involve IV access, oxygenation, fluid resuscitation, or blood transfusion.

- Address life-threatening maternal injuries promptly, involving surgical or obstetric consultations as needed.

b. **Placental Abruption Concerns:**

- Recognize that placental abruption is a leading cause of foetal injury after maternal trauma. Monitor for signs such as vaginal bleeding, uterine tenderness, or frequent contractions.
- If abruption is suspected, closely monitor both maternal and foetal well-being. Depending on the severity and gestational age, prompt delivery may be necessary.

c. **Foetal Distress Interventions:**

- If foetal distress is detected, involve an obstetrician immediately to evaluate the need for emergency delivery or further interventions.
- The mode of delivery (caesarean section vs. vaginal delivery) will depend on maternal status, foetal condition, gestational age, and the nature of the injuries.

d. **Gestational Age Considerations:**

- For pregnancies at or beyond the point of viability, be prepared for potential neonatal resuscitation and ensure the availability of neonatal intensive care facilities or consider transferring to a centre with such capabilities.

- For pregnancies before the point of viability, management should focus primarily on maternal well-being, while also considering the potential for future reproductive health implications.

e. **Emotional Support:**

- Recognize the emotional and psychological impact of a potential foetal injury on the mother and her family. Provide counselling, support, and, if necessary, refer for further psychological care.

f. **Follow-Up:**

- Depending on the severity of the trauma and the potential foetal injuries, arrange for a comprehensive follow-up with obstetrics to monitor the progression of the pregnancy, foetal well-being, and healing of any injuries.

Conclusion: Foetal injuries post-maternal trauma require a meticulous and compassionate approach in the emergency department. While addressing the medical needs, the emotional well-being of the mother and her family should also be prioritized. Regular interdisciplinary collaboration and updates based on current clinical guidelines ensure optimal maternal and foetal outcomes.

Placental Injury:

1. Diagnosis:

Objective: To promptly identify potential placental injuries, particularly placental abruption, which poses a high risk for foetal mortality.

Steps:

a. **Clinical Suspicion:**

- Given the understanding that placental abruption is a primary cause of foetal death after blunt trauma, maintain a high index of suspicion, especially if the mother reports abdominal pain, vaginal bleeding, or changes in foetal movements.
- Document the nature of the trauma, focusing on the force and point of impact.

b. **Physical Examination:**

- Examine the abdomen for tenderness, contractions, or other abnormalities.
- If indicated and without contraindications, conduct a gentle vaginal examination to check for any signs of bleeding, which might suggest placental abruption or other complications.

c. **Foetal Monitoring:**

- Use continuous or intermittent cardiotocography to identify signs of foetal distress, which may be an indirect sign of placental abruption.

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2. Ultrasound:

Objective: To employ ultrasound as a diagnostic tool, while acknowledging its limitations in the context of placental injuries.

Steps:

a. **Immediate Scan:**

- Conduct a prompt bedside ultrasound to assess the placental position, foetal well-being, and amniotic fluid volume.

b. **Abruption Evaluation:**

- While ultrasound has limited sensitivity for detecting placental abruption, it can help identify other causes of abdominal pain or vaginal bleeding, such as placenta previa or vasa previa.
- Hematomas or collection between the placenta and uterine wall, if visible, can be indicative of an abruption. However, a negative ultrasound does not rule out the condition.

c. **Specialist Consult:**

- If the clinical suspicion remains high despite a non-conclusive ultrasound, consider consulting with an obstetrician or a radiologist for a more comprehensive ultrasound evaluation.

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3. Management:

Objective: To implement appropriate clinical interventions depending on the severity of the placental injury and the stage of pregnancy.

Steps:

a. **Initial Stabilization:**

- Address maternal stability by following standard trauma protocols, prioritizing airway, breathing, and circulation.

b. **Monitoring:**

- Continuously or frequently monitor the foetus, checking for signs of distress or changes in heart rate patterns that could suggest worsening placental injury.

c. **Degree of Abruption:**

- In cases of minor or suspected abruption (less than 25% separation), if both the mother and foetus are stable, opt for expectant management with continuous monitoring.
- In the case of significant separation, particularly if associated with foetal distress, maternal haemorrhage, or other complications, immediate obstetrical intervention might be necessary.

d. **Gestational Age Consideration:**

- For pregnancies beyond viability (usually >22-24 weeks), be prepared for potential neonatal resuscitation and ensure access to neonatal intensive care facilities.
- If the pregnancy is at a very advanced stage (e.g., >32 weeks), the risks of continued pregnancy might outweigh the benefits, especially if there's significant placental separation. In such cases, immediate delivery might be the best course of action.

e. **Immediate Caesarean Section:**

- In severe cases where the foetus is viable, and there's a sudden or profound foetal distress due to placental abruption, an immediate caesarean delivery might be indicated to save the foetus.

f. **Follow-Up:**

- Regardless of the immediate interventions, arrange for a thorough follow-up with obstetrics to monitor the progression of the pregnancy post-injury.

Conclusion: Placental injuries, particularly placental abruptions, demand swift and focused management in the emergency department. Emphasizing interdisciplinary collaboration, the department should strive for timely interventions while ensuring the safety of both the mother and foetus. Regular updates based on current clinical guidelines ensure optimal outcomes.

Uterine Injury:

1. Diagnosis:

Objective: To swiftly identify potential uterine injuries, particularly traumatic uterine rupture, which is a rare but critical event.

Steps:

a. **History and Presentation:**

- Obtain a thorough history of the traumatic event, emphasizing the nature and point of impact.
- Understand the gestational age and any past medical or obstetrical complications.

b. **Physical Examination:**

- Evaluate the abdomen for signs of tenderness, guarding, or rigidity.
- Examine for easily palpable foetal parts, suggesting uterine rupture and extrusion of the foetus into the abdominal cavity.
- Check for vaginal bleeding, which might suggest uterine or cervical trauma.

c. **Ultrasound:**

- Conduct a bedside ultrasound to quickly assess the position and well-being of the foetus and to identify any free fluid in the abdomen, suggesting hemoperitoneum.
- Assess the integrity of the uterus, though it's essential to recognize that even with a comprehensive scan, minor tears or ruptures may not be evident.

d. **Diagnostic Peritoneal Lavage or Focused Assessment with Sonography for Trauma (FAST):**

- If there's suspicion of intra-abdominal bleeding, consider a diagnostic procedure to confirm it.

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2. Management:

Objective: To provide immediate and appropriate interventions based on the severity and extent of the uterine injury.

Steps:

a. **Immediate Stabilization:**

- As with any trauma, follow the standard ABCs (airway, breathing, circulation) to stabilize the patient.
- Administer intravenous fluids or blood products as needed to manage shock.

b. **Continuous Monitoring:**

- Monitor the mother for changes in vital signs and ensure foetal monitoring for signs of distress.

c. **Surgical Intervention:**

- If a uterine rupture is confirmed or highly suspected:
    - For minor tears that are accessible and where the patient is hemodynamically stable, surgical repair of the uterus may be the chosen course.
    - In cases of extensive uterine damage or if the mother's life is in imminent danger, a hysterectomy may be necessary. This decision should be made in collaboration with an obstetric surgeon.

- If the foetus is viable, an emergency caesarean delivery should be performed either prior to or in conjunction with the uterine repair or hysterectomy.

d. **Collaborative Decision Making:**

- Involve a multi-disciplinary team in the decision-making process, including obstetricians, trauma surgeons, and neonatologists.

e. **Post-Operative Care:**

- Ensure appropriate post-operative care and monitoring for the mother.
- If the foetus is delivered and viable, ensure immediate neonatal care and intervention.

f. **Counselling and Follow-Up:**

- Provide counselling to the patient and her family about the nature of the injury, the interventions performed, and potential implications for future pregnancies.
- Arrange for thorough follow-up care, both for immediate post-trauma recovery and long-term gynaecological and obstetrical care.

Conclusion: Uterine injuries, especially ruptures, are emergency events that require swift identification and intervention in the emergency department.

An integrated, team-based approach is essential to manage both maternal and foetal implications effectively. Regular updates and training based on contemporary clinical guidelines can optimize outcomes for patients.

General Principles for All Types of Trauma:

1. **Multidisciplinary Approach:** Involve obstetrics and gynaecology, surgery, and other relevant specialties as early as possible.
2. **Maternal and Foetal Monitoring:** Continuous monitoring of both the mother and foetus is essential.
3. **Education and Prevention:** Proactively educate pregnant women about the risks and preventive measures associated with trauma during pregnancy.
4. **Documentation:** Ensure thorough documentation of all findings, interventions, and discussions with the patient and their family.

Conclusion: The management of trauma in pregnant patients requires awareness of the unique risks posed to both the mother and the foetus. This protocol aims to offer guidance on addressing specific traumatic injuries in this population to ensure optimal outcomes. Regular reviews and

training will ensure that healthcare providers are adept at addressing these complex scenarios.

DIAGNOSTIC TESTING IN TRAUMA DURING PREGNANCY: Emergency Department Management Protocol with Inclusion of Estimated Foetal Radiation Dose

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Objective: Provide a comprehensive guideline for evaluating trauma in potentially pregnant women, emphasizing maternal and foetal safety and accurate diagnostic procedures.

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1. Preliminary Assessment:

- On presentation, all women of childbearing potential with trauma should be tested for pregnancy.

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2. Laboratory Investigations:

Steps:

a. **Routine Investigations:**

- Order a complete blood count, basic electrolyte panel, and coagulation studies including fibrinogen.
- Determine blood type and Rh status to evaluate potential incompatibility issues.
- Review serum bicarbonate levels to identify potential maternal shock, adjusting for the altered normal range during pregnancy.

b. **Kleihauer-Betke Test for Feto-maternal Haemorrhage (FMH):**

- Recognise that FMH can occur due to trauma, especially in cases with anterior placental location or uterine tenderness.
- Administer Rhesus immune globulin (RhIG) prophylactically within 72 hours of the injury to Rh-negative mothers with trauma.

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3. Radiographic Investigations:

Guidelines based on Estimated Foetal Radiation Dose

- **Radiography:**
  - Cervical spine: <0.001 mGy
  - Extremities: <0.001 mGy
  - Chest: 0.0005–0.01 mGy

    - Thoracic spine: 0.003 mGy
    - Abdomen: 0.1–3.0 mGy
    - Lumbar spine: 1–10 mGy
- **Computed Tomography (CT):**
    - Head/neck: 0.001–0.01 mGy
    - Chest (routine): 0.01–0.66 mGy
    - Chest (pulmonary embolism protocol): 0.01–0.66 mGy
    - Abdomen: 1.3–35 mGy
    - Pelvis: 10–50 mGy
    - Abdomen and pelvis: 13–25 mGy
    - CT angiography (aorta): 6.7–56 mGy
    - CT angiography (coronary arteries): 0.1–3 mGy
- **Nuclear Medicine:**
    - Low-dose perfusion scintigraphy: 0.1–0.5 mGy
    - V/Q scintigraphy: 0.1–0.8 mGy
    - Myocardial perfusion with 99mTc-sestamibi: 17 mGy
    - Myocardial perfusion with 99mTc-tetrofosmin: 8.45 mGy

1. Understanding Radiation Exposure:

Steps:

a. **Basic Knowledge:**

- Radiation can have detrimental effects on rapidly dividing cells, making the foetus especially vulnerable during organogenesis.

- Be aware that the greatest sensitivity to radiation occurs during intrauterine development, especially between weeks 2 to 15 of gestation.

b. **Safe Radiation Limits:**

- It's acknowledged that exposure below 50 mGy is unlikely to cause foetal harm.
- For a clearer perspective: abdominal X-rays typically expose the foetus to about 1-3 mGy, whereas abdominal and pelvic CTs can expose the foetus to doses ranging from 13-25 mGy.
- Understand that while doses below 50 mGy have negligible risks of physical malformations, there remains a minor increase in the risk of childhood cancer. However, this risk is minuscule when compared to the spontaneous risk of health problems.

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2. Before Ordering Radiographic Examinations:

Steps:

a. **Assess the Necessity:**

- Always evaluate if the diagnostic information obtained from the radiographic procedure is vital for the medical management of the patient.
- Consider alternative diagnostic tools that do not use ionizing radiation, such as ultrasonography or MRI, when feasible.

b. **Estimate Potential Foetal Exposure:**

- Consult with a radiologist or medical physicist when uncertain about radiation doses to ensure you're within safe limits.
- Always be guided by the principle: "As low as reasonably achievable" (ALARA) when considering radiological investigations.

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3. Techniques to Minimize Radiation Exposure:

Steps:

a. **Shielding:**

- Utilize lead shields or aprons, especially for examinations where the primary x-ray beam is close to the foetus.
- Note: Shielding might not be effective for certain procedures like CT where scatter radiation is the primary concern. Collaborate with the radiology department to optimize protection.

b. **Collimation:**

- This refers to restricting the x-ray beam size to cover only the specific area of interest.
- Ensuring that only the necessary area is exposed can significantly reduce the radiation dose to the foetus.

c. **Technical Adjustments:**

- Adjust the technical parameters of the radiographic examination, such as reducing the duration of fluoroscopic studies or modifying the CT scan protocols to reduce radiation doses.
- Ensure the radiology department is informed about the patient's pregnancy status, so they can make necessary adjustments.

d. **Frequency of Exposure:**

- Limit the number of repeat examinations. If multiple studies are required, attempt to spread them out over time when possible.

4. Post Examination:

Steps:

a. **Documenting Exposure:**

- Keep a detailed record of all radiological tests, estimated foetal radiation doses, and the reasons for the examinations.

b. **Counselling:**

- Inform the patient about the estimated foetal radiation exposure, explaining the risks and reassuring them if doses are within safe limits.
- Address any patient concerns and provide relevant literature or resources for further reading.

Conclusion: Being vigilant about potential radiation exposure to the foetus during maternal trauma evaluation is paramount. By adhering to safe practices and continuously updating knowledge on the topic, healthcare professionals can ensure the safety of both the mother and the foetus.

b. **Ultrasound:**

- Prefer ultrasound as the primary diagnostic modality since it offers simultaneous maternal and foetal evaluation without radiation risks.

c. **Computed Tomography (CT) and MRI:**

- Consider CT or MRI when ultrasound findings are inconclusive or when specific organ damage needs to be assessed.
- Prefer MRI over CT when available due to the absence of radiation.

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4. Interpretation of Diagnostic Results:

Steps:

a. **Hematologic Interpretations:**

- Note the physiological anaemia of pregnancy. Despite a lowered haematocrit, there may be an increased oxygen-carrying capacity.
- A Paco2 of 40 mm Hg during pregnancy might indicate potential respiratory acidosis and foetal distress.

b. **Radiographic Interpretations:**

- Collaborate with a radiologist for expert interpretation, especially in unclear or high-risk situations.

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5. Counselling and Communication:

Steps:

a. **Informing the Patient:**

- Clearly explain the necessity of each test, its risks, and its benefits, ensuring informed consent.

b. **Documenting Results:**

- Maintain comprehensive records of all diagnostic tests conducted, results obtained, and interventions made. Collaborate with a multidisciplinary team for comprehensive care.

Conclusion: Accurate diagnostic testing post-trauma in potentially pregnant women is vital. This protocol ensures the well-being of both mother and foetus, focusing on evidence-based interventions and multidisciplinary collaboration for optimum care.

Maternal Trauma Management Protocol in Pregnancy

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1. Primary Survey:

- **Mother's Focus:**
  - Prioritize the mother's health.
  - Obtain preliminary information about the foetus's age.
- **Airway and Breathing:**
  - Institute oxygen therapy early.
  - Maintain oxygenation saturation levels above 95%.
  - Consider rapid sequence intubation after pre-oxygenation.
  - Adjust mechanical ventilation settings as needed.
- **Circulation:**
  - Ensure intravenous access with two large-bore catheters above the diaphragm.
  - Monitor maternal blood pressure and heart rate.
  - Begin fluid resuscitation with isotonic fluids if significant blood loss is suspected.
  - Use Type O-negative packed red blood cells until type-specific blood products are available.
  - Initiate a massive transfusion protocol with a 1: 1: 1 ratio of red blood cells, platelets, and plasma.
  - Administer tranexamic acid within 3 hours of injury.
  - Implement a left lateral tilt of 15 to 30 degrees if the gestation is beyond 20 weeks.
  - Use a Foley catheter to measure urine output for circulatory volume status evaluation.
- **Assessment of Uterine Size and Foetal Viability:**

- Measure uterine size from the symphysis pubis to the fundus to estimate gestational age.
- Check foetal heart tones through auscultation or Doppler probe.

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2. Secondary Survey:

- **Maternal Examination:**
  - Conduct a detailed examination of the mother.
  - Examine the abdomen for uterine tenderness, contraction frequency, and vaginal bleeding.
  - Perform an external perineal examination and a sterile speculum examination as needed.
  - Monitor for potential vaginal injuries and initiate temporary treatments if needed.
- **Foetal Evaluation:**
  - Monitor the foetal heart rate and detect foetal movement.
  - Check for signs of foetal distress.
  - Assess foetal heart rate variability.
  - Identify and evaluate any decelerations in foetal heart rate.

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3. Determining Stability:

- **Mother Stable, Foetus Stable:**
    - Continuously monitor the viable foetus.
    - Extend monitoring up to 24 hours if there are complications.
    - On discharge, instruct the pregnant woman to monitor foetal movements.
- **Mother Stable, Foetus Unstable:**
    - Consider caesarean section for the distressed foetus if necessary.
- **Mother Unstable, Foetus Unstable:**
    - **Prioritize the Mother's Health:**
        - In situations where both the mother and foetus are unstable, the primary focus should remain on stabilizing the mother first. Restoring maternal health will inherently benefit the foetus.
    - **Decision for Resuscitative Hysterotomy:**
        - Resuscitative hysterotomy, previously known as a perimortem caesarean section, is a drastic but potentially lifesaving procedure for both the mother and the foetus.
        - It becomes a consideration when the mother goes into cardiac arrest and does not achieve Return of Spontaneous Circulation (ROSC) within 4-5 minutes.

- A key factor for this procedure is foetal viability. If the foetus is at a stage where it has the potential for independent life (typically beyond 20 weeks of gestation), then this procedure might be warranted.

- **Need for Senior, Experienced Intervention:**
  - Due to the complexities involved in a resuscitative hysterotomy and the associated risks, it is imperative that this procedure be performed by a senior surgeon with experience in emergency obstetric surgeries.
  - The decision to carry out this procedure must be made swiftly, given the narrow window of time. However, it is crucial that the surgeon possesses the expertise and confidence to manage potential complications.
  - Close collaboration with an experienced obstetrician is vital, as their expertise will be paramount in navigating challenges specific to the pregnant anatomy and ensuring the best outcome for both the mother and foetus.
  - As postoperative care is also crucial, the presence of a senior anaesthesiologist, neonatologist, and critical care specialist can enhance maternal and foetal outcomes.
- **Post-Hysterotomy Management:**

- After the procedure, the mother should be monitored intensively. Any change in her condition should be addressed immediately with the involvement of relevant specialists.
- The neonatal team should be ready to provide immediate care to the newborn, especially if premature, to optimize the chances of survival and minimize complications.

In conclusion, while a resuscitative hysterotomy can be a life-saving measure for both mother and foetus, it's a complex procedure demanding the expertise of a senior and experienced surgical team. Immediate and well-coordinated postoperative care is equally crucial for the survival and well-being of both.

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4. Special Considerations:

- **Defibrillation:**
  - Perform defibrillation or cardioversion as required and monitor the foetus.

- **Resuscitative Hysterotomy:**
    - Perform this procedure if maternal circulation is compromised, and the foetus is viable.
    - Aim for rapid delivery to alleviate aortocaval compression.
- **Disposition:**
    - Evaluate both the mother's and the foetus’s stability.
    - Continue monitoring for at least 4 hours even after minor trauma in pregnancies at or beyond 22-24 weeks.

By following this protocol, healthcare professionals can ensure optimal outcomes for both the mother and the foetus during traumatic incidents. Collaboration with the radiology and obstetric departments, as well as specialists, will enhance the care provided.