Normal and Abnormal Puerperium

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Introduction
Puerperium is defined as the time from the delivery of the placenta through the first few weeks after the delivery. This period is usually considered to be 6 weeks in duration. By 6 weeks after delivery, most of the changes of pregnancy, labor, and delivery have resolved and the body has reverted to the nonpregnant state.

An overview of the relevant anatomy and physiology in the postpartum period follows.

Uterus
The pregnant term uterus (not including baby, placenta, fluids, etc) weighs approximately 1000 g. In the 6 weeks following delivery, the uterus recedes to a weight of 50-100 g. Immediately postpartum, the uterine fundus is palpable at or near the level of the maternal umbilicus. Thereafter, most of the reduction in size and weight occurs in the first 2 weeks, at which time the uterus has shrunk enough to return to the true pelvis. Over the next several weeks, the uterus slowly returns to its nonpregnant state, although the overall uterine size remains larger than prior to gestation.

The endometrial lining rapidly regenerates, so that by the seventh day endometrial glands are already evident. By the 16th day, the endometrium is restored throughout the uterus, except at the placental site. The placental site undergoes a series of changes in the postpartum period. Immediately after delivery, the contractions of the arterial smooth muscle and compression of the vessels by contraction of the myometrium ("physiological ligatures") result in hemostasis. The size of the placental bed decreases by half, and the changes in the placental bed result in the quantity and quality of the lochia that is experienced.

Immediately after delivery, a large amount of red blood flows from the uterus until the contraction phase occurs. Thereafter, the volume of vaginal discharge (lochia) rapidly decreases. The duration of this discharge, known as lochia rubra, is variable. The red discharge progressively changes to brownish red, with a more watery consistency (lochia serosa). Over a period of weeks, the discharge
continues to decrease in amount and color and eventually changes to yellow (lochia alba). The period of time the lochia can last varies, although it averages approximately 5 weeks.

The amount of flow and color of the lochia can vary considerably. Fifteen percent of women have continue to have lochia 6 weeks or more postpartum. Often, women experience an increase in the amount of bleeding at 7-14 days secondary to the sloughing of the eschar on the placental site. This is the classic time for delayed postpartum hemorrhages to occur.

**Cervix**
The cervix also begins to rapidly revert to a nonpregnant state, but it never returns to the nulliparous state. By the end of the first week, the external os closes such that a finger cannot be easily introduced.

**Vagina**
The vagina also regresses but it does not completely return to its prepregnant size. Resolution of the increased vascularity and edema occurs by 3 weeks, and the rugae of the vagina begin to reappear in women who are not breastfeeding. At this time, the vaginal epithelium appears atrophic on smear. This is restored by weeks 6-10; however, it is further delayed in breastfeeding mothers because of persistently decreased estrogen levels.

**Perineum**
The perineum has been stretched and traumatized, and sometimes torn or cut, during the process of labor and delivery. The swollen and engorged vulva rapidly resolves within 1-2 weeks. Most of the muscle tone is regained by 6 weeks, with more improvement over the following few months. The muscle tone may or may not return to normal, depending on the extent of injury to muscle, nerve, and connecting tissues.

**Abdominal wall**
The abdominal wall remains soft and poorly toned for many weeks. The return to a prepregnant state depends greatly on maternal exercise.

**Ovaries**
The resumption of normal function by the ovaries is highly variable and is greatly influenced by breastfeeding the infant. The woman who breastfeeds her infant has a longer period of amenorrhea and anovulation than the mother who chooses to bottle-feed. The mother who does not breastfeed may ovulate as early as 27 days after delivery. Most women have a menstrual period by 12 weeks; the mean time to first menses is 7-9 weeks.

In the breastfeeding woman, the resumption of menses is highly variable and depends on a number of factors, including how much and how often the baby is fed and whether the baby's food is supplemented with formula. The delay in the
return to normal ovarian function in the lactating mother is caused by the suppression of ovulation due to the elevation in prolactin. Half to three quarters of women who breastfeed return to periods within 36 weeks of delivery.

**Breasts**
The changes to the breasts that prepare the body for breastfeeding occur throughout pregnancy. If delivery ensues, lactation can be established as early as 16 weeks' gestation. Lactogenesis is initially triggered by the delivery of the placenta, which results in falling levels of estrogen and progesterone, with the continued presence of prolactin. If the mother is not breastfeeding, the prolactin levels decrease and return to normal within 2-3 weeks.

The colostrum is the liquid that is initially released by the breasts during the first 2-4 days after delivery. High in protein content, this liquid is protective for the newborn. The colostrum, which the baby receives in the first few days postpartum, is already present in the breasts, and suckling by the newborn triggers its release. The process, which begins as an endocrine process, switches to an autocrine process; the removal of milk from the breast stimulates more milk production. Over the first 7 days, the milk matures and contains all necessary nutrients in the neonatal period. The milk continues to change throughout the period of breastfeeding to meet the changing demands of the baby.

**Routine Postpartum Care**
The immediate postpartum period most often occurs in the hospital setting, where women remain for anything from 6 hours to approximately 2 days after a vaginal delivery and typically 2-3 days after a cesarean delivery. During this time, women are recovering from their delivery and are beginning to care for the newborn. This period is used to make sure the mother is stable and to educate her in the care of her baby (especially the first-time mother). While still in the hospital, the mother is monitored for blood loss, signs of infection, abnormal blood pressure, contraction of the uterus, and ability to void.

In a Rh-negative mother we check of the baby's blood type. If it is Rh-positive, the mother is given anti-D, based on a calculation of how many fetal cells are in her circulation. The mother's FBC level is checked on the first postpartum day if indicated. Women are encouraged to ambulate and to eat a regular diet.

**Vaginal delivery**
After a vaginal delivery, most women experience swelling of the perineum and consequent pain. This is intensified if the woman has had an episiotomy or a laceration. Routine care of this area includes ice applied to the perineum to reduce the swelling and to help with pain relief. Conventional treatment is to use ice for the first 24 hours after delivery and then switch to warm baths. However, little evidence supports this method over other methods of postpartum perineum treatment. Pain medications are helpful eg paracetamol and NSAIDs. There is a theoretical risk to the baby of codeine in breast-feeding mums. As it is morphine-related, an
occasional baby gets drowsiness, sluggish eating, and suppressed breathing. Local anesthetic spray may help the perineum.

Hemorrhoids are another postpartum issue likely to affect women who have vaginal deliveries. Symptomatic relief is the best treatment during this immediate postpartum period because hemorrhoids often resolve as the perineum recovers. It may become necessary to use creams, (witch hazel) compresses, and local anesthetics. There is no substitute for a high-fibre diet and plenty of fluids in preventing constipation, but lactulose may be useful as a temporary measure.

Tampon use can be resumed when the patient is comfortable inserting the tampon and can wear it without discomfort. This takes longer for the woman who has had an episiotomy or a laceration than for one who has not. The vagina and perineum should first be fully healed, which takes about 3 weeks. Tampons must be changed frequently to prevent infection.

**Cesarean delivery**

Women who have had a cesarean delivery are often slower to begin ambulating, eating, and voiding; however, encourage them to quickly resume these and other normal activities. The main pain has gone by the end of the first week, but for two months the woman can have days when the scar is sore, or gets jabbing pain, especially when she has done too much. Paracetamol is usually enough, potentially supplemented by NSAIDs. Codeine has a theoretical risk in breast feeding.

Besides pain, the normal tiredness of the puerperium is exaggerated in women who have had a CS. In the first month especially, they may have days of getting exhausted by normal tasks. If this happens, check the Hb!

**Sexual intercourse**

Sexual intercourse may resume when bright red bleeding ceases, the vagina and vulva are healed, and the woman is physically comfortable and emotionally ready. Physical readiness usually takes about 3 weeks. Birth control is important to protect against pregnancy because the first ovulation is very unpredictable.

**Breast Feeding**

Substantial education takes place during the hospital stay, especially for the first-time mother. The mother (and often the father) is taught routine care of the baby, including feeding, diapering, and bathing, as well as what can be expected from the baby in terms of sleep, urination, bowel movements, and eating.

Breastfeeding is neither easy nor automatic. It requires much effort on the part of the mother and her support team, (which may include motivated ‘peer support’ mums who have been through it, and go to the homes of others to help them establish breast feeding). Breastfeeding should be initiated as soon after delivery as possible; in a normal, uncomplicated vaginal delivery breastfeeding is possible.
almost immediately after birth. Encourage the mother to feed the baby on demand (at least while she is awake during the day) to stimulate milk production – though not more often than 2-hourly. Long feedings are unnecessary. Milk production should be well established by 96 hours.

In women who choose not to breastfeed, the care of the breasts is different. Care should be taken not to stimulate the breasts in order to prevent milk production. Ice packs applied to the breasts and the use of a tight brassiere or a binder can also help to prevent breast engorgement. NSAIDs can alleviate the symptoms of breast engorgement (eg, tenderness, swelling, fever) if it occurs. A single dose of cabergoline is effective in suppressing lactation, and is particularly important for women who have, tragically, lost the baby.

**Discharge instructions**
The most important information information to give the mother is who and where to call if she has problems or questions. She will get a wealth of leaflets, eg on breast and bottle feeding, MMR, BCG, cot death, physio, pelvic floor exercises, contraception and diet. She also needs details about resuming her normal activity. Instructions vary, depending on whether the mother has had a vaginal or a cesarean delivery.

The woman who has had a vaginal delivery may resume all physical activity, including using stairs, riding or driving in a car, and performing muscle-toning exercises, as long as she experiences no pain or discomfort. The key to resuming normal activity is not to overdo it on one day to the point that the mother is completely exhausted the next day. Pregnancy, labor, delivery, and care of the newborn are strenuous and stressful, and the mother needs sufficient rest to recover. The woman who has had a cesarean delivery can do normal activity, but must be more careful about strenuous activities. This is in small part in order to prevent an early dehiscence or a hernia later on, but mainly because over-activity leads to more pain!

Women typically return for their postpartum visit at approximately 6 weeks after delivery. No sound reason for this exists; the time has probably become the standard so that women who are returning to work can be medically cleared to return. Anything that must be done at a 6-weeks' postpartum visit can be done earlier or later than 6 weeks. An earlier visit can often aid a new mother in resolving problems she may be having or in providing a time to answer her questions.

The mother should be counseled about birth control options before she leaves the hospital, and this is followed up by first the midwife, and then the health visitor. She may not be ready to decide about a method, but she needs to know the options. Her decision will be based on a number of factors, including her motivation in using a particular method, how many children she has, and whether she is breastfeeding.
Intrauterine devices can be placed 3 weeks after delivery. Mirena is often a sound choice, (if well tolerated), as it has an extremely low failure rate, (similar to sterilisation!), and often produces reduced or absent periods.

**Hemorrhage**
Postpartum hemorrhage (PPH) is defined as excessive blood loss during or after the third stage of labor. The average blood loss is 500 mL at vaginal delivery and more at cesarean delivery. Since diagnosis is often based on subjective observation, it is difficult to define clinically.

Objectively, PPH can be defined as a 10% change in hematocrit level between admission and the postpartum period or the need for transfusion after delivery secondary to blood loss. Early (primary) PPH is described as that occurring within the first 24 hours after delivery. Secondary PPH most frequently occurs 1-2 weeks after delivery but may occur up to 6 weeks postpartum.

**Etiology**
Early PPH may result from uterine atony, retained products of conception, uterine rupture, uterine inversion, placenta accreta, lower genital tract lacerations, coagulopathy, and hematoma. Causes of late postpartum hemorrhage include retained products of conception, infection, subinvolution of placental site, and coagulopathy.

Uterine atony and lower genital tract lacerations are the most common causes of postpartum hemorrhage. Factors predisposing to uterine atony include overdistension of the uterus secondary to multiple gestations, polyhydramnios, macrosomia, rapid or prolonged labor, and grand multiparity. In uterine atony, lack of closure of the spiral arteries and venous sinuses coupled with the increased blood flow to the pregnant uterus causes excessive bleeding.

Active management of the third stage of labor with administration of uterotonicics before the placenta is delivered (oxytocin still being the agent of choice), is proven to reduce blood loss and decrease the rate of postpartum hemorrhage.

Lower genital tract lacerations, including cervical and vaginal lacerations are the result of obstetrical trauma and are more common with operative vaginal deliveries, such as with forceps or vacuum extraction. Other predisposing factors include macrosomia, precipitous delivery, and episiotomy.

**Incidence**
Vaginal delivery is associated with a 4% incidence of significant PPH. Cesarean delivery is associated with a 10% incidence. Delayed ‘secondary’ PPH occurs in 1-2% of patients, usually as a result of either infection, retained products, or both. In the United States, PPH is responsible for 5% of maternal deaths. In the UK, it is
about 5th or 6th as a principal cause of mortality, but can contribute to death from other causes.

History

Examination
Physical examination is performed simultaneously with resuscitative measures. Perform a vigorous bimanual examination, which may reveal a retained placenta or a hematoma of the perineum or pelvis, and which also allows for uterine massage. Closely inspect the lower genital tract in order to identify lacerations. Closely examine the placenta to determine if any fragments are missing. In active serious primary PPH, massaging the uterus helps make it contract.

Investigations and initial management
If the onset of PPH is acute, intervention is immediate, and resolution is often within minutes; consequently, laboratory studies or imaging might have little role. However, it is important to check a patient’s FBC and clotting, (prothrombin time/activated partial thromboplastin time) to exclude resulting anemia or coagulopathy, which may require further treatment. In more worrying cases, blood should be sent for grouping, saving serum for cross match, and, if available, checking compatibility for electronic issue of blood. In serious bleeding, (.1.5 litres, or more than 150ml/min), four units of blood should be sent for. At 2 litres of blood loss, clotting products will be needed – at the least 2 units of Fresh Frozen Plasma. Adequate intravenous access should be set up whilst taking blood, and for serious bleeding this means two venflons, at least grey (16g), or orange (14g).

Treatment
Initial therapy includes oxygen delivery, bimanual massage, removal of any blood clots from the uterus, emptying of the bladder, and the routine administration of oxytocin infusion (20u in 50ml normal saline via a pump, starting at eg 10ml/hr). If retained products of conception are noted in the cervix, remove them with sponge-holding forceps. If retained products in the uterus are suspected, theatre needs to be arranged, usually preceded by a scan to confirm the diagnosis.

If oxytocin is ineffective, carboprost in an intramuscularly administered dose of 0.25 mg can be administered up to every 15 minutes, not to exceed 3 doses. Studies indicate a 75-88% success rate when carboprost is used alone and a 95% success rate when it is used in combination with other oxytocic agents. Misoprostol 800mcg PR or PV is also effective in stopping PPH.

When postpartum hemorrhage is not responsive to pharmacological therapy and no vaginal or cervical lacerations have been identified, consider the following more
invasive treatment methods: Uterine packing, Bakri balloon, Uterine artery embolization, or formal surgery, at which if a B-Lynch suture does not help, uterine artery or hypogastric artery ligation and hysterectomy may needed.

When women die of PPH, subsequent investigation usually reveals three common factors:
- the consultants were called in too late – cons obs, cons obs anaesthesia, and, for the critical cases, cons haematologist. (So call them early!!!)
- poor communication, (so that not everyone realised the severity).
- ‘too little too late’. Failure to do things early enough – giving blood, giving FFP, removing the uterus.

**Anaemia**
As the woman continues to lose lochia, and as the plasma expands after acute blood loss, it is common to find the Hb dropping. If below 7 and symptomatic, blood transfusion may be needed. More usually, iron is given. Pregaday contains folic acid, which helps the iron be more effective. One per day is usually adequate, though more can be given if tolerated.

Iron tablets often cause constipation and/or nausea, (or sometimes diarrhoea). This is often because they are being given in too high a dose. The first thing to try is a lower dose, of a better tolerated preparation. Giving Vit C at the same time aids absorption. Giving a multivitamin and mineral preparation, (eg pregnacare, Forceval), seems a sensible addition, particularly in the vulnerable, or in those with poor diet.

If iron preparations do not work, (and if the cause of anaemia is iron deficiency, as demonstrated by a low ferritin – eg <20), then an iron infusion such as cosmofer or venofer may (rarely) be needed.

**Psychiatric Disorders**
Four psychiatric disorders may arise in the postpartum period: postpartum blues, postnatal depression (PND), post-traumatic stress disorder, (PTSD), and postpartum psychosis.

Postpartum blues is a transient disorder the lasts hours to weeks and is characterized by bouts of crying and sadness. PND is a more prolonged affective disorder that lasts for weeks to months, and sometimes even years. PND is not well defined in terms of diagnostic criteria, but the signs and symptoms do not differ from depression in other settings. Postpartum psychosis occurs in the first postpartum year and refers to a group of severe and varied disorders that elicit psychotic symptoms.
**Etiology**

The specific etiology of these disorders is unknown. Clearly PND may be associated with a very unsatisfactory childbirth experience, particularly when there is a combination of: fear, sudden change in expectations, and a feeling of things being out of control. Additionally, some women have an adverse psychological response to the responsibilities and tiredness of having a newborn baby.

But such instances are not enough to explain all PNDs, by any means. Perhaps hormonal or other physiological factors can play a part, eg the sudden decrease in the endorphins of labor and the sudden fall in estrogen and progesterone levels that occur after delivery. Low free serum tryptophan levels have been observed, which is consistent with findings in major depression in other settings. Postpartum thyroid dysfunction has also been correlated with postpartum psychiatric disorders.

Risk factors include undesired pregnancy, age younger than 20 years, unmarried status, low self-esteem, dissatisfaction with extent of education, economic problems with housing or income, poor relationship with husband or boyfriend, being part of a family with 6 or more siblings, limited parental support (either as a child or as an adult), and past or present evidence of emotional problems. Women with a history of PND and postpartum psychosis have a 50% chance of recurrence. Women with a previous history of depression unrelated to childbirth have a 30% chance of developing PND.

**Incidence**

Approximately 50-70% of women who have given birth develop symptoms of postpartum blues. PPD occurs in 10-15% of new mothers. It is thought that 1% of mothers experience PTSD, but most will not report it. Often, it may only materialise years later, for instance when the woman experiences emotional or physical symptoms surrounding planning of a future pregnancy. The incidence of postpartum or puerperal psychosis is 0.2%.

**Morbidity and mortality**

Psychiatric disorders can have hugely deleterious effects on the mother, the relationship with the partner, the family, and on social, cognitive, and emotional development of the newborn. Suicide is one of the top causes of maternal death within a year of childbirth.

**History**

Postpartum blues is a mild, transient, self-limited disorder that usually develops when the patient returns home. It commonly arises during the first 2 weeks after delivery and is characterized by bouts of sadness, crying, anxiety, irritation, restlessness, mood lability, headache, confusion, forgetfulness, and insomnia.

Patients suffering from PND report insomnia, lethargy, loss of libido, diminished appetite, pessimism, incapacity for familial love, feelings of inadequacy, ambivalence or negative feelings toward the infant, and an inability to cope. In
more serious cases, there may be comorbid drug abuse, lack of interest in the infant, excessive concern for the infant's health, suicidal or homicidal ideations, hallucinations, psychotic behavior, overall impairment of function, or failure to respond to therapeutic trial.

The signs and symptoms of postpartum psychosis typically do not differ from those of acute psychosis in other settings. Patients with postpartum psychosis usually present with thought disorder, bizarre behaviour, or manic depression, which signals the emergence of preexisting mental illness induced by the physical and emotional stresses of pregnancy and delivery.

**Treatment**
Postpartum blues, which has little effect on a patient's ability to function, often resolves by postpartum day 10; therefore, no pharmacotherapy is indicated. Providing support and education has been shown to have a positive effect.

Because of the overlap between baby blues and PND, the latter is often underdiagnosed. Screening for PND increases the identification of women suffering from it. The Edinburgh Postnatal Depression Scale has proven to be an effective tool for this. It requires little extra time and is acceptable to both patients and professionals.

PND generally lasts for 3-6 months, with 25% of patients still affected at 1 year. PND greatly affects the patient's ability to complete activities associated with daily living. Supportive care and reassurance from healthcare professionals and the patient's family is the first-line therapy, but there should be a low threshold for drug therapy and involvement of the appropriate professional, (e.g., Community Psychiatric Nurse), in anything but the mildest cases.

First-line agents include selective serotonin reuptake inhibitors (SSRIs). These can mainly be used by nursing mothers without adverse effects on the infant. Postpartum psychosis: Treatment of postpartum psychosis should be supervised by a psychiatrist and may involve hospitalization. Postpartum psychosis generally lasts only 2-3 months.

**Domestic violence / abuse**
We should be vigilant that sometimes the presentation of a woman to a health professional in the puerperium might be a 'cry for help' in relation to domestic violence. The woman will rarely report it, and will need careful coaching often to admit to it, so professional need to be careful not to miss it.

**Infections**
Infections can kill previously healthy women, especially those at a low ebb after for instance a long labour with PPH. Doctors must therefore be vigilant in the puerperium, and have a low threshold for a full physical examination, appropriate
In severe infection, as in other acute life-threatening illness, the duty of a junior member of staff is very clear:

1. Stabilise the patient – eg oxygen, ABC, IV fluids, (& baseline investigations), IV antibiotics
2. Inform your seniors!

Endometritis
Endometritis is an ascending polymicrobial infection. The causative agents are usually normal vaginal flora or enteric bacteria.

Etiology
Endometritis is the primary cause of postpartum infection. The most common organisms are divided into 4 groups: aerobic gram-negative bacilli, anaerobic gram-negative bacilli, aerobic streptococci, and anaerobic gram-positive cocci. Specifically, Escherichia coli, Klebsiella pneumoniae, and Proteus species are the most frequently identified organisms.

Endometritis occurring on postpartum day 1 or 2 can be caused by group A streptococci. This might well be a mild infection, but can rarely be overwhelming and fatal. Therefore early empirical IV antibiotic treatment is vital when severe infection is suspected. (eg Meropenem 1gm BD, or Clindamycin 600mg IV tds; plus Gentamicin 5mg/kg lean body mass iv stat – in severe cases repeated 24 hourly. Tazocin is another all round powerful antibiotic. As with meropenem and clindamycin, use of tazocin should be in consultation with a bacteriologist). If the infection develops on day 3 or 4, the causative organism is frequently enteric bacteria, most commonly E coli, or anaerobic bacteria. (Use eg co-amoxyclov). Endometritis that develops more than 7 days after delivery can caused by Chlamydia trachomatis. (thus erythromycin or azithromycin might be a reasonable choice). Endometritis following cesarean delivery is most frequently caused by mixed anaerobic gram-negative bacilli, and anaerobes, and so co-amoxyclov is a reasonable choice. (1.2g TDS IV if worried enough to treat IV).

Known risk factors for endometritis include cesarean delivery, young age, low socioeconomic status, prolonged labor, prolonged rupture of membranes, multiple vaginal examinations, placement of an intrauterine catheter, preexisting infection or colonization of the lower genital tract, twin delivery, and manual removal of the placenta. It has also been shown that manual removal of the placenta at cesarean delivery increases the incidence of endometritis.

Incidence
Endometritis complicates 1-3% of all vaginal deliveries and 5-15% of scheduled cesarean deliveries. The incidence of endometritis in patients who undergo cesarean delivery after an extended period of labor is 30-35% and falls to 15-20%
if the patient receives prophylactic antibiotics. Following 48-72 hours of intravenous antibiotic therapy, 90% of women recover. Fewer than 2% of patients develop life-threatening complications such as septic shock, pelvic abscess, or septic pelvic thrombophlebitis.

**History**
A patient may report any of the following symptoms: fever, chills, lower abdominal pain, malodorous lochia, increased vaginal bleeding, anorexia, and malaise.

**Examination**
A focused physical examination is important and should include vital signs, an examination of the respiratory system, breasts, abdomen, perineum, and lower extremities. A patient with endometritis typically has a fever of 38°C, tachycardia, and fundal tenderness. Some patients may develop mucopurulent vaginal discharge, whereas others have scant and odorless discharge.

**Differential diagnosis**
Urinary tract infection; Acute pyelonephritis; Lower genital tract infection; Wound infection; Atelectasis; Pneumonia; Thrombophlebitis; Mastitis; Appendicitis; DVT!!

**Laboratory tests:**
The appropriate tests for a febrile postpartum patient include FBC with differential WCC, CRP, urinalysis for nitrites and leucocytes, urine culture, and blood cultures. If retained products are suspected, a uterine scan may be helpful. If a respiratory process is high on the differential, obtain a chest XRay.

**Treatment**
Treatment of endometritis is as above. Parenteral antibiotics are usually stopped once the patient is afebrile for 24-48 hours, tolerating a regular diet, and ambulating without difficulty. Continuing the course for 5 days is usual, but it can be up to 10 days in particular cases. Don’t forget to check the result of C&S on any swabs or urine sent to microbiology.

**Urinary Tract Infections**

**Etiology**
Risk factors for postpartum UTI include cesarean delivery, forceps delivery, vacuum delivery, induction of labor, maternal renal disease, epidural anesthesia, bladder catheterization, length of hospital stay, and previous UTI during pregnancy. The most common pathogen is E coli. Other causative organisms include Staphylococcus saprophyticus, E faecalis, Proteus, and K pneumoniae.

**Incidence**
Postpartum bacteruria occurs in up to one third of patients, resulting in a symptomatic infection in approximately 2%.
**History**
A patient may report frequency, urgency, dysuria, hematuria, nausea, suprapubic or lower abdominal pain, or no symptoms at all.

**Investigation**
On examination, vital signs are stable and the patient is afebrile. Suprapubic tenderness may be elicited on abdominal examination.

**Investigation**
Appropriate laboratory tests include urinalysis, urine culture from either a clean-catch or catheterized specimen, and FBC.

**Treatment**
Treatment is started empirically in uncomplicated infection because the usual organisms have predictable susceptibility profiles. When sensitivities are available, use them to guide antimicrobial selection. Treatment is with a 3- or 5-day antibiotic regimen. Commonly used antibiotics include trimethoprim, nitrofurantoin, co-amoxyclov, and amoxicillin.

**Mastitis**

**Etiology**
Milk stasis and cracked nipples, which contribute to the influx of skin flora, are the underlying factors associated with the development of mastitis. Mastitis is associated with primiparity, incomplete emptying of the breast, and improper nursing technique. The most common causative organism, isolated in approximately half of all cases, is Staphylococcus aureus. Other common pathogens include Staphylococcus epidermidis, S saprophyticus, Streptococcus viridans, and E coli.

**Incidence**
In the United States, the incidence of postpartum mastitis is 2.5-3%. Mastitis typically develops during the first 3 months postpartum, with the highest incidence in the first few weeks after delivery.

**Morbidity and mortality**
Neglected, resistant, or recurrent infections can lead to the development of an abscess, requiring parenteral antibiotics and surgical drainage. Abscess development complicates 5-11% of the cases of postpartum mastitis and should be suspected when antibiotic therapy fails. Mastitis and breast abscess also increase the risk of viral transmission from mother to infant. The diagnosis of mastitis is solely based on the clinical picture.
Fever, chills, myalgias, erythema, warmth, swelling, and breast tenderness characterize this disease.

**Examination**
Focus examination on vital signs, review of systems, and a complete examination to look for other sources of infection. Typical findings include an area of the breast that is warm, red, and tender. When the exam reveals a tender, hard, possibly fluctuant mass with overlying erythema, a breast abscess should be considered.

**Investigation**
No laboratory tests are required. Expressed milk can be sent for analysis, but the accuracy and reliability of these results are controversial and aid little in the diagnosis and treatment of mastitis.

**Treatment**
Milk stasis sets the stage for the development of mastitis, which can be treated with moist heat, massage, fluids, rest, proper positioning of the infant during nursing, nursing or manual expression of milk, and analgesics.

Flucloxacillin is the drug of first choice. Erythromycin, clindamycin, and vancomycin may be used for infections that are resistant to penicillin. Resolution usually occurs 48 hours after the onset of antimicrobial therapy. An abscess usually needs surgery.

**Wound Infection**
Wound infections in the postpartum period include infections of the perineum developing at the site of an episiotomy or laceration, as well as infection of the abdominal incision after a cesarean birth. Wound infections are diagnosed on the basis of erythema, induration, warmth, tenderness, and purulent drainage from the incision site, with or without fever. This definition can be applied both to the perineum and to abdominal incisions.

**Etiology**
Perineal infections: Infections of the perineum are rare. In general, they become apparent on the third or fourth postpartum day. Known risk factors include infected lochia, fecal contamination of the wound, and poor hygiene. These infections are generally polymicrobial, arising from the vaginal flora.

Abdominal wound infections: Abdominal wound infections are most frequently the result of contamination with vaginal flora. However, S aureus, either from the skin or from an exogenous source, is isolated in 25% of these infections. Genital Mycoplasma species are commonly isolated from infected wounds, making erythromycin a reasonable addition to flucloxacillin. Known risk factors include diabetes, hypertension, obesity, treatment with corticosteroids, immunosuppression, anemia, development of a hematoma, chorioamnionitis,
prolonged labor, prolonged rupture of membranes, prolonged operating time, abdominal twin delivery, and excessive blood loss.

**Incidence**
The incidence of perineal infections is 0.35-10%. The incidence of incisional abdominal wound infections is 3-15% and can be decreased to approximately 2% with the use of prophylactic antibiotics.

**Morbidity and mortality**
The most common consequence of wound infection is increased length of hospital stay. About 7% of abdominal wound infections are further complicated by wound dehiscence. More serious sequelae, such as necrotizing fasciitis, are rare.

**Examination**
Perineal infections: An infected perineum often looks erythematous and edematous and may be accompanied by purulent discharge. Perform an inspection to identify hematoma, perineal abscess, or stitch abscess.

Abdominal wound infections: Infected incisions may be erythematous, warm, tender, and indurated. Purulent drainage may or may not be obvious. A fluid collection may be appreciated near the wound, which, when entered, may release serosanguineous or purulent fluid.

**Investigation**
The diagnosis of wound infection is often made based on the clinical findings. Serial FBC counts with differentials may be helpful, especially if a patient does not respond to therapy as anticipated.

**Treatment**
Perineal infections: Treatment of perineal infections includes symptomatic relief with NSAIDs, local anesthetic spray, and baths. Identified abscesses must be drained, and broad-spectrum antibiotics may be initiated.

Abdominal wound infections: These infections are treated with drainage and inspection of the fascia to ensure that it is intact. Antibiotics may be used if the patient is afebrile. Most patients respond quickly to the antibiotic once the wound is drained. Antibiotics are generally continued until the patient has been afebrile for 24-48 hours. Patients do not require long-term antibiotics unless cellulitis has developed.

**Venous thrombo-embolism (VTE)**
VTE is consistently the number one 'direct' cause of maternal death in the UK, ('direct' - i.e. a death which was directly due to the pregnancy, and would not have happened if she had not been pregnant).

The recent statutory VTE assessment on everyone admitted to UK hospitals should go a long way to help prevent this tragedy, which has traditionally killed
about 5 women per year in England and Wales. Although death is rare, DVT is common, especially in women with risk factors such as obesity and long labour. Such women often get home before any clexane is thought of, and typically if a DVT is going to happen, it will be about 10 days later, when health staff are off their guard.

The message for staff is to have a high index of suspicion, not just in obvious presentations such as chest or calf pain, but also in the less common ones such as fever.

**Pre-eclampsia / Eclampsia / Hypertension**

Pre-eclampsia usually settles in the first 24 hours after delivery. However, it can be most unpredictable, and can (rarely) first declare itself after the baby is born. In half the cases of eclamptic fit, the first fit is post partum – sometimes on the second or third day, and very rarely even after 2 to 3 weeks.

The importance of knowing this is that the treatment requires close IV infusion control of the blood pressure with intra-arterial monitoring; plus magnesium sulphate for prevention of further fits.

It is common for pre-eclampsia to leave a residual hypertension lasting some weeks. This usually needs treatment, with the aim of keeping the BP at around 130-140/80-90. Labetolol is a typical treatment, but in African women and those with preceding essential hypertension, an ACE inhibitor is often needed.

**Endocrine Disorders**

Approximately 4% of women develop transient thyrotoxicosis in the postpartum period. Of these, 66-90% return to a euthyroid state; 33% progress to hypothyroid. Approximately 2-8% of women develop hypothyroidism in the postpartum period. A third of these patients experience transient thyrotoxicosis, whereas 10-30% go on to develop permanent thyroid dysfunction.

**Sheehan Syndrome**

Sheehan syndrome is the result of ischemia, congestion, and infarction of the pituitary gland, resulting in panhypopituitarism caused by severe blood loss at the time of delivery. Patients have trouble lactating and develop amenorrhea, as well as symptoms of cortisol and thyroid hormone deficiency. Treatment is with hormone replacement in order to maintain normal metabolism and response to stress.