

## ***Antenatal care: timetable***

NICE issued guidelines on routine care for the healthy pregnant woman in March 2008. They recommend:

- 10 antenatal visits in the first pregnancy if uncomplicated
- 7 antenatal visits in subsequent pregnancies if uncomplicated
- women do not need to be seen by a consultant if the pregnancy is uncomplicated

<b>Gestation</b>	<b>Purpose of visit</b>
8 - 12 weeks (ideally < 10 weeks)	Booking visit <ul style="list-style-type: none"><li>• general information e.g. diet, alcohol, smoking, folic acid, vitamin D, antenatal classes</li><li>• BP, urine dipstick, check BMI</li></ul>
	Booking bloods/urine <ul style="list-style-type: none"><li>• FBC, blood group, rhesus status, red cell alloantibodies, haemoglobinopathies</li><li>• hepatitis B, syphilis, rubella</li><li>• HIV test is offered to all women</li><li>• urine culture to detect asymptomatic bacteriuria</li></ul>
10 - 13 weeks	Early scan to confirm dates, exclude multiple pregnancy
11 - 13+6 weeks	Down's syndrome screening including nuchal scan
16 weeks	Information on the anomaly and the blood results. If Hb < 11 g/dl consider iron Routine care: BP and urine dipstick
18 - 20+6 weeks	Anomaly scan
25 weeks (only if primip)	Routine care: BP, urine dipstick, symphysis-fundal height (SFH)
28 weeks	Routine care: BP, urine dipstick, SFH Second screen for anaemia and atypical red cell alloantibodies. If Hb < 10.5 g/dl consider iron First dose of anti-D prophylaxis to rhesus negative women
31 weeks (only if primip)	Routine care as above
34 weeks	Routine care as above Second dose of anti-D prophylaxis to rhesus negative women Information on labour and birth plan
36 weeks	Routine care as above Check presentation - offer external cephalic version if indicated Information on breast feeding, vitamin K, 'baby-blues'
38 weeks	Routine care as above
40 weeks (only if primip)	Routine care as above Discussion about options for prolonged pregnancy
41 weeks	Routine care as above Discuss labour plans and possibility of induction

## ***Prescribing in pregnant patients***

Very few drugs are known to be completely safe in pregnancy. The list below largely comprises of those known to be harmful. Some countries have developed a grading system - see the link.

### Antibiotics

- tetracyclines
- aminoglycosides
- sulphonamides and trimethoprim
- quinolones: the BNF advises to avoid due to arthropathy in some animal studies

### Other drugs

- ACE inhibitors, angiotensin II receptor antagonists
- statins
- warfarin
- sulfonylureas
- retinoids (including topical)
- cytotoxic agents

The majority of antiepileptics including valproate, carbamazepine and phenytoin are known to be potentially harmful. The decision to stop such treatments however is difficult as uncontrolled epilepsy is also a risk

## ***Bleeding in pregnancy***

The table below outlines the major causes of bleeding during pregnancy. Antepartum haemorrhage is defined as bleeding after 24 weeks

<b>1st trimester</b>	<b>2nd trimester</b>	<b>3rd trimester</b>
Spontaneous abortion	Spontaneous abortion	Bloody show
Ectopic pregnancy	Hydatidiform mole	Placental abruption
Hydatidiform mole	Placental abruption	Placenta praevia
		Vasa praevia

Alongside the pregnancy related causes, conditions such as sexually transmitted infections and cervical polyps should be excluded.

The table below outlines the key features of each condition:

<b>Spontaneous abortion</b>	<b>Threatened miscarriage</b> - painless vaginal bleeding typically around 6-9 weeks <b>Missed (delayed) miscarriage</b> - light vaginal bleeding and symptoms of pregnancy disappear <b>Inevitable miscarriage</b> - complete or incomplete depending on whether all fetal and placental tissue has been expelled. <b>Incomplete miscarriage</b> - heavy bleeding and crampy, lower abdo pain. <b>Complete miscarriage</b> - little bleeding
<b>Ectopic pregnancy</b>	Typically history of 6-8 weeks amenorrhoea with lower abdominal pain (usually unilateral) initially and vaginal bleeding later. Shoulder tip pain and cervical excitation may be present

<b>Hydatidiform mole</b>	Typically bleeding in first or early second trimester associated with exaggerated symptoms of pregnancy e.g. hyperemesis. The uterus may be large for dates and serum hCG is very high
<b>Placental abruption</b>	Constant lower abdominal pain and, woman may be more shocked than is expected by visible blood loss. Tender, tense uterus* with normal lie and presentation. Fetal heart may be distressed
<b>Placental praevia</b>	Vaginal bleeding, no pain. Non-tender uterus* but lie and presentation may be abnormal
<b>Vasa praevia</b>	Rupture of membranes followed immediately by vaginal bleeding. Fetal bradycardia is classically seen

\*vaginal examination should not be performed in primary care for suspected antepartum haemorrhage - women with placenta praevia may haemorrhage

### ***Pregnancy: diabetes mellitus***

Diabetes mellitus may be a pre-existing problem or develop during pregnancy, gestational diabetes. It complicates around 1 in 40 pregnancies

Risk factors for gestational diabetes

- BMI of  $> 30 \text{ kg/m}^2$
- previous macrosomic baby weighing 4.5 kg or above.
- previous gestational diabetes
- first-degree relative with diabetes
- family origin with a high prevalence of diabetes (South Asian, black Caribbean and Middle Eastern)

Screening for gestational diabetes

- if a woman has had gestational diabetes previously an oral glucose tolerance test (OGTT) should be performed at 16-18 weeks and at 28 weeks if the first test is normal
- women with any of the other risk factors should be offered an OGTT at 24-28 weeks
- currently the same WHO diagnostic criteria are used as for non-pregnant patients. There is however increasing evidence that a lower threshold should be used as treating borderline patients improves both maternal and neonatal outcomes

NICE issued guidelines on the management of diabetes mellitus in pregnancy in 2008

Management of pre-existing diabetes

- weight loss for women with BMI of  $> 27 \text{ kg/m}^2$
- stop oral hypoglycaemic agents, apart from metformin, and commence insulin
- folic acid 5 mg/day from pre-conception to 12 weeks gestation
- detailed anomaly scan at 18-20 weeks including four-chamber view of the heart and outflow tracts
- tight glycaemic control reduces complication rates
- treat retinopathy as can worsen during pregnancy

## Management of gestational diabetes

- responds to changes in diet and exercise in around 80% of women
- oral hypoglycaemic agents (metformin or glibenclamide) or insulin injections are needed if blood glucose control is poor or there is any evidence of complications (e.g. macrosomia)
- there is increasing evidence that oral hypoglycaemic agents are both safe and give similar outcomes to insulin
- hypoglycaemic medication should be stopped following delivery
- a fasting glucose should be checked at the 6 week postnatal check

## **Pregnancy: diabetes - complications**

### Maternal complications

- polyhydramnios - 25%, possibly due to fetal polyuria
- preterm labour - 15%, associated with polyhydramnios

### Neonatal complications

- macrosomia (although diabetes may also cause small for gestational age babies)
- hypoglycaemia
- respiratory distress syndrome: surfactant production is delayed
- polycythaemia: therefore more neonatal jaundice
- malformation rates increase 3-4 fold e.g. sacral agenesis, CNS and CVS malformations (hypertrophic cardiomyopathy)
- stillbirth
- hypomagnesaemia
- hypocalcaemia
- shoulder dystocia (may cause Erb's palsy)

## ***Hypertension in pregnancy***

The classification of hypertension in pregnancy is complicated and varies. Remember, in normal pregnancy:

- blood pressure usually falls in the first trimester (particularly the diastolic), and continues to fall until 20-24 weeks
- after this time the blood pressure usually increases to pre-pregnancy levels by term

**Pregnancy related blood pressure problems (such as pregnancy-induced hypertension or pre-eclampsia) do not occur before 20 weeks.**

Hypertension in pregnancy is usually defined as:

- systolic  $> 140$  mmHg or diastolic  $> 90$  mmHg
- or an increase above booking readings of  $> 30$  mmHg systolic or  $> 15$  mmHg diastolic

After establishing that the patient is hypertensive they should be categorised into one of the following groups

<b>Pre-existing hypertension</b>	<b>Pregnancy-induced hypertension (PIH, also known as gestational hypertension)</b>	<b>Pre-eclampsia</b>
A history of hypertension before pregnancy or an elevated blood pressure > 140/90 mmHg before 20 weeks gestation	Hypertension (as defined above) occurring in the second half of pregnancy (i.e. after 20 weeks)	Pregnancy-induced hypertension in association with proteinuria (> 0.3g / 24 hours)
No proteinuria, no oedema	No proteinuria, no oedema	Oedema may occur but is now less commonly used as a criteria
Occurs in 3-5% of pregnancies and is more common in older women	Occurs in around 5-7% of pregnancies Resolves following birth (typically after one month). Women with PIH are at increased risk of future pre-eclampsia or hypertension later in life	Occurs in around 5% of pregnancies

### ***Antenatal care: specific points***

NICE issued guidelines on routine care for the healthy pregnant woman in March 2008

Nausea and vomiting

- natural remedies - ginger and acupuncture on the 'p6' point (by the wrist) are recommended by NICE
- antihistamines should be used first-line (BNF suggests promethazine as first-line)

Vitamin D

- NICE recommend 'All women should be informed at the booking appointment about the importance for their own and their baby's health of maintaining adequate vitamin D stores during pregnancy and whilst breastfeeding'
- 'women may choose to take 10 micrograms of vitamin D per day, as found in the Healthy Start multivitamin supplement'
- particular care should be taken with women at risk (e.g. Asian, obese, poor diet)

Alcohol

- NICE recommend women should avoid alcohol during the first trimester
- if women choose to drink alcohol during pregnancy they should be advised to drink no more than 1 to 2 UK units once or twice a week

### ***Antepartum haemorrhage: determining cause***

Antepartum haemorrhage is defined as bleeding from the genital tract after 24 weeks pregnancy, prior to delivery of the fetus

### **Distinguishing placental abruption from praevia**

Placental abruption

- shock out of keeping with visible loss
- pain constant
- tender, tense uterus\*
- normal lie and presentation
- fetal heart: absent/distressed
- coagulation problems
- beware pre-eclampsia, DIC, anuria

#### Placenta praevia

- shock in proportion to visible loss
- no pain
- uterus not tender\*
- lie and presentation may be abnormal
- fetal heart usually normal
- coagulation problems rare
- small bleeds before large

**\*vaginal examination should not be performed in primary care for suspected antepartum haemorrhage - women with placenta praevia may haemorrhage**

### *Hyperemesis gravidarum*

Hyperemesis gravidarum describes excessive vomiting during pregnancy. It occurs in around 1% of pregnancies and is thought to be related to raised beta hCG levels. Hyperemesis gravidarum is most common between 8 and 12 weeks but may persist up to 20 weeks\*.

#### Associations

- multiple pregnancies
- trophoblastic disease
- hyperthyroidism
- nulliparity
- obesity

Smoking is associated with a decreased incidence of hyperemesis

#### Management

- antihistamines should be used first-line (BNF suggests promethazine as first-line)
- admission may be needed for IV hydration

#### Complications

##### Wernicke's encephalopathy

- Mallory-Weiss tear
- central pontine myelinolysis
- acute tubular necrosis
- fetal: small for gestational age, pre-term birth

\*and in very rare cases beyond 20 week

## ***Puerperal pyrexia***

Puerperal pyrexia may be defined as a temperature of  $> 38^{\circ}\text{C}$  in the first 14 days following delivery.

Causes:

- endometritis: most common cause
- urinary tract infection
- wound infections (perineal tears + caesarean section)
- mastitis
- venous thromboembolism

Management

- if endometritis is suspected the patient should be referred to hospital for intravenous antibiotics (clindamycin and gentamicin until afebrile for greater than 24 hours)

## ***Amniocentesis***

Amniocentesis is a procedure used in prenatal diagnosis. It may be offered after screening tests have indicated a high risk of fetal abnormality or in women considered to be at high risk, for example if  $> 35$  years old.

Around 20 ml of fluid is removed by transabdominal needle under ultrasound guidance. Fetal cells present in the amniotic fluid are then studied to aid the diagnosis of a number of conditions.

Amniocentesis is usually performed at 16 weeks and the risk of fetal loss is 0.5-1%. The karyotype results typically take 3 weeks. It is known the karyotype may be wrong in 1/1000 cases due to maternal cells being present

Conditions which may be diagnosed

- neural tube defects (raised AFP levels in the amniotic fluid)
- chromosomal disorders
- inborn errors of metabolism

## ***Breech presentation***

In a breech presentation the caudal end of the fetus occupies the lower segment. Whilst around 25% of pregnancies at 28 weeks are breech it only occurs in 3% of babies near term. A frank breech is the most common presentation with the hips flexed and knees fully extended. A footling breech, where one or both feet come first with the bottom at a higher position, is rare but carries a higher perinatal morbidity

Risk factors for breech presentation

- uterine malformations, fibroids
- placenta praevia
- polyhydramnios or oligohydramnios
- fetal abnormality (e.g. CNS malformation, chromosomal disorders)

- prematurity (due to increased incidence earlier in gestation)

Cord prolapse is more common in breech presentations

### Management

- if < 36 weeks: many fetuses will turn spontaneously
- if still breech at 36 weeks NICE recommend external cephalic version (ECV)- this has a success rate of around 60%. The RCOG recommend ECV should be offered from 36 weeks in nulliparous women and from 37 weeks in multiparous women
- if the baby is still breech then delivery options include planned caesarean section or vaginal delivery

Information to help decision making - the RCOG recommend:

- 'Women should be informed that planned caesarean section carries a reduced perinatal mortality and early neonatal morbidity for babies with a breech presentation at term compared with planned vaginal birth.'
- 'Women should be informed that there is no evidence that the long term health of babies with a breech presentation delivered at term is influenced by how the baby is born.'

### *Ultrasound in pregnancy*

A nuchal scan is performed at 11-13 weeks. Causes of an increased nuchal translucency include:

- Down's syndrome
- congenital heart defects
- abdominal wall defects

Causes of hyperechogenic bowel:

- cystic fibrosis
- Down's syndrome
- cytomegalovirus infection

### *Pre-eclampsia*

Pre-eclampsia is a condition seen after 20 weeks gestation characterised by pregnancy-induced hypertension in association with proteinuria (> 0.3g / 24 hours). Oedema used to be third element of the classic triad but is now often not included in the definition as it is not specific

Pre-eclampsia is important as it predisposes to the following problems

- fetal: prematurity, intrauterine growth retardation
- eclampsia
- haemorrhage: placental abruption, intra-abdominal, intra-cerebral
- cardiac failure
- multi-organ failure

## Risk factors

- > 40 years old
- nulliparity (or new partner)
- multiple pregnancy
- body mass index > 30 kg/m<sup>2</sup>
- diabetes mellitus
- pregnancy interval of more than 10 years
- family history of pre-eclampsia
- previous history of pre-eclampsia
- pre-existing vascular disease such as hypertension or renal disease

## Features of severe pre-eclampsia

- hypertension: typically > 170/110 mmHg and proteinuria as above
- proteinuria: dipstick ++/+++
- headache
- visual disturbance
- papilloedema
- RUQ/epigastric pain
- hyperreflexia
- platelet count < 100 \* 10<sup>6</sup>/l, abnormal liver enzymes or HELLP syndrome

## Management

- consensus guidelines recommend treating blood pressure > 160/110 mmHg although many clinicians have a lower threshold
- oral methyldopa is often used first-line with oral labetalol, nifedipine and hydralazine also being used
- for severe hypertension IV labetalol and IV hydralazine are used in addition to the above
- delivery of the baby is the most important and definitive management step. The timing depends on the individual clinical scenario

## ***Down's syndrome: antenatal testing***

NICE issued guidelines on antenatal care in March 2008 including advice on screening for Down's syndrome

- the combined test is now standard: nuchal translucency measurement + serum B-HCG + pregnancy associated plasma protein A
- these tests should be done between 11 - 13+6 weeks
- if women book later in pregnancy either the triple\* or quadruple test\*\* should be offered between 15 - 20 weeks

\*alpha-fetoprotein, unconjugated oestriol, human chorionic gonadotrophin

\*\*alpha-fetoprotein, unconjugated oestriol, human chorionic gonadotrophin and inhibin-A

## ***Oligohydramnios***

In oligohydramnios there is reduced amniotic fluid. Definitions vary but include less than 500ml at 32-36 weeks and an amniotic fluid index (AFI) < 5th percentile.

### Causes

- premature rupture of membranes
- fetal renal problems e.g. renal agenesis
- intrauterine growth restriction
- post-term gestation
- pre-eclampsia

## ***Alpha fetoprotein***

Alpha-fetoprotein (AFP) is a protein produced by the developing fetus

### **Increased AFP**

Neural tube defects (meningocele, myelomeningocele and anencephaly)  
Abdominal wall defects (omphalocele and gastroschisis)  
Multiple pregnancy

### **Decreased AFP**

Down's syndrome  
Trisomy 18  
Maternal diabetes mellitus

## ***Fitness to fly***

The Civil Aviation Authority (CAA) has issued guidelines on air travel for people with medical conditions; please see the link provided.

### Cardiovascular disease

- unstable angina, uncontrolled hypertension, uncontrolled cardiac arrhythmia, decompensated heart failure, severe symptomatic valvular disease: should not fly
- uncomplicated myocardial infarction: may fly after 7-10 days
- complicated myocardial infarction: after 4-6 weeks
- coronary artery bypass graft: after 10-14 days
- percutaneous coronary intervention: after 5 days

### Respiratory disease

- pneumonia: should be 'clinically improved with no residual infection'
- pneumothorax: absolute contraindication, the CAA suggest patients may travel 2 weeks after successful drainage if there is no residual air. The British Thoracic Society used to recommend not travelling by air for a period of 6 weeks but this has now been changed to 1 week post check x-ray

### Pregnancy

- most airlines do not allow travel after 36 weeks for a single pregnancy and after 32 weeks for a multiple pregnancy
- most airlines require a certificate after 28 weeks confirming that the pregnancy is progressing normally

## Surgery

- travel should be avoided for 10 days following abdominal surgery
- laparoscopic surgery: after 24 hours
- colonoscopy: after 24 hours
- following the application of a plaster cast, the majority of airlines restrict flying for 24 hours on flights of less than 2 hours or 48 hours for longer flights

## Haematological disorders

- patients with a haemoglobin of greater than 8 g/dl may travel without problems (assuming there is no coexisting condition such as cardiovascular or respiratory disease)

## ***Pregnancy: thyroid problems***

In pregnancy there is an increase in the levels of thyroxine-binding globulin (TBG). This causes an increase in the levels of total thyroxine but does not affect the free thyroxine level

### **Thyrotoxicosis**

Untreated thyrotoxicosis increases the risk of fetal loss, maternal heart failure and premature labour

Graves' disease is the most common cause of thyrotoxicosis in pregnancy. It is also recognised that activation of the TSH receptor by HCG may also occur - often termed transient gestational hyperthyroidism. HCG levels will fall in second and third trimester

### Management

- propylthiouracil has traditionally been the antithyroid drug of choice. This approach was supported by the 2007 Endocrine Society consensus guidelines
- maternal free thyroxine levels should be kept in the upper third of the normal reference range to avoid fetal hypothyroidism
- thyrotrophin receptor stimulating antibodies should be checked at 30-36 weeks gestation - helps to determine risk of neonatal thyroid problems
- block-and-replace regimes should not be used in pregnancy
- radioiodine therapy is contraindicated

### **Hypothyroidism**

#### Key points

- thyroxine is safe during pregnancy
- serum thyroid stimulating hormone measured in each trimester and 6-8 weeks post-partum
- some women require an increased dose of thyroxine during pregnancy
- breast feeding is safe whilst on thyroxine

## ***Rhesus negative pregnancy***

A basic understanding of the pathophysiology is essential to understand the management of Rhesus negative pregnancies

- along with the ABO system the Rhesus system is the most important antigen found on red blood cells. The D antigen is the most important antigen of the rhesus system
- around 15% of mothers are rhesus negative (Rh -ve)
- if a Rh -ve mother delivers a Rh +ve child a leak of fetal red blood cells may occur
- this causes anti-D IgG antibodies to form in mother
- in later pregnancies these can cross placenta and cause haemolysis in fetus
- this can also occur in the first pregnancy due to leaks

### Prevention

- test for D antibodies in all Rh -ve mothers at booking
- give anti-D to Rh -ve mothers at 28 and 34 weeks
- anti-D is prophylaxis - once sensitization has occurred it is irreversible
- if event is in 2nd/3rd trimester give large dose of anti-D and perform Kleihauer test - determines proportion of fetal RBCs present

Anti-D immunoglobulin should be given as soon as possible (but always within 72 hours) in the following situations:

- delivery of a Rh +ve infant, whether live or stillborn
- any termination of pregnancy
- miscarriage if gestation is > 12 weeks
- ectopic pregnancy
- external cephalic version
- antepartum haemorrhage
- amniocentesis, chorionic villus sampling, fetal blood sampling

### Tests

- all babies born to Rh -ve mother should have cord blood taken at delivery for FBC, blood group & direct Coombs test
- Coombs test: direct antiglobulin , will demonstrate antibodies on RBCs of baby
- Kleihauer test: add acid to maternal blood, fetal cells are resistant

### Affected fetus

- oedematous (hydrops fetalis, as liver devoted to RBC production albumin falls)
- jaundice, anaemia, hepatosplenomegaly
- heart failure
- kernicterus
- treatment: transfusions, UV phototherapy

### ***Preterm birth***

Preterm birth is defined as delivery of an infant before 37 weeks gestation. It occurs in around 5-10% of pregnancies (6% of singletons, 45% of twins)

### Causes

- unexplained (30-40%)

- multiple pregnancies (20-30%)
- congenital abnormalities
- antepartum haemorrhage
- pre-eclampsia
- cervical incompetence
- diabetes mellitus
- polyhydramnios
- uterine abnormalities
- infections e.g. Pyelonephritis

### ***Post-partum haemorrhage***

Post-partum haemorrhage (PPH) is defined as blood loss of > 500mls and may be primary or secondary

#### Primary PPH

- occurs within 24 hours
- affects around 5-7% of deliveries
- most common cause of PPH is uterine atony (90% of cases). Other causes include genital trauma and clotting factors

Risk factors for primary PPH include\*:

- previous PPH
- prolonged labour
- pre-eclampsia
- increased maternal age
- polyhydramnios
- emergency Caesarean section
- placenta praevia
- macrosomia
- ritodrine (a beta-2 adrenergic receptor agonist used for tocolysis)

#### Management

- ABC
- IV syntocinon (oxytocin) 10 units or IV ergometrine 500 mcg
- IM carboprost
- other options include: B-Lynch suture, ligation of the uterine arteries or internal iliac arteries
- if severe, uncontrolled haemorrhage then a hysterectomy is sometimes performed as a life-saving procedure

#### Secondary PPH

- occurs between 24 hours - 12 weeks\*\*
- due to retained placental tissue or endometritis

\*the effect of parity on the risk of PPH is complicated. It was previously thought multiparity was a risk factor but more modern studies suggest nulliparity is actually a risk factor

\*\*previously the definition of secondary PPH was 24 hours - 6 weeks. Please see the RCOG guidelines for more details

### ***Symphysis-fundal height***

The symphysis-fundal height (SFH) is measured from the top of the pubic bone to the top of the uterus in centimetres

It should match the gestational age in weeks to within 2 cm after 20 weeks, e.g. if 24 weeks then the a normal SFH = 22 to 26 cm

### ***Biophysical profile***

A biophysical profile is an antenatal ultrasound test which assesses:

- amniotic fluid volume
- fetal tone
- fetal activity
- fetal breathing movements
- reactivity of the heart