

Providing perioperative care for pregnant women

Nunney R (2008) Providing perioperative care for pregnant women. *Nursing Standard*. 22, 47, 40-44.
Date of acceptance: February 19 2008.

Summary

This article explores approaches to the perioperative care of pregnant women. Considerations such as the anatomical and physiological changes that occur during pregnancy are addressed, as well as adaptations to perioperative care made necessary by these changes. The potential limitations, constraints and difficulties faced when planning and implementing care are discussed. Social, psychological and environmental issues are also addressed.

Author

Robert Nunney is a student operating department practitioner, Edge Hill University, Ormskirk.
Email: robertnunney@gmail.com

Keywords

Obstetrics; Perioperative care; Physiology of pregnancy

These keywords are based on the subject headings from the British Nursing Index. This article has been subject to double-blind review. For author and research article guidelines visit the *Nursing Standard* home page at www.nursing-standard.co.uk. For related articles visit our online archive and search using the keywords.

A WOMAN'S BODY goes through many, and often, dramatic changes during pregnancy. Many of these changes make the woman more vulnerable and multiply various risks involved in surgery, such as difficult intubation or ventilation, increased risk of haemorrhage, as well as spontaneous abortion or abnormal development of the unborn child. Perioperative care of pregnant women is specialised and is crucial to the provision of optimum care for the woman and the fetus.

Anatomical changes during pregnancy

The uterus Many changes take place in a woman's body during pregnancy; the most obvious being the increase in size of the uterus. If the ovum has been fertilised within the fallopian tube, five to seven days later it will begin to embed itself in the thickened vascular endometrium. This then becomes the decidua – the thickened

uterine lining formed to receive the fertilised ovum once pregnancy is established. The endometrium will have been prepared by the action of hormones to receive the ovum. As the ovum develops into an embryo, and then into a fetus, it grows causing the uterus to expand (Watson 2005). The embryo and subsequent fetus develop within a buoyant medium known as amniotic fluid within the amniotic sac. The amniotic fluid permits symmetrical development, cushions the fetus, helps to maintain consistent temperature and pressure and allows the fetus free movement (Van De Graaff and Fox 1995). The weight of the gravid uterus shifts the centre of gravity, particularly during the third trimester (Coad 2005). This leads to a change in posture and gait, which in turn can cause back pain. This should be taken into consideration when positioning the patient.

After around three months of pregnancy the uterus occupies most of the pelvic cavity. Towards the end of a full-term pregnancy the uterus almost entirely fills the abdominal cavity pushing the liver, stomach and intestines upwards (Tortora and Grabowski 2003). This results in reduced residual and expiratory reserve volumes, particularly in the supine position. Consequently, one of the largest stores of oxygen to the body is lost, leaving the pregnant woman particularly susceptible to hypoxia if she has pre-existing respiratory disease or during general anaesthesia (Lumb 2005). However, Lumb (2005) suggests that hormonal changes during pregnancy have the effect of increasing the tidal volume (the volume of air inspired or expired with each breath), thereby inducing hypocapnia. It is important to bear this in mind when analysing arterial blood gas results.

The breasts Another visible physiological change during pregnancy concerns the breasts. The release of hormones such as oestrogen, progesterone and prolactin leads to an increase in the number and size of breast lobules in preparation for lactation (Blackburn 2002). The increase in size of the breasts, along with an enlarged abdomen, can cause difficulties when intubating a woman in the

third trimester of pregnancy. For this reason, Polio and McCoy laryngoscope blades should be easily accessible if there is any likelihood that a general anaesthetic may be required. A short laryngoscope handle may facilitate intubation further (Smith *et al* 2005).

Fluid retention One of the most fundamental system changes during normal pregnancy is the increase in fluid retention. The majority of this fluid is retained within the circulating plasma volume. The risk of anaemia, thromboembolism and other blood clotting disorders is elevated because the plasma makes up a higher proportion of the circulating blood volume (Blackburn 2002) [Q1 OK as reworded?]. The average maternal weight gain is between 11 and 13kg, of which between 8 and 10kg consists of retained fluid. Cardiac output and renal blood flow are also increased (Campbell and Lees 2000). The increase in cardiac output results from an increase in heart rate, a reduced systemic vascular resistance and the stroke volume improving by almost one third. These compensatory measures are intended to cope with the growing fetus, uterus and placenta (Mushambi 2002).

Management and prevention of disorders during pregnancy

When a woman suspects that she might be pregnant, it is usual for her to make an appointment with the GP. During the consultation, the GP usually takes the woman's blood pressure and checks that she is generally fit and well. Once pregnancy has been confirmed by a urine test the GP will advise the expectant mother to start taking folic acid if she is not doing so already. Research has shown that by taking folic acid as a daily supplement before conception, and for the first 12 weeks of pregnancy, the risk of the baby developing a neural tube defect, such as spina bifida is reduced (Department of Health 2004). The GP will also check that the woman is not taking any medication that is contraindicated during pregnancy. This may include drugs such as antiepileptics, antidepressants and non-steroidal anti-inflammatory drugs (British National Formulary 2008).

Beevers *et al* (2007) state that one in ten of all pregnant women has clinically relevant hypertension. Raised blood pressure is a key factor in the medical management of pregnancy for many of these women. Hypertension may be a symptom of pre-eclampsia or it may be transient (Impey 2004). Diabetes may also occur transiently in the form of gestational diabetes mellitus. Pregnancy causes blood glucose levels to rise. Depending on the glucose levels before

pregnancy, this can sometimes rise to a level defined as diabetes. The key to reducing the risk of serious abnormalities and infant death is to maintain strict glucose control using insulin during pregnancy (Impey 2004).

The GP will make arrangements for the first antenatal visit with the midwife. This is usually made 12 weeks into the pregnancy. The main purpose of this visit is to screen for any possible complications that could arise during the pregnancy, labour or the puerperium, which is the six-week period following delivery. The type and frequency of further antenatal care, as well as choices regarding the delivery, are decided after discussion with the parents. This will need to be re-evaluated throughout the pregnancy. It is usual to carry out an ultrasound examination at 16-20 weeks' gestation. This is useful to verify the gestation period as well as to check for structural fetal abnormalities, detect twins and to reassure the parents (Impey 2004).

General surgery during pregnancy

It may be necessary for the pregnant woman to undergo surgery. Elective surgery is best put off until after the baby is born. In the early stages of pregnancy, there is a risk of embryo malformation or spontaneous abortion brought on by general anaesthesia. In the later stages of pregnancy there is an increased risk of regurgitation and acid aspiration which could lead to Mendelson's syndrome (chemical pneumonia) (Smith 2006). The risk of Mendelson's syndrome results from weakness of the gastro-oesophageal sphincter occurring in almost one-third of women in the second half of pregnancy (Simpson and Popat 2002). It is safe practice to assume that all women at this stage of pregnancy are at risk. For this reason, a rapid sequence induction involving the use of suxamethonium and cricoid pressure is carried out if the patient is to be anaesthetised (Simpson and Popat 2002). Suxamethonium is a fast-acting muscle relaxant used to reduce the time between induction and intubation when the patient is most at risk of aspirating stomach acid; downward pressure on the cricoid ring occludes the oesophagus further reducing the risk of aspiration (Thorburn 2006).

Ellis *et al* (2006) emphasise the dangers of appendicitis, which is no more or less common in women who are pregnant than in those who are not. However, it has a higher morbidity and mortality rate in pregnant women as it may be confused with complications of pregnancy. Appendicitis during pregnancy is easily confused with pyelonephritis, vomiting of pregnancy or red degeneration of a fibroid which occurs when the fibroid's blood supply is cut off, causing it to

turn red and die [Q2 What does this sentence mean?]. During pregnancy, the appendix is positioned higher in the abdomen and therefore the location of pain resulting from appendicitis may not be what is expected [Q3 OK as written here?]. Appendicitis carries with it a considerable risk of spontaneous abortion, particularly in the first trimester (Ellis *et al* 2006).

Trauma during pregnancy

There is a possibility of trauma during pregnancy. When recording the patient's observations, it is important to be aware of the normal parameters for a pregnant woman, for example decreased blood pressure and increased heart rate. During the last trimester, the supine position should be avoided as this causes compression to the inferior vena cava. Instead, the patient should be positioned in a semi-lateral position with a wedge under the right side of her back. To reduce the risk of aspiration pneumonia, intravenous (IV) ranitidine is indicated if there is any risk of the patient losing consciousness or needing a general anaesthetic. In the case of abdominal trauma, the patient's blood group should be determined to establish whether or not the woman is rhesus-D-negative. If she is, she should be given anti-D immunoglobulin to prevent her from producing antibodies against a potentially rhesus-positive fetus (Moulton and Yates 2006).

When treating a pregnant woman for any kind of trauma it is important to remember that two or more individuals are being cared for: the mother and the fetus or fetuses. For this reason, the obstetric team should be involved in the management of care. The team will need to monitor the fetus for any signs of distress (King 1999). If the pregnant woman has a cardiac arrest resulting in death, a decision should be made to carry out a post-mortem Caesarean section (King 1999). It is essential that cardiopulmonary resuscitation be performed until the fetus is delivered for it to have the best chance of survival.

In 2000-2002 the maternal mortality rate for the UK (both direct and indirect causes of death) was 13.1 maternal deaths per 100,000 maternities (Confidential Enquiry into Maternal and Child Health 2004). The most common direct cause of death was thromboembolism, which has remained unchanged for the past three years. However, the death rates associated with haemorrhage and anaesthesia have increased within the same period. The majority of deaths

resulted from indirect causes, such as those caused by diseases exacerbated by the pregnancy, for example cardiac disease, psychiatric disease and epilepsy. Women most at risk of maternal death included those living in families where both partners were unemployed, those living in deprived areas of England, and women from minority ethnic groups (Confidential Enquiry into Maternal and Child Health 2004).

Anaesthesia during labour and/or Caesarean section

When possible, regional anaesthesia is preferable to general anaesthesia as a result of the teratogenic risks in the first trimester, and the chance of developing Mendelson's syndrome later on in pregnancy. Tests in animals have found that drugs used for regional and local anaesthesia do not carry a risk of teratogenicity (Philips 2003).

During pregnancy, oestrogen and progesterone are produced by the corpus luteum up until the eighth week, at which point the placenta begins to produce these hormones instead (Kumar 1998). During natural labour, oxytocin is produced, which stimulates uterine contraction (Kumar 1998). Synthetic oxytocin (Syntocinon®) can be given in an IV infusion for the induction of labour and/or in a bolus dose immediately after delivery by Caesarean section. This reduces the risk of a uterine haemorrhage (Laurence *et al* 1997).

Epidural analgesia is commonly used for pain relief during labour. It has the advantage of many hours' duration and is easily topped up when necessary. In some patients it is so effective that it gives sufficient analgesia to carry out a Caesarean section if natural childbirth is no longer a safe option (Simpson and Papat 2002). Although the duration of an epidural block is long lasting, its onset (45 minutes) is much slower than that of a spinal block, which begins to take effect after ten minutes. For this reason, if the patient is not already in labour and therefore does not have an epidural catheter in place, a spinal block is usually the first choice of anaesthesia for Caesarean section (Thorburn 2006).

There are certain cases when giving birth naturally is too risky and a Caesarean section is the safest option. Indications for Caesarean section include (Campbell and Lees 2000):

- ▶ Obstructed labour, for example cephalopelvic disproportion.
- ▶ Malpresentation – an abnormal position of the fetus in the birth canal.
- ▶ Multiple gestation.

- ▶ Fetal distress or prolapsed cord.
- ▶ Maternal medical conditions requiring urgent or controlled delivery, for example hypertensive disorders of pregnancy or diabetes.
- ▶ Obstetric complications such as placenta praevia.
- ▶ Previous Caesarean section.

Serious complications during a Caesarean section are rare but are elevated in comparison to those during a vaginal delivery. For example, the risk of haemorrhage increases during a Caesarean section. For planned Caesarean sections, the mother's blood should be cross-matched in advance so that blood is available if needed. O Rhesus negative blood should be kept within easy access of the maternity theatres at all times, in case of an emergency. The post-Caesarean section mortality rate is one in 500 (Impey 2004). An obstetric haemorrhage can quickly become life threatening, mainly as a result of the increased vascularity of the uterus during pregnancy. The placental blood flow at ten weeks' gestation increases more than tenfold by term; from 50ml to 500-800ml per minute (Wilde 2005).

As with any surgery, thromboprophylaxis is best practice. However, warfarin is contraindicated from six to 12 weeks' gestation, as it can cause harm to the fetus (Hampton and Preston 2002). Hampton and Preston (2002) recommend the use of heparin at any time during pregnancy to combat the increased risk of thromboembolism.

Post-partum care

The National Institute for Clinical Excellence (NICE) (2004) recommend that following a Caesarean section with no complications, the

wound dressing should be removed after 24 hours. NICE (2004) estimate that the expected length of hospital stay is three or four days following Caesarean section. A woman may be discharged from hospital in as little as six hours after an uncomplicated vaginal delivery (Campbell and Lees 2000).

Care for the mother and the baby does not end after discharge. Impey (2004) points out that the morbidity and mortality rate associated with pregnancy is at its highest during the puerperium. In the UK the community midwife should visit the mother and baby every day for at least ten days post-discharge. If necessary, the midwife will continue these visits for up to four weeks (Campbell and Lees 2000). A health visitor will usually visit the mother when the baby is ten days old and the family GP is likely to carry out a postnatal check at six weeks (Wiltshire Primary Care Trust 2006).

Childbirth is also associated with mental illness. Postnatal depression is one of the most common depressive illnesses (Hanley 2006). A tenth of all women experience 'baby blues' (Hanley 2006). The exact cause of postnatal depression is not known (Dennis and Ross 2006); however, it is thought to affect mothers equally regardless of their social status or race (Hanley 2006).

Social influences

Social trends in family planning are changing in the UK. A study by Moffitt *et al* (2002) compared teenage mothers with mothers over the age of 20 years. It found that teenage mothers were more likely to come from a deprived background, had less support from their partners and were more likely to experience mental illness. The children of young mothers achieved less at school, had more behavioural problems and were more likely to be

References

- Astolfi P, Zonta LA** (2002) Delayed maternity and risk at delivery. *Paediatric and Perinatal Epidemiology*, 16, 1, 67-72.
- Beevers DG, Lip GYH, O'Brien E** (2007) *ABC of Hypertension*. Fifth edition. BMJ Books, London.
- Blackburn T** (2002) *Maternal, Fetal and Neonatal Physiology: A Clinical Perspective*. Second edition. Saunders, St. Louis, Mo.
- British National Formulary** (2008) *British National Formulary No. 55*. British Medical Association and the Royal Pharmaceutical Society of Great Britain, London.
- Campbell S, Lees C (Eds)** (2000) *Obstetrics by Ten Teachers*. Seventeenth edition. Hodder Arnold, London.
- Coad J** (2005) Physiological adaptation to pregnancy. In Coad J, Dunstall M (Eds) *Anatomy and Physiology for Midwives*. Second edition. Churchill Livingstone, London, 251-281.
- Confidential Enquiry into Maternal and Child Health** (2004) *Why Mothers Die 2000-2002 Report*. www.cemach.org.uk/Publications/Saving-Mothers-Lives-Report-2000-2002.aspx (Last accessed: July 4 2008.)
- Dennis CL, Ross L** (2006) Women's perceptions of partner support and conflict in the development of postpartum depressive symptoms. *Journal of Advanced Nursing*, 56, 6, 588-599.
- Department of Health** (2004) *Thinking of Having a Baby: Folic Acid – An Essential Ingredient in Making Babies*. www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4081396 (Last accessed: July 3 2008.)
- Ellis H, Calne R, Watson C** (2006) *General Surgery*. Eleventh edition. Blackwell Science, Oxford.
- Hampton KK, Preston FE** (2002) [Q4 2003 on Amazon?] Bleeding disorders, thrombosis, and anticoagulation. In Proven D (Ed) *ABC of Clinical Haematology*. Second edition. BMJ Books, London, 43-46.
- Hanley J** (2006) The assessment and treatment of postnatal depression. *Nursing Times*, 102, 1, 24-26.
- Impey L** (2004) *Obstetrics and Gynaecology*. Second edition. Blackwell Publishing, Oxford.
- King C** (1999) Trauma care. In Wells MMP, Phippen ML (Eds) *Patient Care During Operative and Invasive Procedures*. WB Saunders, London, 637-650.
- Kumar B** (1998) *Working in the Operating Department*. Second edition. Churchill Livingstone, London.
- Laurence DR, Bennett PN, Brown MJ** (1997) *Clinical*

maltreated (Moffitt *et al* 2002). Women who have their first child at the age of 35 years and over are becoming more common (Astolfi and Zonta 2002). If trends continue as they are, by the year 2025, in Italy, around one quarter of all mothers will fall into this category (Astolfi and Zonta 2002). The study also found that older first-time mothers were at a higher risk of complications, such as premature births, low birth weight at term and stillbirths (Astolfi and Zonta 2002).

It is not only older mothers who are at risk of complications. Being obese increases the risk of miscarriage threefold and the chances of needing an operative delivery rise by nearly 27% (Yu *et al* 2006). Twenty-one per cent of women aged between 35 and 64 years are classed as being obese (Yu *et al* 2006) and caring for obese pregnant women in theatre is becoming more common.

Conclusion

The physiological and anatomical changes that occur during pregnancy are numerous. These

changes directly affect the planning of care for the pregnant woman. The fetus, uterus and placenta grow in size displacing other organs. This can make diagnosis of illness, not related to pregnancy, more difficult as well as having an adverse effect on the spine. This abdominal growth, coupled with an enlargement of the breasts make intubation more challenging. Breathing patterns are affected by pregnancy and this in turn affects anaesthesia and blood gas values. An increase in plasma volume can lead to problems such as anaemia and clotting disorders.

Social issues such as the rise in teenage pregnancy, obesity and older first-time mothers may also influence the care of the pregnant woman in theatres. For example older and obese mothers have an increased risk of complications during pregnancy and delivery. In the UK, there is an antenatal system of care in place, which is designed to screen for potential complications to improve management and involves care from the multidisciplinary team. Surgery may need to be carried out for complications of pregnancy as well as conditions unrelated to pregnancy. Adaptations to care and appropriate measures are necessary in such cases, to promote maternal and fetal safety **NS**

Pharmacology. Eighth edition. Churchill Livingstone, London.

Lumb AB (2005) *Nunn's Applied Respiratory Physiology*. Sixth edition. Elsevier, London.

Moffitt TE; E-Risk Study Team (2002) Teen-aged mothers in contemporary Britain. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. 43, 6, 727-742.

Moulton C, Yates D (2006) *Emergency Medicine*. Third edition. Blackwell Publishing, Oxford.

Mushambi C (2002) [Q5 2003 on Amazon?] Physiology of pregnancy. In Pinnock C, Lin T, Smith T (Eds) *Fundamentals of Anaesthesia*. Second edition. Greenwich Medical Media, London, 511-528.

National Institute for Clinical

Excellence (2004) *Caesarean Section. Understanding NICE Guidance: Information for Pregnant Women, their Partners and the Public*. www.rcog.org.uk/resources/public/pdf/cs_information_for_pregnant_women.pdf (Last accessed: July 3 2008.)

Phillips NF (2003) *Berry & Kohn's Operating Room Technique*. Tenth edition. Mosby, St Louis, Mo.

Simpson PJ, Popat M (2002) *Understanding Anaesthesia*. Fourth edition. Butterworth-Heinemann, Oxford.

Smith B, Williams T, Williams J (2005) Care of the obstetric patient. In Woodhead K, Wicker P (Eds) *A Textbook of Perioperative Care*. Elsevier, London, 285-298.

Smith G [Q6 Baxendale BR is author on Amazon?] (2006) Preoperative assessment and pre-medication. In Aitkenhead AR, Rowbotham DJ, Smith G (Eds) *Textbook of Anaesthesia*. Fifth edition. Churchill Livingstone, London, 305-318 [Q7 280-296 on Amazon?].

Thorburn J (2006) Obstetric anaesthesia and analgesia. In Aitkenhead AR, Rowbotham DJ, Smith G (Eds) *Textbook of Anaesthesia*. Fifth edition. Churchill Livingstone, London, 533-550 [Q8 617-652 on Amazon?].

Tortora GJ, Grabowski SR (2003) *Principles of Anatomy and Physiology*. Tenth edition. Wiley, Hoboken, NJ.

Van De Graaff KM, Fox SI (1995) *Concepts of Human Anatomy and*

Physiology. Fourth edition. William C Brown Publishers, London.

Watson R (2005) *Anatomy and Physiology for Nurses*. Twelfth edition. Elsevier, London.

Wilde S (2005) Obstetric haemorrhage in the perioperative environment. *British Journal of Perioperative Nursing*. 15, 7, 292-301.

Wiltshire Primary Care Trust (2006) *Postnatal Information for Women*. www.wiltshirepct.nhs.uk/MaternityServices/MaternityLeaflets/45_Postnatal_Sept06.pdf (Last accessed: July 3 2008.)

Yu CK, Teoh TG, Robinson S (2006) Obesity in pregnancy. *BJOG: an International Journal of Obstetrics and Gynaecology*. 113, 10, 1117-1125.