

DOCUMENT CONTROL PAGE	
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Author	Originated / Modified By: Dr J Bamfo Designation: Sub-specialty Trainee in Maternal Fetal Medicine
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1. Introduction

Asthma is a chronic inflammatory disease of the airways with episodic reversible airway narrowing due to airway hyper-responsiveness. This is characterised by coughing, wheezing and shortness of breath. Asthma is the most common chronic condition in pregnancy, with a prevalence of 4–12% (Rey 2007, Kwon 2003). Asthma control is stable in one-third of pregnant women, improves in one third and worsens in one third (Schatz 1988). Most asthma exacerbations occur after 20 weeks gestation (Murphy et al., 2006). There is an association between asthma and hypertension, fetal growth restriction, preterm labour and caesarean section (Murphy, 2011, Bracken 2003, Murphy 2006). Compliance with treatment is vital in asthma and it is important for women to understand that well controlled asthma does not increase pregnancy risk, whilst poor control may do so. Any severe exacerbations of asthma must be treated promptly to ensure optimal outcome for mother and baby. Triggers such as respiratory tract infections and smoking should be avoided. Management of asthma in pregnancy follows the same lines as in non-pregnant adults (SIGN, 2012).

2. Detail of the guideline

2.1 Antenatal management

2.1.1 Management of asthma in pregnancy is the same as for non-pregnant adults. Women should be advised of the importance of good asthma control during pregnancy to avoid problems to both mother and baby. Women should be advised that if asthma is well controlled, pregnancy is usually well tolerated.

2.1.2 Women must be encouraged to continue with their medication throughout pregnancy (SIGN, 2012).

2.1.3 Most asthma medications are not contraindicated in pregnancy:

- Women should use short acting β_2 agonists as normal during pregnancy
- Women should use inhaled steroids as normal
- Women should use oral and intravenous theophyllines as normal
- Women should use steroid tablets as normal when indicated for severe asthma. Steroid tablets should never be withheld because of pregnancy
- Leukotriene antagonists may be continued in women who have demonstrated significant improvement in asthma control with these agents prior to pregnancy not achievable with other medications

2.1.4 Women who smoke must be advised about the dangers for themselves and their babies and given appropriate support to stop smoking (Smoking Cessation).

2.1.5 The previous best peak expiratory flow rate (PEFR) or if unknown, the best predicted 'peak flow' (refer to appendix A) must be documented in the woman's hand held notes. For best practice, at the first visit, the doctor should ensure that the woman performs a peak expiratory flow rate in clinic and document the peak flow in the woman's hand held notes if the woman does not have a recent

not have a recent one she has measured.

- 2.1.6 **PEFR (Peak Expiratory Flow Rate)** is an objective assessment of lung function and measures the maximum speed of expiration. It involves blowing into a hand held device (which all women with asthma should be familiar with) and is a good objective way of monitoring the severity of asthma. Normal values vary depending of age, height and sex (see appendix 1)
- 2.1.7 If there is evidence of poor asthma control - any woman fulfilling criteria 4 and/or 5 of the Stepwise Approach (see 2.4) should be referred to the Antenatal Anaesthetic Clinic.
- 2.1.8 **In the event of an acute exacerbation, the attending clinician must:**
 - o Call for Help
 - o Administer high flow oxygen (15 litres/min) to maintain saturation of 94-98%
 - o Continuous fetal monitoring is recommended for severe acute asthma
 - o Where a woman has poorly controlled asthma, there should be a close liaison between the respiratory physician and obstetrician, with early referral to critical care physicians for women with acute severe asthma. See below (Section 2.8)

Table 1: Key Points of the Management of Exacerbations of Asthma (SIGN, 2012)

<p>Exacerbations of Asthma The Obstetric SHO and Registrar must be informed and involved with the management of any asthmatic patient who reports or displays any symptoms (See section 2.8)</p>	
<p>Healthcare professionals must be aware that patients with severe asthma recognised by one or more of the features below and one or more adverse behavioural or psychosocial factors are at risk of developing near-fatal or fatal asthma</p>	
<p>Severe asthma features:</p> <ul style="list-style-type: none"> • Previous near-fatal asthma • Previous ventilation or respiratory acidosis • Previous admission for asthma especially if in the last year • Requiring three or more classes of asthma medication • Heavy use of β2 agonist • Repeated attendances at emergency departments for asthma care especially if in the last year • Brittle” asthma 	<p>Adverse behavioural or psychological factors include:</p> <ul style="list-style-type: none"> • Non-compliance with treatment or monitoring • Failure to attend appointments • Fewer GP contacts • Frequent home visits • Self discharge from hospital • Psychosis, depression, other psychiatric illness or deliberate self harm • Current or recent major tranquilliser use • Denial • Alcohol or drug abuse • Obesity • Learning difficulties • Employment problems • Income problems • Social isolation • Childhood abuse • Severe domestic, marital or legal stress

2.2 Aim of Asthma Management

The aim of asthma management is the control of the disease and prevention of acute asthmatic attacks. Control is defined as:

- No daytime symptoms
- No night time awakening due to asthma
- No exacerbations
- No need for rescue medication
- No limitations on activity, including exercise
- Normal lung function (in practical terms FEV1 and/or PEFr > 80% predicted or best)
- PEFr > % 80 predicted or best (refer to Appendix A)
- Minimal side effects from medication

2.3 Physiological changes during pregnancy

Several physiological changes occur during pregnancy which could worsen or improve asthma (Goldie et al, 2013). These include:

- An increase in free cortisol levels which may prevent inflammatory triggers

- An Increase in progesterone which may improve airway responsiveness
- An Increase in prostaglandin $F_{2\alpha}$ may promote airway constriction
- Altered maternal immunity may alter response to infection

Many women experience increase in symptoms i.e. wheezing and/or persistent cough because they stop or reduce their medication due to fears about its safety.

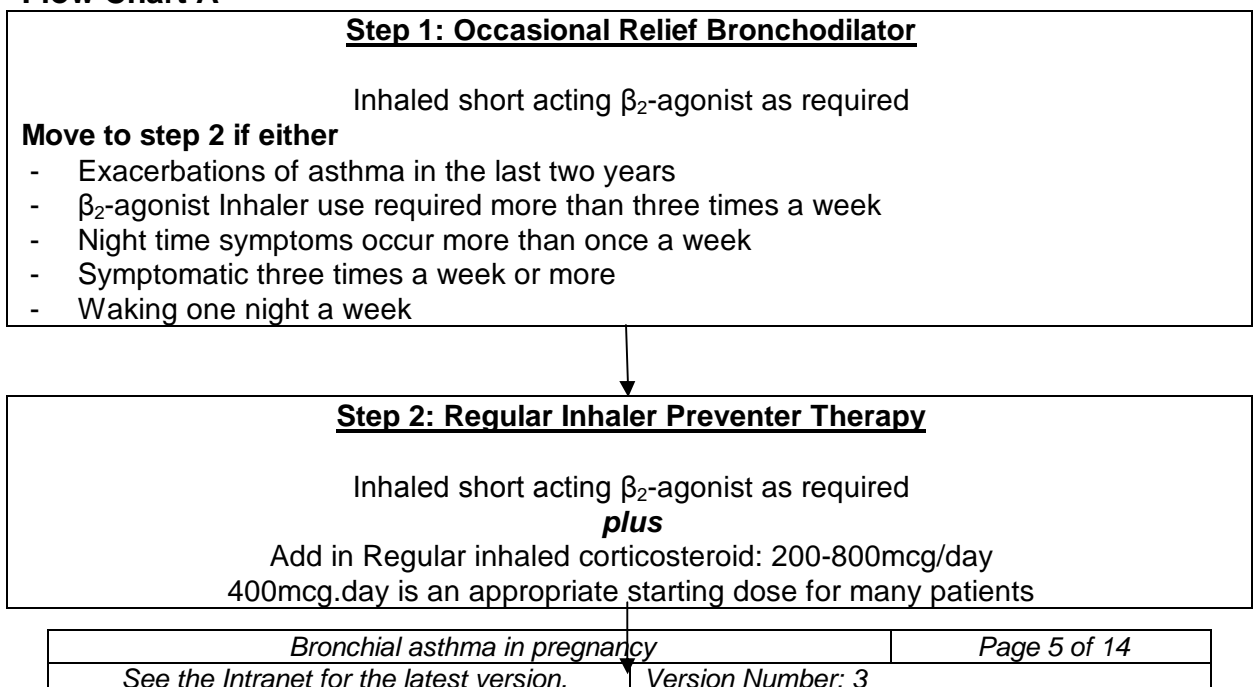
2.4 Management of Asthma – The Stepwise Approach

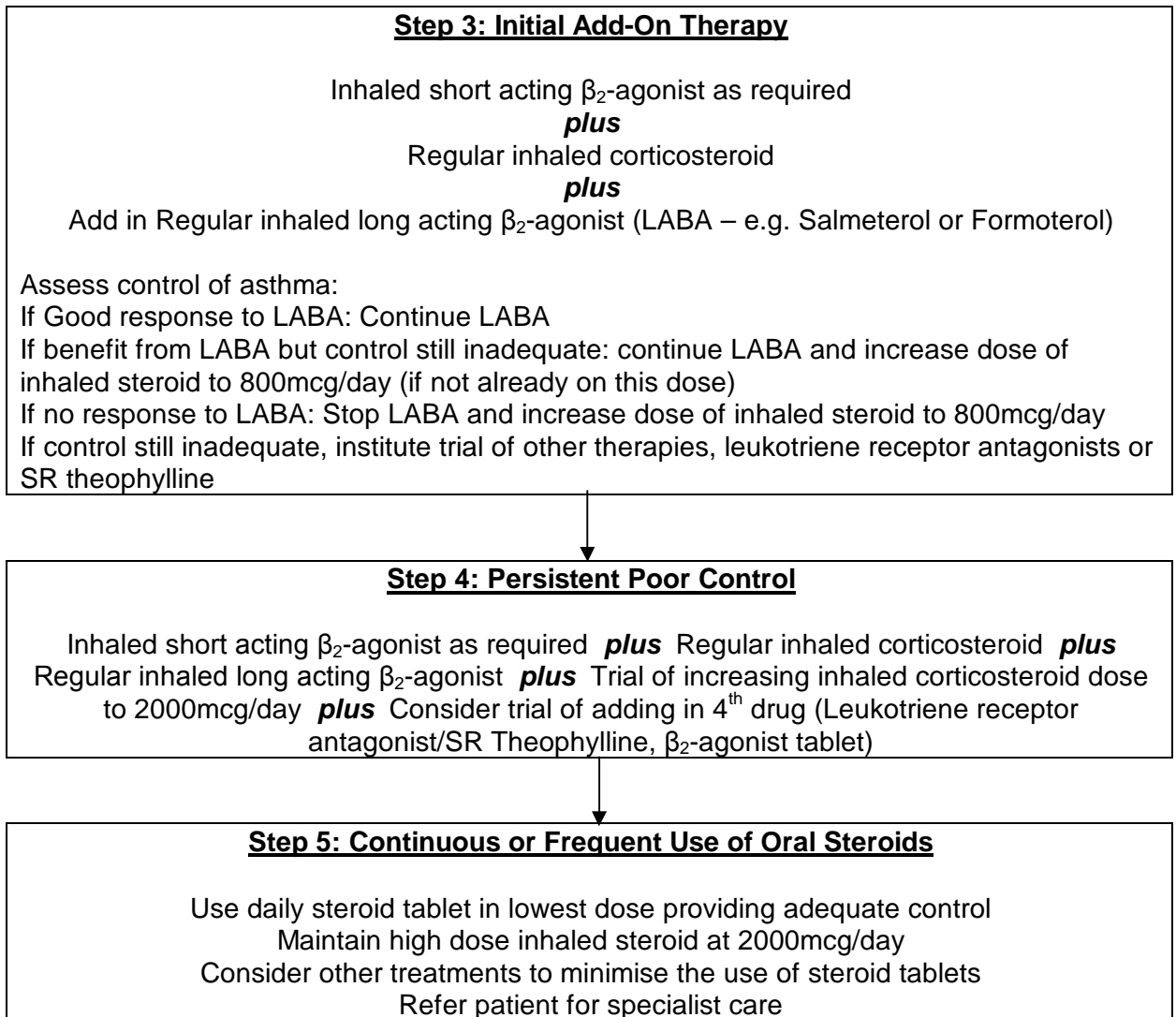
2.4.1 Treatment is to be titrated up or down depending on response with the aim of achieving and maintaining control of symptoms; stepping up treatment when symptoms persist and stepping down when control is good (refer to flowchart A) (SIGN, 2012)

2.4.2 A moderate exacerbation is defined as:

- Worsening symptoms (Shortness of breath, wheeze)
- PEFr of 50 – 75% of best or predicted
- Maintains ability to complete sentences
- Respiratory rate < 25/minute
- Pulse < 110 bpm
- If symptoms and signs do not meet this criteria then treat as a more severe exacerbations (refer to section 5)
- Good asthma control is associated with little or no need for short-acting β_2 agonist. Using two or more canisters of β_2 agonists per month or >10-12 puffs per day is a marker of poorly controlled asthma that puts patients at risk of fatal or near-fatal asthma. Before initiating a new drug therapy practitioners should recheck adherence, inhaler technique and eliminate trigger factors

Flow Chart A





2.4.3 Stepping down therapy

- Regular review is important to allow stepping down therapy and should ideally be done by the general practitioner/respiratory physician.
- The aim is to keep patient on the minimum dose of inhaled steroid as possible whilst maintaining control.
- Reduction of inhaled steroid dose should be slow as patients can deteriorate at different rates, therefore, reduction should be considered every 3 months, aiming to reduce the dose by 25-50% each time.

2.5 During Labour

2.5.1 Acute asthmatic attacks in labour are rare (SIGN 2012). Women should be advised to continue their usual asthma medications in labour.

2.5.2 Bronchodilators such as Salbutamol inhaler (100-200 mcg) must not be discontinued during labour and can be used as required. There is no evidence

to suggest that beta 2 agonists delay the onset of active phase of labour or slow the course of labour.

- 2.5.3 Women receiving oral steroids (>7.5mg prednisolone per day for >2 weeks prior to delivery), must receive parental hydrocortisone - 100 mg /6-8 hourly to cover the stress of the labour and until oral medication is restarted (De Swiet, 1999). Oral medication may be restarted following delivery.
- 2.5.4 The following medications are safe for use in women with asthma (De Swiet, 1999)

- All forms of pain relief (regional preferable to GA)
- Prostin/Propress for induction of labour (PG E2 is a bronchodilator)

2 Syntometrine for 3rd stage (unless severe asthma – see section 2.8)

- 2.5.5 Avoid the use of the following drugs (used commonly during labour) in women with asthma as they may precipitate severe bronchospasm (De Swiet, 1999):
- Ergometrine alone (as supplementary therapy) should be avoided after delivery as bronchospasm has been described (Syntometrine has not been associated with problems and the standard single dose should be used)
 - Non-steroidal anti-inflammatory drugs eg diclofenac. If taken previously without worsening of asthma symptoms and patient is clinically stable then may be taken if clinically indicated
 - Prostaglandins F2a (carboprost / Haemobate) unless life-threatening PPH and all other options have been tried

Caution must be taken with the use of:

- Beta-blockers such as labetalol for hypertension. The use of beta-blockers will depend on the severity of the woman's asthma, the need to control hypertension and whether other alternatives are available. If there are doubts as to whether it is appropriate it should be discussed with the consultant obstetrician and consultant anaesthetist.

2.5.6 In the absence of acute severe asthma, caesarean section remains for obstetric indications.

2.6 Postnatal

Breast feeding is safe with asthma medication and should be encouraged for its many benefits, and as it may also have a potential protective effect in relation to early asthma (SIGN 2012).

2.7 The underlying principle of asthma management is the control of the disease and therefore medication used during the antenatal period can be used safely during labour and after delivery

2.8 Key points of management of acute asthma in pregnancy (SIGN, 2009, 2012)

An acute exacerbation of asthma is a potentially life threatening condition, requiring vigorous / active management. The features and management of severe asthma are similar to that of the non-pregnant adults.

2.8.1 Definition and Clinical Stages of Acute asthma (SIGN, 2012)

Acute Severe	Life Threatening
<p>Any one of:</p> <p>*PEFR 33-50% of best or predicted RR \geq 25 breaths/min Inability to complete sentence in one breath</p> <p>Heart rate > 110 bpm</p>	<p>Any one of:</p> <p>*PEFR <33% SpO₂ <92% PaO₂ < 8 kPa "Normal" PaCO₂ (4.6 - 6 kPa, 35-45 mmHg) on blood gas analysis Silent Chest Cyanosis Arrhythmia Poor respiratory effort Exhaustion Altered conscious level</p>
<p>Near Fatal: Raised PaCO₂ and/or requiring mechanical ventilation with raised inflation pressures</p>	

2.8.2 Immediate Treatment:

Acute asthma requires expert medical assistance

- Bleep the medical Registrar (Bleep 3501).
- Involve the Obstetric Anaesthetists for early assessment (Anaesthetic Consultants 0161 701 0131; Anaesthetic Registrars- Bleep 2755/1031)
- Ensure close liaison between the respiratory consultant and obstetrician.
- Ensure early referral to critical care for those with acute severe asthma.

Anyone with an acute exacerbation of their asthma should be given the following treatment immediately:

- Call for help
- Oxygen - use the highest concentration available at a high flow rate to maintain saturations at 94-98%. Lack of pulse oximetry equipment must not prevent the use of oxygen
- High doses of inhaled (nebulised – oxygen driven) Salbutamol 5mg
- Ipratropium Bromide 500mcg (nebulised)
- Give steroids: IV hydrocortisone 100mg immediately

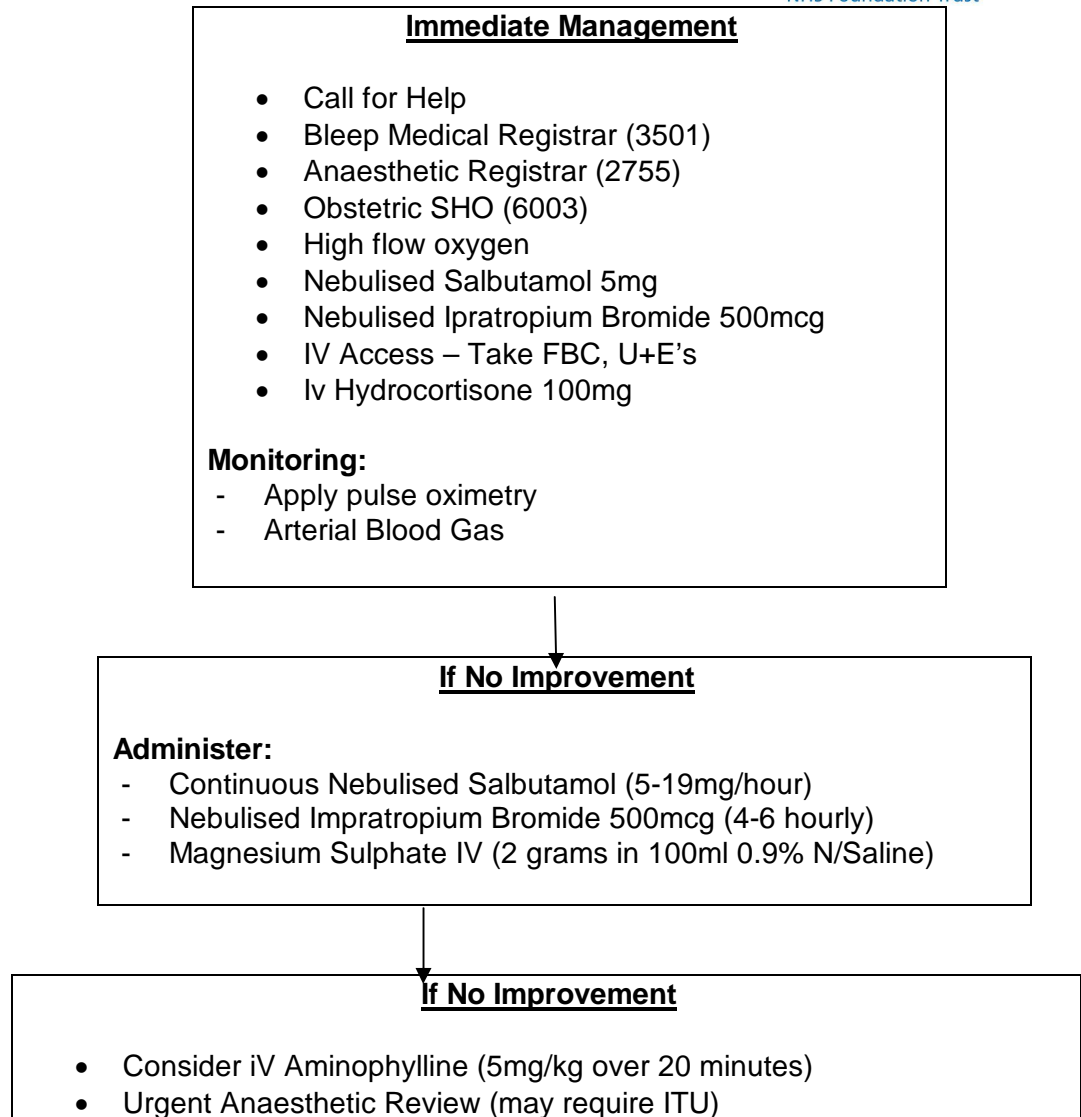
The following investigations must be undertaken in the presence of acute asthma:

- Pulse Oximetry: must be used to measure the oxygen saturation (SpO₂) to determine the adequacy of oxygen therapy and the need for arterial blood gas analysis (ABG). The aim of oxygen therapy is to maintain SpO₂ at 94-98% (SIGN, 2012)
- Arterial Blood Gas: Arterial blood gas measurements must be taken if the SpO₂ is below 92% (irrespective if on oxygen or not) or if there are any other features of life threatening asthma. An SpO₂ < 92% is associated with hypercapnia (not detected by pulse oximetry) (SIGN, 2012)

2.8.3 Further Management if no improvement:

- Give continuous nebulised Salbutamol 5-10mg/hour
- Give continuous nebulised ipratropium Bromide 500mcg 4-6 hourly
- Consider a single dose of IV magnesium sulphate for those with life threatening or near death asthma or those with severe asthma not responding to initial therapy. Give 2 g of Magnesium sulphate in 100ml 0.9% normal saline over 20 minutes after consultation with senior medical staff (SIGN, 2009, 2012).
- Consider intravenous administration Aminophylline. Some women with life threatening or near death asthma who have not responded to initial therapy may gain some benefit from IV aminophylline. Loading dose is 5mg/Kg over 20 minutes. Maintenance dose is 0.5-0.7mg/kg/hr (SIGN, 2012). If IV aminophylline is given to patients on oral aminophylline or theophylline, blood levels should be checked on admission. Levels should be checked daily for all patients on aminophylline infusions. The rate of infusion is to be adjusted according to the response of the peak expiratory flow and heart rate

The response to treatment must be monitored throughout (Refer to Section 2.9)



2.8.4 Subsequent Investigations:

- Chest X Ray (SIGN, 2012)
- Chest X-ray is not routinely recommended in patients in the absence of: Suspected pneumomediastinum or pneumothorax
 - Suspected consolidation
 - Life threatening asthma
 - Failure to respond to treatment satisfactorily
 - Requirement for ventilation.
- Full blood count, plasma urea and electrolytes should be measured. Hypokalaemia may develop secondary to Salbutamol or steroid treatment and should, therefore, be measured and corrected.

2.8.5 Continuous Electronic Fetal Monitoring

Continuous fetal monitoring should be performed when asthma is uncontrolled or severe, as maternal acidosis is poorly tolerated by the fetus.

2.9 Monitoring of Treatment (SIGN, 2009, 2012)

- Measure peak expiratory flow every 15 – 30 minutes after starting treatment, and thereafter according to response. Peak expiratory flow rate should also be measured and recorded before and after bronchodilator treatment (at least four times daily) throughout the hospital stay or until controlled.
- Record oxygen saturation by oximetry and maintain arterial SpO₂ at 94-98%.
- Repeat blood gas analysis within 1 hour of starting initial treatment if either:
 - The initial Po₂ was less than 8kPa
 - The initial PCO₂ was normal or raised
 - The patient's condition deteriorates
- Arterial blood gases must be repeated if the patient's condition has not improved by 4-6 hours following exacerbation.
- Measure and record the heart rate.
- As part of long term inpatient management plan serum potassium and blood glucose concentrations must be monitored daily and action plan devised accordingly.
- Serum theophylline levels must be measured if an infusion continues for over 24 hours (aiming for concentration of 10-20mg/l or 55-110 mol/l).

2.10 Indications for referral to Intensive Care

Referral to intensive care is required if patient requires ventilator support. Intermittent positive pressure ventilation is required if the PO₂ ≤ 8 and a PCO₂ ≥ 6 despite receiving 60% oxygen or if the woman is exhausted.

Patient must also be transferred to ITU if there is an acute or severe asthma failing to respond to treatment, evidenced by:

- Deteriorating PEFR
- Persisting or worsening hypoxia
- Hypercapnia
- ABG analysis showing fall in pH or rising H⁺ concentration (acidosis)
- Exhaustion, feeble respiratory effort
- Drowsiness, confusion, altered conscious state
- Respiratory arrest

All patients transferred to intensive care must be transferred according to CMFT ITU transfer guideline (see guidelines) and/or be accompanied by a doctor suitably equipped and skilled to intubate if necessary (SIGN, 2012)

2.11 Subsequent Management: Prior to Discharge

- Control of asthma is achieved where symptoms have cleared and lung function has stabilised or returned to normal or best level, as identified by a peak expiratory flow of >75% of the woman's predicted level, with less than a 25% diurnal variation or deterioration, and with no nocturnal symptoms.

- Women may monitor their own treatment for asthma according to peak flow measurements, but it is the Midwives responsibility to ensure these measurements are recorded every four hours.
- All women experiencing an exacerbation of their asthma in pregnancy should be followed up by a respiratory physician following discharge.

2.11.1 Communication and Documentation

All women with learning disabilities, visual or hearing impairments or those whose first language is not English must be offered assistance with interpretation where applicable, and where appropriate a telephone interpreter must be used. It is paramount that clear channels of communication are maintained at all times between all staff, the women and their families. Once any decisions have been made/agreed, comprehensive and clear details must be given to the woman thereby confirming the wishes of the women and their families.

The contents of any leaflet issued must be explained in full at the time it is issued. All communication difficulties (including learning difficulties) and language barriers must be addressed as outlined in the previous paragraph at the time the leaflet is issued.

Ensure the provision and discussion of information of the risks and benefits with women during the antenatal, intrapartum and postnatal periods.

Staff should aim to foster a culturally sensitive care approach in accordance with the religious and cultural beliefs of the parents and families in our care.

3. Equality Impact Assessment.

The EqIA score fell into low priority (0-9); no significant issues in relation to equality, diversity, gender, colour, race or religion are identified as raising a concern.

4. Consultation, Approval and Ratification Process

See: guideline for the introduction or re-approval a clinical guideline for obstetric practice

5. References and Bibliography

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6 Appendices
Appendix 1: Normal values for peak expiratory flow (PEF)

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