GAIN

GUIDELINES AND AUDIT
IMPLEMENTATION NETWORK

MANAGEMENT OF SEVERE PRE-ECLAMPSIA AND ECLAMPSIA

March 2012

CONTENTS

All statements in *"italics"* are direct quotes from the stated references.

FOREWORD

Guidelines for the Management of Severe Pre-Eclampsia and Eclampsia.

These guidelines have been published by the Guidelines & Audit Implementation Network (GAIN), which is a team of health care professionals established under the auspices of the Department of Health, Social Services & Public Safety in 2010. The aim of GAIN is to promote quality in the Health Service in Northern Ireland, through audit and guidelines, while ensuring the highest possible standard of clinical practice is maintained.

This guideline is a review of the Clinical Resource Efficiency Support Team (CREST) August 2001 guideline and was produced by a sub-group of health care professionals from varied backgrounds and was chaired by Dr H Sidhu, Consultant Obstetrician and Gynaecologist.

GAIN wishes to thank all those who contributed in any way to the development of these guidelines.

INTRODUCTION

Obstetric emergency guidelines are drawn up to improve the consistency of management of pregnant women and their unborn children. As different teams of doctors and midwives are involved in the management of emergencies, standardisation should improve the efficiency of the unit and the outcomes for mother and child. **Guidelines are not intended to replace the process of critical evaluation of every case and individualised decision making.** Consultant staff should always be involved in the decisions taken in the management of all obstetric emergencies but until such time as they are informed and available, these guidelines will help midwives and junior staff to initiate immediate management.

An early combined obstetric and anaesthetic approach to monitoring and management provides optimal care.

"Women with pre-eclampsia, in common with others who have poorly understood diseases, have suffered from many treatments that ultimately turned out to be ineffective or even harmful, but which were difficult to question when they were in common use.

...Hardly any mothers or babies die directly from a first convulsion in hospital; they die, if at all, from the underlying disease." [1]

These guidelines have been collated from what is currently practised in Labour Wards in Northern Ireland, using RCOG guidelines and evidence-based information where possible.

Review Date: 2014

Dr H Sidhu
Consultant in Obstetrics & Gynaecology

Incidence

Severe pre-eclampsia and eclampsia are relatively uncommon but can cause serious complications of pregnancy. In the triennium 2006-2008 there were 19 maternal deaths resulting from severe pre-eclampsia and eclampsia.[2] Severe pre-eclampsia and eclampsia were the second leading cause of Direct Maternal deaths. It is estimated that around 5/1000 maternities in the UK suffer from severe pre-eclampsia[3] and 5/10,000 maternities develop eclampsia.[4]

Definitions

- **Eclampsia** is defined as a convulsive condition associated with pre-eclampsia [5]

- **Severe pre-eclampsia** is defined as pre-eclampsia with severe hypertension with diastolic blood pressure **≥110 mmHg, systolic blood pressure ≥ 160 mmHg and/or with symptoms, and/or biochemical and/or haematological impairment** [5]

- **The clinical features of severe pre-eclampsia (in addition to hypertension and proteinuria) are:**
  - severe headache
  - sudden swelling of face, hands, feet
  - visual disturbance such as blurring or flashing before eyes
  - epigastric pain and/or vomiting
  - signs of clonus
  - papilloedema
  - liver tenderness
  - platelet count falling to below 100 x 10^6/l [6]
  - abnormal liver enzymes (ALT or AST rising to above 70iu/l)
  - HELLP syndrome

MANAGEMENT OF SEVERE PRE-ECLAMPSIA

1. **Principles of Management**
   - Assess
   - Observe/monitor
   - Investigate
   - Control blood pressure
   - Prevention of seizures
   - Steroids for fetal lung maturity
   - Careful fluid balance
   - Consider the need for in utero/neonatal transfer
   - Timing of Delivery
   - Continue vigilance post delivery
   - Follow up

2. **Admit for assessment if:**
   - Systolic blood pressure ≥ 160 mmHg, or if
   - Diastolic blood pressure ≥ 100 mmHg, or if
   - Hypertension and proteinuria ≥ +, or if
   - Presence of any clinical signs or symptoms

3. **Inform of admission:**
   - Obstetric Registrar and Consultant
   - Paediatric Registrar and Consultant
   - Anaesthetic Registrar and Consultant

4. **Observe and monitor**
   - Blood pressure measurement : every 15 minutes until stable, then every 30 minutes. Less frequent monitoring may become appropriate in some situations following full assessment
   - Generalised oedema
   - Symptoms
   - Optic fundi
   - Reflexes +/- clonus

- Test all urine specimens for protein
- Measure and record all fluid intake and urinary output
- MEOWS chart
- Fetal cardiotocograph (continuous if in labour)
- Fetal ultrasound scan for EFW, AFV, placental maturity,
- Fetal Umbilical Artery Doppler studies
- Middle Cerebral Artery Doppler studies if fetal umbilical artery doppler studies are abnormal or there is other concern about fetus e.g. IUGR or reduced fetal activity

5. Investigations

- **Blood**

  Full blood picture including Platelets
  Urea & Electolytes
  Urate Serum Creatinine investigations (uric acid)
  Liver Function Tests
  Coagulation screen if platelet count less than100 x 10^6/l
  Group and hold serum

- **Urine**

  24-hour urine collections for:
  i. Total protein and creatinine clearance
  ii. Catecholamines

6. Control of Blood Pressure

Cerebral haemorrhage is the main cause of death in women with pre-eclampsia/ eclampsia. To prevent haemorrhagic stroke, severe life-threatening hypertension, especially high systolic blood pressure, must be treated quickly and effectively. [2]

- **Treat hypertension if:**

  Systolic blood pressure ≥ 160 mmHg, or if
  Diastolic blood pressure ≥ 110 mmHg, or if

Mean arterial pressure ≥ 125 mmHg, or if
Blood pressure ≤ 160/110 mmHg but other evidence of severe disease

Aim to reduce blood pressure to around 130-140/90-100 mmHg

A rapid and precipitous fall in maternal blood pressure or maternal hypotension as a result of intravenous anti-hypertensive drugs, especially hydralazine, may cause fetal heart rate abnormalities, especially in growth restricted/compromised fetuses.

Monitor fetal heart with continuous CTG during and for 30 minutes after administration of intravenous anti-hypertensive drugs

Aim to stabilise blood pressure before delivery.

Anti-hypertensive drugs

The choice of antihypertensive in severe pre-eclampsia has evolved historically rather than scientifically. Effective and safe control of severe hypertension is the most important aspect of critical care management, as the main cause of maternal death is the consequence of poorly controlled hypertension.[5] The choice of antihypertensive drugs for acute control varies but is usually labetalol, hydralazine or nifedipine.[7]

Drugs: **Labetalol orally or intravenously**

(Labetalol should be avoided in women with known asthma)

- 200mg orally stat if possible, repeated hourly for up to 4 hours
  or
- Up to 50 mg IV stat slowly; then if necessary erect IV infusion of 200 mg in 200 ml NaCl 0.9%, starting at 40 mg/hour, doubling dose at half hourly intervals as required to a maximum of 160 mg/hour.

Nifedipine

- Decision to administer nifedipine antenatally should be made by consultant staff

- Oral route is safer and as effective as sublingual route
- 10 mg oral stat dose
- Repeat every 20 minutes to a maximum of 40 mg
- Monitor fetal heart with CTG

NOTE: An interaction between nifedipine and magnesium sulphate has been reported to produce profound muscle weakness, maternal hypotension and fetal distress.[8, 9, 10, 11]

Hydralazine:

- 10 mg IV slowly
- a further bolus of 5 mg IV after a 20 minute interval may be given if necessary (the effect of a single dose can last up to 6 hours)
- If no lasting effect with boluses of hydralazine (assess over 20 minutes), consider an infusion of 2.0 mg/hour increasing by 0.5 mg/hour as required (2-20 mg/hour usually required)

- **Close liaison with anaesthetists: may require plasma expansion**[5]
  Consider using up to 500 ml crystalloid fluid before or at the same time as the first dose of intravenous hydrallazine in the antenatal period.
  In women with severe hypertension who are in critical care, aim to keep systolic blood pressure below 150 mmHg and diastolic blood pressure between 80 and 100 mmHg [5]
  In women with less severe disease not requiring urgent delivery (blood pressure < 160/110 mmHg), maternal antihypertensive treatment with methyldopa or labetalol may allow prolongation of pregnancy for up to 15 days, although there may be a small reduction in birth weight[12]

7. Prevention of seizures

Magnesium sulphate is the drug of choice[13] and should be considered if there is concern about the risk of eclampsia[7] (Appendix 1)

Assess patients for the presence of: severe headache with visual disturbance, hyper-reflexia, clonus, irritability, restlessness

If magnesium sulphate is given, it should be continued for 24 hours after delivery or 24 hours after the last seizure, whichever is the later, unless there is a clinical reason to continue[7]

If magnesium sulphate is given antenatally, monitor the fetal heart with continuous CTG.

8. Corticosteroids

Initiate corticosteroids if gestation < 34 weeks. Every effort should be made to initiate antenatal corticosteroid therapy in women between 24 and 34 weeks gestation. Between 35 to 36 weeks gestation obstetricians may wish to consider antenatal steroid use. Recommended therapy involves two doses of betamethasone 12mg, given intramuscularly 24 hours apart.[14]

9. Principles of Fluid Balance

FLUID RESTRICTION IS ADVISABLE TO REDUCE THE RISK OF FLUID OVERLOAD IN THE INTRAPARTUM AND POSTPARTUM PERIODS

BEWARE: Over the last 20 years pulmonary oedema has been a significant cause of maternal death in Severe Pre-Eclampsia/Eclampsia. This has often been associated with inappropriate fluid management.[15]

1. Accurate Recording of Fluid Balance

- including delivery and postpartum blood loss, input/output deficit

2. Maintenance Crystalloid Infusion

- 80 ml/hour, or 1 ml/kg/hour[7]

3. **Selective Colloid Expansion** may be necessary prior to pharmacological vasodilatation to prevent maternal hypotension and fetal compromise or in oliguria with low CVP: Colloid should only be given after discussion with anaesthetist

4. **Diuretics:** only for women with confirmed pulmonary oedema

5. **Avoid non-steroidal analgesia until fluid recovery**

10. **Consider the need for in utero/neonatal transfer:**[7]

If a Maternity Unit does not have access to HDU/ICU or is unable to cope with maternal complications, or is unable to cope with pre-term babies, it may be appropriate to consider antenatal transfer of the mother. However, maternal safety must not be jeopardised and each case should be considered on its clinical merits; in most cases it is safer to deliver the mother and then consider the need for transfer of mother and/or child.

Maternity Units should consider developing transfer protocols to ensure that patients are transferred with appropriate personnel and equipment. Transfer documentation needs to be standardised.

11. **Birth**

A team effort involving obstetricians, midwives, anaesthetists and paediatricians

- The timing of birth is dependent on the maternal and fetal condition. Either caesarean section or induction of labour may be appropriate depending on the clinical findings.[5]

- In eclampsia, the definitive treatment is delivery

However, **it is inappropriate to deliver an unstable mother** even if there is fetal compromise. Once seizures are controlled, severe hypertension treated and hypoxia corrected, delivery can be expedited.

The third stage should be managed with 5 units of Syntocinon, either intramuscularly or slowly intravenously. Ergometrine should **not** be used in severe pre-eclampsia and eclampsia.

Consider Prophylaxis against Thromboembolism.[16]

12. Principles of Care After Birth

- Maintain vigilance as the majority of eclamptic seizures occur after delivery
- High dependency care should be provided as clinically indicated (24 hours minimum) [7, 17]
- Consider the need for admission to ICU.
- Close monitoring should be undertaken by experienced staff: nurse/midwife should be allocated to provide one to one care, with input from senior medical staff
- Maintain close attention to fluid balance
- Monitor platelets, transaminases and creatinine until they have returned to normal values
- Review anti-hypertensive medication as indicated: methyldopa should be avoided postpartum because of its tendency to cause depression. β-Blockers (e.g. atenelol 50-100 mg daily), with the addition of a calcium antagonist (e.g. slow-release nifedipine 10-20 mg b.d.) and/or an ACE inhibitor (e.g. enalapril 5-10 mg b.d.) if required, are appropriate for the treatment of postpartum hypertension.
- Review Magnesium sulphate medication as indicated

13. Follow-Up

- If eclampsia has occurred, consider CT scan of the head
- Specific investigations: anti-phospholipid antibodies, lupus anticoagulant and thrombophilia screen.[18]
- Discussion with mother concerning what has happened and its significance for the future
- Inform general practitioner and community midwives at discharge.
- Arrange long-term follow-up to make sure that blood pressure resolves.
- Arrange hospital review 2 weeks after discharge if discharged home on antihypertensive medication5
- In women who have had severe pre-eclampsia and/or eclampsia, arrange hospital review at 6 weeks to check bloods, proteinuria (refer for specialist kidney assessment if still present), monitor BP (refer to physicians if still elevated); and for final debriefing 5
- Offer future preconceptual counselling to consider risk factors and preventative therapy (e.g. aspirin, lose weight)

MANAGEMENT OF ECLAMPSIA[19]

DO NOT LEAVE PATIENT ALONE

ACTIVATE EMERGENCY BUZZER & CALL FOR HELP
Duty obstetric & anaesthetic registrars; senior midwife; INFORM duty consultant obstetrician & anaesthetist

Arrange for ECLAMPSIA BOX to be brought in

Is it safe to approach the patient?
Consider hazards around patient that will affect your safety

Prevent maternal injury during convulsion
Place patient in semi-prone position (left side)

Airway	Assess Protect airway and maintain patency Give high-flow oxygen
Breathing	Assess Ventilate as required
Circulation	Evaluate pulse & blood pressure If absent, initiate CPR: 30 chest compressions / 2 rescue breaths. Call ARREST TEAM Left lateral tilt / displace uterus with wedge Secure IV access as soon as safely possible Fluids by infusion pump at no more than 1mg/kg/hr

Medication for the Management of Seizures

- The vast majority of the initial seizures are self-limiting[20]
- **MAGNESIUM SULPHATE** is the anticonvulsant drug of choice[13]
- 4g iv bolus: See APPENDIX 1 for regimen
- Avoid polypharmacy to treat seizures – increases risk of respiratory arrest

Observations & Investigations

As per Management of **Severe Pre-Eclampsia**
Take Blood Gases and baseline bloods
Respirations and oxygen saturation - attach pulse oximeter
Attach ECG and automatic blood pressure monitors
Urinary catheter – hourly urinometer readings and test for protein
Fluid input/output chart
MEWS chart
Check for aspiration - always auscultate lungs after the convulsion has ended
Continuous electronic fetal monitoring
Deliver once stabilised if antenatal

DOCUMENTATION

- Timings
- Drugs administered
- Persons present

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RECOMMENDED READING

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APPENDICES

APPENDIX 1

MAGNESIUM SULPHATE REGIMEN AND MONITORING

Administer via infusion pump

Loading Dose **4 g IV over 10-15 minutes**
Add 8 ml of 50% $MgSO_4$ to 12 ml N Saline
= 4 g in 20 ml = 20% solution

Maintenance **1 g per hour**
Add 25 g $MgSO_4$ (50 ml) to 250 ml N Saline
1 g $MgSO_4$ = 12 ml per hour IV
1 g/hour is infused for 24 hours after delivery or after last seizure, whichever is later, provided that:

- Respiratory rate > 16 breaths/minute
- Urine output > 25 ml/hour, and
- Patellar reflexes are present

REMEMBER TO SUBSTRACT VOLUME INFUSED FROM TOTAL MAINTENANCE INFUSION VOLUME (80 ml/hour)

A higher maintenance dose may be required initially to prevent recurrent seizures – consultant must make this decision

If seizure continues, or if seizures recur, give a second bolus of magnesium sulphate:

2-4 g depending on weight of patient, over 5-10 minutes
(2 g if < 70 kg and 4 g if > 70 kg)
ONE STAT DOSE ONLY

Alternately, increase the rate of magnesium sulphate infusion to 1.5g or 2.0g/hour

If seizures persist, then alternate agents such as diazepam or thiopentone may be used, but only as single doses, since prolonged use of diazepam is associated with an increase in maternal death. Intubation may become necessary in such women to protect the airway and ensure adequate oxygenation. Transfer to intensive care facilities with intermittent positive pressure ventilation is appropriate in these circumstances

When using Magnesium Sulphate

Monitor

Hourly urine output
Respiratory rate, oxygen saturation and patellar reflexes – every 10 minutes for first two hours and then every 30 minutes
Check serum magnesium levels every day if infusion is continued for >24 hours

Request $MgSO_4$ Levels if

Respiratory rate < 16 breaths/minute (**CARE:** lower rate may be appropriate if on opiates)
Urine output < 25 ml/hour for 4 hours
Loss of patellar reflexes
Further seizures occur

Magnesium Levels

Therapeutic 2.0 – 4.0 mmol/l

With increasing magnesium levels, the following may occur:

Feeling of warmth, flushing, double vision
Slurred speech. . . . . 3.8-5.0 mmol/l
Loss of tendon reflexes . . . . . >5.0 mmol/l
Respiratory Depression . . . . . >6.0 mmol/l
Respiratory Arrest . . . . . 6.3-7.1 mmol/l
Cardiac Arrest. . . . . >12.0 mmol/l

Magnesium Toxicity	**Urine output <100 ml in 4 hours:** If no clinical signs of magnesium toxicity, decrease rate to 0.5 g/hour Review overall management with attention to fluid balance and blood loss **Absent patellar reflexes:** Stop $MgSO_4$ infusion until reflexes return **Respiratory Depressions:** Stop $MgSO_4$ infusion Give oxygen via facemask and place in recovery position because of impaired level of consciousness Monitor closely **Respiratory Arrest:** Stop $MgSO_4$ infusion Give IV Calcium Gluconate Intubate and ventilate immediately **Cardiac Arrest:** Commence CPR Stop $MgSO_4$ infusion Give IV Calcium Gluconate Intubate and ventilate immediately If antenatal, immediate delivery
Antidote	**10% Calcium Gluconate 10 ml IV over 10 minutes**

APPENDIX 2
Management of IMMINENT ECLAMPSIA or ECLAMPSIA

DO NOT LEAVE PATIENT ALONE

Place in semi-prone position

Call for HELP – Duty obstetric & anaesthetic registrars; senior midwife
Inform consultants – obstetrician and anaesthetist on-call

OBSERVATIONS
Pulse Oximeter BP
Respirations Temperature
ECG
Test urine for protein
Hourly urine output
Fluid balance / MEOWS chart
FH – monitor continuously

AIRWAY
- Assess; consider left lateral tilt
- Protect Airway and maintain patency
- Give oxygen

BREATHING
- Assess
- Ventilate as required

CIRCULATION
- Evaluate pulse & BP
- If absent, start CPR: 30 compressions/2 breaths
- Call ARREST TEAM
- Secure IV access as soon as safely possible

INVESTIGATIONS
FBP & Platelets
U&E
Urate
Serum Creatinine
LFTs
Coagulation Screen
Group and Hold Serum
MSSU/CSU
24 hr urine collections for:
- Total protein & creatinine clearance
- Catecholamines

CONTROL SEIZURES
- **Loading dose $MgSO_4$:** 4 g $MgSO_4$ in 20% solution IV over 10-15 minutes
  Add 8ml of 50% $MgSO_4$ solution to 12 ml N Saline
- **Maintenance dose $MgSO_4$:** 1g per hour infusion
  Add 25g MgSO4 (50 ml) to 250 ml N Saline
  1g $MgSO_4$ = 12 ml per hour IV
- **If seizures continue/recur:** $MgSO_4$ 2g ≤ 70kg; 4g ≥ 70kg IV as per loading dose over 5-10 minutes.
- **Monitor:** Hourly urine output
  Respiratory rate, O_2 saturation & patellar reflexes – every 10 minutes for first 2 hours and then every 30 minutes
  Check serum magnesium levels daily if infusion is continued for >24 hours
- **Stop Infusion:** Check magnesium levels and review management with consultant if:
  Urine output < 100ml in 4 hours
  or if: Patellar reflexes are absent
  or if: Respiratory rate < 16 breaths/minute
  or if: Oxygen saturation <90%
- **Antidote:** 10% Calcium gluconate 10ml IV over 10 minutes

CONTROL HYPERTENSION
- **Treat hypertension if systolic BP ≥ 160 mmHg or diastolic BP ≥** 110 mmHg or MAP ≥ 125 mmHg
  Aim to reduce BP to around 130-140/90-100 mmHg
- **Beware maternal hypotension and fetal heart rate abnormalities** – monitor FH with continuous CTG
- **LABETALOL** Up to 50mg IV stat slowly then erect IV infusion: 200 mg in 200 ml N Saline at 40 mg/hr, doubling dose at 1/2 hourly intervals as required to a maximum of 160 mg/hour
- **NIFEDIPINE 10mg oral stat dose; repeat every 20 mins to a maximum of 40mg**
- **HYDRAZALINE** 10mg IV slowly.
  Repeated doses of HYDRALAZINE 5mg IV 20 minutes apart may be given if necessary
  Close liaison with anaesthetists: may require plasma expansion

If not postpartum DELIVER
- There is no place for the continuation of pregnancy if eclampsia occurs
- **"STABILISE" THE MOTHER BEFORE DELIVERY**
- **DELIVERY IS A TEAM EFFORT** involving obstetricians, midwives, anaesthetists and paediatricians
- Ergometrine should not be used in severe eclampsia – syntocinon 5 units im / slowly iv may be used
- Consider prophylaxis against Thromboembolism
- Maintain vigilance as the majority of eclamptic seizures occur after delivery

APPENDIX 3

Abbreviations

AFV	Amniotic Fluid Volume
ALT	Alanine transaminase
AST	Aspartate transaminase
BP	Blood pressure
CPR	Cardio-pulmonary resuscitation
CSU	Catheter sample of urine
CTG	Cardiotocography
CT	Computer assisted tomography
CVP	Central venous pressure
ECG	Electrocardiograph
EFW	Estimated Fetal Weight
FBP	Full blood picture
FH	Fetal heart
HELLP	Haemolysis, elevated liver enzymes, low platelets
HDU	High dependency unit
ICU	Intensive care unit
IUGR	Intrauterine Growth Retardation
IPPV	Intermittent positive pressure ventilation
IV	Intravenous
LFTs	Liver function tests
MAP	Mean arterial pressure
MEWS	Maternal Early Warning Score
$MgSO_4$	Magnesium sulphate
MSSU	Mid-stream sample of urine
RCOG	Royal College of Obstetricians and Gynaecologists
U&E	Urea & Electrolytes

APPENDIX 4

Emergency Box for Eclampsia

1. Drugs

Magnesium sulphate 50%, 5 g in 10 ml ampoule	x 10 amps
Calcium gluconate 10%, 8.9 mg in 10 ml ampoule	x 2 amps
Hydralazine 20 mg in 1 ml ampoule	x 2 amps
Labetalol 200 mg in 20 ml ampoule	x 1 amp
Sodium chloride 10 ml ampoule	x 10 amps
10% Calcium Gluconate 10 ml IV	x 10 amps

2. Intravenous fluids

250 ml bag of Sodium chloride	x 2
1 litre of Hartmann's solution	x 1
IVAC giving set	x 1
IV blood giving set	x 1

3. Venous access

20G Cannula (pink)	x 2
18G Cannula (green)	x 2
16G Cannula (grey)	x 2
Tourniquet	x 1
Fixation tape	x 1 roll

4. Airway equipment

Guedel airways: sizes 4, 3, and 2
Laedal bag, mask and valve
Green oxygen tubing 2 meters
Yankaeur sucker

5. Other equipment

50 ml syringe	x 2
20 ml syringe	x 2
10 ml syringe	x 2
Green needles	x 2
Reflex hammer	x 1

APPENDIX 5

Patient Information

Patient information packs can be obtained from:

ACTION ON PRE-ECLAMPSIA (PEC)
105 High Street
Evesham
Worcs
WR11 4EB
Tel: 01386 761848
Email: info@apec.org.uk
www.apec.org.uk

Registered Charity Number: 1013557

APPENDIX 6

Membership of the Pre-eclampsia and Eclampsia Working Group

Chair

Dr H Sidhu	Consultant Obstetrician	Southern HSC Trust

Members

Dr A Harper	Consultant Obstetrician	Belfast HSC Trust
Dr D McAtamney	Consultant Anaesthetist	Belfast HSC Trust
Dr C McAllister	Consultant Anaesthetist	Southern HSC Trust
Mrs K McDaid	Assistant Director of Healthcare	Western HSC Trust
Miss N Porter	Guideline & Audit Manager	GAIN

In attendance

Mrs C Le Guiniec	Administrative Support	GAIN

Peer Review

These guidelines have been peer reviewed as per NICE guidelines.

Further copies of this guideline can be obtained by either contacting the GAIN Office or by logging on to the website.

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