University Hospital Southampton NHS
NHS Foundation Trust

Magnesium sulphate in preterm delivery before 30 weeks gestation		Version:	2.0
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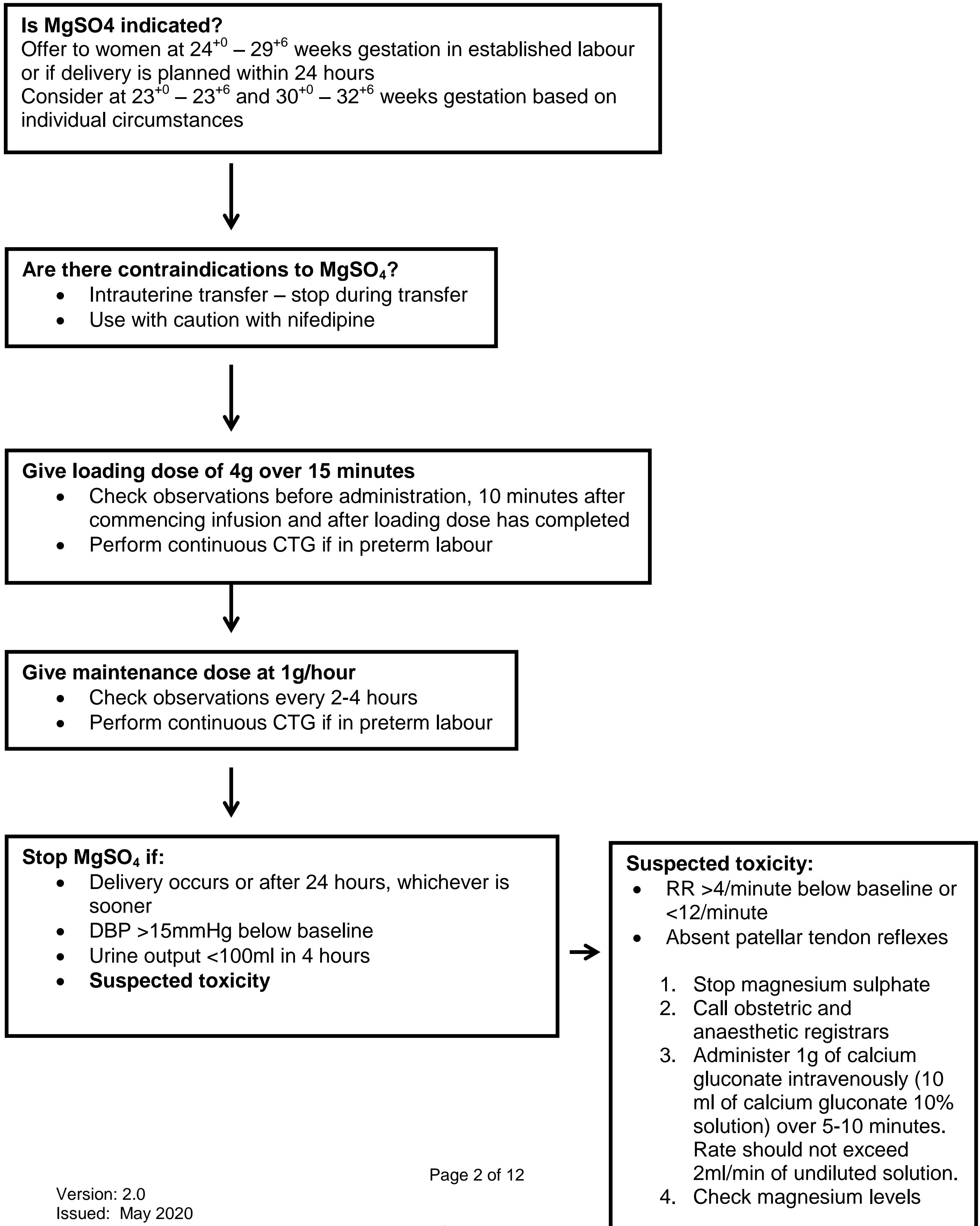
Executive Summary

Flow chart for the use of Magnesium Sulphate in preterm delivery



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1. Scope and Purpose

1.1. Scope of the guideline

This guideline relates to all women being cared for within UHS maternity services who are at risk or with a diagnosis of preterm labour or planned delivery before 30 weeks gestation.

1.2. Aim of the guideline

To enable staff to provide evidence based individualised care to women who are planned or expected to have a preterm birth (< 30 weeks) in order to reduce the incidence of cerebral palsy.

1.3. Guideline objectives

To provide support for staff in the management of women who are planned or expected to have a preterm birth (< 30 weeks).
To facilitate safe, consistent and evidence based care for women based as above on best practice

2. Definitions

MEOWS - Modified Early Obstetric Warning System
MgSO4 – Magnesium Sulphate

Established preterm labour – Progressive cervical dilatation from with regular contractions

3. Introduction

The risk of cerebral palsy rises with increasing prematurity. Cerebral palsy in preterm infants is more likely to be a result of perinatal injury in comparison to those born at term. Administration of magnesium sulphate prior to delivery reduces the risk of cerebral palsy in preterm infants. Neuroprotective effects begin shortly after administration.

4. Who and when to treat?

Magnesium sulphate should be offered for neuroprotection of the baby to women between 24^{+0} and 29^{+6} weeks gestation who are in established labour or when preterm birth is planned or expected within the next 24 hours.

NICE recommends that administration of magnesium sulphate for neuroprotection should be discussed with women between 23^{+0} and 23^{+6} weeks and at 30^{+0} and 32^{+6} weeks gestation in the context of her individual circumstances.

Magnesium sulphate should be offered regardless of indication for preterm delivery, administration of steroids, expected mode of delivery, fetal number and parity.

Neuroprotective effects are seen a short time after administration. Ideally magnesium sulphate should be administered at least four hours before birth but it is still likely to confer benefit even if given later than this.

Urgent delivery should not be delayed to administer magnesium sulphate.

5. Cautions

Magnesium sulphate may interact with nifedipine causing hypotension. If this occurs the infusion should be discontinued.

It may also cause muscle weakness in individuals with neuromuscular disorders.

Because of the small risk of respiratory depression-magnesium sulphate should not be used during transfer between hospitals

6. Dose and timing of administration

Magnesium sulphate should be given intravenously with a 4 gram loading dose (over 15 minutes) The infusion should be continued until birth or for 24 hours, whichever comes first.

The dosage and administration rate is the same as the treatment for pre-eclampsia, with less frequent observations of blood pressure (see ‘7. Monitoring’). For patients with pre-eclampsia the observations should be consistent with the UHS Hypertension in Pregnancy and the Puerperium guideline.

6.1. To prepare 4g bolus of magnesium sulphate:

This is supplied from pharmacy as prefilled syringes containing 4g magnesium sulphate in 20ml. If this is unavailable, pharmacy will supply ampoules of 20% magnesium sulphate (2g in 10ml) and the appropriate volume may be drawn up from these.

- Administer over 15 minutes by careful titrated dosing via a syringe pump or by hand by an experienced clinician.

- If 20% prefilled syringes or ampoules are unavailable, prepare bolus as follows and give as above:
- Add 8mls of magnesium sulphate 50% (1gm/2mls) to 12 mls of 0.9% sodium chloride

6.2. Following the bolus use a maintenance infusion as below:

This is supplied from pharmacy as prefilled syringes containing 10g magnesium sulphate in 50ml (20%).

- Administer at a rate of 5ml/hour (infusion rate 1g/hour)

If 20% prefilled syringes or ampoules are unavailable, prepare maintenance dose as follows and give as above:

- Add 20mls of magnesium sulphate 50% (1gm/2mls) to 30mls of 0.9% sodium chloride

The infusion can be continued at this rate provided that:

- the knee jerk or biceps reflex are present
- urine output remains >25 ml/hour
- respiratory rate does not fall below 12 per minute (if respiratory rate<12 but SpO2 remains normal and reflexes present this is unlikely to be caused by magnesium toxicity and more likely to be related to opioid analgesia)

6.3. Cautions

- Hepatic impairment (not known to be harmful for short term IV administration in eclampsia)
- Excessive doses in third trimester can cause respiratory depression

6.4. Adverse effects include:

Nausea; vomiting; thirst; flushing; hypotension; respiratory depression; loss of tendon reflexes; muscle weakness**.**

6.5. Repeat doses

In the event that birth has not occurred after giving magnesium sulphate for neuroprotection of the infant and preterm birth (less than 30 weeks' gestation) again appears imminent (planned or definitely expected within 24 hours), a repeat loading dose of magnesium sulphate may be considered if more than six hours after completing the previous infusion. There is no guidance on how many repeat doses can be given before 30 weeks however only one loading dose is required in a 24 hour period. If repeated infusions are considered this should be decided by the obstetric team at the time.

7. Monitoring

During administration of magnesium sulphate intravenously, women should be regularly assessed and resuscitation and ventilatory support should be immediately available. Should hypotension or respiratory depression occur prompt medical review is recommended and the infusion may need to be stopped. The frequency of observations may be dictated by other aspects of care, particularly whether the mother is in active labour or being prepared for elective delivery.

Before and after loading

A minimum assessment should include checking pulse, blood pressure, respiratory rate and patellar reflexes before loading dose, 10 minutes after loading dose infusion has started and at the end of the loading dose infusion (15 minutes)

During maintenance infusion
Observations and management whilst on Magnesium Sulphate infusion:

- Observations, including tendon reflexes and urine output, should be carried out at a minimum of every 4 hours. Observations may be required more frequently depending on the circumstance e.g. in severe pre-eclampsia.
- Repeat electrolytes and creatinine every 12 hours if there are concerns about maternal renal function
- Continuous CTG should be carried out if the mother is in preterm labour and 25 weeks gestation or over. Interpretation of the CTG should take into account the reduced variability that is often seen with magnesium infusions. If preparing for elective caesarean section, CTG should be carried out if there are clinical indications which would increase the risk of CTG abnormalities, such as severe pre-eclampsia or growth restriction.

The infusion should be stopped if:

- respiratory rate decreases more than 4 breaths per minute below baseline, or is less than 12 breaths per minute
- diastolic blood pressure decreases more than 15 mm Hg below baseline level
- Patellar reflexes are absent
- Urine output less than 100ml in 4 hours
- After 24 hours or when delivery occurs, whichever is sooner

Magnesium levels:
There is no need to measure magnesium levels routinely. If measured, therapeutic magnesium levels are thought to be in the range of 1.25 - 2.5 mmol/l. The abolition of knee jerk reflex occurs at 3.3 - 5 mmol/l, respiratory arrest at 5 - 7.5 mmol/l and cardiac arrest at 15 mmol/l.

Indications for measuring magnesium levels include:

- Impaired renal function (urine output<25mls/hour, creatinine>90)
- Signs of toxicity (loss of reflexes)
- Unexplained clinical symptoms or signs

Toxicity
Magnesium toxicity is unlikely with the regimens recommended in these guidelines and serum magnesium concentrations do not need to be routinely measured (RCOG 2006). In women with impaired renal function, serum magnesium monitoring is recommended.

8. Magnesium antidote

If loss of deep tendon reflexes and/or respiratory depression is observed, the following actions should be taken:

- Stop magnesium sulphate
- Call obstetric and anaesthetic registrar
- Administer 1g of Calcium Gluconate intravenously (10 ml of calcium gluconate 10% solution) over 5-10 minutes. Rate should not exceed 2ml/min of undiluted solution.
- Check magnesium levels

9. Roles and Responsibilities

This guideline applies to all clinical staff employed or contracted by University Hospital Southampton (UHS) Foundation Trust who provide care to women and babies. Staff have a responsibility to ensure that they are aware of this guideline and its contents. They should clearly document their rationale if they have not complied with the recommendations detailed in this guideline. It is the responsibility of department managers, consultants, team leaders and education leaders to ensure staff are aware of this guideline.

Consultant Obstetrician	Has overall clinical responsibility in the management of women with planned or expected preterm delivery (<30 weeks). As clinically indicated, discussions should be had with the anaesthetic and neonatal team. Management plans should be clearly communicated with the obstetric team, labour ward coordinators, midwives and patient.
Consultant Anaesthetist	The senior anaesthetist on call for labour ward is included in the early management of women with planned or expected preterm delivery (<30 weeks). They will confirm management plans with the consultant obstetrician, labour ward coordinators, midwives, HDU staff and neonatologists.
Neonatologists	Will be informed of likely early delivery before 30 weeks by the obstetric registrar or consultant. The neonatologist will discuss potential outcome for the baby with the mother/parents as appropriate.
Labour Ward Coordinator	Will support the clinical team in co-ordinating and providing care for women with planned or expected preterm delivery (<30 weeks).
HDU Midwife	Will communicate with the obstetric consultant and registrar, anaesthetists, neonatal staff and labour ward coordinator regarding ongoing care and management of women on labour ward or in HDU with planned or expected preterm delivery (<30 weeks). They will liaise with the women and family.

10. Related Trust Policies

UHS Hypertension in Pregnancy and the Puerperium guideline: Management of including severe pre-eclampsia & eclampsia
UHS Pre Term Pre Labour Rupture of Membranes (PPROM) – Guideline
UHS Modified Early Obstetric Warning System (MEOWS): Guideline

11. Implementation

The guideline) will be displayed on the Staffnet, and sent to the relevant Care Group clinical teams. The team leaders will be expected to cascade to all relevant staff groups. All medical, nursing and midwifery staff caring for women and newborns should have support and training in implementing the contents of the guideline. In addition, the guidelines will be included in local induction programmes for all new staff members.

The author is responsible for ensuring the effective dissemination of this guideline.
To ensure dissemination takes place and to avoid duplication of work, do not assume others will do this based on their involvement in guideline consultation process.

Methods of dissemination may include

- Present the guideline at meetings e.g. ICC, MOST, MSG
- Discussion at mQuest
- Email correspondence e.g. midwiferystaff@uhs.nhs.uk, O&Gjuniordoctors@uhs.nhs.uk, consultantobstetricians@uhs.nhs.uk, consultantneonatologists@uhs.nhs.uk, W&Nanaestheticguidelineconsultationgroup@uhs.nhs.uk
- Theme of the Week (bear in mind busy schedule so may need to plan ahead)
- Communication board in birth environments and ward areas for discussion at handover
- Teaching sessions – involve Education team early in guideline consultation process
- Training materials e.g. prompt cards, laminated flowchart
- PGDs – new PGDs need to be read and signed and signature list given to Education team
- Consider how you will audit/measure uptake of new guidance

12. Process for Monitoring Compliance/Effectiveness

The purpose of monitoring is to provide assurance that the agreed approach in the guidance is being followed to ensure we get things right for patients, use resources well and protect our reputation. Our monitoring will therefore be proportionate, achievable and deal with specifics that can be assessed or measured.

Audit results will be circulated and presented at the multidisciplinary audit meetings, identified in the monitoring table. Any areas of non compliance or gaps in assurance that arise from the monitoring of this guideline will result in an action plan detailing recommendations and proposals to address areas of non compliance and/or embed learning. Monitoring of these plans will be coordinated by the group/committee identified in the monitoring table.

Those responsible for instigating the resulting actions will be identified in the audit meeting minutes and the action plans and results will also reviewed **Maternity Services Meeting and Obstetric Operational Meeting.**

The resulting actions will be reviewed or followed up at the subsequent multidisciplinary audit meeting(s).

Key aspects of the procedural document that will be monitored:

What aspects of compliance with the document will be monitored	What will be reviewed to evidence this	How and how often will this be done	Detail sample size (if applicable)	Who will co-ordinate and report findings (1)	Which group or report will receive findings
Was Magnesium sulphate given as per guideline?	Maternity records	Annual audit report with quarterly data collection commencing on validation of this guideline	2 sets a quarter of healthcare records of women who have delivered preterm (<30 weeks) 75% compliance required	Obstetric Consultant Nominated obstetric trainee	W & N Audit group ICC and/or Maternity services group as described (in section 12)

(1) State post not person.

Where monitoring identifies deficiencies actions plans will be developed to address them.

13. Arrangements for Review of the Policy

Guideline to be reviewed after three years or sooner as a result of audit findings or as any changes to practice occurs.

14. References

1. Australian Research Centre for Health of Women and Babies. Antenatal Magnesium Sulphate Prior to Preterm Birth for Neuroprotection of the Fetus, Infant and Child – National Clinical Practice Guidelines. Adelaide: ARCH, 2011.
2. Royal College of Obstetricians and Gynaecologists. Magnesium sulphate to prevent cerebral palsy following preterm birth. Scientific Advisory Committee Opinion Paper 29, 2011.

Appendices

None

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Document Monitoring Information	
Approval Committee:	Women and Newborn Governance Steering Group
Date of Approval:	1st May 2020
Ratification Committee:	Women and Newborn Governance Steering Group
Date of Ratification:	1st May 2020
Signature of ratifying Committee Group/Chair:	Ash Monga – Women and Newborn Governance Steering Group
Lead Name and Job Title of originator/author or responsible committee/individual:	Nazia Irshad – Consultant Obstetrician Emily Brooke- ST3 Eleanor Curtis- HDU midwife
Name of responsible individual:	Freya Pearson – Divisional Clinical Director
Policy Monitoring (Section 7) Completion Date:	3-yearly audit commencing 6 months after validation
Policy Monitoring to be presented to responsible committee or PRAMG:	Maternity Services Group Meeting
Target audience:	Obstetricians, Midwives, Anaesthetists, Neonatologists
Key words:	MgSO4, preterm labour (<30 weeks), neuroprotection, cerebral palsy
Main areas affected:	Maternity services, Neonatology, Anaesthetics
Summary of most recent changes if applicable:	Adjustment in dosage and timings of administration Adjustment in gestation at which Magnesium Sulphate is to be considered
First Consultation:	18th February 2020 W&N Anaesthetic Guideline Consultation Group W&N Gynaecology Guideline Consultation Group W&N Midwifery Guideline Consultation Group W&N Neonatal Guideline Consultation Group W&N Obstetric Guideline Consultation Group
Second Consultation:	N/A
Comments received from:	Shelley Haynes Tara Selman Joanne Hemmings
Is there any non compliance with NICE guidance?	No

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Does this document replace or revise an existing document	Revision on an existing guideline
Should this document be made available on the public website?	No
Is this document to be published in any other format?	No

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