NEO-SOP-002: Weight-based medicine dosing for neonates and infants

Standard operating procedure (SOP) · NEO-SOP-002 · Version 0.1 · Draft for local review

Supports: 37.1

At a glance

- Every medicine for a neonate or infant is dosed on a measured, current weight, in mg/kg, using an approved neonatal reference.
- Every calculation is checked by a second person before the medicine is given. Infusions and high-alert medicines are also verified by a pharmacist.
- Dose limits, prematurity and organ function are checked before each new prescription and each change of dose.
- Every dose, calculation check and administration is recorded on the same chart, with the weight used.
- Stop and get help straight away if: no measured weight is available, the calculated dose is above the maximum, or the two calculations do not match.

1. Purpose

To make sure every medicine given to a neonate or infant is dosed for the child's current weight and age, that the calculation is correct and independently checked, and that every dose is recorded. The aim is to prevent dosing errors, which are among the most frequent causes of serious harm in neonatal care (37.1).

2. Scope

Item	Coverage
Applies to	All prescribers, pharmacists, nurses and doctors who prescribe, prepare, check or give medicines to neonates and infants
Patients	Neonates (birth to 28 days of postnatal age, including preterm infants by corrected age) and infants (28 days to 12 months)
Locations	Neonatal units, special care baby units, maternity wards and any ward caring for neonates or infants, including neonatal transfer teams
Medicines	All medicines, including those given by mouth, by tube, by injection, by infusion, on the skin and in the eye

3. Definitions

Term	Meaning in this SOP
Measured weight	A weight taken on a calibrated scale, recorded with the date, time and scale used. Used for dosing only if it is no more than 24 hours old, or if the infant's weight is known to be stable.
Dose per kilogram	The dose in mg/kg (or microgram/kg) stated in the approved reference, multiplied by the measured weight in kg.
Concentration	The amount of active medicine in each millilitre of the preparation as supplied or prepared (for example 10 mg/mL).
Postnatal age	Days or weeks since birth.
Postmenstrual age	Gestational age at birth plus postnatal age. Used to adjust doses in preterm infants.
High-alert medicine	A medicine with a high risk of serious harm when used in error, listed in Section 11.
Independent double check	A second registered professional recalculates the dose from the prescription and the weight, without seeing the first result, and confirms it matches.

4. Background

Neonates and infants differ from adults and older children in how they absorb, distribute, break down and excrete medicines. Liver enzymes and kidney function are immature, particularly in preterm infants, and body water and protein binding change in the first weeks of life. Many medicines have no licensed neonatal dose, so prescribers use reference sources that give doses by weight and postmenstrual or postnatal age.

Weight changes quickly in the first days of life, so a birth weight may not be the right weight for dosing. Errors most often come from using an old weight, mis-placing a decimal point, confusing units, or misreading a concentration.

5. Responsibilities

Role	Responsibility
Prescriber (doctor or prescribing nurse practitioner)	Records the current measured weight, calculates the dose in mg/kg and mg, states the volume and concentration, checks the maximum dose and any adjustment for prematurity or organ function.
Pharmacist	Verifies the prescription for high-alert medicines, all infusions, and any dose outside the approved reference. Advises on preparation and stability.
Registered nurse preparing the medicine	Calculates the volume independently, prepares and labels the medicine, and starts the second check.
Second registered nurse or doctor	Carries out the independent double check for high-alert medicines and infusions, and signs the chart.
Registered nurse giving the medicine	Confirms the patient, medicine, dose, route and time before giving it, and records the administration.
Unit manager	Makes sure staff are trained and assessed, that scales are calibrated, and that audits take place.
Medical director or chief executive	Approves this SOP and its neonatal reference sources, and receives audit results and incidents.

6. Materials and equipment

- Calibrated neonatal scale, checked and recorded at least monthly (or per manufacturer's instructions).
- Current approved neonatal reference: the BNFc or the national neonatal formulary, with the unit's local neonatal dosing guide.
- Dosing chart with fields for weight, date and time, prescribed dose in mg/kg and mg, volume, concentration, and the checks.
- Calculator approved for clinical use.
- Standard list of concentrations stocked in the unit. Stock concentrations that are not on the list are not used without pharmacy advice.
- Labels for prepared medicines with the patient identifier, medicine name, dose in mg, volume, concentration, and preparation date and time.

- Infusion pumps with dose-error reduction software where available.

7. Safety

Write numbers so that the risk of misreading is removed:

- Write a leading zero before a decimal point (write 0.5 mg, not .5 mg).
- Never write a trailing zero after a decimal point (write 5 mg, not 5.0 mg).
- Write 'microgram' in full, not 'mcg' or 'µg', because the abbreviations are easily confused with 'mg'.
- Do not use 'U' for units or 'IU' for insulin units. Write 'units'.
- Express every dose in mg/kg and in mg, and the volume in mL, on the same line.
- Check that the concentration on the label matches the concentration in the prescription before drawing up.

> Dose errors in neonates are often a factor of ten. Before giving any dose, ask yourself whether the number is plausible for this infant's weight.

8. Before you start

1. Check the patient's identity using two identifiers (for example hospital number and date of birth).
2. Check that a measured weight is available and no more than 24 hours old. If not, weigh the infant before calculating.
3. Record gestational age at birth and current postnatal age, and calculate postmenstrual age.
4. Check allergies, feed status, current medicines and the most recent renal and liver results where relevant.
5. Check the reference for the medicine, the dose per kg, the maximum single dose and the maximum daily dose for this age.

9. Procedure

9.1 Prescribing

1. Weigh the infant on the calibrated scale and record the weight in kg to two decimal places, with date, time and scale.

2. Write the prescription in mg/kg and in mg, state the volume and concentration, and state the frequency and duration.
3. Check the dose against the reference for postmenstrual and postnatal age. Adjust for prematurity, kidney or liver impairment, and interacting medicines.
4. Confirm the dose is within the maximum single and daily dose. If it is above a maximum, do not prescribe it without discussion with the pharmacist and the consultant.

9.2 Verification and preparation

1. For high-alert medicines and all infusions, the pharmacist verifies the prescription before the first dose and after any change.
2. The nurse preparing the medicine calculates the volume independently and compares it with the prescription.
3. A second registered professional repeats the calculation without seeing the first result. Both results must match before the medicine is given.
4. Label the prepared medicine with all the information in Section 7 and the patient identifier. Do not give a medicine that has no label or an unclear label.
5. If the two calculations do not match, stop. Recalculate with the prescriber and pharmacist, and record the outcome.

9.3 Administration

1. Use the five checks at the bedside: right patient, right medicine, right dose, right route, right time.
2. For pump infusions, check the programmed rate, the concentration and the dose per hour against the prescription, with the second person.
3. Record the dose given, the time, the route, the nurse's name and the checks completed on the chart.
4. If a dose is not given, record the reason and inform the prescriber.

9.4 After the dose

1. Monitor the infant's response and any adverse effects as set in the drug's protocol.
2. Report any dosing error, near miss or unexpected effect under the incident reporting policy within 24 hours.

10. Decision points

Situation	Action
No measured weight within 24 hours	Weigh the infant before calculating. Do not calculate from a previous weight unless the infant is in an emergency (see Section 12).
Calculated dose is above the maximum single or daily dose	Do not give. Discuss with the pharmacist and the prescriber, and document the decision.
Two calculations do not match	Stop, recalculate with a third check if needed, and do not give until resolved.
Medicine not in the unit's reference	Ask the pharmacist before use. Record the source of the dose used.
Kidney or liver impairment	Ask the pharmacist for an adjustment and record the reason for the change.
Infant is unwell or deteriorating	Discuss the dose with the senior clinician before giving. Do not delay treatment in an emergency.

11. High-alert medicines in the neonatal unit

The following always need a pharmacist verification and an independent double check before the first dose and before each change of dose: infusions and concentrated preparations; opioids; anticoagulants; insulin; concentrated potassium and electrolytes; neuromuscular blocking agents; antiseizure medicines given intravenously; and any medicine on the unit's local high-alert list.

12. Special situations

- Resuscitation: use the unit's resuscitation dosing card. Still record the weight used and the dose given. Complete the calculation and check after the immediate response.
- Very low birth weight (under 1,500 g): doses are usually more sensitive to small errors, so the pharmacist check is required for all doses.
- Transfers: the sending team's dose is checked against the receiving unit's reference and weight on arrival. Do not assume a dose is correct because it was given before transfer.
- Breastfeeding and breast milk: check medicine compatibility before giving a medicine with breast milk and record the decision.

- Weight loss or gain in the first week: re-weigh if the infant has lost or gained more than 10 percent from the birth weight, and recalculate the dose.

13. Escalation

- Prescription unclear or conflicting: call the prescriber immediately. Do not give the medicine until it is clear.
- Dose above a maximum, or a suspected error: stop the process, call the on-call neonatologist and the pharmacist.
- Infant deteriorating after a dose: follow the unit's deterioration escalation policy and inform the consultant.
- Harm or near miss: report under the incident policy within 24 hours and inform the unit manager. Serious incidents follow INC-SOP-001.

14. Monitoring

The unit manager carries out a monthly audit of 20 randomly selected neonatal prescriptions, or all if fewer, and reports results to the neonatal governance meeting each quarter.

Measure	Target
Prescriptions with a weight measured within 24 hours	100 percent
High-alert medicines with a pharmacist verification and an independent double check	100 percent
Calculations correct on audit	100 percent for high-alert medicines, at least 98 percent for all other medicines
Dosing incidents reported and reviewed within 7 days	100 percent

15. Records

- Weight chart with date, time and scale used.
- Prescription and dosing chart with the calculation, the checks and both signatures.
- Administration record with time, route and nurse name.
- Pharmacist verification record for high-alert medicines and infusions.
- Incident and near-miss reports.
- Records are kept for the period required by national law and local policy.

16. Training

All staff who prescribe, prepare, check or give medicines to neonates or infants complete a dose calculation assessment at induction and every year. The assessment includes at least ten calculations from realistic neonatal scenarios. A score of 100 percent is required on the calculation section. Staff who do not pass receive supervised practice and are reassessed within four weeks.

17. Related documents

Code	Document
NEO-POL-001	Neonatal level of care
NEO-FRM-001	Neonatal level of care assessment record
NEO-REG-001	Neonatal staffing against level of care register
PHM-SOP-001	Medicine storage and temperature monitoring
INC-SOP-001	Root cause analysis of serious incidents

18. Evidence

This SOP is based on the reference sources listed below and on the requirement of criterion 37.1 of the ASF standards. The local neonatal dosing guide must be checked against these sources at each review, and the review date recorded in the change history.

E-learning for this document

- No course linked yet. Dose-calculation and medication-safety courses are to be requested from the academy (see the Standard 37 request list).

References

1. British Medical Association and Royal Pharmaceutical Society. British National Formulary for Children (BNFc). Current edition.
2. Institute for Safe Medication Practices (ISMP). List of Error-Prone Abbreviations, Symbols, and Dose Designations. Current edition.
3. The Joint Commission. National Patient Safety Goal NPSG.03.06.01: Maintain and communicate accurate patient medication information. Current edition.

4. Local neonatal dosing guide and national neonatal formulary (to be inserted by the unit at adoption).

Change history

Version	Date	Change
0.1	2026-10-26	First draft for review. Not yet approved by the ASF Expert Committee.

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