european standards of
care for newborn health

*Topic Expert Group:* **Patient safety and hygiene practice**

**Prevention of medication errors in NICU patients**

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*Target group*
Infants and parents

*User group*
Healthcare professionals, neonatal units, hospitals, and health services

*Statement of standard*
Medication errors are monitored and evaluated to reduce the exposure of infants to avoidable therapeutic risks.

*Rationale*
The risk of drug administration errors is high in infants for a range of reasons, including different types of errors and reduced compensatory ability. (1,2) The majority of prescriptions for infants are for off-label and unlicensed medications, which are more often associated with medication errors and potential adverse drug events. (3–5)

There is a high risk of calculation errors because doses are based on bodyweight, which may vary 10-fold (from 0.5-5kg), and changes with growth during the first months. Electronic prescribing reduces the frequency of missing, illegible and incomplete orders. Absence of electronic clinical decision support may result in dose (calculation) errors. (6,7) Errors and inaccuracy in drug preparation occur because use of adult dosage formulations require measurement of small volumes, and/or calculation of dilution steps. (8,9) Patient identification may be problematic, as infants cannot confirm their identity and may be part of a multiple pregnancy with similar names and birth dates. (10) Infants often have both intra-venous and intra-arterial catheters and nasogastric tubes increasing the risk of administration by the wrong route. (11)

*Benefits*

*Short-term benefits*
- Easily understandable information about drug doses, preparation, and administration (12)
- Reduced risk of calculation errors (7)
- Reduced risk of administration by incorrect route (13)
- Reduced risk of illegible and incomplete drug prescriptions (7)

*Long-term benefits*
- Evidence-based drug information specific to newborn infants (14)
- Improved availability of neonatal formulations (14)
- Improved accuracy of drug doses (9)
- Improved drug safety alerting (15)

*Components of the standard*

| Component | Grading of evidence | Indicator of meeting the standard |
|---|---|---|
| For parents and family | | |
| 1. Parents are informed by healthcare professionals about any medication errors. | B (High quality) | Clinical records |
| 2. Parents are encouraged to speak up when they believe a mistake has been made with the prescription, dosage or administration of medicines to their infant. | B (Moderate quality) | Parent feedback |
| For healthcare professionals | | |
| 3. A guideline for compounding, dosage, and administration of all dispensed parenteral and oral drugs in neonatal care is adhered to by all healthcare professionals. | B (High quality) | Guideline |
| 4. Training on medication compounding and in the use of electronic calculation support and electronic prescribing is attended by all responsible healthcare professionals. | B (High quality) | Training documentation |
| 5. Electronic calculation support is used. (1,7,15) | A (Moderate quality)<br>B (Moderate quality) | Guideline |
| 6. Healthcare professionals are not interrupted during medication compounding. (1,16) | A (Moderate quality)<br>B (Moderate quality) | Guideline |
| 7. Medication is compounded and administered using double checks at each stage. (1) | A (Moderate quality)<br>B (Moderate quality) | Guideline |
| 8. Generated drug safety alerts are handled carefully weighing benefits and risks. (1,15) | A (Moderate quality)<br>B (Moderate quality) | Guideline |
| 9. Medication errors are recorded in clinical records, explained to parents and reported within the hospital. (1) | A (Moderate quality)<br>B (Moderate quality) | Audit report, guideline |
| 10. Adverse drug reactions are reported to the national authorities. (17) | A (Moderate quality)<br>B (Moderate quality)<br>C (High quality) | Audit report |

| | | |
|---|---|---|
| **For neonatal unit and hospital** | | |
| 11. A guideline for compounding, dosage, and administration of all dispensed parenteral and oral drugs in neonatal care is available and regularly updated. | B (High quality) | Guideline |
| 12. Training on medication compounding and in the use of electronic calculation support and electronic prescribing is ensured. | B (High quality) | Training documentation |
| 13. An electronic prescribing system for all medication orders is provided. (1,7) | A (Moderate quality)<br>B (Moderate quality) | Guideline |
| 14. Different connecting systems for oral and intravenous administration are available. (11,13,17) | A (Moderate quality)<br>B (Moderate quality)<br>C (High quality) | Training documentation |
| 15. A system for reporting and analysis of medication errors is available. (1,17) | A (Moderate quality)<br>B (Moderate quality)<br>C (High quality) | Audit report |
| 16. A hospital pharmacist trained and experienced in neonatal practice is available. (8) | A (Moderate quality)<br>B (Moderate quality) | Audit report |
| **For health service** | | |
| 17. A national guideline on compounding, dosage, and administration of all dispensed parenteral and oral drugs in neonatal care is available and regularly updated. | B (High quality) | Guideline |
| 18. A national system for analysis of medication errors is available. (17) | A (Moderate quality)<br>B (Low quality)<br>C (High quality) | Audit report |

*Where to go – further development of care*

| **Further development** | **Grading of evidence** |
|---|---|
| For parents and family | |
| N/A | |
| For healthcare professionals | |
| N/A | |
| For neonatal unit | |
| N/A | |
| For hospital | |
| • Implement an electronic prescribing system with integral clinical decision support (checks for dose, drug-drug interactions, duplicate therapy, allergy and contraindications). | B (Moderate quality) |
| • Provide satellite pharmacies or central pharmacy compounding individualised doses for infants. | B (Moderate quality) |
| • Implement smart infusion pumps. | A (Low quality |
| • Implement bar code assisted medication administration. | B (Moderate quality) |
| For health service | |
| • Provide national neonatal/paediatric drug formulary with evidence based (or expert based) dose recommendations. | B (Moderate quality) |
| • Support the development of paediatric investigation plans. (14) | A (Moderate quality)<br>B (Moderate quality)<br>C (High quality) |

*Getting started*

| **Initial steps** |
|---|
| For parents and family |
| • Parents are verbally informed by healthcare professionals about prescribed medication and medication errors. |
| For healthcare professionals |
| • Attend training on medication compounding and in the use of electronic calculation support and electronic prescribing. |
| • Perform double checks for compounding and administration of drugs. |
| • Report and document medication errors. |
| • Use calculation aids for calculation of doses. |
| For neonatal unit and hospital |
| • Develop and implement a guideline for compounding and administration of drugs. |
| • Develop and implement a guideline specifying which handbook/formulary is to be used. |
| • Develop information material on drug information and medication errors for parents. |
| • Support healthcare professionals to participate in training on medication compounding and in the use of electronic calculation support and electronic prescribing. |

- Ensure a hospital pharmacist is trained and experienced in neonatal practice.

For health service

- Develop and implement a national guideline on compounding, dosage and administration of all dispensed parenteral and oral drugs in neonatal care.
- Establish a national service for medication error reporting.

## *Source*

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