

ESSENTIAL NEONATAL CARE

CLINICAL & THERAPEUTIC GUIDELINE

January 2015



MSF OCG & OCBA (INTERNAL USE)

Updated: <https://ftp.ocg.msf.org/data/public/2b1f7b.php>

Correspond to the Ch10 (Newborn care) of the
MSF “Essential Obstetric and Newborn Care” guideline 2015

Most of the newborns don't need more than attention and routine care (70 – 90%). Unfortunately despite its extreme simplicity it is far to be done to every newborn in MSF program. Case management of sick newborns (10 – 30%) requires to approach not only antenatal obstetric emergencies, neonatal intra-partum resuscitation, diseases transmitted from mother to child, and the main diseases acquired after birth but also to have a specific regard to children of low birth weight (Low Birth Weight - LBW), very low birth weight (Very Low Birth Weight - VLBW) and extremely low birth weight (Extremely Low Birth Weight babies - ELBW). Newborns in tropical countries and poor settings have been too long neglected in past decades. It is time to act urgently to reduce the 4 million annual neonatal deaths (40% of all deaths of children under five years).

This brief guide is intended as clinical and therapeutic assistance **for essential neonatal care. It is meant to be used in all MSF programs where there are newborns**: mobile clinics, outpatient (OPD), hospitalizations (IPD), obstetrics etc ... whatever the technical skills of medical and paramedical personnel in charge.

These recommendations and treatments were broadly endorsed by the MSF Pediatric and Reproductive Health Working Groups although discussion is continuing to reach a consensus on some technical issues and policy before final confirmation.

This protocol is an integral part of BiBop of MSF Switzerland and will be regularly updated to reflect the capitalization of the experience gathered on the land (your feedbacks), the evolution of science (literature) and recommendations WHO. Be vigilant and use only the latest version.

Ask for the new edition of the OCG advanced neonatal guideline, available from June 2014

Some adaptations can be discussed according to the country to meet and / or follow a national protocol or to respond better to a particular context. However, any changes and / or adaptation must be communicated and approved by the medical department before being used.

We would like to sincerely thank the pediatricians, midwives and obstetricians in different Operational Centres (OC) of MSF who participated in the writing of this treatment protocol in particular:

For the Paediatric Working Group: Anne Pittet, Elisabeth Canisius, Harriet Roggeveen, Isabel Zuniga, Marie-Claude Bottineau (Leader), Nicolas Peyraud, Roberta Petrucci, Daniel Martinez, Laurent Hiffler, Belen Caminoa.

For the Sexual and Reproductive Health Working Group: Anne-Sophie Coutin, Catrin Schulte-Hillen (Leader), Debbie Cunningham, Eva Deplecker, Kara Blackburn, Nelly Staderini, Olivia Hill.

OCG paediatricians, by alphabetic order:

- Dr Alejandra: Training Paediatric Dr Alejandra.Garcia@geneva.msf.org
- Dr Anne: Coaching Paediatric Dr Anne.Pittet@geneva.msf.org
- Dr Elisabeth: Coaching Paediatric Dr Elisabeth.Canisius@geneva.msf.org
- Dr Marie-Claude: Paediatric WG Leader and Women & Child Health OCG Manager [Marie- Claude.Bottineau@geneva.msf.org](mailto:Marie-Claude.Bottineau@geneva.msf.org)
- Dr Nicolas: Paediatric Advisor Nicolas.Peyraud@geneva.msf.org
- Dr Roberta: Paediatrician for the "Medical Operation Support Unit" (MOSU) Roberta.Petrucci@geneva.msf.org

OCBA paediatricians, by alphabetic order:

- Dr Daniel, Paediatrics Advisor, Daniel.martinez@barcelona.msf.org
- Dr Laurent, Paediatrics Advisor, Laurent.Hiffler@barcelona.msf.org
- Dr Nadia, Mobile Paediatrics Implementer, Nadia.Lafferty@barcelona.msf.org

We hope this tool will provide valuable assistance. We look forward to getting remarks, comments, suggestions and questions from the field. Everything will be welcome, taking into account and a source of progress.

Chapter 10:

Newborn care in the maternity hospital

10.1 Routine care and examination in the first few hours of life	3
10.1.1 Clearing the airway	3
10.1.2 Cord clamping and cord care.....	3
10.1.3 Apgar score	3
10.1.4 Clinical examination.....	4
10.1.5 Thermoregulation.....	5
10.1.6 Feeding	5
10.1.7 Preventive treatments.....	5
10.1.8 Vaccinations.....	6
10.1.9 Daily monitoring	6
10.2 Réanimation du nouveau-né	7
10.2.1 Basic resuscitation	7
10.2.2 After resuscitation	9
10.3 Care of the sick newborn	10
10.3.1 Danger signs	10
10.3.2 Management of life-threatening emergencies	10
10.3.3 Management of symptomatic neonatal infections.....	11
10.3.4 Management of asymptomatic newborns at risk of neonatal infection	12
10.3.5 Management of hypoglycaemia.....	13
10.3.6 Management of jaundice	14
10.4 Specific care when the mother has a transmissible infection	16
10.4.1 Syphilis	16
10.4.2 Genital gonococcal and/or chlamydial infection.....	16
10.4.3 Genital herpes	17
10.4.4 Hepatitis B infection	17
10.4.5 HIV infection	17
10.4.6 Active pulmonary tuberculosis.....	18
10.5 Care of the low birth weight newborn (1500-2500 g)	19
10.5.1 Kangaroo care.....	19
10.5.2 Thermoregulation.....	20
10.5.3 Feeding	20
10.5.4 Monitoring.....	20
10.6 Criteria for discharge from the maternity hospital	21

Appendix 3. Breastfeeding

Annex 4.1 Daily amounts required for enteral feeding ONLY

Annex 4.2 Daily amounts required for IV and Enteral feeding

Appendix 5. Placing a oro/nasogastric tube

10.1 Routine care and examination in the first few hours of life

Immediately and rapidly assess the infant's condition so that resuscitation can be started, if needed (Section 10.2). The resuscitation equipment should be ready at hand and ready for use.

10.1.1 Clearing the airway

Wipe the nose and mouth to clear the airway.

Only suction the nose and mouth if there is obvious obstruction. Do not enter the larynx/trachea (there is a risk of bradycardia or laryngeal spasm). Preferably use a suction bulb (Penguin).

10.1.2 Cord clamping and cord care

Wait at least 2 minutes before clamping the cord in all infants who are crying vigorously (and especially those weighing less than 2500 g).

For optimal transfusion, keep the infant on the mother's chest.

Clamp the cord with two Kocher forceps 10 cm from the umbilicus and cut between the two forceps. Use sterile blade or scissors – a different pair than were used for episiotomy, if performed.

Tie off the cord with a Barr clamp or sterile thread (double ligature), leaving a 2- to 3-cm stump.

Disinfect the umbilicus with a sterile compress soaked in 4% **chlorhexidine** (or, if not available, 10% **polyvidone** with a maximum of 3 applications total).

10.1.3 Apgar score

The Apgar score is evaluated at 1 and 5 minutes after complete delivery of the infant and recorded in the medical chart and the infant's health record.

The score is a tool for monitoring the infant's adaptation to extra-uterine life. It is not used to determine whether resuscitation is indicated; this should be evaluated at birth, based on whether or not there is spontaneous respiratory effort, without waiting for the 1-minute assessment.

In case of resuscitation, the Apgar score is determined retrospectively.

If the Apgar score is ≤ 4 at 1 minute or ≤ 6 at 5 minutes, the midwife should call the doctor and should initiate necessary steps based on infant's needs. Once stabilised, the infant should be kept under observation for at least 24 hours.

Table 10.1 - Apgar score

Items evaluated/score	0	1	2
Skin colour*	Extreme pallor	Cyanotic extremities No central cyanosis	Totally pink
Respiration	None	Abnormal (slow, shallow, apnoea, etc.)	Normal
Heart rate	0	≤ 100/minute	> 100/minute
Muscle tone	Absent	Hypotony Incomplete flexion of extremities	Good Complete flexion of extremities
Responsiveness (after stimulation)	Nil	Grimace	Good, vigorous cry

* A healthy infant is usually born cyanotic but turns pink within 30 seconds after breathing starts. For infants with dark skin, assess skin colour by the soles of the feet, palms of the hands and mucous membranes.

Table 10.2 - Significance of the Apgar score

1-minute score		5-minute score	
0 - 4	Asphyxia	0 - 6	Asphyxia
5 - 7	Difficulty adapting	7 - 8	Difficulty adapting
8 - 10	Good adaptation	9 - 10	Good adaptation

10.1.4 Clinical examination

The birth attendant should perform a complete examination of the newborn as soon as possible and preferably within 2 hours. The examination should be done under a warmer for infants.

All observations are recorded on a monitoring sheet.

The first priority is to look for danger signs: e.g. abnormal temperature, abnormal colour, difficulty breathing, neurological signs, severe abdominal distension, or symptomatic hypoglycaemia (Sections 10.3.1 and 10.3.5).

Assess the risk factors for neonatal infection (Section 10.3.4) for all infants, whether the examination reveals danger signs or not.

The examination includes:

- Respiratory rate (normal values for infants 0-1 month are 30-60 breaths/minute)
- Heart rate (normal values for infants 0-1 month are 100-160 beats/minute)
- Temperature

- Weight (weigh the infant naked on an appropriate scale, calibrated beforehand).
- Examination of the skin and mucous membranes, oral cavity, palate, eyes, ears, fontanelles, abdomen, spine, genital organs, anus, feet, hands; neurological examination (posture, tone and reflexes, including sucking, grasp, response to stimulation).
- Check if the infant urinates and produces stools.

10.1.5 Thermoregulation

- At birth, dry the infant with a clean, dry cloth. Then, wrap the infant in another clean, dry cloth. Cover the head with a cap to reduce heat loss.
- Keep the infant in a warm room (at least 25°C).
- Place the infant skin-to-skin against the mother's (dried) body and cover with a dry cloth or blanket.
- Do not bathe the infant for 6 to 12 hours after birth.

The axillary temperature should be kept between 36 and 37°C, and the infant should have pink, warm feet.

10.1.6 Feeding

- Exclusive breastfeeding is the best option (Appendix 3).
- Put the infant to the breast as soon as possible within an hour of birth.
- Encourage breastfeeding on demand day and night (at least 8 times/24 hours, i.e. every 3 hours).
- If the mother is HIV-infected, see Appendix 3, Section 3.7.

10.1.7 Preventive treatments

Routine prophylaxis for gonococcal ocular infection

For all infants:

Apply 1% tetracycline eye ointment: a 1-cm strip in each eye as soon as possible, preferably within an hour of birth.

Note: if the mother has a symptomatic genital infection at the time of delivery, see Section 10.4.

Routine prophylaxis for haemorrhagic disease of the newborn

phytomenadione (vitamin K1) IM in the anterolateral aspect of the thigh within the first few hours of life:

Infant weighing more than 1500 g: 1 mg as a single dose (0.1 ml if 2 mg/0.2 ml ampoule)

Infant weighing less than 1500 g: 0.5 mg as a single dose (0.05 ml if 2 mg/0.2 ml ampoule)

Note: open ampoules of phytomenadione should be used immediately or discarded. Do not store open ampoules, even in the refrigerator.

Prevention of mother-to-child HIV transmission

All infants of HIV-infected mothers should receive antiretroviral treatment as soon as possible. See the specific PMTCT protocol.

10.1.8 Vaccinations

The monovalent Hepatitis B, BCG and oral Polio vaccines are recommended as soon as possible after birth for all newborns, including low birth weight and premature infants.

For the Hepatitis B and oral Polio vaccines, the dose administered at birth is an extra dose (called and recorded as "Dose 0"). It does not count as one of the 3 doses required by the Expanded Programme on Immunization during the postnatal period.

The purpose of Hepatitis B Dose 0 is to prevent mother-to-child transmission of the disease. It should be administered as soon as possible, preferably within the first 12 hours of life. While it may still be administered after that time, the later the vaccine is administered, the less effective the protection^{1,2}. In principle, this vaccine should be administered in the delivery room.

Table 10.3 - Neonatal vaccination

Vaccin	Contra-indications	Dose/route of administration
Hepatitis B monovalent Dose 0	No contra-indication, but use only the monovalent vaccine (Hepatitis B only)	One dose = 10 micrograms IM injection, anterolateral aspect of the thigh
BCG	Newborn whose mother has active TB as long as she is contagious (Section 10.4.6)*	One dose = 0.05 ml Intradermal injection, deltoid region (at the junction of the lower 2/3 and upper 1/3 of the lateral aspect of the upper arm)
Polio oral Dose 0	No contra-indication	One dose = 2 or 3 drops, depending on the manufacturer Oral route

* Start the infant on isoniazid preventive therapy, and administer the BCG vaccination when the isoniazid therapy is completed.

Note: to perform an IM injection in newborns:

- Disinfect the skin beforehand (risk of abscess and other infections).
- Use the lateral aspect of the quadriceps muscle (thigh). Never inject into the gluteal or deltoid muscle (arm).
- Use the appropriate needle: 26G if < 2500 g; 23G if > 2500 g.
- The maximum amount to inject is 1 ml if < 2500 g; 2 ml if > 2500 g.

10.1.9 Daily monitoring

Newborn (and maternal) mortality is the highest in the first 24 hours after birth. Women are encouraged to stay for 24 hours in the maternity.

Routine monitoring and care includes:

- Temperature, heart and respiratory rate, twice daily.
- Cord disinfection once the first day (use the available antiseptic, Section 10.1.2). After that, keep it clean, dry and exposed to the air (no dressing).
- Support to breastfeeding.
- Urination and stool production.

Record the observations on the newborn's monitoring sheet.

For the discharge criteria: see Section 10.6.

10.2 Réanimation du nouveau-né

10% of newborns need help breathing properly at birth; this help comes in the form of tactile stimulation and/or airway clearing.

For half of them, these procedures are not sufficient, and if the newborn is not breathing or is gasping despite stimulation/suction, ventilation is needed as of the first minute of life. A small percentage of ventilated newborns will require more advanced resuscitation.

The birth attendant in charge of the delivery is also responsible for the newborn. S/he should start resuscitation immediately then, if necessary, call for help.



Anticipate the potential need for resuscitation at every birth. The necessary equipment should be ready at hand and ready for use.

Hypothermia compromises resuscitation. Resuscitation should be done in a heated room, if possible under a warming lamp.

10.2.1 Basic resuscitation^a

Steps 1 to 6 should be performed in the first minute of life.

1 - Check for meconium

If the amniotic fluid is meconium-stained but the infant is breathing spontaneously and is tonic: suction is not indicated; simply wipe the face.

If the amniotic fluid is meconium-stained and the infant is not breathing well or is hypotonic: quickly but gently suction the mouth, preferably with a suction bulb (Penguin).

2 - Stimulate the infant by drying

Tactile stimulation can trigger spontaneous breathing. It is done by drying the infant vigorously, but not roughly. Effective respiratory effort should begin within 5 seconds. If not, stop the stimulation; the infant requires additional care.

3 - Clamp and cut the cord

4 - Position the infant's head

Lay the infant on the back with the head in a neutral position (Figure 10.1); avoid flexion or hyperextension of the neck, as this can obstruct the airway.

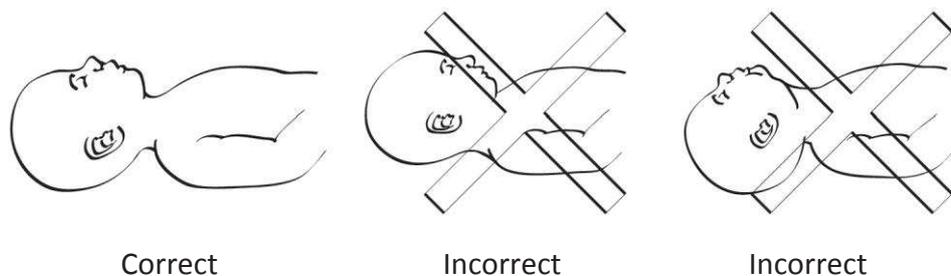


Figure 10.1

Head position for clearing the airway

^a

For more information, refer to the Helping Babies Breathe training course.

5 - Clear the airway (only in the rare cases where there are copious secretions)

Suction the mouth gently – i.e., not too deeply (maximum depth 2 cm from the lips) – and quickly (maximum duration 5 seconds) with a bulb syringe.

6 - Stimulate the infant

Rub the back and the soles of the feet (do not shake, slap or hang the infant by the feet). If effective respiratory effort has not begun after 5 seconds: stop the stimulation; the infant requires ventilation.

7 - Perform bag-mask ventilation (room air)

Fit the mask to the infant's face covering nose and mouth. Press firmly to prevent air leaks. Hold it with one hand, with the thumb on one side and the index and middle fingers on the other (Figures 10.2 and 10.3).

With the other hand, squeeze the bag at a rate of 30 to 50 compressions per minute for 60 seconds.

Ventilation is effective if the chest rises and falls.

Note: excessive ventilation pressure can cause pneumothorax. If the chest fails to rise:

- Check the connection between the bag and the mask;
- Correct the position of the mask on the face;
- Correct the head position.

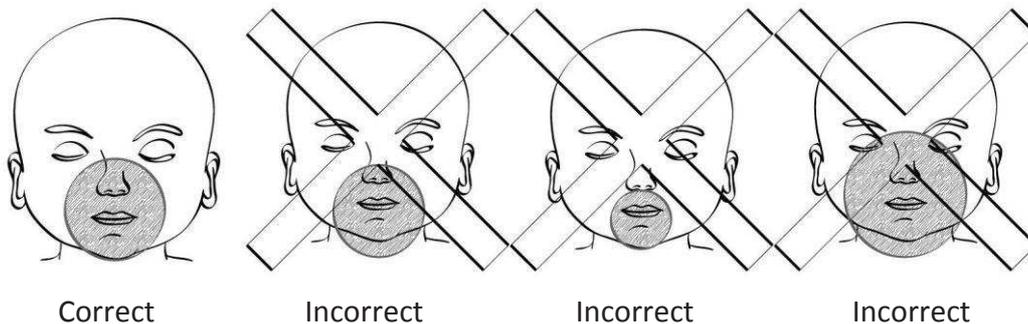


Figure 10.2
Mask position

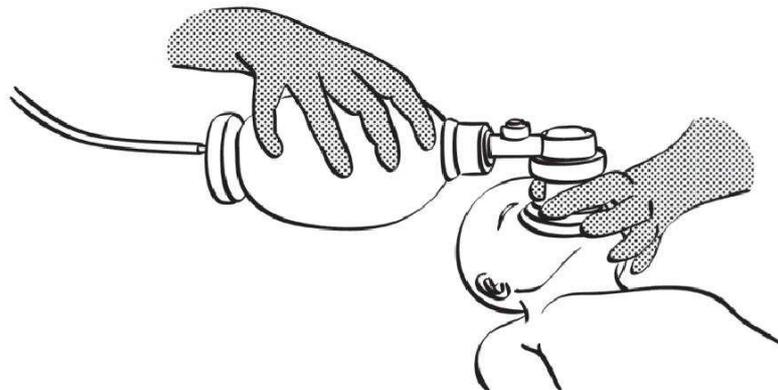


Figure 10.3
Manual ventilation

Check every minute for spontaneous respiratory effort (look for chest movement); do not take the mask off the infant's face to check for spontaneous breathing. Continue manual ventilation until there is spontaneous respiratory effort.

If oxygen is available: connect the ambu bag to an oxygen reservoir after 1 to 2 minutes of ventilation, setting it at a 2 litres/minute flow rate. Ventilation is a priority and should not be interrupted to connect the oxygen (have an assistant connect the oxygen).

Stop resuscitation if the infant has no heart rate after 10 minutes or if the heart rate is < 60/minute of effective manual ventilation.

If the infant has a heart rate > 60/minute, but does not breathe spontaneously, manual ventilation can be continued. However, resuscitation should be stopped if the infant does not breathe spontaneously within 30 minutes.

Record all procedures on the monitoring sheet.

10.2.2 After resuscitation

Check the infant's immediate needs: blood glucose, head position, oxygen saturation, temperature and assessment for signs of sepsis.

Perform a retroactive Apgar score assessment (Section 10.1.3), and record the results on the monitoring sheet.

If the Apgar score was ≤ 4 at 1 minute or ≤ 6 at 5 minutes, or if the infant was ventilated with a mask for 2 minutes or more:

- Hospitalise in a neonatal care unit (keep the mother and infant together if possible).
- If transfer is not possible, keep the infant under observation for at least 24 hours. Monitor every 2 hours: look for danger signs (Section 10.3.1) and monitor vital signs. Ensure routine care (Section 10.1). Begin breastfeeding as soon as possible.

If the infant is floppy, has no sucking reflex or exhibits other neurological problems (e.g. seizures), check blood glucose. If blood glucose cannot be checked, start presumptive treatment for hypoglycaemia (Section 10.3.5).

If oxygen saturation is low or there are signs of respiratory distress, see Section 10.3.2.

In the event of seizures:

- Check blood glucose and/or treat for hypoglycaemia.
- If the infant continues to have seizures after receiving glucose, administer a loading dose of **phenobarbital** (20 mg/kg) by slow IV infusion (dilute the required dose of phenobarbital in 20 ml of 0.9% sodium chloride and administer over 30 minutes). Never administer phenobarbital as a rapid, undiluted direct IV injection. If intravenous access cannot be obtained, administer the same dose of phenobarbital (undiluted) by IM injection.
- Precaution should be taken when administering phenobarbital; there is a risk of respiratory depression: monitor the infant closely; have ventilation equipment at hand.
- If seizures persist after 30 minutes, give a second dose of phenobarbital (10 mg/kg) by slow IV infusion over 30 minutes as above. If IV access cannot be obtained, administer the second dose (10 mg/kg) of phenobarbital undiluted by IM injection 60 minutes minimum after the first IM dose.
- In any cases, monitor the infant closely for at least 6 hours.
- For recurrent seizures, administer **phenobarbital** PO: 5 mg/kg/day for 5 days.

10.3 Care of the sick newborn

10.3.1 Danger signs

Routinely check all newborns for danger signs at birth and during their stay in the maternity hospital. Danger signs indicate severe infection and require immediate care.

Danger signs	
Temperature	> 38°C: hyperthermia < 35.5°C: hypothermia
Neurological signs	Seizures (including subtle* or “abnormal” movements) Bulging fontanelle Inability to suckle effectively Lethargy or coma Hypotony
Respiration	Apnoea (respiratory pause > 20 seconds or combined with bradycardia) Bradypnoea (respiratory rate < 30/minute) Tachypnoea (respiratory rate > 60/minute) Grunting respirations Chest indrawing
Abdomen	Severe abdominal distension
Skin colour	Generalised cyanosis (blue colouring) Extreme pallor
Skin	Umbilicus red or oozing blood or pus Numerous or large pustules
Joints	Swollen, painful joint (irritability when moved) with reduced joint movement
Blood glucose	Recurrent hypoglycaemia (> 2 episodes)

* Subtle movements: sucking or chewing, blinking or disorganised eye movements, disordered arm or leg movements (pedalling).

10.3.2 Management of life-threatening emergencies

Cyanosis and/or respiratory distress

- Position the head to open the airway.
- Administer oxygen with an appropriate nasal cannula, at a maximum flow rate of 2 litres/minute, monitoring with a pulse oxymeter. The oxygen saturation in full-term or premature infants should be 90 to 95%.
Use an appropriate paediatric flow splitter so that the oxygen flow can be adjusted correctly when there are several infants on the same oxygen concentrator.
- Place a gastric tube for feeding (Appendix 5).

Apnoea or bradypnoea

- Perform bag-mask ventilation (add oxygen if the ventilation lasts more than 1 to 2 minutes).

Impaired consciousness and/or seizures

- Check the blood glucose or, if that is not possible, treat hypoglycaemia (Section 10.3.5).
- Administer phenobarbital in case of seizures (Section 10.2.2).
- Place a gastric tube for feeding (Appendix 5).

10.3.3 Management of symptomatic neonatal infections

A neonatal infection is likely and an antibiotic therapy and transfer to neonate unit are required:

<p>In presence of one of these danger signs</p>	<ul style="list-style-type: none"> – Hyperthermia – Seizures – Bulging fontanelle – Apnoea – Severe abdominal distension – Generalised cyanosis – Umbilicus red or oozing blood or pus – Numerous or large pustules – Swollen, painful joint with reduced joint movement – Recurrent hypoglycaemia (> 2 episodes)
<p>OR</p> <p>In presence of two of these danger signs or If one these danger signs persist for more than one hour</p>	<ul style="list-style-type: none"> – Hypothermia – Inability to suckle effectively – Lethargy or coma – Hypotony – Bradypnoea – Tachypnoea – Grunting respirations – Chest indrawing – Extreme pallor

- The first-line treatment is the combination **ampicillin IV + gentamicin IM**.

The ampicillin is preferably used IV; the IM route is an option if the context does not permit proper IV administration. To avoid multiple IM injections, however, it may be better to use **fortified penicillin procaine IM^b + gentamicin IM** or, as a last resort (if fortified penicillin procaine is not available) **ceftriaxone^c IM + gentamicin IM**.

- If meningitis is suspected, do not use fortified penicillin procaine.

- If the infection is cutaneous in origin, replace the ampicillin with cloxacillin IV^d.

^b Penicillin G procaine can be used in place of fortified penicillin procaine (same dose). These two penicillins SHOULD NEVER BE USED INTRAVENOUSLY.

^c Ceftriaxone is contra-indicated in newborns with jaundice.

^d Due to the risk of local necrosis, cloxacillin should be administered by IV infusion in 5% glucose or 0.9% sodium chloride over 30 to 60 minutes (or if impossible, by slow IV injection over at least 5 minutes).

Symptomatic neonatal infections are treated for a total of 10 to 14 days. This may be shorted to 7 days if there is complete recovery in the first 24 hours. It should never be less than 7 days and never given by mouth. Gentamicin should usually be stopped after 5 days of treatment.

Premature and low birth weight infants are at greater risk of serious infection.

Table 10.5 - Antibiotic dosages for newborns less than 7 days old

Antibacterial	Birth weight	
	≤ 2000 g	> 2000 g
ampicillin IV/IM injection	100 mg/kg/day in 2 divided doses If meningitis: 200 mg/kg/day in 3 divided doses	150 mg/kg/day in 3 divided doses If meningitis: 300 mg/kg/day in 3 divided doses
gentamicin IM injection	3 mg/kg once daily	5 mg/kg once daily
fortified penicillin procaine IM injection	50 000 IU/kg once daily If meningitis: do not administer.	
ceftriaxone IV/IM injection	50 mg/kg once daily If meningitis: 100 mg/kg once daily	
cloxacillin IV infusion	50 mg/kg/day in 2 divided doses	75 mg/kg/day in 3 divided doses

In all cases, while awaiting the transfer in neonatal intensive care unit:

- Start antibiotic therapy.
- Ensure routine newborn care (Section 10.1).
- Keep the infant warm in a 25°C room, wrapped in a survival blanket or under a warming lamp if possible, and cover the head with a cap.
- Closely monitor temperature, respiratory rate and oxygen saturation.

10.3.4 Management of asymptomatic newborns at risk of neonatal infection

In asymptomatic newborns (no danger signs), neonatal infection should nevertheless be suspected if any of the risk factors below are present.

Major risk factors (RF)

- Peripartum maternal fever (To ≥ 38°C before delivery or during labour)
- Chorioamnionitis (foul-smelling, cloudy amniotic fluid)
- Prolonged rupture of membranes lasting > 18 hours before delivery

Minor risk factors

- Birth weight < 2000 g
- Resuscitation at birth with manual ventilation
- Meconium-stained amniotic fluid: this is a risk factor for neonatal infection, but not in itself an indication for antibiotic therapy. Meconium-stained amniotic fluid is also a risk factor for pneumothorax and aspiration pneumonia.

Criteria for suspecting asymptomatic neonatal infection

- 1 major RF if the mother did not receive antibiotics during labour (or received less than 2 doses^e)
- or
- 1 major RF and birth weight < 2000 g, whether the mother received antibiotics during labour or not
- or
- ≥ 2 major RFs, whether the mother received antibiotics during labour or not
- or
- 1 major and ≥ 2 minor RFs, whether the mother received antibiotics during labour or not
- or
- ≥ 3 minor RFs, whether the mother received antibiotics during labour or not

Management of suspected asymptomatic neonatal infection (one of the criteria above)

- Administer antibiotics for 48 hours³: ampicillin IV + gentamicin IM or fortified penicillin procaine IM + gentamicin IM. See Table 10.5 for dosage.
- Monitor for danger signs (Section 10.3.1). If the infant presents at least one danger sign, see Section 10.3.3.
- If the infant has not presented any of the danger signs during the first 48 hours, stop the antibiotics and keep under observation for an additional 48 hours.
- If the infant has not presented any of the danger signs during the observation period or at the discharge clinical examination (preferably done by a doctor): send home. In this case, tell the parents which signs require immediate consultation.

Management for all other asymptomatic newborns (none of the criteria above)

- Keep under observation in the maternity hospital for 24 hours.
- Monitor for danger signs (Section 10.3.1). If the infant presents at least one danger sign, see Section 10.3.3.
- If the infant did not present any danger signs during observation: send home. In that case, tell the parents which signs require immediate consultation.

10.3.5 Management of hypoglycaemia

Criteria defining newborns at risk for hypoglycaemia

- Presence of at least one of the following signs:
 - Hypothermia (axillary temperature < 35.5°C)
 - Irritability or trembling
 - Bradypnoea or apnoea or cyanosis
 - Difficulty breastfeeding (difficulty attaching to the breast, difficulty sucking, inadequate milk production)
 - Hypotony or poor response to stimulation (impaired consciousness)
 - Seizures

^e

Antibiotics during labour when there is a prolonged rupture of membranes (Chapter 4, Section 4.9.3) reduces risk of septicaemia in the newborn. Coverage is considered effective if at least 2 doses have been administered 4 hours apart during labour.

- Birth weight < 2500 g or > 4000 g
- Maternal diabetes
- Mother treated with labetalol

Always check blood glucose ^f if at least one of the above criteria is present.

Management

If the blood glucose is normal (> 2.5 mmol/l or > 45 mg/dl):

- Breastfeeding every 3 hours (add 10% glucose PO if breastfeeding is insufficient).
- Keep the infant warm.
- Check the blood glucose before each meal until there are 3 consecutive normal results.

If the hypoglycaemia is moderate (2 to 2.5 mmol/l or 35 to 45 mg/dl) and it is the first episode of hypoglycaemia:

- Put to the breast and give 5 ml/kg of 10% glucose over 5-10 minutes PO or by gastric tube, or
- Administer 2 ml/kg of 10% glucose by IV infusion as below, if an IV line is already in place and if the newborn is symptomatic.
- Check the blood glucose after 30 minutes; administer IV glucose if blood glucose is < 2.5 mmol/l (< 45 mg/dl).
- Check the blood glucose before each meal until there are 3 consecutive normal results.

If the hypoglycaemia is severe (< 2 mmol/l or < 35 mg/dl) or recurrent:

- Place an IV line and administer 2 ml/kg of 10% glucose.
- If not feasible, administer 10 ml/kg of 10% glucose by gastric tube.
- Then start a continuous infusion of glucose 10%: 80 ml/kg/day for at least 24 hours, if conditions permit.
- Check the blood glucose after 30 minutes and then before each meal until there are 3 consecutive normal results.

The use of 50% glucose (1 ml/kg) sublingually is recommended only if it is impossible to do an infusion or place a gastric tube.

10.3.6 Management of jaundice

Severe jaundice can cause acute encephalopathy, potentially leading to neurological sequelae and death.

Diagnosis

Jaundice is yellow colouring of the skin and mucous membranes due to hyperbilirubinaemia. It appears first on the face, and then moves to the chest and then the extremities.

The examination should be done in day light. It is done by pressing the infant's skin and looking to see if it is yellow immediately after the pressure is removed.

Jaundice can be physiologic, with a yellowish skin colour, without the criteria for pathological jaundice below.

Physiologic jaundice is a diagnosis of exclusion in an infant in excellent general condition who is feeding well and whose neurological examination is normal.

^f

Blood glucose is measured on a sample of capillary blood taken from the lateral aspect of the heel using a lancet or 24G needle. This technique is used for other tests like HemoCue haemoglobin measurement.

Pathological jaundice starts the first day of life (the second day of life if < 35 weeks), and lasts more than 14 days in full-term infants or more than 21 days in premature infants. It is an intense colour that affects the palms of the hands and soles of the feet, and may be associated with a neonatal infection.

In cases of jaundice, consider septicaemia or congenital malaria.

Management

Infants presenting criteria of severity (early onset jaundice, extensive jaundice, low birth weight, or specific risk) should be referred.

Table 10.6 - Criteria for transferring newborns with jaundice to neonatal unit

Time of onset	Criteria for transfer
Day 0	– All newborns, regardless of birth weight
Day 1	– Newborns < 1500 g – Newborns > 1500 g with extensive jaundice: head, chest, abdomen, upper arms and thighs
Day 2 or later	– Newborns < 1500 g with very extensive jaundice (head, chest, abdomen, upper arm and forearm, thigh and lower leg) – Newborns > 1500 g with: <ul style="list-style-type: none"> • very extensive jaundice (head, chest, abdomen, upper arm and forearm, thigh and lower leg) AND <ul style="list-style-type: none"> • at least one of the following risk factors: ABO or Rh incompatibility, G6PD deficiency, inadequate breastfeeding, infection, hypothermia, asphyxia, cephalohaematoma or maternal diabetes – Newborns > 1500 g with no risk factors but extreme jaundice also affecting the palms of the hands and soles of the feet

If there are no criteria of severity or while awaiting the transfer:

- Maintain good hydration (breastfeeding), if necessary use infant formula and a gastric tube.
- Begin treatment for infection, if present.
- Sun exposure is not an effective treatment for severe jaundice. However, if there are no other options, expose the bare newborn to the sun for 10 minutes 4 times a day, in the morning and late afternoon, when the sun is not too strong.
Cover the infant's eyes.

10.4 Specific care when the mother has a transmissible infection

10.4.1 Syphilis

Look for signs of syphilis in all infants of mothers with a positive syphilis test:

- Mucocutaneous rash, grey patches, papules and bullae followed by desquamation of the skin on the palms and soles of the feet;
- Sepsis, jaundice, anaemia, enlarged lymph nodes and abdominal distension with hepatosplenomegaly.

If the infant has no signs of syphilis and the mother received appropriate treatment during the pregnancy (at least one dose of penicillin^g administered at least one month before delivery), give the infant: **benzathine benzylpenicillin** IM, 50 000 IU/kg as a single dose.

If the infant has signs of syphilis or the mother did not receive appropriate treatment (see above):

- Administer to the infant:

benzylpenicillin IV for 10 days: 100 000 IU/kg/day in 2 divided doses given 12 hours apart from Day 0 to Day 7, and then 150 000 IU/kg/day in 3 divided doses given 8 hours apart from Day 8 to Day 10

or **fortified penicillin procaine** IM for 10 days: 50 000 IU/kg once daily^h

- In addition to “standard” precautions, use “contact” precautions^h during care for 24 hours after starting the treatment.

10.4.2 Genital gonococcal and/or chlamydial infection

Newborns of mothers with purulent cervical discharge at the time of delivery may be asymptomatic or present purulent conjunctivitis, usually within the first 7 days for gonorrhoea and after 7 days for chlamydia. Chlamydial pneumonia is possible.

Administer **ceftriaxone** IM: 50 mg/kg as a single dose (maximum 125 mg) to:

- All infants with purulent conjunctivitis, whether the mother is symptomatic or not;
- All infants born to mothers who were symptomatic at the time of delivery, even if the infants are asymptomatic.

In case of symptomatic conjunctivitis (purulent discharge): clean each eye with 0.9% sodium chloride at least 4 times a day.

If the conjunctivitis persists 48 hours after the ceftriaxone injection, administer

: **erythromycin** PO: 25 to 50 mg/kg/day in 4 divided doses for 14 days

or **azithromycin** PO: 20 mg/kg once daily for 3 days

If the symptoms appear after 7 days of life, administer ceftriaxone IM + erythromycin or azithromycin PO, as above.

^g Erythromycin is not an appropriate treatment.

^h Contact precautions include: isolation of the infant, use of gloves and protective gown at each contact with the infant.

10.4.3 Genital herpes⁴

Infants of mothers who have active genital herpes lesions at the time of delivery may present with neonatal herpes.

The infant is usually asymptomatic at birth. The symptoms appear sometime within the first 4 weeks of life (usually between 3 and 10 days of life).

Symptoms of neonatal herpes may include:

- Local, external involvement: skin, mouth (vesicles) and/or eyes (conjunctivitis);
- Cerebral involvement: encephalitis (with seizures in 60% of cases), accompanied in 60% of cases by local external involvement;
- Disseminated infection: primarily brain, lungs and liver. The infant may present danger signs suggesting septicaemia (fever, lethargy, respiratory distress or seizure). Local external involvement is associated in 60% of cases.

Management depends on the infant's risk at birth:

High risk of herpes infection

- Infant with symptoms of neonatal herpes, or
- Active primary or unknown maternal genital herpes at the time of delivery, or
- Active recurrent maternal genital herpes at the time of delivery, with at least one of the following risk factors: rupture of membranes \geq 6 hours before delivery (vaginal delivery or caesarean section) or birth weight $<$ 2000 g or premature \leq 37 weeks or skin laceration or maternal HIV infection.

In these cases, 3% aciclovir eye ointment: a single application in each eye at birth (in this case, wait 12 hours before applying tetracycline eye ointment, Section 10.1.7) and refer to neonatal care unit for aciclovir IV therapy, with isolation of mother and infant.

Low risk of herpes infection

Recurrent active genital herpes with none of the risk factors listed above.

In these cases, observe for 5 days, with isolation of the mother and infant. Apply 3% aciclovir eye ointment, as above.

If the infant becomes symptomatic, refer to neonatal care unit for aciclovir IV therapy.

Discharge at 5 days of life if the infant has not developed symptoms; ask parents to seek urgent attention if symptoms appear.

10.4.4 Hepatitis B infection

The infant is asymptomatic.

Administer Hepatitis B vaccine to the infant at birth, regardless of the mother's serological status (Section 10.1.8).

10.4.5 HIV infection

The infant is asymptomatic.

Administer antiretroviral prophylaxis immediately after birth: refer to the PMTCT-specific guides.

For breastfeeding: see Appendix 3, Section 3.7.

10.4.6 Active pulmonary tuberculosis

Congenital tuberculosis is rare, and the infant is usually asymptomatic at birth.

After birth, the mother can transmit tuberculosis to the infant as long as she is contagious, i.e. sputum smear positive or culture positive.

In that case:

- Do not administer BCG.
- Administer preventive therapy to the infant, **isoniazid** PO: 10 mg/kg once daily for 6 months.
- Administer the BCG vaccine after completion of isoniazid therapy.
- Do not separate the mother from the infant (breastfeeding, etc.), but observe the rules for transmission prevention. For more information, refer to the MSF handbook, Tuberculosis.

10.5 Care of the low birth weight newborn (1500-2500 g)

Low birth weight indicates prematurity (less than 37 weeks) or intrauterine foetal growth retardation or a combination of the two.

Low birth weight newborns, whether premature or not, are at significant short-term risk of hypothermia, hypoglycaemia, apnoea, respiratory distress, jaundice, infection, anaemia, dehydration and feeding problems, and at significant long-term risk of poor psychomotor development.

Newborns who are sick or who weigh less than 1500 g should be referred to a neonatal care unit whenever possible.

Newborns who weigh 1500 to 2500 g, regardless of the term, are managed in the maternity hospital if they are not sick, according to the recommendations below.

10.5.1 Kangaroo care

(Figures 10.4)

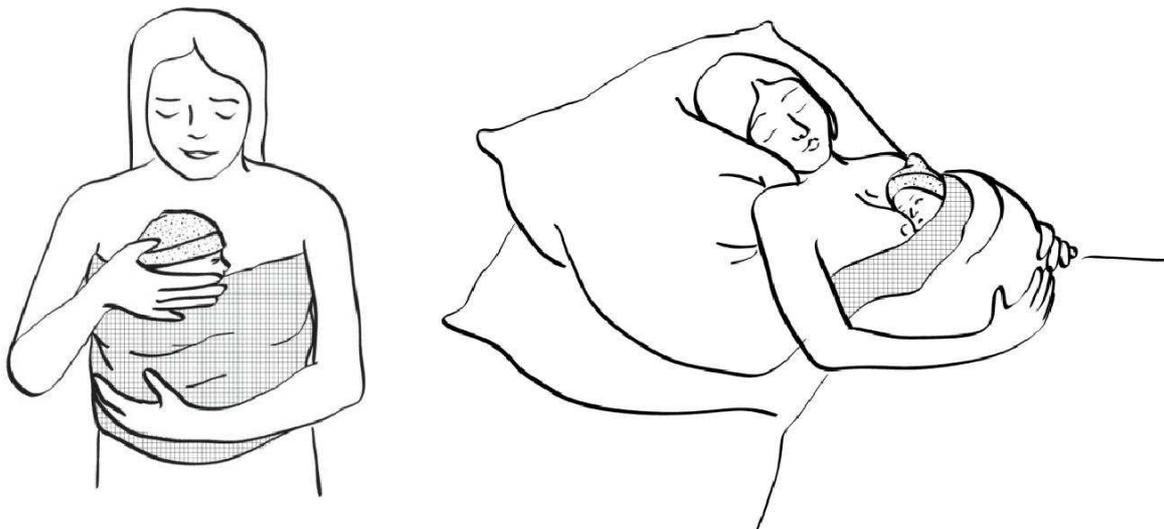
The Kangaroo mother careⁱ is a method of caring for infants that involves putting them on the mother's chest skin-to-skin, preferably 24 hours a day.

This method can be used for all non-sick infant whose birth weight is less than 2500 g (prematurity and/or intrauterine foetal growth retardation).

The bare infant is placed vertically against the mother's chest; the mouth should always be able to reach the nipple. Use a pague to hold the infant.

If needed, use a blanket to keep the mother and infant warm.

When the mother is sleeping, her bust should be raised and the infant should be monitored.



Figures 10.4
Kangaroo care

ⁱ For more information: World Health Organization. Kangaroo mother care: a practical guide. 2003. http://www.who.int/maternal_child_adolescent/documents/9241590351/en/

The objectives of the Kangaroo care are:

- To keep the infant warm and to prevent or treat hypothermia.
- To help get breastfeeding started and keep it going.
- To foster the mother-infant bond and reduce the infant's stress.
- To reduce episodes of apnoea and bradycardia in premature infants.

Note: the skin-to-skin contact can also be done by the father, another family member or a wet-nurse during periods when the mother is not available.

10.5.2 Thermoregulation

- Cover the infant's head to reduce heat loss.
- Make sure that the room temperature is at least 25°C.
- Use the Kangaroo care (Section 10.5.1).

10.5.3 Feeding

- Exclusive breastfeeding is the best choice (Appendix 3).
- If sucking is ineffective but the swallowing reflex is present: express the milk manually or using a breast pump and feed the infant using a cup/spoon (Appendix 3, Sections 3.2 and 3.3).
- If sucking is ineffective and the swallowing reflex is poor or absent: express the milk and feed the infant using a gastric tube (Appendix 3, Sections 3.2 and 3.4).
- For the daily amounts required for feeding, see Appendix 4.
- If the mother does not have enough milk:
 - In the first 72 hours of life, make up the required amounts with 10% glucose PO.
 - After 72 hours of life, make up the amount with infant formula (or if not available, use diluted F 100 milk^j).

At the same time, continue to stimulate the mother's milk production (breast pump and the "supplementary nursing" technique, Appendix 3, Section 3.5).

- For newborns less than 1500 g, glucose is routinely given in addition to the mother's milk (Appendix 4).

In case of regurgitation:

- Administer each meal very slowly.
- Hold the infant tilted slightly head-up.

In case of vomiting, abdominal distension, blood in the stool or greenish, foul-smelling stool, stop feeding and request a medical opinion.

In all cases, try putting the infant to the breast periodically to test whether he can (or cannot) breastfeed effectively.

10.5.4 Monitoring

Same monitoring as for a newborn > 2500 g, plus:

- Daily weighing;
- Temperature every 4 hours;
- Blood glucose test before every meal or every 3 hours until there are 3 consecutive normal results. In case of hypoglycaemia, see Section 10.3.5.

^j Diluted F-100 milk: 1 sachet (456 g) of F-100 milk in 2800 ml of water.

10.6 Criteria for discharge from the maternity hospital

- No danger signs (Section 10.3.1).
- Appropriate management of neonatal infection (Sections 10.3.3 and 10.4) and risk factors for neonatal infection (Section 10.3.4).
- Healthy infant: good breastfeeding on demand, normal respiration and temperature, etc.
- Weight > 1500 g.

AND

- Preventive treatments (Section 10.1.7) and BCG, Hepatitis B (0) and Polio (0) vaccines administered (Section 10.1.8).
- Clinical record filled out (including discharge weight).
- Postnatal visit appointment (Section 11.3) given.

AND

Information for the mother

- 1) Breastfeeding: Appendix 3.
- 2) Infant care:
 - Wash the infant with soap and water once a day, and immediately dry him with a towel or cloth to avoid hypothermia.
 - Cord care: clean with soap and water each time it is soiled, rinse well and dry then let it uncovered. Do not apply an antiseptic or other product or dressing on the cord, the cord falls between the 5th and 15th day after birth.
 - Kangaroo care if weight < 2500 g (Section 10.5.1).
 - Lay infant on the back.
 - Use a mosquito net day and night when the infant sleeps.
 - Keep the infant away from sick (contagious) children and adults.
 - Wash hands before and after caring for the infant.
 - Dispose of stool in the latrine.
- 3) Danger signs requiring a consultation:
 - Inability to breastfeed properly
 - Abnormal movements
 - Reduced activity
 - Trouble breathing
 - Abnormal colouring
 - Redness or purulent discharge from the umbilicus
 - Fever or hypothermia

Appendix 3. Breastfeeding

Exclusive breastfeeding (no food or drink other than breast milk) for the first 6 months is the best choice for infants, regardless of the term or birth weight.

For HIV-infected mothers, see Section 3.7.

If the infant is unable to suck effectively or at all:

- Breast milk can be expressed with a breast pump or by hand (Section 3.2).
- If the infant has a good swallowing reflex: the milk can then be given by cup, spoon or syringe (Section 3.3).
- If the infant cannot swallow effectively or at all: the milk is given with a gastric tube (Section 3.4) to prevent aspiration and exhausting the infant.

If sucking is ineffective, check for hypoglycaemia (Chapter 10, Section 10.3.5) and danger signs (Chapter 10, Section 10.3.1).

If the child is able to suckle but the quantity of maternal milk is not sufficient, the supplemental suckling technique offers the possibility to feed her/him with infant milk while stimulating milk production. (Section 3.5).

Always make sure that any medications being taken by the mother are compatible with breastfeeding, and if necessary, adjust the treatment accordingly.

3.1 Breastfeeding success factors

The factors for success in breastfeeding are:

- Informing pregnant women about breastfeeding benefits and implementation.
- Putting the infant to the breast early, within an hour of birth.
- Correct and comfortable positioning of mother and infant. Proper latch-on allows effective sucking and reduces complications (cracks): the infant should face the mother's body, with the chin against her breast, the nose free and the nipple and most of the areola in the mouth.
- For women with inverted or flat nipples: use techniques to help nipple protrude (nipple massage, use of breast pump just before the infant feeds).
- Maintaining exclusive breastfeeding (unless medically contra-indicated).
- Breastfeeding on demand at least 8 times a day (at least every 3 hours).
- Good hydration (at least 3 litres/day) and a caloric intake > 2500 kcal/day for the mother, as these directly affect the amount of milk produced.
- Nipple care, washing with water before nursing.
- An organisation that allows the mother and infant to stay together 24 hours a day.
- Help with maintaining lactation even if the mother has to be separated from her infant (preventing milk production from stopping due to lack of stimulation).

Do not stop breastfeeding if:

- The infant has diarrhoea: explain to the mother that her milk is not causing the diarrhoea.
- The mother is sick (unless serious condition): explain to the mother that her milk is not of poor quality because she is sick.

3.2 Hand expression and storage of breast milk

Hand expression is an alternative when a breast pump is not available. Milk is expressed every 2 to 3 hours.

Show the mother the technique. Give her a clean cup or container for collecting the milk. The container should be washed, boiled and rinsed with boiled water and air-dried before each use.

Technique

- Wash hands, sit comfortably and hold the container under the breast.
- With the other hand, hold the breast up with four fingers, and place the thumb above the areola.
- Squeeze the areola between the thumb and the fingers while pressing backward toward the rib cage.
- Express each breast for at least 5 minutes, alternating, until the milk stops flowing.
- If the milk fails to flow, check the technique and apply warm compresses to the breasts.

Feed the infant immediately after expressing the milk (by cup or gastric tube).

If the infant does not take all of the collected milk, it can be stored in a clean container in the refrigerator (2 to 8°C) for a maximum of 24 hours^a.

Warm the milk (water bath) to body temperature for the next feeding.

3.3 Administering the milk by cup or other utensil

The milk can be administered using a cup, spoon or syringe.

Use a clean (washed, boiled or rinsed with boiled water and air-dried) container/utensil for each feeding.

Technique

The mother should (with help from a carer):

- Measure out the volume of milk needed according the infant's age and weight (Appendix 4).
- Hold the infant in a half-seated or upright position on her lap.
- Place the cup/spoon gently against the infant's lower lip and touch the outside of the upper lip with the edge of the cup.
- Tilt the cup/spoon so that the milk just reaches the infant's lips.
- Let the infant take the milk at his own pace; never pour the milk into the mouth.
- Stop feeding when the infant closes the mouth and is no longer interested in feeding.

3.4 Administering the milk by oro/nasogastric tube

Indications

- Infants < 1500 g: poor sucking, limited or no coordination between sucking and swallowing, tire rapidly.
- Infants with respiratory distress: risk of aspiration, tire rapidly.

a

Managing newborn problems: a guide for doctors, nurses, and midwives. World Health Organization. 2003. http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/9241546220/en/

- Infants in poor general condition (asphyxia, meningitis, seizures, etc.): little or no sucking, weak reflexes.
- Infants with cleft palate, particularly when the cleft is very wide.

Placing the tube

See Appendix 5.

Feeding

Before each feeding:

- Check that the abdomen is not distended or painful.
- Aspirate the gastric contents to verify that the gastric tube is in the correct position and evaluate the gastric residual:
 - If the residual is clear or milky and < 2 to 3 ml/kg: re-inject the residual and feed the planned amount.
 - If the residual is clear or milky and > 2 to 3 ml/kg after two consecutive feedings: re-inject the residual and feed enough to reach the total planned amount. If the day's feedings should have been increased, wait until the next day to increase the amounts.
 - If the residual is bilious (yellow-green): do not re-inject the residual; give the planned amount of milk then, reassess the residual. If the residual is still bilious: stop the feeding, look for danger signs (Chapter 10, Section 10.3.1 and 10.3.3) and necrotizing enterocolitis (blood in stools and painful abdominal distension). Insert an intravenous line for maintenance fluid therapy, start antibiotic therapy before transferring the infants to neonate unit.

Administering the milk:

- Take a sterile or clean (washed, rinsed with boiled water and air-dried) syringe, large enough to hold the total amount of the feeding. Remove the plunger and connect the syringe to the conic end of the tube.
 - Pour the milk into the syringe, which should be held vertically.
 - Ask the mother to hold the syringe 10 cm above the infant and let the milk flow through the tube by gravity.
 - Do not use the plunger of the syringe to force the milk down faster.
- Each feeding should last 10 to 15 minutes.

For the daily amounts required for feeding, see Appendix 4.

3.5 “Supplementary nursing” technique

This technique is used to maintain breastfeeding when milk production is less than the daily amount needed by the infant.

It consists of giving the infant formula through a feeding tube while stimulating milk production.

Technique

- Cut off the end of a CH8 gastric tube (1 cm from the holes) and remove the cap from the other end.
- Attach the first end to the nipple using adhesive tape. Place the other end in the cup. The infant should have both the nipple and the tube in the mouth as he nurses (Figure 1).
- The mother should hold the cup 10 cm below breast-level, so that the milk is not sucked up too quickly.

The infant may need 2 or 3 days to adjust to the technique. If, for the first few days, the infant does not take all of the milk in the cup, give him the rest with a cup, spoon or syringe.



Figure 1
“Supplementary nursing” technique

3.6 Management of feeding problems (summary)

Situation	Management
Problem with breastfeeding, but breastfeeding seems possible (milk production, sucking and swallowing are all adequate)	Give mother more advice, build her confidence, always have a member of the medical team present during breastfeeding, recording observations in the infant’s chart.
Breastfeeding with inadequate amount of breast milk (amount of milk produced less than infant’s daily requirements)	<ul style="list-style-type: none"> • Stimulate milk production by frequent breastfeeding (8 x/day). • Use a breast pump and the “supplementary nursing” technique.
Ineffective sucking but good swallowing reflex	<ul style="list-style-type: none"> • Express the milk with a breast pump or by hand. • Administer the milk using a cup, spoon or syringe.
Ineffective sucking and poor or no swallowing reflex	<ul style="list-style-type: none"> • Express the milk with a breast pump or by hand. • Feed breast milk via a gastric tube.

3.7 Breastfeeding in HIV-infected women

To reduce the risk of HIV transmission, mothers should receive long-term antiretroviral therapy or for as long as they are breastfeeding.

Exclusive breastfeeding is recommended for the first 6 months of life, with gradual weaning over one month starting at age 6 months. Stopping breastfeeding abruptly is not recommended.

Breast milk substitutes can be used as an alternative to exclusive breastfeeding only under the following conditions:

- There is enough infant formula available for exclusive use to age 6 months.
- The mother (or the person in charge) is able to prepare the formula under good hygiene conditions and frequently enough to limit the risk of diarrhoea or malnutrition.
- There is access to a health care facility offering a full range of paediatric care.

Annex 4.1 Daily amounts required for enteral feeding ONLY

This annex has been modified and does not correspond to the current chapter in the 2014 Neonatal protocol

Birth weight > 3 500 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted
D1	60	8 x 28 ml
D2	80	8 x 38 ml
D3	100	8 x 47 ml
D4	120	8 x 56 ml
D5	140	8 x 66 ml
D6	160	8 x 75 ml
D7 and greater	160-180	8 x 75-84 ml

Birth weight 3 000 g - < 3 500 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted
D1	60	8 x 24 ml
D2	80	8 x 33 ml
D3	100	8 x 41 ml
D4	120	8 x 49 ml
D5	140	8 x 57 ml
D6	160	8 x 65 ml
D7 and greater	160-180	8 x 65-73 ml

Birth weight 2 500 g – < 3 000 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted
D1	60	8 x 21 ml
D2	80	8 x 28 ml
D3	100	8 x 34 ml
D4	120	8 x 41 ml
D5	140	8 x 48 ml
D6	160	8 x 55 ml
D7 and greater	160-180	8 x 55-62 ml

Birth weight 2 000 g – < 2 500 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted
D1	60	8 x 17 ml
D2	80	8 x 23 ml
D3	100	8 x 28 ml
D4	120	8 x 34 ml
D5	140	8 x 40 ml
D6	160	8 x 45 ml
D7 and greater	160-180	8 x 45-51 ml

Test blood glucose in the first hour of life for infants < 2 500g and then according to the protocole “risk of hypoglycaemia”.

Birth weight 1 500 g – < 2 000 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted
D1	60	8 x 13 ml
D2	80	8 x 18 ml
D3	100	8 x 22 ml
D4	120	8 x 26 ml
D5	140	8 x 31 ml
D6	160	8 x 35 ml
D7 and greater	160-180	8 x 35-39 ml

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

Test blood glucose in the first hour of life for infants < 2 500g and then according to the protocole “risk of hypoglycaemia”.

Birth weight 1000 g – < 1500 g

In principle, newborns whose birth weight is < 1500 g should receive only 10% glucose in continuous IV infusion for the first 48 hours of life, due to the very high risk of acute necrotising enterocolitis with rapid early enteral nutrition.

The 2 tables below show how much milk and glucose to administer simultaneously by mouth, as a last resort – that is, only when it is impossible to administer a continuous infusion and the newborn cannot be transferred to a neonatal care unit.

Birth weight 1250 g – < 1500 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted	10% glucose
D1	80	12 x 5 ml	12 x 4 ml
D2	100	12 x 7 ml	12 x 4 ml
D3	120	12 x 10 ml	12 x 4 ml
D4	140	12 x 14 ml	12 x 2 ml
D5	160	12 x 18 ml	–
D6 and after	160-180	12 x 18-21 ml	–

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

Test blood glucose in the first hour of life for infants < 2 500g and then according to the protocole “risk of hypoglycaemia”.

Birth weight 1000 g – < 1250 g

	Total (ml/kg/day)	Breast milk. Second line: infant formula Third line: F-100 diluted	10% glucose
D1	80	12 x 5 ml	12 x 3 ml
D2	100	12 x 6 ml	12 x 3 ml
D3	120	12 x 8 ml	12 x 3 ml
D4	140	12 x 11 ml	12 x 2 ml
D5	160	12 x 15 ml	–
D6 and after	160-180	12 x 15-17 ml	–

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

Test blood glucose in the first hour of life for infants < 2 500g and then according to the protocole “risk of hypoglycaemia”.

General Comments

The tables above are mainly used when the mother is unable to directly breastfeed. If she directly breastfeeds, amount of breast milk received by the baby will not be known. We recommend to always quantify the quantity of breast milk given for the < 1800g (thus with the mother using a breast pump) because of the frequent insufficient gain of weight for that group of newborn.

Standard fluid needs for infants as of day 6 of life (and the following weeks) is estimated to be at 160ml/kg/day. It is possible to administer up to 200ml/kg/day if needed for infant growth/weight gain for the < 1500g. It is important to adjust quantities according to maximum weight (birth weight is to be used in the first days of life until it has been regained). Newborns generally lose weight over the first days of life and during this time birth weight is to be used for fluid calculations until the infant has regained birth weight.

Fluid intake on average for a well breastfed newborn in the first 24 hours of life is at 20ml/kg/day with an increase of 20ml/kg/day over the following days. A sick newborn requires more energy and thus an increased volume of fluids due to an increased catabolic rate.

Breast milk is the preferred choice for enteral feeding and if not available or insufficient, infants can be supplemented with **infant formula** or if not available, with **F-100 diluted**.

If the neonate is installed on a warming mattress / table with lamp or under a phototherapy lamp, increase the global volume of daily fluids (infusion + enteral volume) of 10 ml/kg/d because of the losses due to sudation.

Annex 4.2 Daily amounts required for IV and Enteral feeding

This annex has been modified and does not correspond to the current chapter in the 2014 Neonatal protocol

Birth weight > 3 500 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	60	216 D10%	0
D2	80	192 D10%	8 x 14 ml
D3	100	144 (1/5 Nacl 0.9% + 4/5 D10%)	8 x 28 ml
D4	120	120 (1/5 Nacl 0.9% + 4/5 D10%)	8 x 38 ml
D5	140	0	8 x 66 ml
D6	160	0	8 x 75 ml
D7 and greater	160-180	0	8 x 75-84 ml

NB: This corresponds to IV fluid volumes of 60 – 50 – 40 then 30 ml/kg/day between Day of life 1-4 and enteral volumes of 0 – 30 – 60 – 80 – 100 – 120 ml/kg/day between Days of life 1-6.

Birth weight 3 000 g - < 3 500 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	60	192 D10%	0
D2	80	168 D10%	8 x 12 ml
D3	100	144 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 24 ml
D4	120	96 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 33 ml
D5	140	0	8 x 57 ml
D6	160	0	8 x 65 ml
D7 and greater	160-180	0	8 x 65-73 ml

NB: This corresponds to IV fluid volumes of 60 – 50 – 40 then 30 ml/kg/day between Days of life 1-4 and enteral volumes of 0 – 30 – 60 – 80 – 100 – 120 ml/kg/day between Days of life 1-6.

Birth weight 2 500 g – < 3 000 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	60	168 D10%	0
D2	80	144 D10%	8 x 11 ml
D3	100	120 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 21 ml
D4	120	96 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 28 ml
D5	140	0	8 x 48 ml
D6	160	0	8 x 55 ml
D7 and greater	160-180	0	8 x 55-62 ml

NB: This corresponds to IV fluid volumes of 60 – 50 – 40 then 30 ml/kg/day between Day of life 1-4 and enteral volumes of 0 – 30 – 60 – 80 – 100 – 120 ml/kg/day between Day of life 1-6.

Birth weight 2 000 g – < 2 500 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	60	144 D10%	0
D2	80	120 D10%	8 x 9 ml
D3	100	96 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 17 ml
D4	120	72 (1/5 Nacl 0.9%+ 4/5 D10%)	8 x 23 ml
D5	140	0	8 x 40 ml
D6	160	0	8 x 45 ml
D7 and greater	160-180	0	8 x 45-51 ml

To test blood glucose in the first hour of life for infants < 2 500g according to the protocol “Risk of hypoglycaemia”.

NB: This corresponds to IV fluid volumes of 60 – 50 – 40 then 30 ml/kg/day between Day of life 1-4 and enteral volumes of 0 – 30 – 60 – 80 – 100 – 120 ml/kg/day between Day of life 1-6.

Birth weight 1 500 g – < 2 000 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	60	96 G10%	0
D2	80	96 G10%	8 x 4 ml
D3	100	96 (1/5 Nacl 0.9%+ 4/5 G10%)	8 x 9 ml
D4	120	96 (1/5 Nacl 0.9%+ 4/5 G10%)	8 x 13 ml
D5	140	72 (1/5 Nacl 0.9%+ 4/5 G10%)	8 x 24 ml
D6	160	0	8 x 35 ml
D7 and greater	160-180	0	8 x 35-39 ml

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

To test blood glucose in the first hour of life for infants < 2 500g according to the protocol “Risk of hypoglycaemia”.

NB: This corresponds to IV fluid volumes of 60 – 60 – 60 – 60 then 40 ml/kg/day between Days of life 1-5 and enteral volumes of 0 – 20 – 40 – 60 – 110 – 120 then 160 ml/kg/day between Days of life 1-6.

Birth weight 1 250 g – < 1 500 g

	Total (ml/kg/day)	IV (ml/day)	Breast milk
D1	80	110 D10%	0
D2	100	140 D10%	0
D3	120	140 (1/5 Nacl 0.9%+ 4/5 D10%)	12x 2 ml
D4	140	140 (1/5 Nacl 0.9%+ 4/5 D10%)	12x 5 ml
D5	160	140 (1/5 Nacl 0.9%+ 4/5 D10%)	12x 7 ml
D6	160	120 (1/5 Nacl 0.9%+ 4/5 D10%)	12 x 9 ml
D7	160	72 (1/5 Nacl 0.9%+ 4/5 D10%)	12 x 11 ml
D8	160	48 (1/5 Nacl 0.9%+ 4/5 D10%)	12 x 14 ml
D9 and greater	160-180	0	12 x 18-21 ml

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

To test blood glucose in the first hour of life for infants < 2 500g according to the protocol “Risk of hypoglycaemia”.

NB: This corresponds to IV fluid volumes of 80 – 100 – 100 – 100 – 100 – 80 – 60 then 40 ml/kg/day between Days of life 1-5 and enteral volumes of 0 – 0 – 20 – 40 – 60 – 80 – 100 – 120 then 160-200 ml/kg/day between Days of life 1-9.

Birth weight 1 000 g – < 1 250 g

	Total (ml/kg/j)	IV (ml/day)	Breast milk
D1	80	96 D10%	0
D2	100	120 D10%	0
D3	120	120 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 2 ml
D4	140	120 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 4 ml
D5	160	120 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 6 ml
D6	160	96 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 8 ml
D7	160	72 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 9 ml
D8	160	48 (1/5 Nacl 0.9% + 4/5 D10%)	12 x 11 ml
D9 and greater	160-180	0	12 x 15-17 ml

Quantify the quantity of milk given to the newborn < 1800 g (use breast pump)

To test blood glucose in the first hour of life for infants < 2 500g according to the protocol “Risk of hypoglycaemia”.

NB: This corresponds to IV fluid volumes of 80 – 100 – 100 – 100 – 100 – 80 – 60 then 40 ml/kg/day between Days of life 1-5 and enteral volumes of 0 – 0 – 20 – 40 – 60 – 80 – 100 – 120 then 160-200 ml/kg/day between Days of life 1-9.

General Comments

The tables above are used to estimate the quantity of fluids needed by the newborn arriving in the newborn unit at DOL 1. For any late arrival (> DOL 1) or for any modification of intake (example: stopping the oral intake), an adaptation of the total feeding/fluid intake should be done (with respect of the total daily intake received by the newborn)

The “breast milk” column of the tables above is mainly used when the mother is unable to directly breastfeed. If she directly breastfeeds, amount of breast milk received by the baby will not be known. We recommend to always quantify the quantity of breast milk given for the < 1800g (thus with the mother using a breast pump) because of the frequent insufficient gain of weight for that group of newborn.

Standard fluid needs for infants as of day 6 of life (and the following weeks) is estimated to be at 160ml/kg/day. It is possible to administer up to 200ml/kg/day if needed for infant growth/weight gain for the < 1500g. It is important to adjust quantities according to maximum weight (birth weight is to be used in the first days of life until it has been regained). Newborns generally lose weight over the first days of life and during this time birth weight is to be used for fluid calculations until the infant has regained birth weight.

Please fill the infusion set each 6 hours. This will avoid a fluid overload which often happen while filling the infusion set each 24 hours and the infusion running too fast

If a newborn > 6 days old, need to have ONLY IV fluid for several days, give max 160ml/kg/day and do not increase more as sometimes seen for oral feeding. Also consider to give KCL IV (but with high cautious)

Breast milk is the preferred choice for enteral feeding and if not available or insufficient, infants can be supplemented with **infant formula** or if not available, with **F-100 diluted**.

INFUSION FOR MAINTENANCE

The IV solution (1/5 0.9% NaCl + 4/5 D10) is ideal and practical for providing the adequate amount of dextrose and sodium for the neonate. However, the sodium load can be too high when an infant is receiving a fluid load of > 100 ml/kg/day all per IV (an infant who is NPO). Therefore, you should modify the composition to (1/10 0.9%NaCl + 9/10 D10%) if you need to have the infant on this solution for multiple days.

If the baby is installed on a warming mattress / table with lamp or under a warming or phototherapy lamp, increase daily quantity (enteral + IV) by 10-20 ml/kg/day compare to usual need.

Practical reminder 1:

- ✚ Pediatric infusion set: 1 ml = 60 drops of liquid solution.
- ✚ Pediatric infusion set: 1 ml = 15 drops of blood.
- ✚ Do not use adult infusion in neonatology.

AVOID ANARCHIC MANAGEMENT of INFUSIONS that means INTERMITTENT INFUSIONS WITH EXCEPTION OF EMERGENCY TREATMENT of SHOCK or SEVERE DEHYDRATION.

In this case the protocol is very clear: 10 ml/kg over 30 minutes x 1, 2 or 3 **ACCORDING TO VITAL VALUES.**

Practical reminder 2:

- ✚ Change infusion set and bag / bottle each day (maximum 24 hours), even if the bag / bottle is not empty because of the high risk of nosocomial infection.
- ✚ Replace O/NGT every 3 to 5 days (according to the conditions) and for each replacement, change the nostril (in case of NGT) or the corner of the mouth (OGT) for the introduction of the new tube. Use a bit of Vaseline to decrease the trauma and the pain.
- ✚ Change IV catheter every 3 days (maximum 5 days depending of settings, hygienic maintenance, workload, staff and clinical condition of the infant). Only “active / used” catheter should remain in place while “preventive / not used” catheters should be removed.

Appendix 5. Placing a oro/nasogastric tube

Gastric tubes must always be used with great caution. There is a risk of aspiration if the tube is used incorrectly.

If possible, use the orogastric route rather than the nasogastric route in cases of respiratory distress or weight below 1500 g. Both nostrils must remain unobstructed for effective breathing.

5.1 Technique

- Choose a CH6 or CH8 tube, depending on the size of the infant's nostrils. The tube must not completely block the opening of the nostril.
- Measure the distance from the mouth (oro-) or bridge of the nose (naso-) to the tragus of the ear, and then the distance from the tragus of the ear to the xiphoid process of the sternum. Mark this insertion length on the tube with a pen.
- Lubricate the tube with water. Hold the infant's head firmly to prevent injury. Insert the tube in a continuous motion to the pen mark.
- Secure the tube with adhesive tape.
- Check for correct tube placement:
 - 1) aspirate the stomach contents AND
 - 2) inject 2 ml of air into the stomach via the tube. Place a stethoscope on the abdomen to listen for the noise of the air in the stomach.If there is any doubt about the tube position, withdraw the tube and start over. Intrapulmonary administration of the liquid contents can be fatal.

To feed, connect a 20-ml syringe, without its plunger, to the tube (tulip) and allow the milk in the syringe to flow by gravity (Appendix 3.4).

Rinse the tube with a few ml of 0.9% sodium chloride after each use.

5.2 Monitoring

The tube position should always be checked before administering any liquid or medication; check the position of the reference mark, check that aspiration brings up gastric liquid, and inject air into the stomach. If not correctly positioned, re-insert the tube and verify that it is correctly positioned.

Replace the tube every 3 days, switching nostrils with each new tube, or sooner if the tube becomes clogged. Evaluate if tube is still necessary before replacing.

References

- 1 Weekly epidemiological record/Relevé épidémiologique hebdomadaire : Hepatitis B vaccines/Vaccins anti-hépatite B, 2 october 2009, 84th year/2 octobre 2009, 84^e année, No. 40, 2009, 84, 405–420.
<http://www.who.int/wer/2009/wer8440.pdf>
- 2 Vaccines. Sixth edition by Stanley Plotkin, Walter Orenstein and Paul Offit (2013).
- 3 Pocket book of hospital care in children, second edition, World Health Organization, 2013.
http://www.who.int/maternal_child_adolescent/documents/child_hospital_care/en/
- 4 Neonatal herpes simplex virus infection: Management and prevention, Gail J Demmler- Harrison, UpToDate, Literature review current through: Oct 2013, last update: Mar 7, 2013.