

Module 1N**Complete Examination of a Newborn****Training objectives:**

Upon completion of the module the participants will be able to perform a complete neonatal examination from "Head to Toes " in order to:

- Quickly identify quickly any danger signs and organize the appropriate referral after pre-referral treatment
- Assess the normal adaptations of a newborn after birth
- Identify conditions requiring special care or follow-up observation.
- Identify any birth defect or birth trauma;
- Monitor growth
- Counsel the mother

Content and duration of the module:**Part I – Classroom work – 170 min**

Activity 1 – Introduction	10 min
Activity 2 – Group discussion exercise	10 min
Activity 3 – Interactive presentation	45 min

Part II – Clinical work

Activity 4 – Case studies	30 min
Activity 5 – Newborn examination	75 min

Preparation for the module

- To read Pregnancy, Childbirth, Post Partum Care Mother and Newborn Care: a guide for essential practice - WHO 2006
- To provide all participants with the Participant's Manual
- To ensure that other facilitators know their respective functions while working with this module

Materials and equipment

Materials

- Participant's Manual
- Case studies for small group work
- Roles for role play

Equipment

- Video projector or slide projector
- Flip chart
- Colour markers
- Pens and pencils
- Badges
- Doll
- Stethoscope

Key messages

- The complete newborn examination is extremely important as it shows whether the newborn is ready for life outside of the womb, and if he/she is facing any medical problem.
- The complete newborn examination is the tool that identifies danger signs that threaten the life of the newborn.
- The examination should be thorough, systematic and complete from "head to toes".
- It is critical to know normal newborn behaviour in order to recognise abnormality and correctly prescribe further tests and/or treatment.
- A routine newborn examination is performed at a time convenient for the newborn, the parents and the health worker.
- The routine newborn examination needs to be a pleasant experience for baby, parent and examiner.
- The environment influences the baby's behaviour during the assessment.
- The complete newborn examination is one of the best opportunities to involve parents in their baby's health and to establish a dialogue between the medical staff and family.
- It is necessary to ensure confidentiality during the examination especially when discussing delicate issues
- It is necessary to discuss findings in detail and take the time necessary to discuss the results of the examination with the mother/family

PART I – CLASSROOM WORK

Activity 1 – Introduction (10 min)

- **Slides 1N-1.** Explain that this module consists of two parts. Part 1, the theoretical part includes several activities and part 2, clinical part. The clinical part will be conducted during the second week.
- Highlight the following points during the introduction Let them know that upon completion of this module they will be able to perform a complete neonatal examination from “Head to Toes” in order:
 - Quickly identify any danger signs and organize the appropriate referral after pre-referral treatment
 - Assess the normal adaptations of a newborn after birth
 - Identify conditions requiring special care or follow-up observation.
 - Identify any birth defect or birth trauma;
 - Monitor growth
 - Counsel the mother
- The results of the examination should be discussed in detail with mother/family.
- Explain to participants that the majority of newborns will be found strictly normal and will need to stay with their mother.
- Only in cases with danger signs or where there are significant birth defects the newborn needs to be referred to a neonatal or a special paediatric unit.
- **Slide 1N-2.** List the key objectives of the examination.
The purpose of the physical exam is to find out if the baby is healthy or if the newborn faces any health problems or adaptation issues.

Activity 2 – Group discussion exercise (10 min)

- Ask the group of participants to answer two questions before displaying slides further on:
 - **When should the complete newborn clinical examination be performed?**
 - **How and where should the complete newborn examination be performed?**
- Write down (or ask your co-facilitator to do it) all the answers on the flip chart. Ensure that all the answers are listed
- Don't comment on the answers. Inform the participants that they will review the answers after they have seen the following slides.

Activity 3- Interactive presentation (45 min)

- Restart the presentation with **Slide 1N-3** after the group discussion exercise.
- **Slide 1N-3.** Present the slide and compare with the results of the group discussion. Note the differences and discuss the following points: It is important to pay a special attention to the following: The routine newborn examination should be conducted at a convenient time convenient for baby, parents and healthcare worker.
- **If the newborn is not facing acute problem after birth, and is breathing well it is extremely important to delay t the complete assessment for 2 hours so e mother and baby can have skin to skin contact without interference.**
- If a danger sign is found during the initial assessment it is necessary to perform the complete examination immediately.
- Explain to the participants that this comprehensive assessment will guide the health staff in counselling mother and family. The same complete newborn examination will be use during the first months to assess the growth and development of the infant. In cases of child abuse or neglect the full examination will be an important tool for identifying these cases.
- **Slide 1N-4 Steps of Newborn Examination:**
 - Assess,
 - Classify (normal signs, signs to be monitor, danger signs),
 - Treat if necessary
 - Counsel the family.

Insist that it is important that the results of newborn assessment be carefully recorded in the infant's file so it can be compared later with other assessments.

- **Slide 1N-5.** Present the slide and compare with the results of the group discussion. Note the differences and make this points:
 - The importance of having parents presents during the assessment.
 - The newborn needs to be kept warm,
 - Do the complete examination,
 - Communicate and discuss all results with the family
- **Slide 1N-6** Insist on the importance of hand washing. Remind participants that they should wash their hands before and after assessing the newborn.
- **Slide 1N-7.** Shows WHO's danger signs. Explain to the participants that the danger signs for newborn are often non specific, such as not feeding well, fast breathing, difficult breathing with severe chest indrawing when breathing in and grunting when breathing out, convulsions, hypothermia, fever, reduced few movement, and jaundice appearing anywhere on the first day or palmar or sole jaundice at any age .
- **Slide 1N-8.** Danger Signs are a threat to the infant's life. If a danger sign is founded it is necessary to rapidly complete the assessment, give immediate

pre-referral treatment, prepare the baby for safe transport (keeping him warm, preventing low blood glucose through breastfeeding or IV glucose infusion), and to refer to a higher level of care as soon as possible.

- **Slides 1N-9 - 1N--10. The Main Characteristics of a Newborn at birth.** All medical health workers in charge of newborns should clearly know and understand the physiologic characteristics of a normal newborn in order to recognise any difference or pathology.
- **Slide 1N-11. Explain** that the health status of a newborn is directly connected with pregnancy and delivery.
 - Check the mother's records (if available).
 - In case of delivery at home, refer all questions to the mother.
 - It is extremely important to ask the mother if she has any concern about the baby's health or behaviour. Mother is the best observer of the baby and she has to be part of the team in charge of observing the baby surveillance from the first medical assessment.
 - It is also important to observe the mother's attitude toward her baby. Is she emphatic, interested or is she distant, and not interested in the newborn examination?
- **Slide 1N-12. Respiratory system.**
Explain that the newborn needs to be calm during this assessment. If possible count the respiratory rate while she/he is sleeping.
- **Slide 1N-13. Cardiovascular System.**
At birth, a cardiac murmur is not always the sign of heart disease, and the absence of a cardiac murmur doesn't give the assure normality. Further evaluation is required if a murmur persists beyond several weeks or if a murmur is associated with a severe condition.
- **Slide 1N-14.** The normal resting posture of a term newborn is in flexion and the preterm baby rests in extension. Babies born in breech presentation may have fully flexed hips and knees, and the feet may be near the mouth; alternatively, the legs and feet may be to the side of the baby.
- **Slide 1N-15** Shows the normal resting postures of preterm and full term babies.
- **Slide 1N-16.** Explain that some skin conditions are not pathological and don't need any treatment.
- **Slide 1N-17** Shows the newborn cranium. It is necessary to check the cranial sutures, the anterior and posterior fontanelles (their size and consistency) and the shape of the cranium to assess for birth trauma or presentation moulding.
- **Slide 1N-18.** Drawings of unilateral cephalohaematoma and moulding. Cephalohaematoma is the most frequent birth trauma related to difficult labour, forceps or vacuum extraction. On the skull it is a fluctuant swelling limited to the sutures. No treatment is needed. The cephalohaematoma usually reabsorbs in 2 weeks to 3 months.

Before showing the slide 1N-19 ask participants what needs to be assessed on the newborn face. Quickly note the suggestion on the flip chart.

- **Slide 1N-19 Compare with participants suggestions and answers any questions**

Eyes:

- Check cornea for cloudiness (sign of congenital cataracts).
- Check conjunctiva for erythema, exudate, orbital oedema, subconjunctival haemorrhage, jaundice of sclera.
- Check for pupil size, shape, equality and reactivity to light (PERLL: pupil, equal, round, reactive to light).
- Check for red reflex: (*use +10 dioptre lens, hold ophthalmoscope 15–20 cm from the eye*). Normally the newborn's eye transmits a red colour. Black dots may be a sign of cataracts and a whitish colour may suggest retinoblastoma.

Mouth:

- Check for defects such as cleft lip and palate.
 - Check for white patches - oral thrush, treated with oral nystatin.
 - Check that the tongue is normal size. Macroglossia indicates hypothyroidism.
- **Slide 1N-20** Insist on checking for abdominal distension, masses, obvious malformations such as omphalocele and gastroschisis.
Umbilical cord:
 - Count the vessels (one big vein and two arteries).
 - Check for effective clamping/
 - Check for pus discharge and for skin redness around umbilicus.
 - **Slide 1N-21.** The genitalia should be carefully assessed for any malformation or sexual ambiguity. Often the scrotum is large due to hydrocele. The transillumination of the sac usually confirms the presence of hydrocele and the absence of hernia or testicular abnormalities. No treatment.
 - If the anus is not perforated the newborn needs to be urgently referred to a specialised department.
 - **Slide 1N-22** Assessment the newborn's back. Carefully examine the newborn's backbone for spinal defects.
 - **Slide 1N-23** Examine limbs and extremities for possible birth defect or birth trauma. Some fractures need to be immobilised for few days (humerus, femur). Explain to the mother that these fractures will heal spontaneously without any residual deformities. The normal healing process includes the formation of a bone callus which disappears in 2-3 weeks.
 - **Slide 1N-24** Emphasize that there are that 2 manoeuvres for assessing hip stability in the newborn; the Ortolani and Barlow Tests. If a one of them is found to be positive, the infant should be referred to a specialist.

The Ortolani and Barlow tests are performed on a newborn lying in a supine position.

Ortolani maneuver is positive if it reduces a dislocated hip.

The examiner's index and middle fingers are on the great trochanter and the thumb is on the inner thigh. The hip is flexed to 90° but not more, and the leg is held in neutral rotation. The hip is gently abducted while lifting the leg anteriorly. While performing this manoeuvre, if a "clunk" is felt, that shows that a dislocated femoral head reduces into the acetabulum. This is a positive Ortolani sign.

Barlow test detects the unstable hip dislocating from the acetabulum.

The hips are flexed to 90°. The leg is then gently adducted while posteriorly directed pressure is placed on the knee. A palpable clunk or sensation of movement is felt as the femoral head exits the acetabulum posteriorly. This is a positive Barlow sign.

- **Slide 1N-25.** Newborn's Neurobehavioral Status. This assessment will give information about the central nervous system.

- **Functions of the cranial nerves 1 through 12**

- **I Smelling**
- **II Response to light, vision**
- **III Extrinsic ocular movements, response of the pupil to light, eyelid elevation**
- **IV Extrinsic ocular movements**
- **V Facial sensibility, sucking, biting**
- **VI Extrinsic ocular movements**
- **VII Facial motility, taste**
- **VIII Hearing, vestibular responses**
- **IX & X Sucking, swallowing, vocalization, taste, gag reflex**
- **XI Head and neck movements**
- **XII Movements of the tongue**

- Some reflexes exist only for specific time periods.

Some of the reflexes observed in newborns:

- Rooting Reflex: present at birth and disappears at 4 months. The baby turns the head and opens the mouth to follow the direction of mouth stimulation. This helps the baby find the breast and initiate breastfeeding.
- Sucking Reflex: begins about the 32nd week of pregnancy, and is fully developed by 36 weeks. Preterm babies may have weak or immature sucking ability.
- Palmar Grasp Reflex: present at birth, disappears at 2–3 months. If the palm is stimulate the baby closes the fingers and grasps what is in the palm.
- Moro Reflex: present at birth, disappears at 4–5 months. Often called the startle reflex because it usually observed when the baby is surprised by a loud sound or movement. The baby throws back the head, extends the arms and legs, cries and then pulls the arms and legs back in.
- Stepping Reflex: present at birth, disappears at 2 months. When the back of the foot is touched by an obstacle, the infant steps by lifting the foot and places it on the obstacle.

- **Slide 1N-26** Explain to participants that when the full clinical examination is completed the newborn could be weighted ,measured and his/her temperature needs to be checked again to be sure that the baby is not getting cold during the assessment. The size of the head, the weight, and the

length should be reported in the baby's files as well as the results of the complete assessment. These measurements should be entered on national growth charts to initiate growth monitoring.

- **Slide 1N-27** Explain that in case of early breastfeeding in the birth room and rooming with mother 24h /24 the loss of weight is minimal.
- It is important to teach the mother how to recognise if her baby is getting enough milk.
Assess breastfeeding:
 - If the newborn is not gaining enough weight
 - If the mother complains about breastfeeding or
 - If the newborn is not passing enough urine or stools.

Ask the mother to put the baby to her breast and observe how the newborn is attached and the baby's position. If the newborn is not correctly attached help the mother to find a comfortable breastfeeding position and help her to attach the newborn properly.

- **Slides 1N-28- 1N-29** Counselling the mother and the family on appropriate care for their newborn is an important part of the assessment process. It is important to teach parent to keep the baby warm, to promote exclusive breastfeeding and to plan further medical assessment and immunization with the family
- The important part of the counselling is telling the mother when to seek care immediately.
- **Slide 1N-30.** Special Focus during specific Newborn visits.
 - Newborn examination on the first day of life
 - Difficultly maintaining body temperature
 - Initiate breastfeeding, support correct attachment and position.
 - Do not give any other feeding or liquid to the newborn.
 - Make sure the cord is well tied and does not bleed.

Check for jaundice on any location the first day. A jaundice which appears on the first day of life is always severe and requests an immediate treatment by phototherapy.

- Newborn examination on the 2nd, and 3rd day

- The mother and newborn are still adjusting to breastfeeding.
- Breast engorgement can happen making breastfeeding difficult
- Newborns that have been infected during birth can show symptoms of infection
- Weight loss of 5-7% is normal in the first days life but should not exceed 10% of the birth weight .

- Newborn examination at 7 days

- Breastfeeding and weight. The mother and newborn are still developing breastfeeding.
- The newborn should start gaining weight and return to her/his birth weight by the 14th day after birth.
- Infections. Newborns that have been infected during birth can show signs of infection by the time of this visit.

- Examine the newborn for jaundice.
- Immunization. Do the first vaccinations according to national guidelines.

Activity 4 – Case studies. Group work (30 min)

This activity can be conducted at any time during the first or second week after this module is completed.

- Divide the participants into 2 groups and give them the case studies.
- Give each group a sheet of flip chart paper and markers.
- Ask the participants to write down their answers on the flip chart paper.
- Ask each group to assign a representative who will present the results of the group work.
- Duration is 10 min.

Case Study 1

Svetlana 3,200g was born in your maternity 12 hours ago. She spontaneously started breathing and her respiratory rate was 50 per minute. The mother tried to breastfeed, but Svetlana had difficulty sucking. The neonatologist assessed the baby immediately and found:

- The baby was pink with acrocyanosis
- Respiratory rate was 56 breathings per minute
- Axillary temperature was 35,4°C
- No grunting, no chest indrawing
- HBR 120 per minutes
- The baby had a cephalohaematoma on the left side of the head
- The rest of the assessment was normal

Questions

- What problems do these babies have?
- How will you solve these problems?
- What treatment will you use and how will you follow up?
- What advices will you give to the mother?

Possible answers:

1. Svetlana is a full-term baby suffering from mild **hypothermia**, she **presents a cephalohaematoma**.
2. It is necessary to start warming Svetlana immediately: provide skin to skin contact with her mother, cover her with an extra blanket and monitor her temperature every 15-30 minutes until the temperature reaches no

less than 36.5°C. Ensure adequate feeding: if she is not ready to attach to the breast use expressed milk from a cup or with a syringe. For the cephalohaematoma no treatment is needed. Reassure the mother and check after one hour if the baby is able to breastfeed.

3. Svetlana does not need a special treatment but she needs monitoring for hypothermia and difficult feeding.
4. Teach the mother how to control the temperature and how to feed Svetlana.

Case Study 2

Ivan 2,800 g was born 3 days ago. He was separated from this mother because of a caesarean section but a nurse brings him to his mother each 3 hours during the day to his mother to breastfeed. During the night he receives infant formula. On the 3rd day rooming-in was organized and the newborn was breastfed 8 times day and night and had no feeding problem. On the 5th day the neonatologist assessed him before discharge and found

- Weight was 2,500 g
- Respiratory rate was 48 breaths per minute. No grunting, no chest in drawing
- Heartbeat rate was 110 per minute
- Ivan's belly was jaundiced but arms and legs were pink
- The skin was red around the umbilicus
- Axillary temperature was 36,8°C
- The rest of the assessment was normal

Questions

- What problems do these babies have?
- How will you solve these problems?
- What treatment will you use and how will you follow up?
- What advices will you give to the mother?

Possible answers:

1. Ivan is a full-term baby who lost more than 10 % of his birth weight; he is also suffering from a local umbilical infection. His jaundice is a "physiologic since on day 5 arms and legs are pink.
2. Assess breastfeeding and counsel the mother.
3. Treat according to WHO recommendations. Local umbilical infection treatment done 3 or 4 times daily
 - Wash hands with clean water and soap; wear clean gloves if available
 - Gently wash off pus and crusts using boiled and cooled water and soap OR an acceptable antiseptic (4% chlorhexidine gluconate); dry the area with a clean cloth or clean gauze sponges
 - Paint the umbilicus and area around it with 0.5% gentian violet.

- Continue this treatment until there is no pus coming from the umbilicus.
 - If there is no improvement in 2 days or the redness and swelling extend more than 1 cm beyond the umbilicus, treat for severe infection.
4. Delay discharge at least for 3 days :
- Advise the mother to breastfeed at least 8 times per 24 h
 - Check for correct position and attachment for breastfeeding
 - Weight Ivan daily for 3 days
 - Cord care, if it is not improvement after 2 days of local treatment according to WHO recommendations. Evaluate for severe infection and treat with antibiotics. *It is necessary to teach the mother about caring for the cord with the antiseptic solution*
- A representative from each group presents the results of the group work
Discuss the answers with the participants.
 - The trainer can go back to the presentation and show the slides supporting the answers if it is needed.

PART II – Practical work

Activity 5 – Newborn examination in the postpartum unit (75 min)

- The course director will have arranged ahead of time with the head of the facility for the second week of clinical practice for the participants.
- One of the facilitators should be responsible to select newborns for complete assessment. 3 newborns need to be selected for the complete examination, one newborn for the demonstration and 2 for each group.
- The facilitators and the unit head should find appropriate mothers with newborns. Inform the mothers) about the clinical training and ask for their authorization in advance.

A. PREPARATION OF FACILITATORS

- **The facilitator should receive the following information before training:**
 - Selected newborns and mother for this activity
 - The participants should have access to the medical records of mothers and newborns
- **A Facilitator will do a demonstration of a complete newborn examination for the entire group and the other facilitator will list on the flip chart the proper order of tasks:**
 1. Select mother and baby, introduce yourself and ask authorization from the mother and explain to her what you will do.
 2. Be sure that the room is warm.
 3. **Wash you hands**
 4. Ask the mother:
 - Newborn's name, date of birth, birth weight and quick history of pregnancy and birth
 - How is the baby feeding?
 - Does she have concern about her baby's health?
 5. Conduct newborn examination according to the presentation
 - Respiratory system, count respiratory rate with participants;
 - cardiovascular system
 - Newborn's posture and movements
 - Skin and colour
 - Cranium
 - Face, eyes , mouth
 - Abdomen
 - Genitals and anus
 - Backbone examination
 - Examination of extremities and limbs, with Ortolani and Barlow Tests
 - Measurements
 6. Counsel the mother

- **Write on the flip chart the list of skills that are necessary for counselling (or in the Participant's Module):**

COUNSELLING SKILLS (Information from module 3C)

It is necessary to use and practice these during ALL interactions with mothers and health care staff:

- Use of open and close questions, listening skills
 - Praise
 - Simple words while providing information and counselling
 - Use of non-verbal means of communication (gestures)
- **Prepare the forms monitoring the participants: check list of the trainer (Attachment 2)**

B. PREPARATION OF THE GROUP

- Prepare the group before visiting the unit:
 - Remind them that the goal of the practical work is to conduct a complete newborn examination and to use good counselling skills.
 - Make sure all group members understand what they are supposed to do and in which order
 - Ask them to carefully read the order of newborn examination (on the flip chart list). The participants can write it down in their notes if necessary
 - Ask the participants to carefully read (recall) the main counselling skills
- Divide the participants into 2 groups (1 facilitator for 1 group)
- One of the participants will be selected to conduct the complete examination while the other participants will observe without intervening and take notes on what was done properly and what was not done properly.
- Each participant should have:
 - Pen/pencil and note/paper.
- **Remind the participants that they should wash their hands before and after a newborn examination**
- Fill out the form Attachment 2 during examination
- Monitor participants' actions and make sure that the newborn does not get cold
- The newborn examination should be quick
- If one of the participants needs to repeat the task or lack some knowledge spend more time with him/her
- Notice what tasks caused difficulties for the participants or what task were not completed.

- Write down all the questions that have to be discussed during the summary of clinical practice

C. CONDUCTING EXAMINATION

- **Do not forget to wash hands before and after the newborn exam.**
- Prepare the room and equipment for examination: warm room (25⁰C); radiant heater if needed.
- Greet, congratulate and praise the mother
- Gather the information from the mother: date of birth; weight at birth and on the day of examination; newborn's name
- Ask the mother: what problems did she have during pregnancy and at birth. What problems did the newborn have (feeding, breathing difficulties, skin)?
- Conduct the examination quickly.
- Explain the examination results to the mother and give her advice

D. DISCUSSION:

- Discuss the results after the examination in a place where the mother cannot hear you, for example, in the corridor or in the classroom.
- Discuss what has been done correctly during the examination.
- Discuss what had been done incorrectly.
- Discuss the type of care the newborn needs (tests/treatment).
- Discuss what advice should be given to the mother.

References

1. Clinical Practice Guideline: Early Detection of Developmental Dysphasia of the Hip.AAP.2000.
2. Committee on Quality Improvement, Subcommittee on Developmental Dysphasia of the Hip.
3. David .E Hertz. Care of the newborn. A handbook for primary care. 2005.
4. Diana Beck, et al. Care of the Newborn. Reference Manual. Saving newborn lives.2004.
5. Essential Newborn Care and Breastfeeding. Training Modules. WHO EURO, Copenhagen, 2002.
6. First Nations and Inuit Health Branch Paediatric Clinical Practice Guidelines for Nurses in Primary Care.Canada.2001
7. IMPAC/Pregnancy, Childbirth, Postpartum and Newborn care: A guide for essential practice. WHO, Geneva, 2006
8. Managing newborn problems. A guide for doctors, nurses, and midwives. WHO, 2003.
9. Routine Examination of the Newborn. NHS Quality Improvement. Best Practice Statement. Scotland 2004.
10. Volpe JJ, neurology of the newborn, 4th edition, Philadelphia, WB Saunders, 2001.

Activity 4

Case Study 1

Svetlana 3,200g was born in your maternity 12 hours ago. She spontaneously started breathing and her respiratory rate was 50 per minute. The mother tried to breastfeed, but Svetlana had difficulty sucking. The neonatologist assessed the baby immediately and found:

- The baby was pink with acrocyanosis
- Respiratory rate was 56 breathings per minute
- Axillary temperature was 35,4°C
- No grunting, no chest indrawing
- HBR 120 per minutes
- The baby had a cephalohaematoma on the left side of the head
- The rest of the assessment was normal

Questions

- What problems do these babies have?
- How will you solve these problems?
- What treatment will you use and how will you follow up?
- What advices will you give to the mother?

Case Study 2

Ivan 2,800 g was born 3 days ago. He was separated from this mother because of a caesarean section but a nurse brings him to his mother each 3 hours during the day to his mother to breastfeed. During the night he receives infant formula. On the 3rd day rooming-in was organized and the newborn was breastfed 8 times day and night and had no feeding problem. On the 5th day the neonatologist assessed him before discharge and found

- Weight was 2,500 g
- Respiratory rate was 48 breaths per minute. No grunting, no chest in drawing
- Heartbeat rate was 110 per minute
- Ivan's belly was jaundiced but arms and legs were pink
- The skin was red around the umbilicus
- Axillary temperature was 36,8°C
- The rest of the assessment was normal

Questions

- What problems do these babies have?
- How will you solve these problems?
- What treatment will you use and how will you follow up?
- What advices will you give to the mother?

Activity 5

Check list for the trainer

# of participant	1	2	3	4
Participant's initials				
Primary newborn's examination				
1. Conducts the examination successfully following all the rules				
2. Breathing evaluation <ul style="list-style-type: none"> • Count of breathing movements • Grunting when breath out • Examination for chest indrawing when breathing in 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. List the danger signs				
4. Describe the appropriate treatment, counselling and future care				
Counselling skills				
1. Uses: <ul style="list-style-type: none"> ▪ Open questions to receive clear information ▪ Praise ▪ Does not judge 	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Provides the information correctly and in a simple way without scientific terminology				
Assessment of breastfeeding (if the Module 7C was conducted)				
1. Assesses at least one breastfeeding session				
2. Monitors the overall process of breastfeeding. Correctly classifies the ability of the newborn to suck the breast properly.				
3. Lists the main indicators: <ul style="list-style-type: none"> ▪ Correct breast attachment ▪ Correct breast position 	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

Module 2N**Post-Resuscitation Neonatal Care****Module Objectives**

By the end the Module the participants will be able to :

- Assess an infant after neonatal resuscitation
- Decide if after resuscitation the baby can stay with his/her mother or should be transfer to a special neonatal or paediatric department
- Know how to care for a newborn after neonatal resuscitation
- Know how to monitor the infant's condition after neonatal resuscitation
- Know the main modes of treatment in the neonatal care unit
- Know when the infant is ready for discharge.

Module agenda and duration:**Part I – Classroom work - 110 min**

Activity 1 – Introduction	10	min
Activity 2 – Brain storming	10	min
Activity 3 – Interactive presentation	55	min
Activity 4 – Work in small groups	35	min

Part II – Clinical work – 140 min

Activity 5 – Practical work: assessment of 1 or 2 newborns after neonatal resuscitation	140	min
---	-----	-----

Preparation for the Module

- Review publications based on the evidence-based data and national standards on newborn care after neonatal resuscitation
- To provide all the participants with the Participant Manuel
- Ensure all the trainers know their responsibilities during work on this Module

Materials and equipment**Materials**

- Participant Manual

Materials and equipment

Equipment

- Video projector or projector overhead
- Presentation 2N-EPC ENG
- Flipchart
- Markers
- Pens and pencils
- Name badges

Key information

- After neonatal resuscitation all newborns should be assessed thoroughly in order to make appropriate decisions for care
- After neonatal resuscitation every newborn must be kept warm and receive adequate calories
- After neonatal resuscitation every newborn needs a thorough monitoring
- The mother and child should not be separated if the newborn is not transferred to a special department
- All needed treatments should be provided in a timely manner
- Mother /family must be there to observe and care for newborn even after neonatal resuscitation.

PART I – Classroom work – 110 min

Activity 1 – Introduction (10 min)

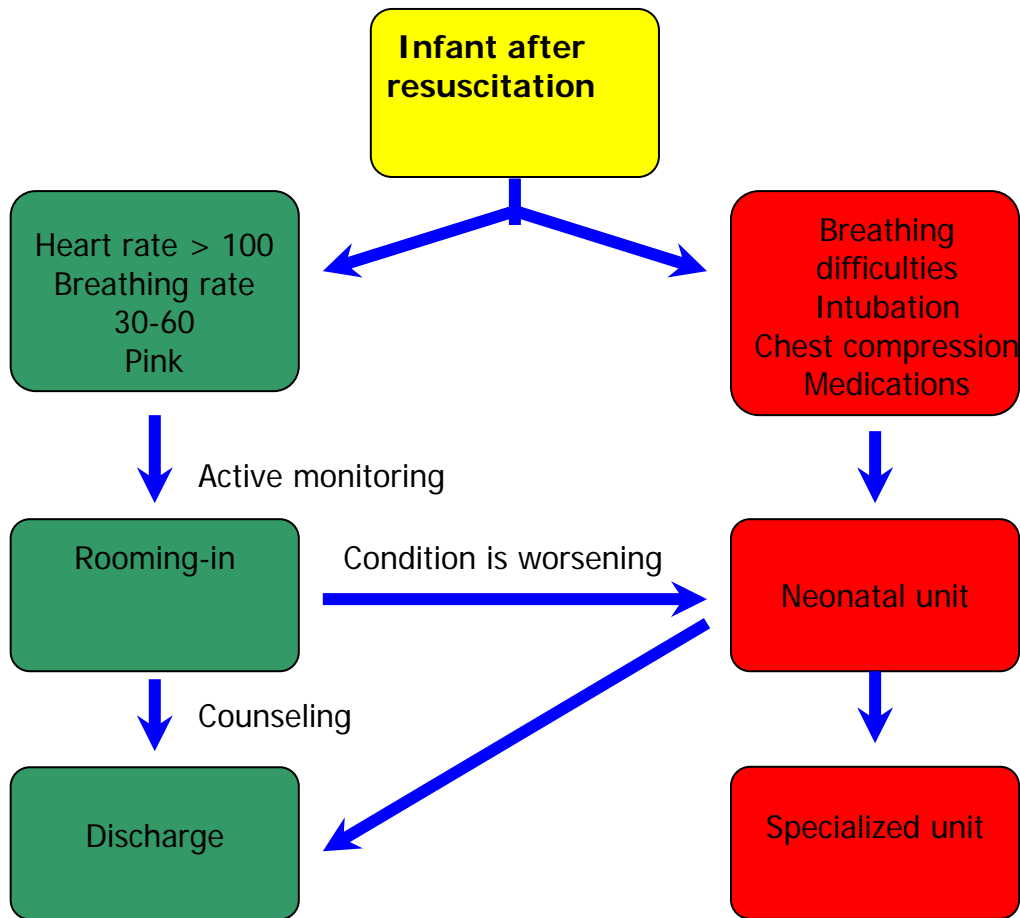
- **Slide 2N-1** Explain the difficult issues involved in caring for newborn after resuscitation. Explain also that there are 2 parts of this Module. Part 1 is the class work and part 2 is the clinical work during the second/practical week.
- Ask one participant to find in his/her Participant Manual the notes for **Slide 2N-1** and to read the list of learning objectives for this module. Discuss the main objectives of this Module with the participants. Ask the participants if they have any questions or suggestions the learning objectives. If there are questions or suggestions record them on the flip-chart.
- Before showing **Slide 2N-2** conduct a group discussion.

Activity 2 – Brain storming (10 min)

- Ask the participants to list the main principles of newborn care after neonatal resuscitation that are practiced in their hospitals:
 - How do they manage a newborn after neonatal resuscitation in the birth room?
 - How they treat a newborn after neonatal resuscitation.
- The second trainer or any participant should record the answers on the flipchart if possible.
- Explain that you will discuss these questions and suggestions during the Module training and at the end of the training.

Activity 3 – Interactive presentation (55 min)

- Restart the presentation with **Slide 2N-2**. Explain to participants that after resuscitation newborns may have several problems; therefore the first goal is to prevent these problems. Thus, it is important to carefully assess the situation and to take immediate actions when problems occur.
- **Slide 2N-3** shows the practical aspects of newborn assessment after resuscitation. Insist on the fact that a good infant evaluation is necessary for all newborn not only those who are resuscitated.
- Before showing the slide **2N-4** the facilitator will draw a "traffic light scheme" on the flipchart with yellow, green and red markers.
 1. **'Infant after resuscitation' – yellow box (attention)**.
 2. If newborns have a heart beat rate > 100 per min, breathing rate 30-60 per min, no severe chest in drawing, no grunting on expiration and becoming pink: **Go to the Green box**: Room-in with mother with active monitoring.
 3. If newborns received extensive resuscitation (intubation, chest compression, drug administration), or have breathing difficulties or severe conditions: **Go to the Red Box**: Neonatal care unit.



- Show **slide 2N-4**: if after neonatal resuscitation the newborn is in good clinical condition, he /she has to be placed in skin to skin on the mother chest and to be carefully monitored during the first 2 hours.
- **Slides 2N-5**. In the birth room a close monitoring of temperature and vital signs needs to be strictly followed.
- Reassure the mother and support her to start as she starts breastfeeding to the baby is feeding well.
- **Slide 2N-6**. Train the mother to carefully monitor her baby. The mother should pay special attention to keep her baby warm and effective breastfeeding. These newborns are healthy and need to receive essential newborn care like all newborns.
- **Slide 2N-7**. There are basic indicators that should be monitored in the post partum unit. The recommended frequency of assessment depends on the infant's age and condition.
- **Slide 2N-8**. 2nd case: After neonatal resuscitation newborns in poor clinical conditions and/or those who experienced advanced resuscitation should be transferred to a neonatal unit where close monitoring and care can be provided.

- **Slides 2N-9 and 2N-10** show the main principles of management in the birth room and in the neonatal unit.
- Show **Slide 2N-11** and *Ask participants how they prepare an admission to the neonatal unit, and discuss how to create a “nest” for newborns using anything available.* Emphasize that these newborns need silence, a minimum of interventions (care and laboratory tests), the presence of the mother and family members and the implementation of main infant care principles.
- **Slides 2N-12 and 2N-13.** Discuss the main principles of management (care and monitoring) in the neonatal unit. Emphasize that all indicators should be monitored precisely and recorded on the special form.
- ***Ask participants who is responsible for monitoring and who usually record results on the monitoring format in their facilities?***
- ***Ask the participants to bring the monitoring form they use in their hospital so they can be discussed during the second clinical week.***
- **Slide 2N-14.** Discuss the issues of newborn feeding in the nursery/neonatal care unit: when it must be started, how it must be organized (help the mother to express the breast milk, involve the mother into the feeding process), and how to decrease IV fluid and to increase normal feeding simultaneously.
- Especially insist on the need to insure adequate caloric intake which is critical for this category of newborns.
- **Slides 2N-15 to 2N-18.** Demonstrate the different components of the routine treatment given to newborns admitted to the nursery/neonatal care unit after neonatal resuscitation. Insist especially on preventing hypothermia, or keeping the baby warm.
- Show **Slide 2N-19** and explain how to manage convulsions. Remind them that the causes for convulsions can be hypoglycemia, asphyxia, metabolic and electrolytic disorders and hypothermia. Thus the initial management of convulsions needs to start immediately (define the level of blood glucose, give Phenobarbital) after that search for the cause of convulsion for specific management.
- ***Ask the participants what additional medical therapy they use in their practice for post resuscitated newborns.*** Encourage them to discuss the use of frozen plasma, of sulphate of magnesium, of mannitol and of corticosteroids (what are the indications, the frequency, and the dose of these drugs).
- Write this information on the flip chart.
- **Slide 2N-20.** Make final conclusions on using these medicines.
- **Slide 2N-21.** Discuss the criteria for discharging a baby resuscitated at birth. Emphasize that the discharge criteria are the same as those for other newborns.
- **Slide 2N-22.** Counseling and training mothers/families is extremely important. Insist on good communication skills.

- Remind participants that training for mothers/families starts at infant's birth. Mother/family should know everything about the infant's health and participate actively in infant care.
- Show **slide 2N-23** and summarize the Module. Ask the participants whether they have any questions and answer their questions.
- Return to the results of the 1st and 2nd activities and discuss notes according to information in **Module 2N**.

Activity 4 – Work in small groups (35 min)

- This activity could be conducted any time when this module is taught during the first or second week.
- Divide the participants into 3 groups and make sure that there are neonatologists and pediatric nurses in each group.
- Give each group a list of paper from the flipchart and markers.
- Give one question to each group and ask them to read the case study carefully in the Participant Manual. Make sure that the participants understand the questions and the case study.
- Ask participants to work 10 minutes and after that to present the groups' conclusions. Limit presentations to 5 minutes.
- Trainers together with participants decide on a conclusion at the end of each group presentation.

Case Study

Maria, a full term newborn, is Galina's first baby. It was a normal pregnancy.

At birth she was cyanotic with irregular breathing. The neonatologist resuscitated her with bag and mask.

Immediately after resuscitation she assessed Maria's condition: the baby was active; her breathing rate was 40 per min; her heart rate was 140 beats per min; no severe chest indrawing no grunting; skin and mucous were pink. Apgar score was 6-7 points.

Maria was weighed and measured; her weight was 3,400 g.

After Maria was resuscitated she was transferred to the neonatal unit for monitoring.

Immediately after admission blood test results showed: red cells: 5.4×10^{12} ; Hb: 210 g/L; white cells: 24×10^9 ; Ht: 50%.

The neonatologist decided to feed Maria 5 ml of 5% glucose orally.

Two hours after birth Maria's temperature was 36.6°C. As Maria was in good condition the neonatologist allowed Maria to room in with her mother.

The next morning (16 hours after birth) Maria's temperature was 36.4°C; she was breathing irregularly and her respiratory rate 46 per min; heart rate 130 beats per min; and she was little hypotonic . Maria's mother said that Maria did not eat at night because she refused the breast and in the morning only sucked for 10 min 2 times and then refused to feed.

The doctor weights Maria. Her weight was 3.250g and she decides to put the baby in an incubator and checks the temperature after 1 hour: the temperature is 36.6°C.

The doctor recommends checking the temperature again in the evening. Due to the 150 g weight loss in a few hours, the neonatologist prescribed baby formula on 10 ml per each feeding 6 times a day.

1st Question:

What are the basic principles of management of resuscitated newborns in the birth room? Explain your answer and compare with what was done in Maria's case.

2nd Question:

What are the basic principles of management of resuscitated newborns in the postpartum department? Explain your answer and compare with what was done in Maria's case.

3rd Question:

When can Maria be discharged from the hospital? Explain your answer.

Correct answers:

1st Question *What are the basic principles of management of resuscitated newborns in the birth room? Explain your answer and compare with what was done in Maria's case.*

- Assess the general condition of a newborn after neonatal resuscitation. If a baby does not have any problems (breathing rate is 30-60 per min, heart beat rate more than 100 per min, no severe chest indrawing and grunting, baby is active and pink) put baby on the mother's chest, take his/her temperature not later than 30 min after birth; monitor breathing, skin color and body temperature by feeling the baby's feet every 15 min during the 1st hour and every 30 min during the 2nd hour. Recheck the baby's temperature at 2 hours **and** at any time the feet feel cold. Start breastfeeding within 1 hour after birth, when the baby shows signs of readiness.
- Comparison with the case study:
 - In the case study the neonatologist has not correctly managed Maria's case

- He measured and weighed her immediately after resuscitation and transferred Maria to the neonatal unit despite her good condition after resuscitation
- He didn't control the temperature in time (the first body temperature was taken after 2 hours)
- The mother did not receive any information on Maria's condition
- The first breastfeeding was late, 4 hours later and the baby received glucose before breastfeeding.

Correct answer:

2nd Question: *What are the basic principles of management of resuscitated newborns in the postpartum department? Explain your answer and compare with what was done in Maria's case.*

- Basic principles of care:
 - To transfer a baby to room in with /his her mother
 - To help the mother to breastfeed her baby on demand (If breastfeeding is difficult train the mother to express her milk and to use alternative feeding (cup, spoon)
 - Monitor a baby's condition regularly to assess the breathing , the temperature , the feeding and the sucking reflex
 - Check frequency of feeding and duration
 - Organize essential newborn care
 - The newborn does not need any interventions if there are no precise reasons.
- Comparison with the case study:
 - Maria was fed the first time with 5% glucose, then the doctor prescribed baby formula immediately without assessing breastfeeding
 - Maria wasn't monitored thoroughly
 - The -warming and temperature control was not well organized. Maria was warmed in an incubator instead using skin to skin technology
 - When Maria was diagnosed with hypothermia the first temperature assessment was done 1 hour after birth and the next temperature assessment was recommended only in evening.

Correct answer :

3rd Question: *When can Maria be discharged from the hospital? Explain your answer.*

- Maria can be discharged when:
 - Her temperature is stable within 36.8-37.2⁰C
 - She is feeding well and her mother trained in alternative methods if necessary
 - Maria is in good clinical condition: no breathing difficulties, no signs of disease
 - Her mother is trained to take care of Maria at home: she knows how to keep the baby warm, breastfeeding on demand, putting the baby to sleep on his back, no smoking in the baby room, knowing how to recognize danger signs and to seek care immediately.

PART II – Clinical Work – 140 min

Activity 5 – Practical work (140 min)

- Make sure the participants understand the key points of newborn care after neonatal resuscitation during the theoretical week.
- Ask the Course Director and/or the Facility Head to select 3 infants who have received resuscitation to conduct clinical assessment: 2 infants in the rooming-in with their mothers; 3rd is in the nursery/intensive care unit.
- Meet the mothers and obtain their agreement for the newborn examination.
- Before examination of selected newborns check the baby's history and collect all the following information:
 - Gestational age, birth weight
 - Characteristics of pregnancy and birth
 - How was each of these babies resuscitated: with bag and mask only or with more advanced resuscitation?
 - After resuscitation what kind of management was used?
 - What were the results of the different clinical examinations since the baby's birth (baby's general condition, urine, neurological status)?
 - What were the results of different lab tests?
 - What monitoring was done for these babies?
 - How these babies were fed?
 - What treatment was provided?
- All this information should be communicated to participants verbally before examination or if you have the chance to print and give out to each participant.
- Then one facilitator will demonstrate in front of the entire group the best technique for assessing the baby in neonatal unit, following the steps listed in Table 1 (plan for 30 minutes for clinical demonstration and 30 minutes for discussion).

Table 1. Steps recommended for assessing a resuscitated newborn

	Step	Comments
1	Wash hands	Soap, towel, water
2	Ensure (check) all necessary conditions for assessment	<ul style="list-style-type: none"> - Warm room (no less than 25°C) - Warm surface (table) - Good light - Source of radiant heat - Warm blanket/cloths for baby
3	Greet the mother and introduce yourself if the mother is present	<ul style="list-style-type: none"> - Greet the mother - Introduce yourself - Congratulate the mother on her newborn and ask her permission to assess her baby in front of participants
4	Collect general information	Ask the mother : <ul style="list-style-type: none"> - How she feels today - Name of the baby and gender - Date of baby's birth, birth weight and weight on assessment day if available
5	Collect health information	Ask the mother : <ul style="list-style-type: none"> - Were pregnancy and delivery normal? - Did the baby face problems during the first days of life (ask her to be precise)? - Did the baby convulse? - Does she know if her baby received any treatment? - How is the baby fed: breastfeeding or using alternative feeding? - Describe how the baby is feeding: e.g. well or with difficulty - How many times per day is she breastfeeding?
6	Check monitoring procedures (if any form is available, ask to see it)	Check for the following indicators and frequency of monitoring: <ul style="list-style-type: none"> - Temperature - Breathing (Breathing rate, Apnea, Severe chest indrawing, Grunting when breathing out, Oxygen saturation (if possible)) - Heartbeat rate - Skin colour of skin and colour of mucous membranes - Alertness and muscle tone - Urine and stool output - Feeding: kind, frequency, quantity - Weight
7	Recording the information on note pad	
8	Clinical examination:	Assess the baby's physical status
	- Look before undressing the baby	<ul style="list-style-type: none"> - Count respiratory rate during 1 minute - Listen for grunting when breathing out
	- Undress the baby gently and check for presence/absence of danger symptoms	<ul style="list-style-type: none"> - Look for skin color (cyanosis/jaundice/pallor) - Look for chest indrawing and grunting - Look for infant's movements: <i>Does the infant move only when stimulated?</i> <i>Does the infant not move even when stimulated?</i> - Count the heart beat rate
	- Assess color and quantity of urine	<ul style="list-style-type: none"> - Ask the mother what she observed <i>or check on the observation form.</i>
	- Finalize the clinical examination	<ul style="list-style-type: none"> - Dress the baby
9	Assess the feeding and baby's weight gain	If the baby is breastfed, kindly ask the mother if she would agree to breastfeed her baby in front of the participants, assessing <ul style="list-style-type: none"> - If the attachment to the breast is correct

		<ul style="list-style-type: none"> - If the baby's position is correct - Does the baby suck effectively <p>Observe carefully, take notes and ask participants to take notes on all this issues because you will ask them to answer questions later.</p> <p>If the baby is fed by the alternative method (cup, or through gavage or syringe):</p> <ul style="list-style-type: none"> - What quantity in ml is given at each fed? - What is the quantity received during the last 24 hours ? - How often is the baby fed? - Who is feeding the baby?
10	Finalization of assessment	<ul style="list-style-type: none"> - Thank the mother and ask her if she would like to ask any question - Leave the room/or intensive care unit

- Outside of the mother's presence lead a discussion with the participants:
 1. What is the baby's general condition?
 2. Analyze the results of clinical assessment?
 3. Ask participants to assess the quality of feeding (breastfeeding or feeding by alternative methods). If baby is feeding by an alternative method calculate the volume of food according to the baby's age and compare to the volume the baby received.
 4. Ask participants to assess the quality of management:
 - Monitoring
 - Treatment
 - Feeding
 5. Ask when this baby could be discharged home.
- Ask the participants whether they have any questions after the discussion.
- Then divide participants into 2 sub groups: 1 facilitator -1 sub group and to define one participant in each group who will perform evaluations.
- Each group "received" a post resuscitated newborn to assess; the facilitator will provide all information for the case.
- **One participant is selected to conduct the assessment; the other participants observe what is happening and take note.**
- **Make sure the participant has washed her/his hands.**
- Make sure the participant follows the main rules of keeping the infant warm during assessment
- Ask the sub group to come back to the class room and discuss both cases.
- The trainers evaluate the participants' actions according to the Table 1.
- Ask the sub group to come back to the class room and discuss both cases.
- Discuss:
 - Baby medical history

- Infant condition at the moment of assessment
 - Treatment and investigations (lab and instrumental)
 - Assessment done (quality)
 - Feeding
 - Problems that became clear during assessment
- Make plan of care for each evaluated infant according to the recommendations provided in the Module 2N.
 - Define when these infants can be discharged:
 - Criteria for discharge
 - Preparation of the baby and mother/family for discharge

Coordinate conclusion with the full group 10 min

1. Ask each group to give a short presentation of their case (not more than 5 min).
2. Then lead a discussion to highlight the specifics of each case.

References

1. Anand KJ. Prevention and Management of Pain in the Neonate: An Update. *Pediatrics* Vol. 118 № 5, November 2006, pp. 2231-2241.
2. Carbajal R, Chauvet X, Couderc S, Olivier-Martin M. Randomised trial of analgesic effects of sucrose, glucose, and pacifiers in term neonates. *BMJ* 1999; 319: 1393-1397.
3. European Resuscitation Council Guidelines for Resuscitation. Section 6: Paediatric life support, Resuscitation of babies at birth, 2005:S115-S133.
4. Gary L Darmstadt et al. Evidence-based, cost effective interventions: how many newborn babies can we save? *Lancet*, March 3, 2005, 19-30.
5. Levene M, Blennow M, Whitelaw A, Hanko E, Fellman V, Hartley R.. Acute effects of two different doses of magnesium sulphate in infants with birth asphyxia. *Arch Dis Child Fetal Neonatal Ed.* 1995 Nov;73(3):F174-7.
6. *Managing Newborn Problems: A guide for doctors, nurses, and midwives.* World Health Organization, Geneva. 2003.
7. Peliowski A, Finer NN. Birth asphyxia in the term infant. In: *Effective care of the newborn infant.* Eds: Sinclair JC, Bracken MB. Oxford University Press. 1992; Chapter 13; 248-279.
8. *Pregnancy, Childbirth, Postpartum and Newborn Care: A guide for essential practice.* World Health Organization, Geneva, 2006.
9. Robertson N. R. C. Use of albumin in neonatal resuscitation. *European Journal of Pediatrics*, Issue Volume 156, Number 6 / May, 1997, 428-431.
10. Royal Women Hospital, NETS Neonatal Handbook, Clinical Practice Guidelines. Last Updated 03-Jan-2007.
11. Volpe JJ. *Neurology of the Newborn.* Philadelphia, Pa: WB Saunders Company; 2000.

Module 3N**Breathing Difficulty in the Newborn****Learning objectives:**

By the end of this module participants will:

- Know how to quickly resuscitate a baby who is gasping or not breathing
- Be able to recognize the clinical signs of breathing difficulty
- Be able to classify the severity of breathing difficulty
- Know how to manage a newborn with breathing difficulty
- Know general and specific treatments for breathing difficulty
- Know the basic principles of oxygen therapy
- Know when a baby who experienced breathing difficulty can be discharged

Module outline and duration:**Part I – Class work - 75 min**

Activity 1 – Introduction	10	min
Activity 2 – «Brain storming»	10	min
Activity 3 – Interactive presentation	50	min
Activity 4 – Conclusion	5	min

Part II – Clinical work

Activity 5 – Group work	30	min
Activity 6 – Practical work: Oxygen administration for breathing difficulty	30	min
Activity 7 – Demonstration of assessment of an infant with breathing difficulty	50	min

Preparation for the module

- Review the existing evidence and recommendations regarding breathing difficulty
- Ensure that all the participants have Participants Manual
- Become familiar, if possible, with the practices that exist in the participants health care settings regarding safe maternal health practices and effective newborn care
- Ensure that all the facilitators know their functions while working on this module

Materials and audiovisual equipment

Materials

- Participant Manual
- Local guidelines on neonatal care (if possible)

Equipment

- LCD or overhead projector
- Flipchart
- Markers of different colours
- Pens and pencils
- Badges
- Doll
- Nasal prongs
- Catheters # 6 and # 8
- Head box
- Syringes on 5-10 ml
- Adhesive tape

Key messages:

- Breathing difficulties can occur in both preterm and term newborns
- They can be caused by sepsis, infection, low blood glucose level, or by another disease
- Signs of breathing difficulties include newborn respiratory rate disorder, central cyanosis, chest indrawing, grunting on expiration and apnoea.
- The severity of breathing difficulty is determined by the respiratory rate per minute, absence or presence of chest indrawing when breathing in and grunting when breathing out.
- The main treatment for breathing difficulty is oxygen administration
- A newborn's response to oxygen administration must be assessed
- Every newborn with a breathing difficulty requires close monitoring.

Part I – Classroom work – 120 min

Activity 1 – Introduction (10 min)

- **Slide 3N-1** Present the main objectives of this Module.
- Inform participants that this module will be taught in 2 parts, the first part is the theoretical part studied in the classroom; the second part will be clinical during the second week of training.
- Highlight the following points:
 - Breathing difficulty is the most frequent reason for a baby being referred to NICU;
 - If not recognised and treated on time , breathing difficulty may lead to a rapid deterioration of the baby's condition and even to death;
 - A good understanding of the signs of breathing difficulty leads to quick diagnosis and the appropriate treatment when time is critical.

Activity 2 – “Brain-storming” (10 min)

- Before showing **Slide 3N-2** ask participants the following question:
 - ***What will you do if a baby who was breathing well at birth, an hour later is gasping or breathing less than 20 breaths per minute?***
- Write the answers on a flipchart and come back to them after the presentation is finished

Activity 3 – Interactive presentation (50 min)

- **Slide 3N-3 and to 3N-4** explain to participants how to resuscitate a baby who was breathing at birth and then experienced breathing difficulty.
- **Slide 3N-5.** Explain participants that a small baby with a birth weight <2.5 kg or preterm baby born before 37 week of gestation could have mild chest indrawing and irregular breathing with many pauses.
- Remind them than central cyanosis (baby's tongue and lips are blue)) is a late signs of breathing difficulty.
- **Slide 3N-6.** Show the general management of breathing difficulty:
 - Give oxygen
 - Resuscitate if needed
 - Measure blood glucose
 - Establish IV line
 - Look for possible cause of breathing difficulty (small baby, asphyxia, sepsis or congenital syphilis).
 - Classify the breathing difficulty as severe, moderate or mild and manage accordingly
- **Slide 3N-7** shows a simple and convenient classification of breathing difficulty which will lead to correctly managing the problem.

- **Slide 3N-8** shows the basic principles of apnoea management.
 - Be clear that the mother must be taught to observe her small or full term baby with breathing difficulty. She will be the first one to provide help in a case of apnoea (tactile stimulation, changing the position).
 - Impress that apnoea in a term baby is always a sign of pathology.
- **Slide 3N-9.** Central cyanosis associated with other signs of breathing difficulty could suggested a congenital heart anomaly
- **Before showing the following slide the facilitator will ask participants what signs they monitor in case of breathing difficulty. How frequently are they monitoring and who is in charge?**
- Write all the answers on a flipchart, then show Slide **3N-10** and compare the information on the slide with participant's answers. Tell the participants, that monitoring the baby's condition is one of the basic principles for managing breathing difficulty.
- **Slide 3N-11.** Emphasize the importance of implementing Essential newborn care in all circumstances.
- **Slides 3N-12 – 3N-14. Management of Severe Breathing Difficulty.** Emphasize that these cases need careful monitoring and need to be treated by experienced staff. If the local staff cannot provide appropriate care transfer the baby after stabilisation.
- **Slides 3N-15 and 3N-16.** Feeding a baby with severe breathing difficulty is challenging. Emphasize that feeding must start as soon as the baby shows some improvement. It is important that the family/mother play a role in feeding the sick baby. Expressed breast milk is the best food for these severely sick newborns. Feeding needs to be carefully monitored to be sure that breathing difficulties do not increase during feeding
- **Slides 3N-17 and 18.** Emphasize strict monitoring in cases of moderate breathing difficulty so staff will know whether the situation is improving or deteriorating and they can take appropriate action. Explain that there is no significant difference between the management of severe and moderate breathing difficulties. However, feeding of babies with moderate breathing difficulty can be initiated earlier as well as "skin-to-skin" contact.
- **Slides 3N–19:** Discuss managing mild breathing difficulty. Emphasize the necessity of strict monitoring.
- **Slide 3N-20.** Discuss the main points of providing oxygen therapy.
- **Slides 3N-21, and 3N-22** review the different techniques of oxygen administration.
- **Slide 3N-23** this slide is self explanatory. It shows the advantages and disadvantages of some methods of oxygen administration.
- **Slide 3N-24.** Pay special attention to the fact that oxygen is expensive, and should be used only if needed.

- **Slides 3N-25 and 3N-26.** Remind participants that incorrect oxygen administration can create damage. Explain that baby's response to oxygen must be closely monitored. And the method of oxygen administration must be chosen according to the baby's response.
- **Slides 3N-27.** Be clear that before discharge the baby should be examined in the presence of the mother. Explain the importance of reassuring her and counselling her about how to take care of her baby at home.
- **Slide 3N-28.** Stress that giving advice before discharge is extremely important, and they need to allocate enough time for the mother and family to understand the recommendations and ask questions if necessary. All these recommendations will be remembered better if given in a written form.

Activity 4 Conclusion (10 min)

- **Slide 3N-29. Conclusion:** breathing difficulty represents an important part of newborn pathology. Basic treatment properly implemented could save many lives.
 - Ask participants if they have any questions. Answer the questions.
 - After the presentation come back to the notes of Activity 2. Ensure that all the answers to the questions written on a flipchart during Activity 2 are given.

Activity 5 – Group work (30 min)

This activity this could be done at any time after completion of the module.

- Divide the participants into 3 groups.
- Ensure that these groups are multidisciplinary: neonatologists and paediatric nurses.
- Give sheets of paper and markers to each group.
- Give one case study to each group (Attachment 1). Ask the participants to nominate a representative to present the results of group work.
- Each group should read the assignment and ensure that the assignment is clear.
- Ask the participants to write the answers on the sheets. **Allot no more than 10 minutes for this activity.**
- The representatives of the groups present the results of group work during 10 minutes.
- After each group report the facilitator gives feedback involving the entire group in the discussion.

Case Study 1

Peter is a second baby born after a normal pregnancy of 41 weeks. At birth Peter's breathing and heart were good and he was not resuscitated. He did not have any birth defects and was placed skin to skin on his mother. Mother and baby were left alone in the birth room as the birth was normal. The mother tried to breastfeed 45 min after birth but Peter seems uninterested in feeding. One hour only after birth the baby was weighed (his weight was 2500 g) and transferred to postpartum ward together with his mother.

Just after arriving in postpartum room the mother tried again to breastfeed Peter but he refused again. She noticed that Peter was breathing more quickly than before, but since she didn't know if it was not normal, she didn't call for help.

Four hours after the delivery Peter was examined by a pediatrician who found a respiratory rate of 80 breaths per minute; a severe chest indrawing and a central cyanosis.

The boy was transferred to the nursery department. When he was admitted to this department his body temperature was 36.4°C. The neonatologist installed Peter in incubator and started IV infusion with glucose 10%.

Questions:

1. **What is Peter's problem? Please classify Peter's problem.**

- Suggested answer:
- Peter has moderate breathing difficulty (RR 80 per minute; severe chest indrawing) and mild hypothermia.
- Peter was breathing well and didn't need resuscitation at birth

2. **Which treatment do you recommend for Peter? How will you monitor Peter's health status? How would you feed Peter?**

- Peter needs to be rewarmed immediately.
- Oxygen should be administered immediately.
- Continue 10% glucose infusion 60 ml/kg (150 ml daily) until the condition is stable (probably within the first 12 hours).
- Monitor: respiratory rate; heart beat rate; skin colour and colour of mucous membranes, temperature, urine; and oxygen saturation every 3 hours until the condition is stable;
- Monitor glucose blood levels every 6 hours at minimum

Start feeding when respiratory rate is less than 90 breaths per minute and the following indicators are exist

- No grunting on expiration, nor severe chest indrawing
- Heart rate 100-160 beats per minute
- Baby doesn't vomit
- Baby has no convulsions

Feeding: train the mother to express her milk (since Peter was admitted to neonatal department) and initiate an alternative way of feeding (gavage tube or cup) with small amounts of breast milk, increasing the volume of milk and simultaneously decreasing the volume of infusion.

3. Consider what could have been done in the birth room and in the post partum area and compare with what was done for Peter.

Ideal situation immediate drying, head and feet covered, skin to skin with mother and assessment on mother chest, first temperature after 30 min, breastfeeding when signs of readiness. The health care worker carefully monitors the respiratory rate and signs of breathing difficulty, colour and warmth of the baby's feet every 15 minutes during the 1st hour, then every 30 minutes during the 2nd hour. An axillary temperature is taken any time the baby's feet feel cold and again at 2 hours. A complete assessment and body measurements 2 hours after birth.

The mother needs to be counselled about how to observe her baby for how the baby is breathing and feeding, as well as baby's skin colour and activity

Peter and his mother were not monitored in the birth room; he was left alone with his mother without proper counselling and active support, thus the mother was not able to attach the baby correctly to the breast. The baby was not properly examined 2 hours after birth and the mother not supported and counselled.

In case it is not possible to demonstrate a case of breathing difficulty during the 11 days of the Effective Perinatal Care course, use the following additional cases study to replace the clinical work Activity 7

Case Study 2

Maria was born 4 hours ago after 37 weeks gestation. At birth she didn't need any resuscitation. Immediately after birth she was examined by a physician, and had a breathing rate of 40 per min. She rapidly became pink and weighted 2550 g. Maria was put skin to skin on her mother's chest where she stayed for two hours and then she was transferred with her mother to the postpartum room. When Maria was assessed for the second time (4 hours after birth) she was fast breathing (70 breaths per minute), but she has no chest indrawing and no grunting on expiration. Maria was pale and her feet were cold. Her temperature was taken for the first time and was 35.9°C. Maria was breastfed for only few minutes and after that she refused the breast.

1. What is Maria's problem? Please classify Maria's problem.

Suggested answer:

- Maria is a full term baby with mild breathing difficulty (RR 70 per minute; no chest indrawing and grunting), moderate hypothermia and feeding difficulty.

2. Which treatment do you recommend for Maria? How would you monitor Maria's health status? How would you feed Maria?

Suggested answer:

- Start to rewarm Maria immediately by radiant warmer rather than skin to skin since oxygen is being given.
- Administer oxygen immediately
- Monitor temperature every 30 minutes until temperature is more than 36.5°C, and after that monitor every 3 hours
- Monitor: respiratory rate; heart beat rate, colour of skin and mucous membranes, urine, and oxygen saturation every 3 hours until the condition is improved;

- Monitor: Measure the glucose blood level. If < 45 mg/dl treat for low blood glucose per protocol (F-92).
- Feeding: train the mother to express her milk and initiate an alternative way of feeding (gavage tube or cup), observe Maria's condition during feeding. Ensure daily required volume of milk.

3. What could have been done in the birth room and in the post partum area and compare that with what was done for Maria?

Ideal situation: immediate drying, head and feet covered, skin to skin with mother and assessment on mother chest, first axillary temperature after 30 min, breastfeeding when signs of readiness. The health care worker carefully monitors the respiratory rate and signs of breathing difficulty, colour and warmth of the baby's feet every 15 minutes during the 1st hour, then every 30 minutes during the 2nd hour. An axillary temperature is taken any time the baby's feet feel cold and again at 2 hours. A complete assessment and body measurements 2 hours after birth .

- The mother needs to be counselled to observe her baby, how baby is breathing and feeding and the baby's skin colour and activity.
 - Maria was first examined by a paediatrician and weighed and was not put immediately on her mother's chest.
 - There was no systematic monitoring by the medical staff of breathing difficulty or warmth in the birth room.
 - The temperature was not taken 30 min after birth and again after 2 hours. The health care worker did not check the baby's feet for warmth.
 - No one showed to the mother how to express her milk or taught her how to feed her baby with a cup.

Case Study 3

Andrei was born 6 hours ago after 39 weeks gestation. At birth he was breathing well and was active with a respiratory rate 50 per minute, but he had central cyanosis with blue tongue and lips. The physician administered a free flow of oxygen. After 10 minutes the respiratory rate was 70 breaths per minute, with no chest indrawing and no grunting on expiration.

Andrei was transferred to NICU under oxygen at 30 minutes after birth.

In NICU the physician inserted a nasal catheter to give 100 % oxygen to Andrei. His temperature was 36. 9°C, his respiratory rate was 76 breaths per minute with no chest indrawing and no grunting. The baby was still cyanotic with blue tongue and lips despite the fact he was receiving 100% oxygen.

1. What is Andrei's problem? Please classify Andrei's problem

Suggested answer:

- Andrei is a full term baby with mild breathing difficulty (RR 70-75 per minute; no chest indrawing and no grunting) AND persistent central cyanosis while on 100% oxygen. In this case we can suspect a congenital heart abnormality.

2. What management do you recommend for Andrei's problem?

Suggested answer:

- Continue to give oxygen at a high flow rate
- Give of expressed breast milk by gastric tube
- If the baby can not tolerate feeding, establish an IV line and give only IV fluid at maintenance volume according to Andrei's age
- Organize transfer and refer Andrei to a tertiary hospital or specialized centre for the future evaluation
- Continue to monitor Andrei till the transfer: respiratory rate; heart beat rate; colour of skin and mucous membranes; temperature; urine output.

3. How would you feed Andrei?

Suggested answer:

- Help the mother to express her breast milk
- Give of expressed milk by gastric tube the required volume according to the baby's age and weight
- If the baby cannot tolerate feeding, establish an IV line and give IV fluid at maintenance volume according to the baby's weight and age.

Part II – Clinical Work

Activity 6 – Practical Work: Demonstration of Oxygen Therapy for Breathing Difficulty (30 min)

- Prepare in classroom: doll, head box, nasal prongs (size 1 and 2)/catheters, bag and mask for resuscitation.

Head Box: Ask participants to list the indications for using a head box for oxygen administration.

- Spontaneous breathing
- Central cyanosis (blue tongue and lips)
- O2 saturation <90%.

Ask participants to list the advantages and disadvantages of this method:

Head box	<ul style="list-style-type: none"> ■ Warms the oxygen ■ Can give a high concentration 	<ul style="list-style-type: none"> ■ High flow of oxygen required to achieve desired concentration
-----------------	---	---

Methodology of oxygen therapy using a head box:

Ask one participant to demonstrate with a doll how to use a head box, ask him/her to comments on what he/she is doing.

- *Place the head box above the head of the doll*
- *Ensure that doll's head is positioned inside the box within the head box without neck compression.*

The facilitator should say that the oxygen needs to be warmed and humidified

Use of Nasal Prongs: Ask the participants to list the indications for use

- Presence of spontaneous breathing
- Central cyanosis (blue lip and tongue)
- O2 (saturation) < 90%.
- Increasing breathing difficulty
- Prolonged administration of low flow of oxygen.

Ask the participants to name advantages and disadvantages of the method

Nasal prongs	Low flow of oxygen required ■ Constant concentration of oxygen if applied correctly	■ Requires special prongs for newborn babies ■ Requires flow control device that allows to control low flow ■ Cold oxygen flows directly into baby's lungs
---------------------	--	--

Methodology of oxygen therapy using nasal prongs

Ask one participant to demonstrate with a doll how to use nasal prongs, ask him/her to comments on what he/she is doing.

- Wash hands thoroughly.
- Open the package of prongs.
- Insert nasal prongs into nostrils.
- Fix the prongs with adhesive tape.

The facilitator should say that the oxygen needs to be warmed and humidified

- Replace nasal prongs twice a day.
- During the prongs replacement or cleaning the prongs administer oxygen using a mask to continue oxygen therapy.

Nasal catheter use Ask participants to list the indications for using a nasal catheter for oxygen administration.

- Presence of spontaneous breathing
- Central cyanosis (blue lip and tongue)
- O₂ (saturation) < 90%.
- Increasing breathing difficulty
- Prolonged administration of low flow of oxygen

Advantages and disadvantages: ask the participants list the disadvantages of the method.

Nasal catheter	■ Low flow of oxygen required ■ Constant concentration of oxygen if applied correctly	■ Requires flow control device that allows to low flow control ■ Cold oxygen flows directly into baby's lungs
-----------------------	--	--

Methodology of oxygen therapy by nasal catheter use: the facilitator will demonstrate with a doll how to use nasal catheter, ask him/her to comments on what he/she is doing.

- Measure the distance from the nostril to the inner margin of the eyebrow
- Wash hands thoroughly.
- Open the pack with the catheter.

Explain that the catheter will be inserted gently into the nostril without pushing. If it is not possible in one nostril try the second one. **Never push.**

Ensure that the catheter is in the correct position; look into the baby mouth cavity. If the catheter is visible at the back of the mouth, pull the catheter out slowly until it is no longer visible.
Fix the catheter with adhesive tape.

The facilitator should say that the oxygen needs to be warmed and humidified.

Activity 7 – Demonstration of the Assessment a Newborn with Breathing Difficulty must only be done by a Facilitator

- Ask the Course Director and/or the head of maternity to help the facilitators identify baby with breathing difficulty for demonstration. Meet the mothers and get their consent for the newborn examination.
- It is important that during the total duration of the course signs of breathing difficulty such as fast breathing, severe chest indrawing and grunting will be demonstrated if possible to participants on any baby
- Before demonstration on a baby with breathing difficulty the following information should be collected:
 - Gestational age, birth weight, gender
 - Characteristics of pregnancy and birth
 - Medical history of breathing difficulty
 - Clinical status on the day of assessment
 - Treatment
 - Feeding

All the information obtained from the baby's record, and from an interview with the neonatologist needs to be communicated to participants verbally before the demonstration/examination.

- One facilitator will demonstrate in front of the entire group the correct technique of assessing a baby with breathing difficulty following the steps listed in Table 1 (The facilitator needs to assess the newborn quickly and gently, and after that discuss with participants).
- If the mother is presents in the room:
 - Greet her and ask the name of the baby
 - Ask her permission to assess her baby in front of participants

Table 1. Assessment of a Baby with Breathing Difficulty

Step	Action	Details
1	Wash your hands	Soap , towel, water
2	Prepare environment for assessment	<ul style="list-style-type: none"> - Warm room (no less than 25°C) - Warm surface (table or incubator) with source of radiant heat - Good light - Warm blanket/cloths
3	General information from neonatologist or mother if she is present in the room about baby health	<p>Ask the neonatologist or mother:</p> <ul style="list-style-type: none"> - Date of baby's birth, birth weight and weight on assessment day if available - Baby's last temperature - Was pregnancy and birth normal? - Was the baby resuscitated? - Did the baby have any problems after birth ? - When did breathing difficulty appear? - What treatment has baby received? - What investigations were done? - How is baby fed? - What are changes in baby's status?
4	Record received information on note pad	
5	Ask participants to count for themselves respiratory rate, and ask after one minute what are the results? Then the facilitator will count before undressing the baby	<ul style="list-style-type: none"> - Count respiratory rate during 1 minute - Listen for grunting - Look for central cyanosis - If baby receives an oxygen therapy, look for method of oxygen administration
6	Undress the baby gently	<ul style="list-style-type: none"> - Assess if the baby is cyanotic - Assess for chest indrawing - Count the heart beat rate
8	Assess presence/absence of the signs of infection	<ul style="list-style-type: none"> - Red umbilicus, or draining pus
9	Assess feeding	<ul style="list-style-type: none"> - Ask for methods of feeding: gavage, cap or breastfeeding and how baby is tolerating the feedings.

Thank the neonatologist and the mother.

The clinical examination is finished and the baby needs to be dressed again.

10	Ask neonatologist to explain how this baby is monitored or ask to show special monitoring format	<ul style="list-style-type: none"> - Check for monitoring of following indicators: <ul style="list-style-type: none"> • Respiratory rate and pattern signs • Heart rate • Colour of skin and mucosa • Body temperature • Feeding (sucking) • Blood glucose level • Urine (quantity) • O2 saturation (if possible) • Blood pressure (if possible)
----	--	---

Leave the room and come back to the classroom.

Step	Action	Details
Discuss with participants following questions:		
11	Assess the severity of breathing difficulty	<ul style="list-style-type: none">- Assess the severity according to table (Slide 3N– 7)- Oxygen therapy: method, duration- Feeding: methods, frequency, quality and daily volume
12	Develop plan of management of this baby	<ul style="list-style-type: none">- Additional treatment: antibioticotherapy for severe breathing difficulty or if infection- Investigations needed- Monitoring needed- Requirements for discharge
13	Compare with the observed case	<ul style="list-style-type: none">- Compare management of the observed newborn with developed (point 12th) plan
14	Make final conclusion	

References

1. Basic Newborn Resuscitation: a practical guide. World Health Organisation, Geneva, 1997.
2. Essential Newborn Care Course Training Manual (Draft). World Health Organization, Geneva, 2006.
3. Managing newborn problems. A guide for doctors, nurses, and midwives. WHO, 2003.
4. Pregnancy, childbirth, postpartum and newborn care. A guide for essential practice. WHO, 2006.

Cochrane reviews:

5. Air versus oxygen for resuscitation of infants at birth.
6. Caffeine versus theophylline for apnea in preterm infants.
7. Early vs. late discontinuation of oxygen in preterm infants.
8. Gradual vs. abrupt discontinuation of oxygen in preterm or low birthweight infants.
9. Kinesthetic stimulation for treating apnea in preterm infants.
10. Restricted vs. liberal ox. Exposure to preventing morb. and mort. in preterm infants.

Activity 5

Case Study 1

Peter is a second baby born after a normal pregnancy of 41 weeks. At birth Peter's breathing and heart were good and he was not resuscitated. He did not have any birth defects and was placed skin to skin on his mother. Mother and baby were left alone in the birth room as the birth was normal. The mother tried to breastfeed 45 min after birth but Peter seems uninterested in feeding. One hour only after birth the baby was weighed (his weight was 2500 g) and transferred to postpartum ward together with his mother.

Just after arriving in postpartum room the mother tried again to breastfeed Peter but he refused again. She noticed that Peter was breathing more quickly than before, but since she didn't know if it was not normal, she didn't call for help.

Four hours after the delivery Peter was examined by a paediatrician who found a respiratory rate of 80 breaths per minute; a severe chest indrawing and a central cyanosis.

The boy was transferred to the nursery department. When he was admitted to this department his body temperature was 36.4°C. The neonatologist installed Peter in incubator and started IV infusion with glucose 10%.

Questions:

1. What is Peter's problem? Please classify Peter's problem.
2. Which treatment do you recommend for Peter? How will you monitor Peter's health status? How will you feed Peter?
3. Consider what could have been done in the birth room and in the post partum area and compare with what was done for Peter.

Case Study 2

Maria was born 4 hours ago after 37 weeks gestation. At birth she didn't need any resuscitation. Immediately after birth she was examined by a physician, and had a breathing rate of 40 per min. She rapidly became pink and weighted 2550 g.

Maria was put skin to skin on her mother's chest where she stayed for two hours and then she was transferred with her mother to the postpartum room.

When Maria was assessed for the second time (4 hours after birth) she was fast breathing (70 breaths per minute), but she has no chest indrawing and no grunting on expiration. Maria was pale and her feet were cold. Her temperature was taken for the first time and was 35.9°C. Maria was breastfed for only few minutes and after that she refused the breast.

Questions

1. What is Maria's problem? Please classify Maria's problem.
2. Which treatment do you recommend for Maria? How will you monitor Maria's health status? How will you feed Maria?
3. Consider what could have been done in the birth room and in the post partum area and compare with what was done for Maria.

Case Study 3

Andrei was born 6 hours ago after 39 weeks gestation. At birth he was breathing well and was active with a respiratory rate 50 per minute, but he had central cyanosis with blue tongue and lips. The physician administered a free flow of oxygen. After 10 minutes the respiratory rate was 70 breaths per minute, with no chest indrawing and no grunting on expiration.

Andrei was transferred to NICU under oxygen at 30 minutes after birth.

In NICU the physician inserted a nasal catheter to give 100 % oxygen to Andrei. His temperature was 36. 9°C, his respiratory rate was 76 breaths per minute with no chest indrawing and no grunting. The baby was still cyanotic with blue tongue and lips despite the fact he was receiving 100% oxygen.

Questions:

1. What is Andrei's problem? Please classify Andrei's problem.
2. Which treatment do you recommend for Andrei? How will you monitor Andrei's health status? How will you feed Andrei?
3. Consider what could have been done in the birth room and in the post partum area and compare with what was done for Andrei.

Module 4N

Neonatal jaundice

Learning objectives:

At the end of the module participants will:

- Be able to perform a newborn examination to identify the early signs of jaundice
- Be able to monitor a jaundiced newborn and recognize when the jaundice is severe
- Be able to identify “physiological” and “pathological” jaundice
- Know the main steps for managing newborns with jaundice
- Know that phototherapy is the key treatment for neonatal jaundice
- Be able to monitor a baby with jaundice during the treatment
- Know the criteria for discharging a jaundiced baby from the hospital
- Be able to counsel the mother and family to monitor a baby with jaundice after discharge

Module outline and duration:

Part I – Classroom work - 140 min

Activity 1 – Introduction	5	min
Activity 2 – “Brainstorming”	10	min
Activity 3 – Interactive presentation	75	min
Activity 4 – Conclusion	5	min
Activity 5 – Small group work	45	min

Part II – Clinical work – 120 min

Activity 6 – Examination of 2 jaundiced newborns and discussion on these cases	120	min
--	-----	-----

Preparation for the module

- Review current publications, evidence materials and public health strategies recommended for jaundiced newborn care.
- Ensure that all participants have Participant Manual.
- Ensure that all co-facilitators know their functions working with this module.

Materials and Audiovisual Equipment

Materials

- Participant Manual
- 4 copies of case studies for small group work
- Local guidelines and orders relevant to neonatal jaundice

Equipment

- Video projector or projector overhead
- Presentation 4N-EPC ENG
- Flipchart
- Markers
- Pens and pencils
- Name badges

Key Messages of the Module

- Up to 50 % of term newborns and up to 80% of pre-term newborns have jaundice in the first days of life.
- Every jaundiced newborn must be monitored by the medical staff at least every 8 – 12 hours. They must check for a worsening of the baby's clinical condition and watch for signs of severe jaundice.
- The risk factors must be assessed in every jaundiced newborn so that timely decision could be made about starting phototherapy.
- Jaundice that appears within the first 24 hours or after day 7, or jaundice accompanied by an elevation of direct bilirubin or darkening of the urine is always pathological and requires immediate intervention.
- Phototherapy is the key method for the effective treatment of neonatal jaundices.
- Every baby receiving phototherapy needs careful monitoring
- Exclusive breastfeeding is the important part of the treatment for neonatal jaundice.
- Every family must be trained in the basic principles of observation and care of a newborn with jaundice.

Part I – Classroom work – 140 min

Activity 1 – Introduction (5 min)

- Show **Slide 4N-1**. Explain that participants will learn modern strategies of effective neonatal care for jaundiced newborns, recommended by World Health Organization (WHO).
- Explain that this Module has two parts: Part 1 covers classroom work which is the theoretical part and Part 2 covers clinical activities which will be done in the second part of the course during the second week.
- Ask one participant to find the notes to slide 4-N 1 in his/her Participant Manual and read learning objectives of this module.

Activity 2 – “Brainstorming” exercise (10 min)

- Ask the participants if neonatal jaundice is an important problem for them? How do they treat it?
- Write down or ask your co-facilitator or a participant to do so, all questions/concerns on the flipchart.
- Ensure that all participants have a chance to ask their questions.
- Explain that you will refer to the list of concerns/questions during and after the presentation and share answers to all questions.

Activity 3 – Interactive presentation (75 min)

- **Slide 4N-2:** This slide shows the global prevalence of neonatal jaundice.
- After showing this slide ask participants to answer the following questions:
 - Have you observed the same prevalence of neonatal jaundice in your region?
 - Do you have local statistical data about the prevalence of neonatal jaundice?
- **Slides 4N-3 and 4N-4.** These slides provide information about the physiology of neonatal jaundice.
- **Reasons for serum bilirubin elevation in the neonatal period:**
 - Massive red cell destruction. The daily average of bilirubin production for a neonate is 6-10 mg/kg compared to 3-4 mg/kg for an adult.
 - Poor liver' bilirubin conjugation.
 - Poor intestinal bilirubin transformation and important reabsorption by the intestinal cells.
- Unconjugated bilirubin is the main cause of neonatal jaundice. Unconjugated bilirubin has a neurotoxic effect if it reaches high levels of concentration.

- **Slide 4N-5.** Stress that there is no clear line between physiological and pathological jaundice. So called physiological jaundice may become “severe” /pathological at any time. Therefore, all jaundiced babies need careful observation and assessment so signs of severity can be identified early and appropriate therapies can be started.
- **Slide 4N-6 and 4N-7** Key clinical and biological characteristics of pathological jaundice.
- **Slide 4N-8.** Clinical estimation of severity of jaundice using body zones and the age when jaundice appears It is a very simple and effective decision-making tool. If severe jaundice is identified, start phototherapy immediately and then identify bilirubin levels.

Before showing the following slide ask participants to list the main complications of neonatal jaundice.

- **Slide 4N-9.** List the complications of bilirubin neuro toxicity: acute bilirubin encephalopathy and the irreversible kernicterus.
Stress the importance of careful monitoring of each jaundiced newborn in order to quickly recognize and treat “severe” jaundice and prevent the complications of neonatal jaundice.
- **Slide 4N-10.** Jaundice is a clinical sign, thus the clinical examination is crucial for recognising and monitoring the jaundiced newborn. Insist on the presence of a parent during the examination and stress that the baby must be examined under a good light , in a warm place, and be completely naked.
- The Kramer scale is an easiest way to estimate bilirubin levels. Stress that visual assessment of approximate bilirubin levels, based on zones of dermal (skin) jaundice is subjective and could be mistaken. Note that these levels are approximate and this scale is just one help in making a decision regarding the severity of jaundice, or the need for phototherapy.
- **Nevertheless if jaundice appears anywhere on day 1 or appears on day 2 and 3 in zones different from those where physiological jaundice appears or reaches zones 3 – 5 according to the Kramer scale, it is recommended to identify trans cutaneous bilirubin (TCB) levels and/or total serum bilirubin [C] and to start phototherapy immediately.**
- **Slide 4N-11** shows a list of steps for a complete newborn clinical examination. It is important to carefully assess for the early signs of central nervous system damage (bilirubin encephalopathy).
- **Slides 4N-12 and 4N-13:** Checking medical history to identify possible risk factors. Some factors could increase the level of haemolysis such as bruises or haemolytic diseases; others could prevent bilirubin conjugation or proper excretion. Risk factors by themselves are not indications to start therapy
- **Slide 4N-14.** It is necessary to test the mother’s blood group and Rhesus factor during the pregnancy.
 - *At birth*
 - *if Mother is Rhesus negative, a Combs test needs to be done using the blood from umbilical cord [B]*

- *If the Mother is group O(I) and Rhesus + , ABO and Combs test also needs to be done using the blood from umbilical cord [C]*
- **Slide 4N-15.** Regular clinical assessments (8-12 hours) are important to recognise early signs of severe jaundice.
- Baby needs to be kept warm [A] and exclusively breastfed at least 8 times/24 h [B]. Emphasize that exclusive breastfeeding is one of the most important parts of the management/treatment of neonatal jaundice.
- **Tell participants that giving water or glucose to a jaundiced newborns does not prevent the development of hyperbilirubinemia and does not reduce total serum bilirubin level. [B]**

*British Columbia Reproductive Care Program.
Jaundice in the Healthy Term Newborn. Newborn
Guideline 4. April 2002 (Revised)*

- **Slide 4N-16** “So called” physiological jaundice, good clinical assessment, biological tests and monitoring.
- **Slide 4N-17.** Specifics of Breast milk related jaundice. This jaundice is not considered as pathological and does not require any specific treatment.
- **Slide 4N-18** Pathological jaundice clinical assessment, biological tests, phototherapy and monitoring.

Ask participants how they treat neonatal jaundice in their facility?

Write their answers on the flip chart.

- **Slide 4N-19.** The slide shows that only 2 treatments are effective for treating neonatal jaundice: phototherapy and exchange transfusion.

Phototherapy is the most effective method to decrease the bilirubin levels in cases of neonatal jaundice. [A]

- Stress that to date there is no evidence supporting the use of any drug for routine treatment of neonatal jaundice .Discuss the example of Phenobarbital.
- **Slide 4N-20:** Indications for phototherapy and exchange transfusion for full term newborns without any signs of haemolytic disease.
- Stress that there are no randomized trials that indicate the appropriate level of TSB necessary to start phototherapy. Indications to start phototherapy are only based on medical observations. [C]
- Remind participants about risk factors. In case of risk factor the decision to begin phototherapy should be taken using a lower TSB level.
- **Slide 4N-21** Indications for phototherapy and exchange transfusion in pre-term newborn or in newborns with signs of haemolytic disease.
- Stress that currently, for full term babies as well as for preterm babies or babies with signs of haemolytic diseases there are no randomized trial that indicate the appropriate level of TSB necessary to start phototherapy or to perform an

exchange transfusion. This issue is critical for babies with high risk of bilirubin encephalopathy and kernicterus.

- **Indications to start phototherapy and to start exchange transfusion for preterm babies are estimated to be identical to the one used for newborns with haemolytic disease, these indications are only based on medical observation.**
- **Slide 4N-22:** How to implement phototherapy? Explain that phototherapy could be done without an incubator using the baby's cradle
- **Slide 4N-23.** Baby needs to be carefully monitored during phototherapy. Stress that phototherapy needs to be continuous with only short breaks for breastfeeding.
- **Slide 4N-24.** Indications for finishing phototherapy. The decision to finish phototherapy depends on the levels of TBS, age of the baby and risk factors They are the same for both full term and pre term babies. Make this decision using Graphs 1 and 2, and if the baby's urine is dark and stools are discolored which shows that she/he has conjugated hyperbilirubinemia.
- **Slide 4N-25.** Key requirements to exchange transfusion.
- Strongly state that exchange transfusion is a dangerous procedure that needs to be done because of strict indications and must be performed only by experienced staff.

Before showing the following slide conduct a brief discussion:

Ask participants how they decide when a jaundiced baby is ready to be discharged from the hospital

- Note all participants' answers on a flip-chart and continue the presentation.
- Show **Slide 4N-26.** The criteria for discharge a jaundiced baby. Facilitator must insist that newborns have a complete clinical examination before discharge. The decision to discharge should be decided on an individual basis .
- **Slide 4N-27.** Bhutani nomograph is a "support" tool to estimate the risk of developing a severe jaundice after discharge from the hospital. The Bhutani scale helps medical staff make the appropriate decision to discharge a jaundiced baby home or to keep him in the hospital.
- Remind participants that this chart was developed for newborns over 35 weeks.
- **Click and the green point will appear.** Tell participants that a term baby without risk factors has bilirubin level of 250 $\mu\text{mol/L}$ at 100 hours of life. This baby can be discharged home where the mother should continue to observe the baby's status.
- **Click again and the red point will appear.** Tell to participants that a term baby without risk factors has a bilirubin level of 300 $\mu\text{mol/L}$ at 100 hours of life This baby has a high risk for developing severe jaundice after discharge from the hospital (high risk zone). Discharging this baby needs to be postponed by at least 24 hours.

- **Slide 4N-28** shows a list of criteria to refer a jaundiced baby to the 3rd level of care or to re – hospitalize a jaundiced infant after discharge from the maternity.

Activity 4 - Conclusion (5 min)

- Show **Slide 4N-29**.
- Come back to the questions/concerns listed during Activity 2 “Brainstorming” and answer questions, which were not covered during the presentation. *(If you are not able to answer to some question tell the group that you will discuss it with the course director and provide answers as soon as possible).*

Activity 5 – Small group work (45 min)

This activity could be conducted at any convenient time during the first or the second week if module 4N is completed.

- Divide the participants into 4 groups. Ensure that each group includes physicians and nurses. Give one piece of flip chart paper and markers to each group.
- Ask participants to carefully read the case study and questions in the Participant’s Manual at the end of this module. Explain that Group 1 needs to answer to question 1, Group 2 needs to answer to question 2 etc.
- Ensure participants understand the task.
- Tell each group that they have 10 min to answer one question. This answer needs to be written on a flip chart and presented to the entire group by one small group member.
- After 10 min inform the groups that they have to give their presentation.
- When each presentation is done ask for comments and questions. After the last presentation, quickly summarize the important points.

Case study

It is Maria’s first pregnancy. The pregnancy was normal. Maria’s blood group is A (II), Rh-positive.

Her daughter Sofia was born after 40 weeks and 2 days, she was not resuscitated. Sofia was examined by the neonatologist 2 hours after birth. She weighted 3,200 g. Her medical assessment was normal. Sofia was pink, active, she didn’t have bruises nor cephalohematoma, her liver and spleen were normal size.

Maria and Sofia went together to “room-in” with recommendation to breastfeed on demand.

Sofia was assessed the next morning (26 hours after birth), her face was yellow, she was suckling well and her mother said Sofia breastfed 7 times since birth.

At 8.00 PM (38 hours after birth) the mother informed the nurse that Sofia's chest was yellow. Neonatologist assessed Sofia under artificial and weak light and, because it was cold in the room the baby was only partially naked with her diaper, socks and shirt still on. Sofia was active and the clinical examination did not change the birth assessment except that baby's face and chest were yellow.

By morning 8 AM, Sofia fed only 4 times because she didn't requested more. The neonatologist prescribed blood tests and SB dosages. The results showed erythrocytes: $5, 4 \times 10^{12}$, hemoglobin: 180 g/L, leucocytes: $8, 5 \times 10^9$; TSB level: 160 $\mu\text{mol/L}$

According to these results the neonatologist prescribed phototherapy: 4 hours phototherapy followed by a 2 hour break, and recommended to continue breastfeeding on demand.

The next day (50 hours after birth) Sofia was assessed again. No change in the clinical status except that jaundice had reached abdomen and arms. The neonatologist recommended to continuing phototherapy, and start an intravenous infusion and activated charcoal. Phototherapy was stopped during the infusion and Sofia received activated charcoal per os diluted in water. As soon as the IV was finished, phototherapy restarted, and trans Cutaneous bilirubin was evaluated to 180 $\mu\text{mol/L}$

The following morning (74 hours after birth) the icteric coloration was in the same zones but less intense. Sofia was active, she breastfed 8 times during the past day, liver and spleen were normal; stools were dark, and urines pale yellow.

Questions for group discussion:

1. How do you evaluate the severity of jaundice? Explain your answer and compare with what happened in Sofia's case.
2. What are the basic principles of jaundice management? Explain your answer and compare with what was done in Sofia's case.
3. Which investigations were necessary in Sofia's case? Explain your answer and compare with what was done in Sofia's case.
4. Can Sofia be discharged from the hospital? Please explain your answer.

Q1: How to evaluate the severity of jaundice? Explain your answer and compare with what happened in Sofia's case

The severity of jaundice is evaluated based on the time and localisation (The Kramer zones)when the jaundice appears and on the clinical status of the baby (Clinical status: activity, signs of infection, breathing difficulty, feeding, urine and stools coloration and size of spleen and liver)

According to recommendations jaundice needs to be assessed every 8-12 hours for intensity and localization.

Sofia jaundice can't be considered as "severe" because:

1. Jaundice appears at hour 26
2. Jaundice never reaches Sofia's legs and hands .
3. Sofia's clinical is good

Nevertheless Sofia was not assessed according to recommendation as the second assessment was conducted only at hour 26 . In addition Sofia was not

completely naked during the assessment and likely the artificial light was not appropriate to assess properly the yellow colour of the skin ..

Q2 :_What are the basic principles of jaundice management ? Explain your answer and compare with what was done in Sofia's case.

1. Conduct an assessment of medical history and risk factors.
2. Check for the appearance of jaundice according to the Kramer scale. This assessment needs to be done every 8-12 hours with a good light
3. Clinical examination daily
4. Insure adequate breastfeeding not less than 8 times a day and no night break
- 5. Keep baby warm**
6. If jaundice appears anywhere on day 1 or reaches the extremities on day 2 and 3 TBS

o In the case study

1. Sofia was not examined by the medical staff on the 1st day and the examination with a poor light)
2. The neonatologist prescribed blood tests and TSB to Sofia despite the fact that on day 2, jaundice was only visible on the face and on the chest.
3. Moreover the doctor advice to phototherapy without proper indication
4. The phototherapy was not continuous .
5. Sofia was not breastfed enough and the doctor did not recommend increasing breastfeeding .
6. On day 3 an infusion was prescribed as well as a useless drug, and phototherapy and breastfeeding were stopped during this procedure.

In conclusion: Sofia's jaundice didn't need phototherapy, an IV or drug. Only breastfeeding should have been strongly encouraged and reinforced

Q 3_ Which investigations were necessary in Sofia's case? Explain your answer and compare with what was done in Sofia's case.

No laboratory investigation was necessary in Sofia's case.

1. According to the Kramer scale Sofia's approximated bilirubin level at hour 26 was probably 100 $\mu\text{mol/L}$; at hour 38 it reached 150 $\mu\text{mol/L}$; at hours 50 the bilirubin level reached 200 $\mu\text{mol/L}$ and went up to 250 $\mu\text{mol/L}$ at hour 74 . Thus the probable TBS levels were never in the danger zone .
2. The blood group of Maria is A(II) Rhesus positive . She can not have developed during the pregnancy any ABO incompatibility or Rhesus incompatibility thus is not necessary to ask Sofia's Rhesus test and Coombs test.

Q 4. Could Sofia be discharged from the hospital? Explain your answer.

By day 3 after birth (at hour 74) Sofia is in good clinical condition. She is breastfed 8 times a day and her jaundice is decreasing

According to the Bhutani nomograph the result of transcutaneous bilirubin test 180 $\mu\text{mol/L}$ is in the "low - intermediate risk zone", thus there is no risk that Sofia will develop a severe jaundice at home.

Sofia can be safely discharged from the hospital.

- Maria must be counselled to continue exclusive breastfeeding at least 8 times a day, to keep Sofia warm and to observe where the jaundice is on Sofia 's body and her activity level. If Sofia is not feeding well or there is any change in her conditions, Maria must immediately call for medical support.
- It is recommended that Sofia will have a complete medical assessment for her jaundice by 120 hours after birth (by day 5)
- Ask participants if they have any questions. Answer all questions if possible

Part II – Clinical work

Activity 6 – Examination of 2 jaundiced newborns and discussion of these cases (120 min)

- Ensure that during the theoretical week participants understand key points of the management of jaundiced newborns.
- Ask the Course Director and/or the head of maternity to help the facilitators to select **three jaundiced babies** for examination. Meet the mothers to get their agreements to a newborn examination.
- Before examining selected newborns, check the babies' history to collect all the following information:
 - Gestational age, birth weight
 - Characteristics of pregnancy and delivery
 - Risk factors
 - Mother blood group and Rhesus
 - Jaundice story.. Results of the different clinical examinations since the baby's birth (frequency, assessment of skin colour, baby's general condition, urine, stools, neurological status, size of spleen and liver)
 - Feeding
 - Lab test and results
 - Treatment.

All these information need to be communicated to participants verbally before examination or if you have the possibility printed and given to each participant.

- One facilitator will demonstrate in front of the entire group good technique for assessing a jaundiced baby following the steps listed in Table 1 (30 min in the room and 30 minutes discussion).

Table 1. Demonstration of assessing a jaundiced baby

Step	Action	Details
1	Wash your hands	Soap , towel, water
2	Prepare environment for assessment	<ul style="list-style-type: none"> • Warm room (no less than 25°C) • Warm surface (table) • Good light • Source of radiant heat • Warm blanket/cloths
3	- Greet the mother and - Ask her permission to assess her baby in front of participants	<ul style="list-style-type: none"> • Welcome the mother • Introduce yourself • Congratulate her on the birth of her baby
4	General information from mother	Ask the mother: <ul style="list-style-type: none"> • Name of the baby and gender • Date of baby's birth, birth weight and weight on assessment day if available <ul style="list-style-type: none"> - Baby's last temperature

Step	Action	Details
5	Ask mother about baby;s health.	<p>Ask the mother :</p> <ul style="list-style-type: none"> • How was your pregnancy; any complications? • How was your labour and birth? • Was the baby resuscitated? • Did the baby faced any problems during the first days of life?. • Did the baby convulse? • Do you know if your baby received any treatment? • Do you know if your baby received water or glucose? • How are you feeding your baby now? • How many times are you breastfeeding in 24 hours? • How is your baby nursing e.g. without difficulty, some problems
6	Record received information on note pad	
7	Look before undressing the baby	<ul style="list-style-type: none"> • count respiratory rate during 1 minute • listen for grunting • look for nasal flaring
8	Undress the baby gently	<ul style="list-style-type: none"> • Assess if the jaundiced is in good condition (warm room no less than 25°C;warm surface ,good light) <ul style="list-style-type: none"> ○ The yellow skin coloration has to be check first on the face and then following the Kramer scales zones. ○ Press gently a finger • Assess jaundice commenting it for participants
9	Check for baby's activity	<ul style="list-style-type: none"> • Look for infant 's movements • Does the infant move only when stimulated? • Does the infant not move event when stimulated?
10	Assess colour and quantity of urine and stools	<ul style="list-style-type: none"> • Ask the mother what she observed
11	Assess size of spleen and liver	<ul style="list-style-type: none"> • Liver could be palpated + 2cm from costal grid • Spleen could be palpated under costal grid
12	Assess presence/absence of signs of infection	<ul style="list-style-type: none"> • Red umbilicus, or draining pus • More than 10 pustules on the skin
13	Assess breastfeeding	<ul style="list-style-type: none"> • Is the attachment correct? • Is the position correct? • Does the baby suckle effectively <p><i>Observe it carefully, take notes and ask participants to take note on all these issues because you will ask them to answer these questions later.</i></p>

Thank the mother and ask her if she has any question.

The clinical examination is finished , the baby needs to be dressed again and given back to his /her mother .Ask her kindly if she agrees to breastfeed her baby in front of participants

14 Assess the phototherapy lamp if present if not ask, participants to leave the room.

Step	Action	Details
15	Once out of the mother room lead the discussion with the participants:	
	<ol style="list-style-type: none"> 1. Does the baby have a good general status?? 2. Analyse the results of the clinical assessment <ul style="list-style-type: none"> ○ localisation of jaundice ○ baby activity ○ signs of local infections ○ liver and spleen ○ urine and stools 3. Ask participants to evaluate the severity of jaundice 4. Ask participants to evaluate quality of feeding (ask all question on attachment , position, frequency and suckling) 5. Ask participants to evaluate the quality of treatment (including timeliness) <ul style="list-style-type: none"> ○ Phototherapy (duration, technical specificity, eyes protection, baby naked? genitals protected?) ○ infusion ○ drugs ○ exchange transfusion 6. Ask when these babies could be discharged home: 	
		<ul style="list-style-type: none"> • Then divide the participants into sub-groups: 1 facilitator – 1 sub-group. • Select one participant in each group to perform an examination. • Ask the other participants not to make any comments during the examination. Participants should make their notes and comments on note pads. • Each group “received” a jaundiced newborn to assess; the facilitator will provide all information on the case. • The responsible for assessment will follow Table 1 in participant module. • Ensure that the participant washes her/his hands. • Ensure that participant follows the main requirements of keeping the baby warm during assessment. • Ask the sub group to come back to the class room and discuss the cases. • Develop a plan of management for each examined baby according to recommendations of module 4N.

Coordinate conclusion with the entire group 10 min

1. Ask each group to give short presentations of their case (not more than 5 min)
2. Then lead a discussion to highlight the different points of these cases

References

1. American Academy of pediatrics & American College of Obstetricians and Gynecologists. Guidelines for Perinatal Care. 1997
2. American Academy of Pediatrics Subcommittee of Hyperbilirubinemia. Management of Hyperbilirubinemia in the newborn infants 35 or more weeks of gestation. Pediatrics 2004; 114:297-316
3. American academy of pediatrics, clinical practice guideline, subcommittee on hyperbilirubinemia management of hyperbilirubinemia in the Newborn Infant 35 or More Weeks of Gestation, Pediatrics 2004; 114:297–316;
4. Bhutani V., Johnson L., Siviery E. Predictive ability of a predischarge hour-specific serum bilirubin for subsequent significant hyperbilirubinemia in healthy term and near-term newborns. 1999; Pediatrics, 103 (1), 6-14
5. Bhutani V, Gourley G, Adler S, Kreamer B, Dalin c, Johnson L. Noninvasive Measurement of Total Bilirubin in a Multiracial Predischarge Newborn Population to Assess the Risk of Severe Hyperbilirubinemia. J Pediatrics (106) 2000, NO 2.
6. British Columbia Reproductive Care Program. Jaundice in the Healthy Term Newborn. Newborn Guideline 4. April 2002 (Revised)
7. Brown AK, Kim MH, Wu PYK, Brylaa DA. Efficacy of Phototherapy in Prevention and Management of Neonatal Hyperbilirubinemia. Pediatrics 1985; 75 (Suppl): 393-400
8. Bryla DA, Nelson KB et al. Phototherapy for neonatal hyperbilirubinemia: six-year follow-up of the National Institute of child Health and Human Development clinical trial. Pediatrics 1990;85:455-463
9. Chalmers I, Enkin M, Keirse MJNC, eds. Effective care in pregnancy and childbirth. Oxford, Oxford University Press, 1989.
10. Cochrane review relevant for jaundice: Early intravenous nutrition for the prevention of neonatal jaundice
11. Cochrane review relevant for jaundice: Fiberoptic phototherapy for neonatal jaundice.htm
12. Cochrane review relevant for jaundice: Metalloporphyrins for treatment of unconjugated hyperbilirubinemia in neonates.htm
13. Cochrane review relevant for jaundice: Single versus double volume exchange transfusion in jaundiced newborn infants.htm
14. Dennery PA, Seidman DS, Stevenson DK. Neonatal hyperbilirubinemia. N Engl J Med 2001; 344: 581-590
15. Gale R, Seldman DS, Stevenson DK. Hyperbilirubinemia and early discharge. J Perinatol 2001; 21:40-43

16. Garcia FJ, Nager AL. Jaundice as an early diagnostic sign of urinary tract infection in infancy. *Pediatrics*. 2002;109:846-851
17. Gartner LM, Herrarias CT, Sebring RH. Practice patterns in neonatal hyperbilirubinemia. *Pediatrics* 1998; 101(1 pt 1): 25-31
18. Jackson JC. Adverse events associated with exchange transfusion in healthy and ill newborns. *Pediatrics* 1997; 99:E7)
19. Johnson LH, Bhutani VK, Brown AK. System based approach to management of neonatal jaundice and prevention of kernicterus. *J Pediatr* 2002; 140: 396-403
20. Knudsen A, Ebbesen F. Cefalocaudal progression of jaundice in newborn admitted to neonatal intensive care units. *Biol Neonate* 1997;71:357-361
21. Kramer LI. Advancement of dermal icterus in the jaundiced newborn. *Amer J Dis Child*. 1969; 118:454-458
22. Kumar RK. Neonatal jaundice. An update for family physicians. *Aust Fam Physician* 1999: 28: 679-682
23. Meredith L. Porter, Beth L.Dennis. Hyperbilirubinemia in the Term Newborns. *American Family Physician*, 2002, Volume 65, Number 4
24. Mills JF, Tudehope D. Fiberoptic phototherapy for neonatal jaundice (Cochrane review). *The Cochrane library*. Issue 2, 2003
25. Newborn Services Clinical Guideline. Protocol Management of Neonatal jaundice. New Zealand. Reviewed by Peter Nobbs, May 2001
26. Royal Prince Alfred Hospital. RPA newborn Care Protocol Book. Jaundice, 2003
27. Shelly C Springer.Kernicterus.eMedicine.2006.
28. Tan KL. Efficacy of Bidirectional Fiber-optic Phototherapy for Neonatal Hyperbilirubinemia. *Pediatrics electronic pages* 1997; 99: May, e 13)
29. The challenge of preventing neonatal bilirubin encephalopathy: a new nursing protocol in the well newborn nursery. Monica A.Cabra, RNC, NNP, and Jonathan V. Whitfield, MBChB.

Module 5N**Management of Neonatal Infections****Learning objectives:**

Upon completion of the module the participants will know:

- That infectious diseases represent the leading cause of neonatal mortality in the world
- What are the periods and ways of transmission of neonatal infection
- What are the main causes of these infections
- How to diagnose neonatal infections taking medical history, assessing for risk factors, and for clinical signs and requesting specific biological tests
- That the clinical signs of infection in newborn are usually non specific
- That neonatal infections can be localized, focalized or disseminated
- How to treat neonatal infections
- How to prevent neonatal nosocomial infections.

Module structure and duration:

Total duration – 210 min

Part I – Classroom work

Activity 1 – Introduction	5 min
Activity 2 – Interactive presentation	100 min
Activity 3 – Conclusion	10 min
Activity 4 – Small group work	90 min

Part II – Clinical practice

Activity 5 – Examination of a newborn with infection (or a newborn receiving antibiotic therapy)	150 min
--	---------

Module preparation

- Review the current publications, medical evidence and recommended public health strategies on prevention and treatment of neonatal infections
- If possible, review the local data on the incidence of neonatal infections, as well as the local practices to manage neonatal infections
- Ensure that each participants have a copy of the participant Manual

Module preparation

- Ensure that all facilitators know their respective duties while working on this module

Training Materials and Audiovisual Equipment

Training Materials

- Participant Manual
- 4 printed case studies for small group work
- Local guidelines and orders related to the management of bacterial neonatal infections (if possible)

Equipment

- LCD or slide projector
- PowerPoint presentation 5N – EPC ENG
- Flipchart
- Markers
- Pens or pencils
- Name badges

Key messages

- Infections are the leading cause of neonatal mortality in the world (38%), mainly due to sepsis and pneumonia
- From a practical point of view, it is important to differentiate localized neonatal infection usually responding well to local treatment
- The diagnosis of any neonatal infection is the result of a synthesis done after the analysis of the documented medical history, clinical signs and results of biological tests/ instrumental investigations.
- Prolonged membrane ruptures > 18 hours, maternal fever and intrauterine infection are important risk factors frequently in relation with severe infection
- The clinical signs of neonatal infections are not specific
- The knowledge of local epidemiological is important to prevent and treat neonatal infections

Key messages

- First line antibiotic for neonatal infections should be effective on Gram-positive and Gram-negative bacteria
- Poor implementation of hand washing policy is the first cause of nosocomial neonatal infections

Part I – Classroom work - 210 min

Activity 1 – Introduction (5 min)

- Show **Slide 5N-1** and explain to participants that the objective of this module is to remind them important information about neonatal bacterial infections. Present the learning objectives and ask if the participants have any questions which will be written down on the flip-chart.
- This module will be taught in two parts: part 1 will focus on work in the classroom and part 2 is the clinical week and will take place in the maternity.
- Inform participants that some neonatal infection such as congenital syphilis, listeriosis, and TB were taught in module 11C.

Activity 2 – Interactive presentation (100 min)

- **Slide 5N-2.** Discuss with the participants the data presented on the slide. **Ask:** “What is the % of neonatal mortality due to neonatal infections in your facility?”; “Did you see any change during the past 10 years?”
- Show **Slide 5N-3** and discuss with the participants briefly the transmission routes and periods of possible contamination.
- **Slide 5N-4** show the main causes of neonatal infections. Stress that Group B streptococcus, E. coli, Enterococcus and Listeria are the most frequent causes of early neonatal infections in high-resource countries. In low-resource countries neonatal infections are more often due to Staphylococcus, Klebsiella, Pseudomonas, and Salmonella.
- **Slide 5N-5.** Stress the fact that newborns get easily infected due to their immature immune system and fragile skin and intestinal mucosa.
- Show **Slide 5N-6** and discuss with the participants the 3 key components to diagnose neonatal infections. Tell the participants that each component will be analysed in details.
- Show **Slide 5N-7** and tell the participants that an important part of the diagnosis is to take detailed and complete medical history. Ask participants if they are using all questions listed on the slide, and if no, why.
- Show **Slides 5N-8 and 5N-9.** Stress that assessing maternal and newborn risk factors supports the diagnosis and the selection of the initial treatment.

- Show **Slides 5N-10 and 5N-11** and discuss briefly how to assess the specific signs of localized infection and the general signs of infection. Stress that general signs of infection are not specific and can be found in many other neonatal pathologies.
- Show **Slide 5N-12** and discuss with the participants which biological tests support the diagnosis of neonatal infection.
- Inform participants that in 25% of cases of neonatal sepsis the blood culture is negative. Remind participants that ideally blood culture should be performed before the administration of antibiotic and that at least 0.5 ml of blood is necessary to obtain reliable results. Insufficient quantity of blood and “technical” mistakes during sampling, storing, transportation and bacteriological processing can affect the result.
- Stress that CRP is one of most specific but “late” markers of **bacterial** infection. The first result is often not informative; therefore, CRP levels should be repeated. A series of negative CRP results allows the provider to exclude, with a high reliability, neonatal bacterial infection and to stop the antibiotic treatment.
- Discuss other screening tests: leukocyte count, leukocyte index and erythrocyte sedimentation rate and remind participants that biological tests need to be repeated to follow the disease evolution.
- **Slide 5N-13.** Discuss with the participants other biological tests.
- Urine tests are usually a part of a complete biological evaluation of neonatal infection. Insist that urine culture should be done if germs are found in the urine.
- Surface bacterial culture should be done in case of skin or mucosa lesions (pustules, omphalitis etc.).
- Lumbar puncture should be done if meningitis is suspected or if baby’s weight <1500 g with suspicion on generalized infection. Inform the participants that the methodology of LP is in Annex 1.
- **Slide 5N-14.** Briefly discuss the necessity to perform X-ray in special cases of neonatal infection.
- **Slide 5N-15** Discuss with the participants the possible clinical forms of neonatal infections. Stress that list is not a real classification but a simplification to present this module
- Before showing next slides inform the participants that the following slides are focusing on localized infections. Ask the participants if localised infections such as skin, umbilical or eyes infection are frequent in their practices and **How do they treat them.**
- Show **Slides 5N-16 and 5N-17** and discuss with the participants the clinical signs of skin and umbilicus infection. Stress that it is mandatory to take a full medical history and to assess for general signs of infection in each case (**Slides 5N-7 to 5N-9**). Repeat that any local infection can become severe.
- Describe local treatment of skin and umbilicus infection and compare with the treatment used by the participants. Pay special attention to follow-up after 2 days to decide to continue or to change the treatment.

- Show **Slides 5N-18 and 5N-19**. Discuss with the participants the clinical signs of eyes infection and the appropriate treatment. Underline the special treatment for Chlamydia and Gonorrhoea conjunctivitis.
- Before showing the next slides ask participants **“How do they treat focalised /systemic infections”** and record their answers on the flip chart .
- Show **Slides 5N-20 to 5N-22** and discuss the signs, diagnosis and treatment of meningitis. Some clinical signs are more specific in case of meningitis such as full or bulging fontanelle which is a late and rare sign. All biological tests (blood culture, screening tests) and lumbar puncture need to be performed to confirm the diagnosis. Meningitis is often associated with sepsis
- Stress that the dose of Ampicillin given for meningitis doubles the dose given for sepsis.
- Inform the participants that monitoring and supportive care for sick baby will be presented at the end of the module.
- Show **Slides 5N-23 to 5N-25** and discuss how to diagnose and treat necrotizing enterocolitis.
- **Slides 5N-26 to 5N-28**. Discuss how to diagnose and treat pneumonia.
- **Slides 5N-29 to 5N-30**. Discuss how to diagnose and treat the rare case of osteomyelitis and osteoarthritis. Stress that osteomyelitis and osteoarthritis are usually late infections and often due to nosocomial infections.
- Before showing next slides ask the participants **how they treat sepsis**, and record their answers on the flip chart .
- Show **Slide 5N-31** and discuss the definition of neonatal sepsis. Repeat that very often the clinical signs of neonatal infection are not specific.
- Before showing **Slide 5N-32** Stress that from a practical point of view it is important to differentiate between early and late sepsis to select appropriate antibiotics. Ask the participants **how they differentiate between early and late sepsis**. Some sources defined early sepsis until 6 days after birth. Currently it is a consensus to define early sepsis if it occurs within the first 72 hours of life.
- Show **Slide 5N-32** and ask the participants to help you to characterize first early neonatal sepsis by the items of the first column in the table, then show second column and discuss late sepsis. Summarize the characteristics of early and late neonatal sepsis.
- **Slide 5N-33** shows the different risk factors for early neonatal sepsis and emphasize the three first one.
- Show **Slide 5N-34** and discuss the criteria to diagnose neonatal sepsis. Remind participants the necessity of careful assessment of the medical history, to identify maternal and newborn’s risk factors to be associated with some clinical signs. The diagnosis is confirmed by a positive blood culture and/or 2 abnormal screening tests (**Slides 5N-7 to 5N-12**).
- Show **Slides 5N-35 and 5N-36** and discuss with the participants how to manage neonatal sepsis.
- Before showing the next slide ask the participants **when they start antibiotic in case of neonatal sepsis in their facilities**.

- Write down all answers and show **Slide 5N-37**. The main message on **Slide 5N-37** is that clinical suspicion of neonatal sepsis is a sufficient indication to immediately start the antibiotic treatment.
- Show **Slide 5N-38** and present the recommended antibiotic used for sepsis with and without meningitis. Inform participants that they can find all details about dosages and dilution of these antibiotics in Attachment 2.
- Show **Slide 5N-39** and explain that if the mother has risk factors and the baby is ≤ 34 weeks with not any sign of infection it is recommended to treat the baby for suspected sepsis. The treatment will be adapted after 48-72 hours according to the clinical evolution and to the results of the different biological tests (blood culture and screening tests). In case of good clinical conditions and negative biological tests, the treatment with antibiotics should be stopped.
- Show **Slide 5N-40 which describes shortly how to manage infected newborn after the end of the antibiotic treatment.**
- **It will depend on the facilitator to show and pass Slides 41 to 45.**
- Before showing next slides inform the participants that the following slides are probably known as they show the general principles of management of sick newborns).
- Show **Slide 5N-46**.
- Go to a brief discussion on the extreme importance of neonatal nosocomial infection issue.
- Ask the participants, **how neonatal nosocomial infection can be prevented**, write the answer on the flip chart.
- Show **Slide 5N-47 and 48**. Compare the two lists with the participants' answers. Stress that the prevention of nosocomial infection is one of the main responsibility of the maternity staff.
- Emphasize the necessity of strict implementation of hand washing policy and rooming-in.

Activity 3 – Conclusion (10 minutes)

- Read the questions/notes written on the flip chart if any and summarize the module with the participants or ask a participant to do it for the group.
 - The diagnosis of infection is done as a synthesis between the medical history (including risk factors), the assessment of clinical signs which are often asymptomatic and the results of different biological tests and other investigations.
 - In the majority of cases, local infection can be treated by local treatment.
 - In case of severe infection antibiotic treatment needs to be added to supportive care.
 - The selection of antibiotic should be effective on Gram-negative and Gram-positive bacteria.
 - Nosocomial neonatal infection can be improved by a better organisation of care, a strict hand washing policy, and a decreasing of invasive procedures.
- Ask the participants if they have any questions, and answer these questions if any.

Activity 4 – Small Group Work (90 minutes)

- Divide the participants into 4 groups. Ensure that each group includes physicians and nurses. Give one piece of flip chart paper and markers to each group.
- Ask participants to carefully read the case study they received and the questions.
- Ensure that participants understand what they have to do.
- Tell each group that they have 15 min to perform the task and to answer to each question of their case study. Ask them to write the answers on the flip chart paper. Inform each group to select a member to present the results of the group's work.
- Each group will have 5 min to present the group's results
- When each presentation is done ask for comments and questions. After the last presentation, quickly summarize the important points.

Case Study 1: Svetlana and Andrey

Svetlana gave birth to Andrey after 40 weeks of a normal pregnancy. The birth was normal; Andrey was not resuscitated at birth and was immediately put on his mother's chest for skin to skin for 10 min. He was breastfed 30 min after birth.

A neonatologist assessed Andrey immediately. The newborn had good clinical condition; he weighed 3,400 g. The baby was weighed, swaddled and put in a cradle close to Svetlana. Mother and baby were transferred together to the postpartum department to rooming in. 10 hours after birth Svetlana called the nurse because she felt that Andrey was breathing fast. The baby was assessed, he was fast breathing with 70 breaths per min, but he did not have chest indrawing neither grunting. His temperature was 35.6°C and he refuses to breastfeed.

1st question: What are the possible diagnoses for Andrey?

2nd question: What are the biological tests you will ask if any and why?

3rd question: How do you take care of Andrey immediately?

Possible answers:

1st question: What are the possible diagnoses for Andrey?

- According to the clinical signs, the absence of risk factors and the medical history (full term baby, normal birth and weight, swaddled and separated from the mother after only 10 min) the following diagnoses can be suggested: likely moderate hypothermia and unlikely neonatal infection (pneumonia or sepsis).

2nd question: What are the biological tests you will ask if any?

- Andrey does not need any routine tests for infection (no blood culture, no screening tests).

- As Andrey was swaddled and not breastfed since birth, he now has mild breathing difficulty and moderate hypothermia, Andrey's blood glucose should be measured.

3rd question: How do you take care of Andrey immediately?

- Andrey needs to be put naked in skin-to-skin contact with the mother, his head and feet have to be covered
- Svetlana and Andrey must be covered with a warm blanket in a warm room (if possible 26°C)
- Andrey's temperature needs to be assessed every hour until it becomes normal (> 36.5°C) during two consecutive measurements
- Svetlana should be helped to breastfeed her son, but if the baby is not able to suck, he needs to be fed with expressed milk with a cup or a spoon
- Andrey should be monitored for every 3 hours for breathing difficulty (respiratory rate, severe chest indrawing and grunting, apnea, and cyanosis) and for other general signs of infection (lethargy or convulsions, regurgitation after feeding etc)
- Svetlana should be trained to observe her baby and to control his temperature

Case Study 2: Maria and Stephan

Stephan was born after 38 weeks of the second normal pregnancy of Maria. During the labour Maria had temperature 38.2°C but the birth was normal and Stephan was put on her mother's chest in skin to skin contact immediately and was breastfed 25 minutes after birth.

The neonatologist assessed Stephan after 2 hours and he found that this 3,200 g baby was in good condition. Maria and Stephan were transferred together to the postpartum department for rooming in. When neonatologist assessed Stephan for the second time 16 hours after birth he discovered that the baby was fast breathing: 80 breaths per min with a severe chest indrawing. Stephan temperature was 37.8°C and he did not show any interest in breastfeeding.

The neonatologist decided to immediately transfer Stephan to NICU. An umbilical venous catheter was immediately placed, Stephan received IV fluids, Ampicillin, Gentamicin IV and immunoglobulin.

Results of blood screening tests:

Leucocytes: $26 \times 10^9/L$

Leukocytes index: 0.44

CRP: 11 mg/L

Erythrocytes sedimentation rate: 10 mm

1st question: What are the possible diagnoses for Stephan?

2nd question: How do you interpret the results of the biological test? Do you want more tests? If yes, which tests and why?

3rd question: Do you agree on what was done for Stephan? What could have been done differently?

Possible answers

1st question: What are the possible diagnoses for Stephan?

- The mother had fever during delivery (risk factor). The clinical signs appeared 16 hours after birth (fast breathing with 80 breaths per min with severe chest indrawing, hyperthermia with 37.8°C and feeding difficulties). Stephan who is a full term baby can have an early neonatal infection (pneumonia or sepsis).

2nd question: How do you interpret the results of the biological test? Do you want more tests? If yes, which tests and why?

- Stephan has 2 positive screening tests (Leukocytes index: 0.44 (normal is < 0, 2) and CRP: 11 mg/L (normal is < 8 mg/L) which is considered as sign of a possible bacterial infection.
- In Stephan case additional laboratory and instrumental tests should be done:
 - blood culture to identify germ and sensitivity
 - Chest X-Ray to confirm or exclude pneumonia as the baby has breathing difficulty

3rd question: Do you agree on what was done for Stephan? What could have been done differently?

- Maria should have been evaluated for amnionitis and received antibiotics during labour.
- Since Stephan's birth skin to skin contact after birth, early breastfeeding, delayed first medical assessment and rooming in were correctly done.
- As Stephan has severe breathing difficulty (fast breathing and severe chest indrawing) it was correct:
 - To immediate transfer Stephan to NICU
 - To establish IV line
 - To give immediately IV Ampicillin and Gentamicin IV to cover Gram (+) and Gram (-) germs
- What was not done correctly since Stephan's birth:
 - Stephan was not monitored by medical staff during 16 hours after birth, in consequence the baby's problems were not discovered in time and the treatment was delayed
 - The mother was not trained to observe her baby
 - Routine administration of IV immunoglobulin for full term newborns is not recommended
 - The insertion of umbilical catheter could be discussed as Stephan is a large full term baby, the antibiotics should have been given by a peripheral perfusion.
- What should be have been done differently:
 - Stephan has clear maternal risk factor of infection thus it was recommended to carefully monitor the baby's condition
 - The mother should have been trained to observe her baby and to call for help if necessary
 - As Stephan has severe breathing difficulty he's required immediate oxygen therapy.

Case Study 3: Olena and Anna

Olena gave birth to Anna with weight of 2,100 g after 33 weeks of gestation. The pregnancy and birth were normal. Immediately after birth Anna was assessed by a neonatologist under a radiant heater. Her clinical condition was good but the neonatologist decides to transfer Anna to NICU because she was born preterm and small.

Anna's clinical condition was monitored in NICU for the 1st day where she was fed by gavage with infant formula. Then she was transferred to post-partum department to be roomed-in with her mother. She was not suckling very well and was fed with expressed breast milk by a cup. The 4th day after birth Anna starts to regurgitate after each feeding. Her temperature was unstable from 36.2°C to 37.8°C. She was fast breathing: 64 breaths per minute but she did not have chest indrawing nor grunting. Her abdomen was distended.

She was immediately readmitted to NICU, where she got several blood tests and a lumbar puncture. A venous umbilical catheter was inserted and Ampicillin + Gentamicin + Cefotaxime + immunoglobulin were given IV.

Results of blood screening tests:

Leucocytes: $18 \times 10^9/L$

Leukocytes index: 0.28

CRP: 12 mg/L

Erythrocytes sedimentation rate: 18 mm

The results of the lumbar puncture were normal.

1st question: What are the possible diagnoses for Anna?

2nd question: How do you interpret the results of the biological test? Do you want more tests? If yes, which tests and why?

3rd question: Do you agree on what was done for Anna? What could have been done differently?

Possible answers

1st question: What are the possible diagnoses for Anna?

- Anna has several risk factors:
 - Preterm delivery (33 weeks of gestation)
 - No skin-to-skin contact after birth
 - Anna was transferred to NICU for monitoring despite on Anna's good clinical condition, thus separate from her mother
 - During her first day of life she was fed with infant formula through gavage
- Anna got clinical signs of infection on day 4
 - She regurgitated after each feeding
 - Her temperature was unstable from 36.2°C to 37.8°C
 - She was fast breathing with 64 breaths per minute without chest indrawing and grunting
 - Her abdomen was distended
- Taking into consideration all listed above, Anna is probably infected. Different diagnosis could be evocated: sepsis, pneumonia or NEC.

2nd question: How do you interpret the results of the biological test? Do you want more tests? If yes, which tests and why?

- Anna has 3 positive screening tests which indicate a sign of infection (Leukocytes index: 0.28 (normal is $< 0, 2$), CRP: 12 mg/L (normal is < 10 mg/L), erythrocytes sedimentation rate: 18 mm (normal is < 15 mm))
- Anna condition needs to be more thoroughly assessed. Additional laboratory and instrumental tests should be done:
 - Blood culture to identify germ and sensitivity
 - Platelets count

- Stool for occult blood and culture
- Chest X rays as the baby has breathing difficulty and abdominal X rays because of possible NEC.

3rd question: Do you agree on what was done for Anna? What could have been done differently?

- Incorrect actions since Anna's birth were done:
 - Immediately after birth Anna was assessed by a neonatologist. This immediate complete assessment was not necessary as the baby was in good condition
 - Skin to skin contact and early breastfeeding were not done
 - Neonatologist transferred Anna to NICU soon after birth without any medical reason. She was in good condition and could stay with her mother to benefit of skin to skin contact and to be breastfed.
 - She was fed by gavage with infant formula instead of expressed breast milk through cup or spoon.
 - Lumbar puncture was done without any indications
 - 3 antibiotics were given without any medical indications
 - Routine administration of immunoglobulin is not recommended
- Correct actions were done since problems were discovered (after 4th day after birth):
 - Immediate readmission to NICU
 - Insertion of umbilical venous catheter
 - Performing several blood tests
- What should be done for Anna differently:
 - Immediately after birth Anna had to be put in skin to skin contact to maintain her temperature
 - Anna should have stayed with her mother, to be closely monitored by the medical staff. If Anna and the mother would have been together gavage feeding with infant formula could have been prevented.
 - Administration of Ampicillin + Gentamicin IV. In case of NEC Metronidasole IV should be administered in addition
 - No any food per mouth – give only IV fluid for 5 days if NEC is diagnosed.

Case study 4: Tatiana and Denis

Denis was born by C-section after 41 weeks of a normal pregnancy. The C-section was done because the previous baby was delivered by C-section. Denis did not require resuscitation and was placed under a radiant heater then went to the nursery for 2 days.

During the day time he was brought to his mother Tatiana for breastfeeding. During the night he was fed with infant formula with a baby bottle. On day 4 the mother notices that the umbilicus was red and smelling foul. The neonatologist assessed Denis completely, the assessment was normal. He was requested a complete blood screenings, a Gram-stained smear from the umbilicus and he was given Ampicillin IV. Denis was sent to a special isolation department where all the care was provided by a nurse in charge of 5 newborns.

1st question: What are the possible diagnoses for Denis?

2nd question: Do you agree on what was done for Denis since his birth? What could have been done differently?

3rd question: When Denis could be discharged from the maternity? What recommendation are you giving to the mother?

Possible answers

1st question: What are the possible diagnoses for Denis?

- Denis has only a red and smelling foul umbilicus without other signs of infection. It is a localized umbilical infection.

2nd question: Do you agree on what was done for Denis since his birth? What could have been done differently?

- Incorrect actions since Denis' birth:
 - Denis and his mother were separated after birth during 2 days
 - Denis was fed in the nursery department during the night with infant formula with a baby bottle during the first 2 days
 - As the signs of umbilical infection were found Denis was separated again from his mother and sent to a special department where the nurse was in charge of too many newborns; ideal ratio 1-3
 - Due to this transfer breastfeeding will probably have been interrupted
 - The treatment with IV antibiotic was not necessary
 - Denis didn't receive any local treatment for his infected umbilicus.
- What could have been done differently:
 - Denis could have been put in skin to skin contact with his father (or with another relative) after birth
 - Denis and Tatiana should not have been separated during 2 days and a relative could have helped Tatiana to take care of her baby, thus the baby would have been breastfed
 - Denis did not require any IV antibiotic as he had a localized umbilical infection without other sign of infection
 - Denis required local treatment with **0,5% Gentian Violet solution** and strict monitoring
 - Train the mother to treat her baby whenever it is possible.

3rd question: When Denis could be discharged from the maternity? What recommendation are you giving to the mother?

- After 2 days of local treatment with signs of improvement Denis can be discharged telling the mother to continue the local treatment until the infection is over
- Denis can be discharged from maternity if in addition:
 - His temperature is stable at 36.5-37.5°C
 - The baby is alert and feeding well
 - The baby is breathing well and his heartbeat rate is >100
 - The baby has no convulsions and any signs of disease
 - Immunizations are done according to the national guidelines
- The mother should be trained to take care for her baby at home:
 - Train to recognize "Danger Signs" and to know when to seek for urgent care.

Part II – Clinical Practice - 150 min

Activity 5 – Demonstration of assessment of an infected newborn or a newborn receiving antibiotic (150 minutes)

- Ensure that during the theoretical week participants understood the key points of the management of newborns with bacterial infection
- Ask the Course Director and/or the head of maternity to help the facilitators to select 3 neonates with infection or receiving antibiotics

Newborn with severe breathing difficulties, history of convulsions need to be excluded from this selection

- Meet the mothers to get their agreements to their newborns' examination.
- Assess in details the 3 medical files of the selected newborns to collect all necessary information:
 - Gestational age and birth weight
 - Date of birth and newborn age (in days or hours)
 - Risk factors (intrapartum fever, prolonged membrane rupture, infections in pregnancy, sepsis history in previous children, neonatal resuscitation)
 - Birth scenario, complication during labour and birth
 - Newborn's condition at birth (breathing, heartbeat rate, skin, floppiness);
 - Ask the mother:
 - how skin-to-skin was conducted
 - How and when the baby was fed: breastfeeding or other
 - Feeding quantity
 - Was the baby roomed-in with the mother or transferred to NICU or nursery
 - Is the newborn's temperature monitored?
 - What investigations (biological tests and instrumental investigations) were done and what are the results?
 - What treatment was given (when, doses and frequency)?
 - How is the newborn monitored?
 - Does the mother take care of her baby (this question is especially important if the baby is in the nursery or in NICU)?
 - Medical history of the newborn from birth until the assessment.
- **All these information need to be communicated to participants verbally before the examination or if you have the possibility print and give the information to them**
- One facilitator will demonstrate in front of the entire group good technique for assessing an infected baby or a baby treated with antibiotics following the steps listed in Table 1 (30 min in the room and 30 minutes discussion).

Table 1. Demonstration of assessment of a newborn with a suspected infection

Step	Action	Details
1	Wash your hands	Soap, towel, water
2	Prepare environment for assessment	<ul style="list-style-type: none"> • Warm room (no less than 25°C) • Warm surface (table) • Good light • Source of radiant heat • Warm blanket/cloths
3	- Greet the mother and - Ask her permission to assess her baby in front of participants	<ul style="list-style-type: none"> • Welcome the mother • Introduce yourself • Congratulate her on the birth of her baby
4	General information from mother	<p>Ask the mother:</p> <ul style="list-style-type: none"> • Name of the baby and gender • Date of baby's birth, birth weight • How pregnancy and labour progressed: assess risk factors • Newborn problems at birth: was the baby resuscitated or had any problems? • Did the baby face any problems during the first days of life (fever, jaundice, breathing difficulties, convulsions, skin or eyes problems, etc)? • Did she know if her baby received any treatment?
5	Ask mother about baby's health	<p>Ask the mother newborn problems in these days:</p> <ul style="list-style-type: none"> • jaundice, breathing difficulties, convulsions, skin pustules, eyes redness, etc • baby's last temperature on assessment day, if available • baby's treatment • how is the baby feeding now: <ul style="list-style-type: none"> ○ does the baby receive any artificial feeding ○ how many times he is breastfeeding ○ did the baby vomit or regurgitate
6	Record received information on note pad	
7	Before undressing the baby	<ul style="list-style-type: none"> • Check for spontaneous activity • Count respiratory rate during 1 minute • Listen for grunting • Check for eyes and skin lesions • Check for full or bulging fontanel
8	Undress the baby gently	<ul style="list-style-type: none"> • Conduct the assessment only if the baby is in a good condition <ul style="list-style-type: none"> ○ Assess jaundice localization according to Kramer Scale ○ Assess umbilicus and skin for possible infection: Red umbilicus, or draining pus, skin pustules

Step	Action	Details
9	Check for baby's activity	<ul style="list-style-type: none"> ○ Check for abdomen distension ● Check for infant 's movements: <ul style="list-style-type: none"> ○ Does the infant move only when stimulated? ○ Is the infant motionless even when stimulated?
<p>Thank the mother and ask her if she has any question. The clinical examination is finished; the baby needs to be dressed again and given back to his /her mother. Ask her kindly if she agrees to breastfeed her baby in front of the participants</p>		
12	Assess breastfeeding or other feeding method	<ul style="list-style-type: none"> ● Is the attachment correct? ● Is the position correct? ● Does the baby suckle effectively? <p><i>Observe it carefully, take notes and ask the participants to take note on all these issues because you will ask them to answer these questions later.</i></p> <p>If other feeding method:</p> <ul style="list-style-type: none"> - Assess appropriateness of the method - quantity - frequency - any incident
13	<p>Once out of the mother room lead the discussion with the participants:</p> <ol style="list-style-type: none"> 1. Does the baby have a good general status?? 2. Analyse the results of the clinical assessment <ul style="list-style-type: none"> ○ localisation of jaundice ○ baby activity ○ signs of infections ○ liver and spleen ○ urine and stools 3. Ask the participants to evaluate the quality of feeding 4. Ask the participants to interpret the results of biological tests and other investigations 5. Ask the participants to evaluate the quality of treatment (including timeliness) <ul style="list-style-type: none"> ○ drugs ○ infusion ○ supportive care 6. Ask when the baby can be discharged home 	
<ul style="list-style-type: none"> ● After the demonstration split the participants into 2 groups: 1 group with 1 facilitator. ● Remind briefly the methodology of newborn examination, according to Table 1. ● Nominate one participant in each group to perform the examination for 20 min maximum ● Ask the other participants not to make any comments during the examination. Participants should make their notes and comments in note pads. 		

- Each group “receives” a baby with infection or suspected infection to be assessed; the facilitator will provide all information on each case.
- Ensure that **the participants wash their hands**.
- Ensure that the participants follow the main requirements of keeping the baby warm during assessment.
- Ask the sub group to come back to the class room to list during 10 min :
 - What was correctly done
 - What could have been done differently according to module 5N (medical history, biological and other investigations, treatment, monitoring feeding, and supportive care)

Coordinate the conclusion of the clinical activities with the entire group for approximately 10 min

References

1. A. Durandy, Development of specific immunity during prenatal life, 2001
2. Ann L Anderson-Berry Neonatal Sepsis University of Nebraska School of Medicine Updated August 18,2006
3. Barbara J. Stoll et al., Late-Onset Sepsis in Very Low Birth Weight Neonates: The Experience of the NICHD Neonatal Research Network. PEDIATRICS Vol. 110 No. 2 August 2002, pp. 285-291
4. Candice E. Johnson, Judy K. Whitwell, Kalpana Pethe, Kapil Saxena, and Dennis M. Super. Term Newborns Who Are at Risk for Sepsis: Are Lumbar Punctures Necessary? PEDIATRICS Vol. 99 No. 4 April 1997, p. e10
5. Chalmers I, Enkin M, Keirse MJNC, eds. Effective care in pregnancy and childbirth. Oxford, Oxford University Press, 1989
6. Claudio Chiesa, Alessandra Panero, John F. Osborn, Antonella F. Simonetti and Lucia Pacifico. Diagnosis of Neonatal Sepsis: A Clinical and Laboratory Challenge. Clinical Chemistry. 2004;50:279-287
7. Cochrane Database Systematic Rev 2003; (3) Webster J, Pritchard M.A. Gowning by attendants and visitors in newborn nurseries for prevention of neonatal morbidity and mortality
8. Cochrane review relevant references: Antibiotic regimens for suspected early neonatal sepsis
9. Cochrane review relevant references: Antibiotic regimens for suspected late onset sepsis in newborn infants
10. Cochrane review relevant references: Gowning by attendants and visitors in newborn nurseries for prevention of neonatal morbidity and mortality
11. Cochrane review relevant references: Intraventricular antibiotics for bacterial meningitis in neonates
12. Cochrane review relevant references: One dose per day compared to multiple doses per day of gentamicin for treatment of suspected or proven sepsis in neonates
13. Cochrane review relevant references: Patient isolation measures for infants with candida colonization or infection for preventing or reducing transmission of candida in neonatal units
14. Essential new born care and Breastfeeding PEPC WHO 2002
15. Essential Newborn care and Breastfeeding WHO Euro 2002
16. Handbook IMCI Integrated Management of Childhood Illnesses. WHO/FCH/CAH/00.12 Geneva: WHO, 2000.

17. JA Garcia-Prats, TR Cooper. The critically ill neonate with infection: management considerations in the term and preterm infant. Seminars in pediatric infectious diseases, Saunders Company. 2000.
18. Kenyon S., Boulvain M. Antibiotics for preterm premature rupture of membranes. In: The Cochrane Library, Issue 2, 2002. Oxford: Update Software
19. Kenyon SL., Taylor DJ., Tarnow-Mordi W, for the ORACLE Collaborative Group. Broad-spectrum antibiotics for preterm, prelabour rupture of fetal membranes: the ORACLE I randomised trial. Lancet 2001;357:979-88
20. Klein J, Marcy S. Bacterial sepsis and meningitis. Mosby, 1995
21. Lawn J.E. et al., Statistical annex – World Health Report 2005. Geneva: World Health Organization, 2005
22. Lawn, J, Simon Cousens, Jelka Zupan. Neonatal Survival 1: 4 million neonatal deaths: When? Where? Why? Lancet, Vol. 365 March 5, 2005
23. Managing Newborn Problems: A guide for doctors, nurses, and midwives. WHO, Geneva, 2003
24. Martin Weber and all. Predictors of neonatal sepsis in developing countries. Pediatr Infect Dis J, 2003; 22:711–16
25. Pocket book of Hospital care of children. Guidelines for the management of common illnesses with limited resources. WHO, 2005
26. Pong A, Bradley JS. Bacterial meningitis and the newborn infant. Infect Dis Clin North Am. 1999 Sep;13(3):711-33
27. Pregnancy, Childbirth, Postpartum and newborn Care: A guide for essential practice. WHO, Geneva, 2006
28. Prevention of perinatal Group B Streptococcus Disease. Revised guideline from CDC. August 16, 2002
29. Randall W King, David Johnson. Osteomyelitis. eMedicine from WebMD. July 13, 2006
30. S Vergnano, M Sharland, P Kazembe, C Mwansambo. P T Heath. Neonatal sepsis: an international perspective Archives of Disease in Childhood Fetal and Neonatal Edition 2005;90:F220-FF224
31. Shelley C Springer and David J Annibale Necrotizing Enterocolitis, eMedicine, 2007
32. The Merk Merck Manuals online medical library. Skin Infections, November 2005
33. The WHO multicentre study group. Clinical prediction of serious bacterial infections in young infants in developing countries. Pediatrics Infection Disease 1999; 18:23–31

34. Tricia Lacy Gomella et al. Neonatology: Management, Procedures, On-Call Problems, Diseases, and Drugs. McGraw-Hill, 2004. 724 p
35. William E. Benitz, Jeffrey B. Gould, and Maurice L. Druzin Risk Factors for Early-onset Group B Streptococcal Sepsis: Estimation of Odds Ratios by Critical Literature Review in Pediatrics, 1999
36. William E. Benitz, Michael Y. Han, Ashima Madan, Pramela Ramachandra. Serial Serum C-Reactive Protein Levels in the Diagnosis of Neonatal Infection. PEDIATRICS Vol. 102 No. 4 October 1998, p. e41

Case Study 1: Svetlana and Andrey

Svetlana gave birth to Andrey after 40 weeks of a normal pregnancy. The birth was normal; Andrey was not resuscitated at birth and was immediately put on his mother's chest for skin-to-skin contact for 10 min. He was breastfed 30 min after birth.

A neonatologist assessed Andrey immediately. The newborn had good clinical condition; he weighed 3,400 g. The baby was swaddled and put in a cradle close to Svetlana. The Mother and the baby were transferred together to the postpartum department for rooming-in. In 10 hours after birth Svetlana called the nurse because she felt that Andrey was breathing fast. The baby was assessed, he was fast breathing with 70 breaths per min, but he did not have chest indrawing neither grunting. His temperature was 35.6°C and he refused to breastfeed.

1st question: What are the possible diagnoses for Andrey?

2nd question: What are the biological tests you will ask, if any?

3rd question: How do you take care of Andrey immediately?

Case Study 2: Maria and Stephan

Stephan was born after 38 weeks of the second normal pregnancy of Maria. During the labour Maria had temperature 38.2 °C but the birth was normal and Stephan was put on her mother's chest in skin-to-skin contact immediately and was breastfed 25 minutes after birth.

The neonatologist assessed Stephan after 2 hours and he found that this 3,200 g baby was in a good condition. Maria and Stephan were transferred together to the postpartum department for rooming-in. When the neonatologist assessed Stephan for the second time 16 hours after birth he discovered that the baby was fast breathing 80 per min with a severe chest indrawing. Stephan's temperature was 37.8°C and he did not show interest in breastfeeding.

The neonatologist decided to immediately transfer Stephan to NICU. An umbilical venous catheter was immediately placed. Stephan received IV fluids, including Ampicillin, gentamicin IV and immunoglobulin.

Results of blood screening tests:

Leucocytes: $26 \times 10^9/L$

Leukocytes index: 0.44
CRP: 11 mg/L
Erythrocytes sedimentation rate: 10 mm

1st question: What are the possible diagnoses for Stephan?

2nd question: How do you interpret the results of the biological tests? Do you want more tests? If yes, which tests and why?

3rd question: Do you agree on what was done for Stephan? What could have been done differently?

Case Study 3: Olena and Anna

Olena gave birth to Anna 2,100 g after 33 weeks of gestation. The pregnancy and birth were normal. Immediately after birth Anna was assessed by a neonatologist under a radiant heater. Her clinical condition was good but the neonatologist decides to transfer Anna to NICU because she was born preterm and was only 2,100 g.

Anna's clinical condition was monitored in NICU for 1 day where she was fed by gavage with infant formula. Then she was transferred to post-partum department to be roomed in with her mother. She was not suckling very well and was fed with expressed breast milk with a cup. On the 4th day after birth Anna started to regurgitate after each feeding. Her temperature was instable from 36.2°C to 37.8°C. She was fast breathing: 64 breaths per minute but she did not have chest indrawing nor grunting. Her abdomen was distended.

She was immediately readmitted to NICU, where she got several blood tests and a lumbar puncture. A venous umbilical catheter was inserted and Ampicillin + Gentamicin + Cefotaxime + immunoglobulin were given IV.

Results of blood screening tests:

Leucocytes – $18 \times 10^9/L$
Leukocytes index – 0.28
CRP – 12 mg/L
Erythrocytes sedimentation rate - 18 mm
The results of the lumbar puncture were normal.

1st question: What are the possible diagnoses for Anna?

2nd question: How do you interpret the results of the biological test? Do you want more tests? If yes, which tests and why?

3rd question: Do you agree on what was done for Anna? What could have been done differently?

Case study 4: Tatiana and Denis

Denis was born by C-section after 41 weeks of a normal pregnancy. The C-section was done because the previous baby was delivered by C-section. Denis did not require resuscitation and was placed under a radiant heater then to the nursery for 2 days.

During the day time he was brought to his mother Tatiana for breastfeeding but during the night he was fed by infant formula with a baby bottle. On day 4 the mother notices that the umbilicus was red and smelling foul. The neonatologist assessed Denis completely, the assessment was normal. He was requested a complete blood screenings and a Gram-stained smear from the umbilicus and he was given Ampicillin IV. Denis was sent to special isolation department where all the care was provided by a nurse in charge of 5 newborns.

1st question: What are the possible diagnoses for Denis?

2nd question: Do you agree on what was done for Denis since his birth? What could have been done differently?

3rd question: When Denis could be discharged from the maternity? What recommendation are you giving to the mother?

Care of a Newborn with Birth Defects/Congenital Malformations or Birth Trauma

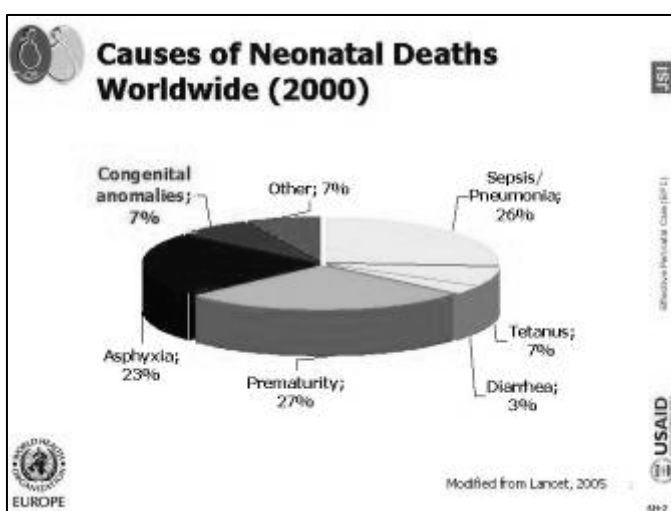
Care of a Newborn with Birth Defects/Congenital Malformations or Birth Trauma

Module 6N

Slide 6N-1 Care of a Newborn with Birth Defects/Congenital Malformations or Birth Trauma

At the end of this module, the participants will:

- Know how to Assess, Classify and Treat newborns with birth defects/ congenital malformations or birth trauma
 - Understand how to take care of a newborn with congenital birth defects /congenital malformations or birth trauma
- Learn effective and safe skills to care for newborns with birth defects /malformations or birth trauma.



Slide 6N-2 Causes of Neonatal Deaths Worldwide (2000)

Congenital malformations or birth defects are responsible for 7% of neonatal deaths in the world.

In developed countries, many of congenital malformation could be diagnosed during the antenatal period. Nevertheless, in these countries the neonatal mortality due to congenital malformations is high, as compared with lower neonatal mortality caused by infection and asphyxia.

Joy E lawn, Simon Cousens, Jelka Zupan, for the Lancet Neonatal Survival Steering Team. 4 million neonatal deaths: When? Where? Why? The Lancet, March 2005, 9-18.

Birth Defects/Congenital Malformations

- 3-5 % of all birth result in birth defect/congenital malformation
 - Minor birth defects (extra finger/fingers, toe/toes, skin tag, Cleft Lip or Clef Palate or Club Foot)
 - Major birth defects (e.g. Diaphragmatic Hernia, Spina Bifida, Meningomyelocele, Oesophageal Atresia, Gastroschisis/Omphalocele, or Imperforate Anus)
 - Genetic birth defects (e.g. Down Syndrome)
- Major malformation required advanced care and the newborn needs to be transferred to a third level hospital
- If one malformation is found check for others

Robinson A, 1993
WHO, 2003

Slide 6N-3 Birth Defects/Congenital Malformations

A birth defect or congenital malformation is an abnormality of structure, function or metabolism (body chemistry) present at birth that results in a physical or mental disability, or is fatal. Several thousand different birth defects have been identified. Birth defects are the leading cause of death in the first year of life.

March of Dimes Perinatal Data Center. Maternal, Infant, and Child Health in the United States, 2001.

Both genetic and environmental factors can cause birth defects. However, the causes of about 60 to 70 percent of birth defects are currently unknown.

Malformations often come in clusters; if you find one malformation, check for others.

Frequency of minor and severe congenital malformations comprise 3-4% of all births.

Robinson A. and Linden MG. Clinical Genetic Handbook, Boston, Blackwell Scientific Publications, 1993.

Care for newborns with minor birth defects can be provided in any maternity and the baby doesn't need to be separated from his/her mother. These newborns need to be kept warm, breast-fed and receive care from their mother.

Newborns with severe abnormalities need to be transferred to a third-level medical facility for special care and treatment.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.

Assessing and Classifying Newborns with Birth Defects or Birth Traumas

At birth dry the newborn immediately

Assess:

- Breathing → Normal
- Heartbeat rate → >100/minute
- Weight / Gestational Term → >2500 g/>37 weeks
- Birth defect or birth trauma → Present

Classify: → Specify birth defect/birth trauma

Treat: → Appropriate treatment (if possible)

WHO, 2002

Logos: USAID, WHO EUROPE, USAID

Slide 6N-4 Assessing and Classifying Newborns with Birth Defects or Birth Traumas

Immediately after birth, as the baby is dried, conduct an immediate assessment to see if there is a need for immediate care such as neonatal resuscitation.

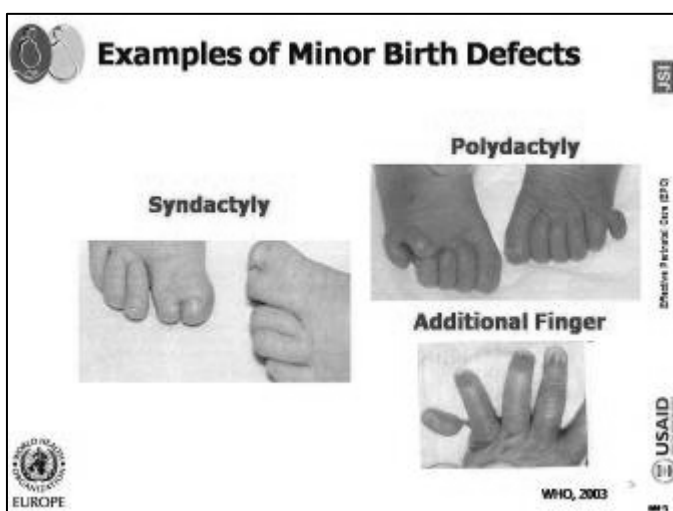
If the newborn is breathing well, has heartbeat rate over 100 per minute and become rapidly pink, he/she do not need any resuscitation measure.

This rapid assessment allows recognising important malformation which need

immediate treatment such as, Spina bifida or Gastroschisis.

The majority of threatening life malformations need to be treated in a third-level medical facility, in this case the newborn with a severe birth defect must be prepared for transportation.

Essential Newborn Care and Breastfeeding: Training Module. WHO Euro, Copenhagen, 2002.



Slide 6N-5 Examples of Minor Birth Defects

Newborns with minor birth defects should stay with their mother in the facility and if necessary, eventually and timely referred to a specialised institution/department.

These newborns require essential care: to be kept warm, to be breastfed, to receive dry cord care management and to be immunised. They can be discharged from hospital on a standard basis.

The mother needs to be reassured and trained to observe the newborn and to

provide appropriate care if any.

Managing Newborn Problems: A guide for doctors nurses and midwives.
WHO, Geneva, 2003.



Slide 6N-6 Minor Birth Defect: Cleft Palate

Cleft palate is a frequent congenital malformation. The malformation may be limited to the lip or could involve the hard and soft palate. The malformation can be unilateral or bilateral.

The major problem for newborns with cleft palate during the first months of life is feeding.

If the malformation is minor, the newborn can breastfeed. If the malformation is more complex alternative feeding

methods are recommended, such as spoon or syringe to feed with expressed breast milk; in some cases an obturator should be applied.

Newborns with cleft palate are at risk for milk aspiration and may not gain weight well.

The date for surgical correction depends on the type of malformation: 3-6 months for cleft lip and 9-12 months for cleft palate.

Managing Newborn Problems: A guide for doctors nurses and midwives.
WHO, Geneva, 2003.

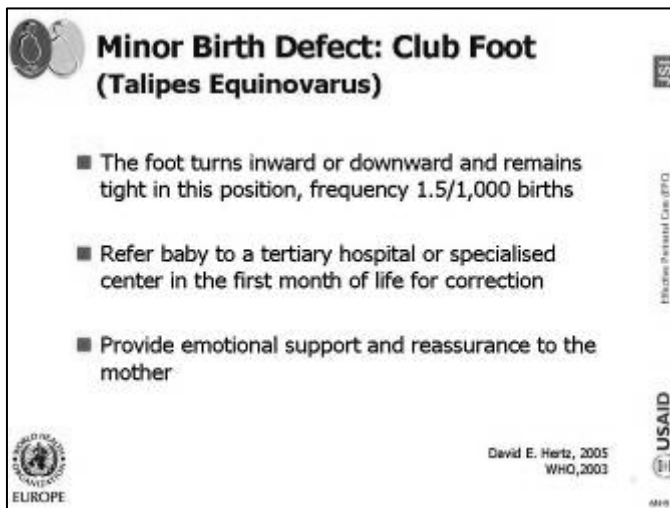
Essential Newborn Care and Breastfeeding: Training Module.
WHO Euro, Copenhagen, 2002.



Slide 6N-7 Cleft Lip with Cleft Palate

Photograph of a newborn with cleft lip involving also the palate.

“Mother and Infant Health Project”, JSI, Ukraine.2004



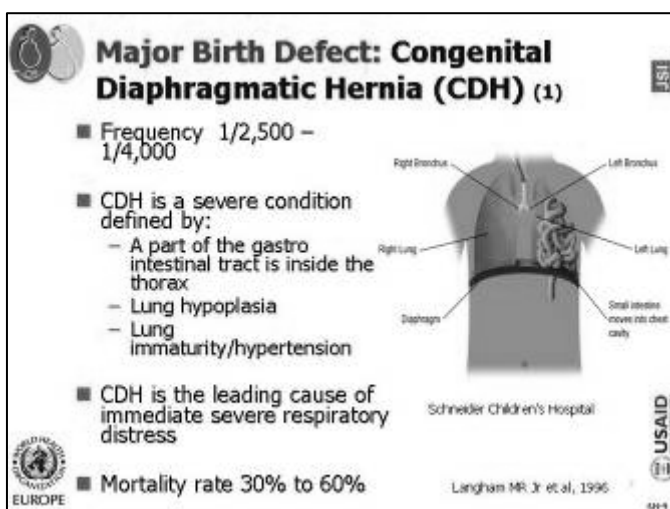
Slide 6N-8 Minor Birth Defect: Club Foot (Talipes Equinovarus)

Provide emotional support and reassurance to the mother.

Refer to a specialized department within one month, if necessary, to treat the club foot.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003

David E. Hertz. Care of the Newborn: A Handbook for Primary Care. Lippincott Williams & Wilkins, 2005, p 234.



Slide 6N-9 Major Birth Defect: Congenital Diaphragmatic Hernia (CDH) (1)

Congenital diaphragmatic hernia is a severe abnormality defined by:

- Lung hypoplasia (*most severe on the affected side*)
- Structural and functional lung immaturity
- Reduction of pulmonary arteriolar cross
- Muscular hyperplasia of remaining pulmonary arterioles.

In almost 20 % of cases CDH is associated with other major anomalies.

After birth the following clinical signs could be observed:

- Chest movements are not well coordinated with baby's breathing rhythm
- Breath sounds are absent on the affected side

- Bowel sounds are heard in the chest
- Concave abdomen that feels less full when touched.

March of Dimes Perinatal Data Center. Maternal, Infant, and Child Health in the United States, 2001.

Langham MR Jr et al. Congenital diaphragmatic hernia. Epidemiology and outcome. Clin Perinatol. 1996 Dec, 23(4), 671-88.

Congenital Diaphragmatic Hernia (CDH) (2)

- Management in cases of known or suspected CDH:
 - Refer mother to 3rd level of care before delivery
 - Ensure that extensive resuscitation can be provided
 - **DO NOT VENTILATE WITH BAG AND MASK**
 - Intubate the newborn immediately
 - Ensure positive pressure ventilation
 - Insert large nasogastric tube to decompress stomach and small bowel
 - Look for other anomalies
- Provide emotional support and reassurance to the mother

WHO, 2003
Dwayne C. Clark, 1999

Slide 6N-10 Congenital Diaphragmatic Hernia (CDH) (2)

During the antenatal period:

- If ultrasonography confirms the diagnosis, refer the pregnant woman to the 3rd level health facility

Delivery Strategy: In a full term pregnancy spontaneous vaginal delivery is recommended.

Principles of postnatal care:

- If unexpected delivery occurs in a

low level of care facility, resuscitation must be undertaken and supervised by the most experienced clinician available

- **Never ventilate with bag and mask, intubate immediately**
- Establish venous access
- Insert a large gastric tube to decompress the stomach and small bowel
- Transfer to specialized surgery department
- Provide emotional support and reassurance to the mother.

Krisa Van Meurs, Billie Lou Short. Congenital Diaphragmatic Hernia: The Neonatologist's Perspective. Paediatrics in Review. 1999, 20, 79-87.

Major Birth Defect: Oesophageal Atresia

- Is an interruption on the oesophagus, frequency 1/4,000
- Oesophageal atresia can be suspected with the following symptoms:
 - Polyhydramnios
 - Excessive salivation at birth
 - It is impossible to insert a gastric tube
 - Cough, difficult breathing and apnoea during feeding
- Do not allow the baby to receive anything by mouth
- Establish an IV line, and give only IV fluids at maintenance volume according to the baby's age
- Transfer the baby to a tertiary hospital or to a specialised surgical ward
- Ensure free drainage during transport
- Provide emotional support and reassurance to the mother

WHO, 2003
Dwayne C. Clark, 1999

Slide 6N-11 Major Birth Defect: Oesophageal Atresia

Oesophageal atresia is a severe malformation requiring urgent treatment. Ultrasonography supports antenatal diagnostic. Polyhydramnios is associated in 60% of cases or difficulty detecting the foetal stomach.

If the diagnosis is suggested during the antenatal period the pregnant woman needs to be referred to a special multidisciplinary fetal diagnostic/management team.

At birth if clinical signs are observed such as excessive salivation, breathing difficulties, cough or apnoea, a trial should be made to gently insert a suction catheter or feeding tube (size 8-10F

is adequate) into the stomach before the first feeding, then inject 2 or 3 cm³ of air while listening to the stomach with a stethoscope. If the tube is in the stomach, the sound of air will be heard.

The diagnosis of oesophageal atresia is confirmed if it is impossible to insert the tube into the stomach. Most often only half of the tube can be inserted; when air is pushed in it comes back into the mouth.

A smaller, softer tube may curl up in the upper oesophageal pouch and give a false negative result.

Establish an IV line, and give only IV fluids at maintenance volume according to the baby's age. Insure that the baby is in supine position with the head up (approximately 30 to 60 degrees). Insure free drainage.

The baby should be transported to a level III surgical neonatal unit as soon as possible. Provide emotional support and reassurance to the mother.

Dwayne C. Clark. Oesophageal Atresia and Tracheoesophageal Fistula. American family Physician, February 15, 1999, Vol. 59, № 4.

Major Birth Defect: Imperforate Anus

- Frequency 1/5,000 births
- Do not allow the baby to receive anything by mouth
- Establish an IV line, and give only IV fluids at maintenance volume according to the baby's age
- Insert a gastric tube and ensure free drainage
- Transfer the baby to a tertiary hospital or to a specialised surgical ward
- Sometime the anus is covered with a piece of skin: in such cases surgery is often delayed by 1-2 days
- Provide emotional support and reassurance to the mother

WHO, 2003

USAID

EUROPE

Slide 6N-12 Major Birth Defect: Imperforate Anus

Imperforate anus is a severe congenital malformation, which may be complicated by intestinal obstruction and requires surgical correction. Imperforate anus is identified during the first complete newborn examination within 2 hours after birth.

In case of imperforate anus, the abdomen can swell; there is an absence of meconium discharge, and vomiting. Some newborns have imperforate anus with fistula, the meconium is discharged in

uncommon places: through vagina, perineum, or with urine.

Do not let the baby receive anything by mouth: establish an IV line and give only IV fluids at maintenance volume according to the baby's age.

Insert a gastric tube and ensure free drainage. Transfer the baby to a tertiary level hospital or to a specialised ward.

Provide emotional support and reassurance to the mother.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.



Slide 6N-13 Imperforate Anus

Photograph of a newborn with imperforate anus.



Slide 6N-14 X-ray of a Baby with Imperforate Anus

This x-ray (invertogram) shows there is no air in the rectal canal.

Major Birth Defects: Gastroschisis and Omphalocele

- **Gastroschisis:** Defect of anterior abdominal wall just lateral to the umbilicus which is associated with an evisceration of the gastro intestinal tract; frequency 1/10,000
- **Omphalocele:** Covered defect of the umbilical ring, into which the intra abdominal contents herniate; frequency 1/5,000
- Do not allow the baby to receive anything by mouth
- Provide emotional support and reassurance to the mother

Logos: WHO EUROPE, USAID, JSI

Text: Effective Perinatal Care (EPIC), David E. Hertz, 2005 WHO, 2003, 6N-15

Slide 6N-15 Major Birth Defects: Gastroschisis and Omphalocele:

- Is a defect of the anterior abdominal wall just lateral to the umbilicus which is associated with an evisceration of the gastro intestinal tract
- The surface of the bowel is usually oedematous and matted and it is not covered by a membrane
- Associated anomalies are reported in up to 15% of cases (mainly gastrointestinal)
- Preterm delivery and growth restriction are frequent

- Necrotising enterocolitis and malabsorption may occur
- Survival rates are about 90%.

Omphalocele (Exomphalos):

- Is a malformation of the abdominal ring of the umbilicus
- Covered by a thin membrane of amnion and peritoneum

- Herniation of abdominal content is variable , the liver could accompany the intestine if there is a large sac, intestine are present if it is a small sac
- Associated anomalies are very frequent in 45 – 67% of cases
- Survival rates are mainly dependent on the presence of associated anomalies
- Necrotising enterocolitis and malabsorption are associated complications.

David E. Hertz. *Care of the Newborn: A Handbook for Primary Care.*
Lippincott Williams & Wilkins, 2005, p. 234.

Managing Newborn Problems: A guide for doctors, nurses and midwives.
WHO, Geneva, 2003.

Gastroschisis and Omphalocele

- Establish an IV line, and give only IV fluids at maintenance volume according to the baby's age
- If the defect is not covered with skin
 - Cover with sterile gauze soaked in sterile warm normal saline
 - Insure that the gauze is kept moist at all times and keep the baby warm
- Insert gastric tube and secure free drainage
- Transfer the baby to a tertiary hospital or if possible to a specialised surgical ward

WHO, 2003

Slide 6N-16 Gastroschisis and Omphalocele

In addition to essential care before referral to a specialised surgical ward:

- Provide emotional support and reassurance to the mother
 - Do not let the baby receive anything by mouth
 - Establish an IV line , and give only IV fluids at maintenance volume according to the baby's age
 - Transfer the baby to a tertiary level hospital or specialised surgical ward
- Monitor temperature frequently. Patients with a ruptured exomphalos sac or gastroschisis may have major problems with temperature control due to evaporative heat loss.

Managing Newborn Problems: A guide for doctors, nurses and midwives.
WHO, Geneva, 2003.

Omphalocele



WHO, 2003

Slide 6N-17 Omphalocele

Please pay attention that the provider holding the cord clamp in this photo is not wearing gloves thus not practicing universal precautions.

Birth Traumas/Birth Injuries

List avoidable and unavoidable mechanical traumas incurred by the infant during labour or delivery, frequency 2-7 per 1,000 births

Predisposing factors:

- Macrosomia
- Prematurity
- Cephalo-pelvic disproportion
- Dystocia
- Prolonged labour
- Instrumental delivery
- Breech presentation

WHO, 2002
JCAHO, 2004

Slide 6N-18 Birth Traumas/Birth Injuries

Birth injuries are mechanical injuries avoidable or inevitable.

Predisposing factors include macrosomia, prematurity, cephalopelvic disproportion, dystocia, prolonged labour and breech presentation as well as instrumental deliveries (vacuum, forceps) (ENC, 2002, page 108)

Joint Commission on Accreditation of Healthcare Organizations. Sentinel Event Alert, issue 30: Preventing infant death and injury during delivery. July 21, 2004.

Essential Newborn Care and Breastfeeding: Training Module. WHO Euro, Copenhagen, 2002.

Cephalohaematoma

Sub periosteal haemorrhage, may be large and bilateral

Haemorrhage is restricted by the bone sutures

Swelling is usually not visible until several hours after birth

May require 3-5 weeks to reabsorb and may prolongs neonatal jaundice

Does not require any treatment

Promote early contact between mother and newborn, as well as early breastfeeding

Provide emotional support and reassurance to the mother

WHO, 2002

Slide 6N-19 Cephalohaematoma

One of the most frequent birth injuries is the cephalohematoma – subperiosteal haemorrhage.

A cephalohaematoma occurs when friction during the birth causes blood vessels to rupture between the periosteum and the skull. The blood accumulates under the periosteum. Unless there is a history of prolonged head engagement, a cephalohematoma is not usually present at birth. Its develops slowly during the first 24 hours of life. A cephalohaematoma is a palpable mass more often in the parietal

region; it can be unilateral or bilateral and is limited by the suture lines.

Cephalohaematoma does not need **any treatment** such as ice, or puncture

The cephalohaematoma will disappear spontaneously and completely by 3 months of age. Be alert for hyperbilirubinemia (late onset) and if there has been significant blood loss, look for, mild anaemia.

Essential Newborn Care and Breastfeeding. Training Module. WHO Euro, 2002

Parker, Leslie A. Advances in Neonatal Care: Part 1: Early recognition and treatment of birth trauma, injuries of the head and face [foundations in newborn care]. December 2005, Volume 6(5), p 288-297.

Sub-Aponeurotic (Subgaleal) Haemorrhage

It is a hemorrhage below the epicranial aponeurosis where a large volume of blood can accumulate

Possible cause: Repeated trials of vacuum extraction

Swelling may not be clinically apparent in an infant lying on his/her back who develops a boggy mass on the occipital region

Treatment: Vitamin K IM 1 mg

In rare cases bleeding may be serious and a blood transfusion may be necessary

Provide emotional support and reassurance to the mother

WHO, 2002

Slide 6N-20 Subaponeurotic (Subgaleal) Haemorrhage

A subgaleal haemorrhage is a potentially severe haemorrhage into a large potential space between the skull periosteum and the scalp galea aponeurosis.

The epicranial aponeurosis is a fibrous tissue covering the entire cranial arch. It is a large space (large enough to carry an infant's entire blood volume). Extensive blood loss is possible, and mortality rate is high (22%).

Subgaleal haemorrhage can occur spontaneously but it is more often associated with vacuum or forceps assisted deliveries.

The initial signs of subgaleal haemorrhage are not specific such as generalized scalp oedema and ecchymosis. Important periorbital and periauricular oedema could appear as the haemorrhage progresses. Other signs such as an irritable cry and or cry of pain can be observed, especially when the head is touched.

Most references state there is no definitive treatment . The subgaleal haemorrhage will disappear spontaneously.

In rare cases bleeding may be serious and a blood transfusion may be necessary thus these infants need to be carefully monitored so that clinical signs of anaemic shock can be recognised in time.

Essential Newborn Care and Breastfeeding. Training Module. WHO Euro, Copenhagen, 2002.

Fractured Clavicle

Occurs in 0.2% to 3.5% of all deliveries

More frequently after shoulder dystocia or breech delivery

Fracture is easily palpated

Explain to the mother that the fracture will heal spontaneously usually without residual deformity

No special treatment is necessary

But if moving the arm causes the baby to cry, strap the arm

Have the mother return with the baby in 5 days to remove the bandage

WHO, 2003
Kaplan B et al, 1998

Slide 6N-21 Fractured Clavicle

Fractured clavicle is the most common bone trauma in newborns.

Occurs frequently during shoulder dystocia or in breech presentation.

The fracture is easy to diagnose by clavicle palpation which finds typical crepitation, and displacement of fragments. The infant may have restricted active movements on the affected side, with absent Moro reflex but normal biceps reflex. This fracture can be accompanied by limited arm mobility. In some cases the

fracture is discovered a few days after birth.

No special treatment; however, if arm movements are painful, the arm could be fixed with a bandage on the newborn's chest.

Sometimes the fracture is found later after a bone callus is discovered.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.

Kaplan B, Rabinerson D, Avrech OM, Carmi N, Steinberg DM, Merlob P.
Fracture of the clavicle in the newborn following normal labor and delivery.
Int J Gynaecol Obstet. 1998 Oct, 63(1), 15-20.

Fractured Humerus

Bandage the arm

Place a layer of cotton batting or gauze padding between the affected arm and the chest from the axilla to the elbow

Strap the upper arm to the chest using a gauze bandage

Flex the elbow of the affected arm to 90° and use a separate bandage to strap the forearm across the abdomen in this position

Do not cover the umbilicus with the bandage

Check the fingers twice daily for 3 days; if blue or swollen, rewrap more loosely; observe 3 more days

Have the mother return in 10 days to remove the bandage

Provide emotional support and reassurance to the mother

WHO, 2003

Slide 6N-22 Fractured Humerus

Clinical signs are variable - the baby could seem normal, or could have pain, or may seem paralyzed.

The diagnosis is confirmed by radiography.

The treatment is immobilisation of the arm.

It is important to check the fingers twice daily:

- If the fingers become blue or swollen -

remove the bandage and rewrap it more loosely.

- If the bandage is rewrapped – observe the fingers for blueness or swelling for an additional three days.

This fracture usually heals very well.

Managing Newborn Problems: A guide for doctors nurses and midwives.
WHO, Geneva, 2003.

Fractured Femur

Bandage the leg

Place the baby on her/his back and placed a padded splint under the baby from waist to below the knee of the affected leg

Strap the splint to the baby by wrapping an elastic bandage around the waist and from the thigh to below the knee of the affected leg

Do not cover the umbilicus with the bandage

Check the toes twice daily for 3 days; if blue or swollen, rewrap more loosely; observe for 3 more days

Have the mother return in 14 days to remove the bandage

Provide emotional support and reassurance to the mother

WHO, 2003

Slide 6N-23 Fractured Femur

Clinical signs are variable - legs are not moving symmetrically; leg swelling, leg in abnormal position, baby cries when leg is touched.

Fractured femur requires leg immobilization.

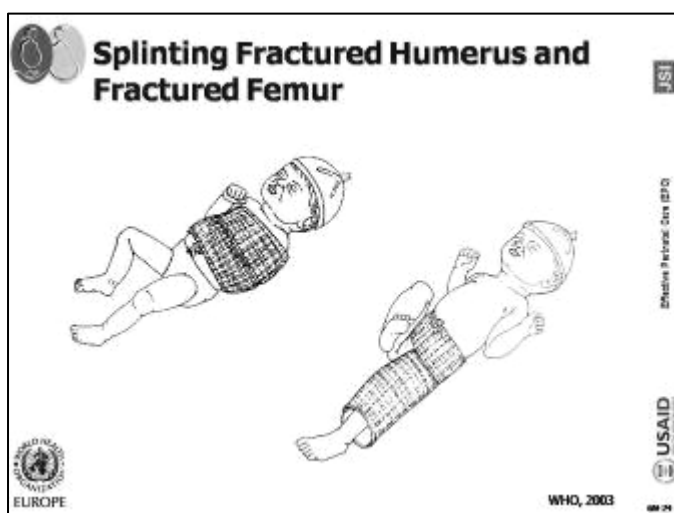
It is important to check the toes twice daily:

- If the toes become blue or swollen - remove the bandage and rewrap it more loosely.
- If the bandage is rewrapped –

observe the toes for blueness or swelling for an additional three days.

Train the mother to care for the baby.

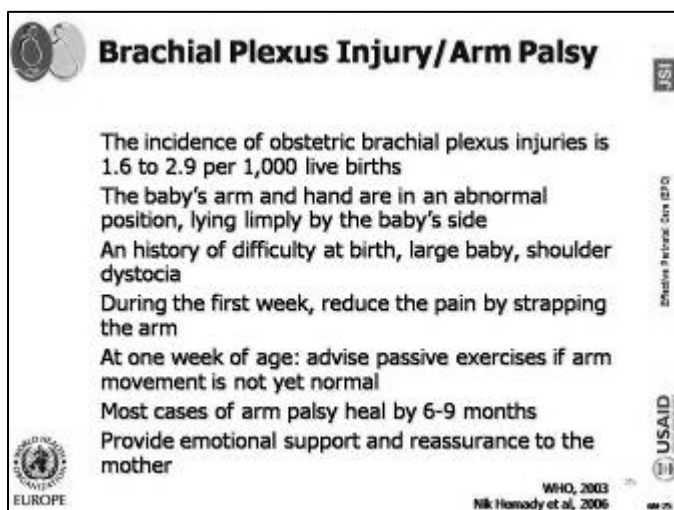
Managing Newborn Problems: A guide for doctors nurses and midwives.
WHO, Geneva, 2003.



Slide 6N-24 Splinting Fractured Humerus and Fractured Femur

Pictures of splinting fractured humerus and fractured femur.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.



Slide 6N-25 Brachial Plexus Injury/Arm Palsy

Approximately 45% of brachial nerve injuries are associated with shoulder dystocia.

They are two categories of arm palsy:
 1. Erb's palsy (also called Erb-Duchenne paralysis). The arm is in adduction with an extended forearm, internally rotated and pronated. It is the classical "porter's tip" or "waiter's tip" appearance. Bicipital and Moro reflexes are absent on the arm. The sensory function is usually preserved.

2. Klumpke's palsy. The distal part of the arm is paralyzed, hand sensitivity and mobility are affected, palmar grab reflex is absent.

arm is paralyzed, hand sensitivity and mobility are affected, palmar grab reflex is absent.

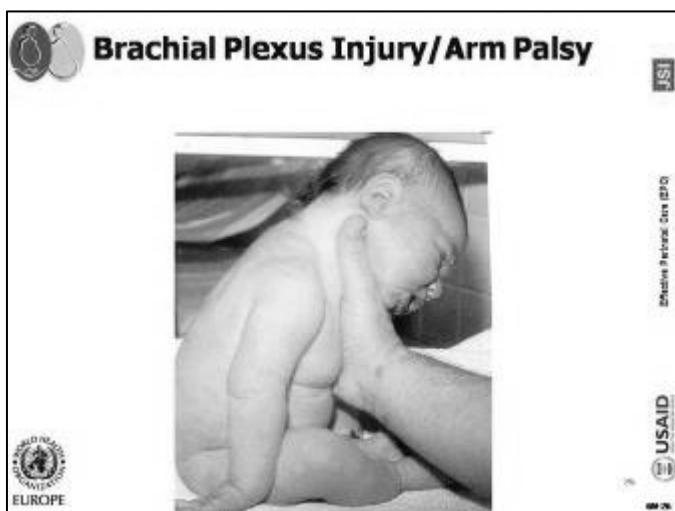
If mobility and sensitivity are not restored within 3 months, newborns need to be referred for specialised treatment.

Selected Differential Diagnosis of Abnormal Arm Posture in a Newborn

Condition	Description
Klumpke's paralysis/palsy	Hand paralysis with possible ptosis (drooping upper eyelid), and myosis (constricted pupil), anhidrosis (decreased perspiration) (Horner syndrome).
Fractured clavicle	Crepitation and bone callus ; occasional bruising; possibly restricted active movements with absent Moro reflex on affected side; biceps reflex present
Erb's palsy	Restricted active movements and absent Moro and biceps reflexes on affected side; "porter's tip" or "waiter's tip" appearance of upper extremity
Fractured humerus	Restricted active movements and absent Moro reflex on affected side, biceps reflex present; crepitus may be felt.

Nik Hemady, Colleen Noble. *Newborn with Abnormal Arm Posture. American Family Physician, June 1, 2006, Vol. 73, No. 11.*

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.

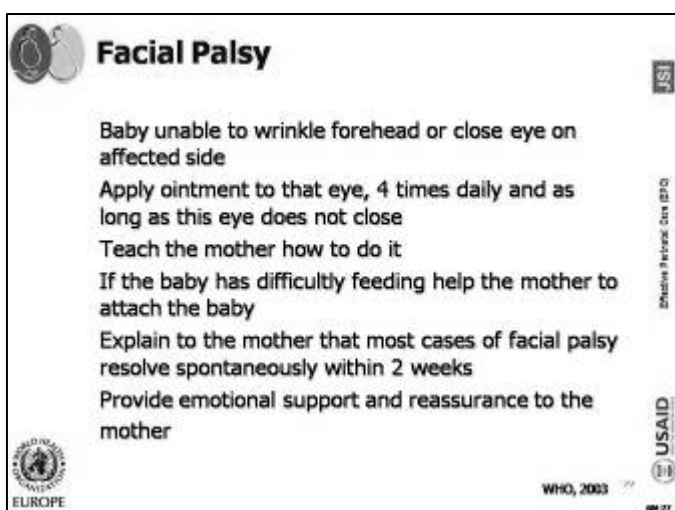


Slide 6N-26 Brachial Plexus Injury/Arm Palsy

Photograph of a brachial plexus injury on the right side.

The injured arm lies limply by the baby's side. The arm is in adduction with an extended forearm internally rotated and pronated.

"Mother and Infant Health Project", JSI, Ukraine.2004



Slide 6N-27 Facial Palsy

Facial nerve palsy is caused by the compression of the facial nerve during the delivery or due to traumatic forceps delivery. Facial palsy usually becomes visible on the first or second day after birth. On the paralyzed side, the nasolabial fold is evened-out, the corner of the mouth droops and when crying, the mouth is drawn to the normal side. The baby is unable to wrinkle forehead or close eye on affected side

Apply ointment to this eye, 4 times daily and as long as this eye does not close.

Teach the mother how to do it.

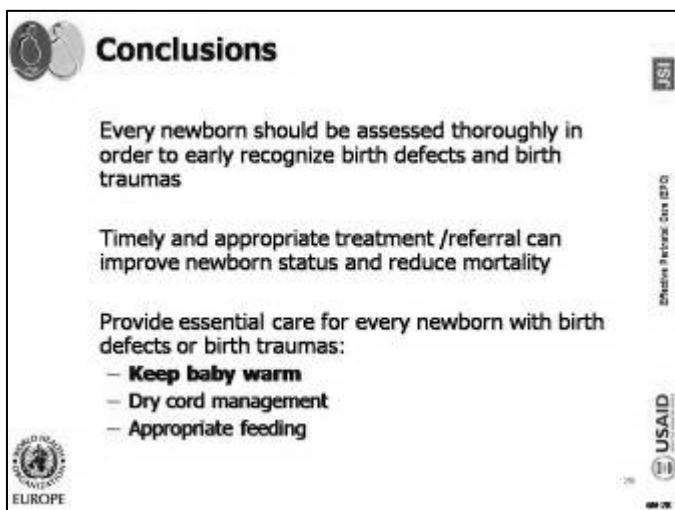
Newborns with facial palsy can have difficulty attaching to the breast.

Most facial nerve palsies resolve spontaneously within days, although full recovery may require weeks to months.

Referral to a specialised department may be necessary if there is no improvement within 10 days.

Managing Newborn Problems: A guide for doctors nurses and midwives. WHO, Geneva, 2003.

Mamta Fulora, Shelley Kreiter. The Newborn Examination: Part I. Emergencies and Common Abnormalities Involving the Skin, Head, Neck, Chest, and Respiratory and Cardiovascular Systems. American Family Physician, 2002, 65, 61-8.



Conclusions

Every newborn should be assessed thoroughly in order to early recognize birth defects and birth traumas

Timely and appropriate treatment /referral can improve newborn status and reduce mortality

Provide essential care for every newborn with birth defects or birth traumas:

- **Keep baby warm**
- Dry cord management
- Appropriate feeding

Logos: WHO, UNICEF, USAID, Effective Perinatal Care (EPC), EUROPE

Slide 6N-28 Conclusions

It is important to recognise the malformation that needs urgent referral.

The family of a baby with a birth defect or one recovering from a birth trauma need to be reassured and counselled.

Module 7N**Low- Birth Weight Baby (LBW)/Small Baby****Care and Feeding****Learning objectives**

By the end of the training the participants should know:

- The definitions for Small Baby, Very Small Baby, Low Birth Weight(LBW) and Very Low-Weight Baby (VLBW)
- The special needs of the Small Baby/LBW
- How to keep the Small Baby/LBW warm
- What additional care is required for the Small Baby/LBW
- Feeding methods for the Small Baby /LBW
- The Kangaroo Mother Care Method and its advantages
- Know the criteria for discharging the Small Baby/LBW from maternity
- How to counsel the mother of a Small Baby/LBW to care for her baby at home

Plan and Duration of the Module:**Part I – Classroom - 110 min**

Activity 1 – Introduction	5	min
Activity 2 – Interactive presentation	90	min
Activity 3 – Conclusion	15	min

Part II – Clinical Work – 180 min

Activity 4 - Cases study	45	min
Activity 5 – Examination of small baby	90	min
Activity 6 – Demonstration of Cup-feeding of Small Baby	30	min
Activity 7- Demonstration of Insertion of gastric tube	15	min

Preparation to the Module

- Review existing publications and materials related to the care and treatment of the small baby.
- Make sure that each of the participants have the Participant Manual
- If possible get information about the existing practices of small baby care in the participant's health facilities.
- Make sure that other facilitators know their duties for this module

Materials and Audio-visual materials

Materials

- Training Manuals for participants
- Case study for group work

Equipment

- Video or slide projector
- Flipchart
- Colour markers
- Badges
- Pens and pencils
- Baby-doll (at least one, preferably 2)
- Clothes for baby-doll
- Cups and spoons for feeding
- Breast model
- Gloves
- Gastric tube (gavage) to demonstrate gavage feeding
- Syringe
- Adhesive tape to fix gastric tube

Key information

- It is important to understand the difficulties involved in caring for small babies, especially in developing countries where 18% of newborn are born “small”. The percentage of small babies in developed countries is 5 – 7 %. Intrauterine growth retardation is the main reason for small babies’ births in developing countries.
- Improving the quality of antenatal care as well as the mother’s health status play an important role in reducing the percentage of LBW births.
- Official y data in NIS countries for small babies *Georgia - 6, 6%, Russia - 6, 1%, Kazakhstan - 5.3%*.
 - These countries do not follow the WHO’s definition of live birth. They register a child born under 1,000g at birth as a late aborting if he dies before day 7.
 - Baltic countries follow the WHO definition of live birth. The percentage of small babies born in Lithuania is 4.5% and for Estonia 4.3% in 2003.
- It is important to remember that **not all small babies are ill babies**; nevertheless small babies are more vulnerable than newborns of a normal weight. They have special needs and thus require special care.
- A small baby stays in the maternity longer than babies of normal weight. Small babies are frequently referred to another care level and they are more prone to become ill.

- At birth small babies are more likely to develop hypothermia thus health care providers should pay special attention to prevent hypothermia and infection.
- Small babies need to be carefully monitored specially during the first hour and days of life.
- The mother of a small baby needs help and support in feeding her baby. The mother should be encouraged to breastfeed her low-weight baby. If the baby is not able to suckle well, alternative feeding methods should be used. The mother needs to be trained to use alternative feeding methods.
- Health care personnel must know and use the Kangaroo Mother Care (KMC) Method to care for small baby.
- It is important to discharge the small baby as soon as possible from the maternity.
- Before discharge, the mother and the family must be counselled on baby care at home and for danger signs that require the baby to be immediately brought to the hospital.

Part I – Classroom – 120 min

Activity 1 – Introduction (5 min)

- Show **Slide 7N-1** and explain that during this Module you will discuss the main principles of effective care for small and very small babies.
- This Module will be taught in two parts: part 1 will focus on work in the classroom and part 2 is the clinical week and will take place in the maternity.

Activity 2 – Interactive presentation (90 min)

- Show **Slide 7N-2** and define what is meant by the term of small baby. Also discuss the definition of very small baby.
- **Slide 7N-3** shows the on the percentage of small babies in EU region and in NIS countries.
- **Ask participants: According to WHO statistics, the number of small babies in NIS countries is decreasing and the number of small babies in EU countries is increasing. How can we compare this data?**
- Stress on the fact that EU countries use the WHO definition of live birth. Explain the WHO definition to participants. A live newborn is the product of conception with at least one sign of life (movement of an extremity, heartbeat, and breathing) despite body weight at birth and gestational age. Therefore in EU countries extremely small babies even < 500g can be declared alive.

- **Slide 7N-4** shows the gestation chart. Use this chart you can assess the correlation of foetal weight and its gestational age, starting from 26 weeks. Explain that the area between the two black lines represents the normal foetal development; the area under the lower line shows insufficient foetal growth. Infants under that line are called “Small for Gestational Age”, during the pregnancy they suffered from, intrauterine growth retardation. Intrauterine growth retardation is caused by many factors. Children above the upper line are called “Large for Gestational Age” for example infants born to mothers with diabetes.
- Explain that the red dot represents a child born after 34 weeks weighing 2.100 g. This child is classified as “low-weight, preterm baby” since his /her weight corresponds to his/her gestational age.
- The green dot represents another child born after 38 weeks weighing 1,600 g. This child is not considered as a preterm baby but he/she is “Small for the Gestational Age”.
- **Ask the participants to use the gestational chart then ask: “What is the normal weight for a baby born at 38 weeks of gestation?”** *The correct answer is - 2,400g - 3,400g. If some participants do not understand the facilitator can ask participants to give more examples of preterm babies and SGA, using the intrauterine growth chart.*
- **Slide 7N-5 - 7N-6** shows the main causes of LBW's births and summarizes the challenges in providing care to small babies **Stress the effects of alcohol and tobacco use by pregnant women on the development of the foetus.**
- **Slide 7N-7** shows the characteristics of LBW. Emphasize that the small baby doesn't have storage of fat and glycogen and they are more at risk for hypothermia. Lack of iron store can lead to anaemia, lack of calcium can lead to hypocalcaemia.
- **Before showing the next slides, ask participants “How do you prepare the birth room for the birth of a small baby” and “What are the main principles of care for a small baby during the first 2 hours in the delivery room”?** *Write all answers on the flipchart.*
- Show **slides 7N-8 - 7N-12** and focus on those details which were not mentioned by participants. Then summarize.
- **Slides 7N-13. Ask participant why the small baby has problems to maintaining a normal temperature?** Stress the fact that the thermoregulation of a small baby is difficult and it could take several days before body temperature is stabilized. Stress that thermal protection for a small baby needs special attention. **It is important to keep a small baby warm.**
- **Slides 7N-14 to 7N-17.** Show the main principles of small baby care in postpartum care. It is important for the baby to room in, to breastfeed early and to receive care provided by the mother. Emphasize that it is mainly the mother who will monitor the baby and provide day to day care, including controlling the baby's temperature. It is important to teach the mother to immediately provide skin-to-skin contact to warm a cold newborn. The medical staff needs to spend enough time to reassure, counsel and support the mother.
- **Slides 7N-18 and 7N-19.** The ways to treat hypothermia are important and valid for any newborn but extremely important for a small baby.

- Underline if the baby is not able to feed at all, begin feeding expressed breast milk by gastric tube once the baby's temperature reaches 35 °C.
- **Slides 7N-20.** List the several challenges involved in feeding the small baby. Stress again on the necessity to feed the baby frequently with small quantities of milk. **Ask participants what they think about the quantity and frequency involved in feeding the small baby.**
- **Slides 7N-21 - 7N-22** illustrate the quantity and the frequency of feeding. Stress again the necessity to feed the small baby frequently with small quantity of milk. This gives the small baby the necessary calories while also taking into consideration their small stomach capacity.
- Ask the question "What is the best feeding method for a "small baby" and show **Slide 7N-23.**
- **Slides 7N-24 - 7N-26.** Selection of a feeding method. Underline that the baby's weight is not the best criteria to guess the baby's ability to suckle. Stress the fact that it is not easy to breastfeed a small baby. Patience and commitments is necessary. And the mother is the best one to do this. She wants what is the best for her baby and is willing to be patient. She is also very committed to her baby's well being. Health care personnel should avoid if possible proposing "easy" feeding methods such as feeding by gavage. Health care personnel need to actively support and counsel the mother to do the best for her baby.
- **Before showing the next slides ask participants how they help the mothers to express their milk. Then show Slide 7N-27.** Teach the mother correct milk-expression techniques.
- **Slides 7N-28 - 7N-31.** Alternative feeding methods: cup-feeding, preparation for cup-feeding, cup-feeding techniques. Alternative feeding methods can replace breastfeeding or complement it. Feeding the very small baby and the sick baby via gavage. Emphasize that the most physiological way is slow gavage over 15-20 minutes.
- **Slide 7N-32.** In some cases, when the baby is not digesting well, feeding needs to be interrupted or the volume needs to be reduced.
- **Slide 7N-33.** Small babies are at risk for developing anaemia and rickets. They need to receive iron and vitamin D supplementation beginning the second week after birth. Breastfed children do not require supplementation of Vitamin A as breast milk contains enough vitamin A.
- Before showing the following slides ask participants: What is the kangaroo Mother Care Method and What are the advantage of this method? Write down all the answers on the flipchart.
- **Slide 7N-34 -7N-38.** KMC technique is described. Answer questions on this issue.
- **Slide 7N-39.** Criteria for discharging a small baby from the maternity. Emphasize that the small baby should be discharged from the maternity as soon as possible. Do not apply an arbitrary weight limit for discharge.

- **Slides 7N-40.** It is important to give all recommendation for home care of the baby to the mother in a written form if possible.
 - Stress that counselling before discharge is extremely important and the staff needs to allocate enough time for it and to use words that the mother can understand.
 - Stress SIDS prevention as preterm babies have a higher risk of SIDS
- A recent survey conducted in the USA shows that mothers who delivered preterm were almost twice as likely to place their baby on the belly to sleep. The authors think that very preterm infants in intensive care nurseries are frequently managed in the prone position; and infants and their caregivers become used to this position. Mothers are likely to follow the advice/example of health care professionals and advice is more likely to be conveyed during a long hospitalization.
- Emphasize that health care professional responsible for organizing the hospital discharge of infants from neonatal intensive care units should become more vigilant about endorsing and modelling the SIDS risk-reduction recommendations significantly before the infant's anticipated discharge.
- Follow up visits needed to be clearly planned during the discharge visit.

Activity 3- Conclusions (15 min)

- **Slides 7N-41.** Summarise the chapter, answer any questions and stress the fact that except for very small babies expensive medical equipment is not needed to provide good care to small babies

Part II – Clinical work (180 min)

Activity 4 -Case Study Work in small groups (45 min)

- ***This activity can be conducted at any convenient time during the first or second week after the module is completed.***
- Split participants into 3 groups. Neonatologists and nurses should be in equal proportion in each group.
- Give to each group one case study (Attachment 1). Make sure participants understand the task.
- Give to participantis flipchart paper and markers.

Case Study 1: Denis and His mother Maria

Maria gave birth to Denis at 35 weeks of gestation. Denis did not need resuscitation at birth. Immediately after birth he was placed on a table and assessed by the neonatologist. Then a nurse weighted him (he weighed 2,000g) dressed him and give him back to his mother.

After 15 minutes of incomplete skin to skin contact, the nurse told Maria that it was time to breastfeed Denis and the nurse tried to attach Denis who was sleeping

calmly. He didn't show any interest in breastfeeding. After 10 minutes of unsuccessful attempts, the nurse took Denis away from Maria, swaddled him and placed him in the cot beside Maria's bed. After 30 min Denis' temperature was 35⁰ C.

Questions for discussion:

1. What information do you get from Denis's story?
2. Classify Denis using the gestational age graph.
3. What treatment does Denis require? What would you recommend that Maria do over the next 2 hours?
4. When does Denis's next assessment to be done and what needs to be assessed?
5. When Denis can be discharged from the maternity?

1. What information do you get from Denis's story?

- Gestational age 35 weeks
- Denis didn't need resuscitation
- Birth weight 2,000g
- Denis didn't get enough skin-to-skin contact
- Denis is hypothermic
- Denis doesn't show any interest in breastfeeding
- The nurse was trying to attach Denis to his mother's breast before he was ready.
- Denis was swaddled and placed in his cot

2. Classify Denis using the gestational age graph

- Denis's weight correlates with his gestational age. Denis is a preterm baby
- Denis is a preterm baby suffering from a moderate hypothermia. He has problems with breastfeeding probably because he is cold.

3. What treatment does Denis needs?

- Immediate treatment of hypothermia. Warm the baby, using skin-to-skin contact, monitoring his temperature every hour for three hours. If the baby's temperature is increasing at least 0.5 C per hour over the last three hours, rewarming is successful; continue measuring the baby's temperature every two hours. Once the baby's temperature is normal, measure the baby's temperature every three hours for 12 hours. If the baby's temperature remains within normal range, discontinue measurements.
- Explain to the mother that Denis is hypothermic and needs skin-to-skin contact get warm again. Initiate skin-to-skin contact as soon as possible.
- Denis needs to be fed because during warming process the consumption of calories and oxygen will increase.
- While the child is in skin-to-skin contact help the mother attach the child to the breast.
- Explain to Maria that her milk/colostrum is the best food for Denis.
- If Denis is unable to suckle at the breast, express colostrum into a cup and give it to Denis.
- Denis doesn't need any other food except breast milk.

4. When does Denis's next assessment need to be done and what needs to be assessed?

- It's necessary to check Denis's temperature every hour for three hours. If the baby's temperature is increasing at least 0.5 C per hour over the last three hours, rewarming is successful; continue measuring the baby's temperature every two hours. Once the baby's temperature is normal, measure the baby's

- temperature every three hours for 12 hours. If the baby's temperature remains within normal range, discontinue measurements.
- The following day, Denis needs to be completely examined by health care worker.
 - Carefully assess breastfeeding, check correct attachment, position and swallowing.
 - Control the numbers of feeds and assess the quantity of urine, the quantity and colour of stools.
 - Check for jaundice.
 - Monitor twice daily the temperature and daily Denis's weight.

5. When can Denis be discharged from the maternity?

- When Denis has a good suckling reflex
- When Denis gains weight (15 g -20 g minimum) for 3 consecutive days.
- When Denis has a stable temperature for 3 consecutive days.
- When the mother does not have any concern about Denis's health and is able to care for Denis at home with access to medical care.

Case Study 2: Anna and Her mother Svetlana

Svetlana gave birth to Anna at gestational age of 34 weeks. Anna's weight was 1,975 g.

Anna was suckling poorly during the first week. The mother began cup-feeding her 8 times a day starting the day she was born according to the neonatologists recommendation.

On day 7th Anna's health state was good, she had a stable temperature (36,7 to 37,1°C), she started breastfeeding and she didn't have breathing difficulties. She was jaundiced on her chest and abdomen from day 3 until day 6.

Anna was weighted daily and by day 4 her weight was 1,905 g (she lost 70 g in the first 4 days after birth). By day 6 she weighted - 1,920 g, on day 7 -1,950g, on day 9 -1.970g and on day 10 -1990 g. The baby was slowly gaining weight and by the day 11 she weighed 2000g and she was breastfeeding 10 times a day.

Anna was immunized against hepatitis B (HB-1) and BCG on day 10. Data on immunization were written in the baby's medical card.

Svetlana does not feel confident about caring for Anna and she is afraid to take her home.

Questions for discussion:

1. Classify Anna using the gestational age graph

- Anna is a preterm baby, with a normal birth weight for her gestational age

2. Is Anna ready to be discharged from the maternity on 11th day?

- Anna can be discharged from the maternity as she began gaining weight from day 6 for 4 consecutive days. Her body temperature is stable and there are no breathing problems. She has physiological jaundice. She has a good suckling reflex.

3. What recommendations would you give to Svetlana when Anna is be discharged from the maternity?

- Anna needs to be kept warm, bath only in a warm room.
- She has to be breastfed 8-10 times during day and through the night,
- Anna should sleep on her back in a smoke free room but not over heated.
- The mother must know the danger signs for seeking immediate care. if the baby refuses breastfeeding or feeds poorly or becomes sick.
- Follow up visit on the 7th day after discharge.

4. It seems that Anna was gaining weight poorly during her first week of life. What could have been done differently?

- Svetlana needed help with breastfeeding. Medical personnel should help with attaching the baby to the breast daily from day 1 to day 6.
- The feeding method with two cups was not explained to the mother: expressing fore-milk in one cup and hind-milk in another cup and feeding the baby with the higher calorie milk- the hind-milk first.

5. On day 3 day Anna received 15 ml of milk at each feeding – Was it enough?

- No, this amount of milk was not enough. Anna should have received 20-23 ml of milk per feed on day 3 according to her age and birth weight. .

Case Study 3: Stephan and His Mother Sofia

Stephan was born without any problem after 35 weeks of gestation. Stephan was very small, nevertheless immediately after birth he was placed on his mother's chest for a few minutes "to be colonized by the mother's flora" as the nurse explained. Then he was assessed and weighed. After 30 minutes his temperature was 36,3°C.

Stephan's weight was 1530 g. Stephan was dressed and tightly swaddled "to keep him warm" the nurse said. Mother and the baby were left alone for two hours in the birth room where the temperature was 25°C. The nurse said that the baby didn't need a blanket as it was warm enough in the room, and she also told the mother to feed Stephan if the baby seemed hungry.

The neonatologist examined Stephan after 2 hours under a radiant heater. She counted the breathing rate and found 70 breaths per minute and heard grunting when the baby breathed out. She recounted and found 65 breaths per minute. Stephan was pale and cold. His temperature was 35.4°C. During the 2 hours in the birth room Stephan was not fed as he didn't show any interest in breastfeeding. The nurse had said "Never force a baby to eat".

Questions for discussions:

1. Classify Stephan using the gestational age graph

- Stephan is a preterm baby, small for gestational age; his weight would normally be between 2,000g to 2,900g

2. List what should have been done in the birth room for Stephan.

- Stephan should have been longer with his mother
- Since Stephan was breathing well, he could stay with this mother during the 2 hours and be weighted and examined at this time
- Stephan was tightly swaddled which made him cold and he was not covered by a blanket when he was in the delivery room.

- Baby and mother were left alone and no one counselled the mother to start breastfeeding. Stephan was probably not interested in for feeding because he was cold and tightly swaddled.

3. Describe what should be done for Stephan and his mother during and after their transportation to the paediatric department.

Before the transportation:

- The baby needs immediate skin to skin contact with his mother and transport to paediatric department with her.
- Give oxygen with a moderate flow rate
- Express the mother's milk and give 10 ml to the baby by cup, spoon or pipette, if he refuses it, install an IV perfusion of glucose 10%.

In the paediatric unit

- Conduct a full examination of the newborn under radiant heater while giving oxygen.
- Continue to warm the baby using skin to skin, or radiant heater or hot mattress. The room has to be warm at least 25 °C.
- Assess the baby's temperature every hour for three hours. If the baby's temperature is increasing at least 0.5 C per hour over the last three hours, rewarming is successful; continue measuring the baby's temperature every two hours. Once the baby's temperature is normal, measure the baby's temperature every three hours for 12 hours. If the baby's temperature remains within normal range, discontinue measurements.
- Monitor breathing parameters every 3 hours (breathing rate, chest indrawing, and grunting) until the baby no longer requires oxygen and then for an additional day.
- Give oxygen until breathing difficulties disappear, monitor if possible the response to oxygen with an oximeter, if not possible use clinical signs, and remember that central cyanosis is a very late sign of breathing difficulties.
- If the baby is not able to feed after becoming warm, install a gastric tube and feed him by gavage feeding every 3 hours.
- Check for the quantity of urine.

Activity 5 – Examination of small baby (90 min)

- Make sure that participants understand the main principles of small baby care and feeding.
- The trainer must ask the help of the maternity head-physician or chief neonatologist in selecting three children for examination if it is possible .If only one child is available the clinical session will be limited to a demonstration done by one facilitator.
- The identification of small babies for assessment by participants can be done at any convenient time after the demonstration.
- Ask the mothers' permission to examine the children.
- Prepare a radiant heater, warm baby clothes, wall thermometer, thermometer for measuring body temperature, scales and a good light.

a) Facilitator 's demonstration of Small Baby examination (30 min with discussion)

Steps	Actions	Details
1	Wash your hands!	Use soap and towels. Good lighting, warm room.
2	Prepare a warm room and a radiant heater if necessary	Check the ambient temperature in the room. Prepare warm baby clothes
3	Ask the mother's/family's permission to examine the child in their presence	
4	Ask the mother	Note the child's birth date, gender, name, birth weight and weight on the day of the examination <ul style="list-style-type: none"> • Did you have problems during your pregnancy? • What problems has the baby had since the birth?
5	Ask the mother	<ul style="list-style-type: none"> • Temperature, urine, jaundice, breathing difficulties • Does the mother have concerns about her child's health?
6	Write down all the information the mother gives you.	
7	Assess the child's breathing before you undress him/her. The child needs to be calm not crying.	<ul style="list-style-type: none"> • Count the number of breaths per minute and whether the breathing is > 60 or less than < 30 per minute • Check for grunting when breathing out
8	Ask the mother to gently undress the baby and check for chest indrawing and jaundice (on abdomen, palms and sole on the feet, depending of the baby's age)	<ul style="list-style-type: none"> • Check for severe chest indrawing when breathing in
9	Measure the child's temperature and weight.	<ul style="list-style-type: none"> • Assess for hypothermia or hyperthermia. • Weigh the baby or check the weight of the day.
10	Assess for other symptoms and possible signs of infection	<ul style="list-style-type: none"> • Assess bulging fontanel • Assess umbilical infection • Is the baby alert, or lethargic? • Is the baby moving normally?
11	Assess for other possible problems of the small baby	<ul style="list-style-type: none"> • E.g. Congenital anomaly or other problems.
12	Ask how the baby is fed Is he breastfed? if not which method is used? What is the daily quantity of milk given? What is the frequency of feeding? Is the baby gaining weight?	

Steps	Actions	Details
13	Praise the mother for her good child care and ask her to dress the baby. Ask whether she has any questions regarding her baby	
14	Comment on everything you did and summarize the examination of the small baby.	
15	Ask if the other trainers/facilitators have comments. Ask the participants if they have questions and answer them.	

b) Assessment of small baby by participants (if children are identified for this activity).

- After that split participants into 2 groups. There will one small baby for each group with one trainer per group.
- One participant is nominated to conduct the examination following the same plan as the facilitator. The other participants watch the examination, without comment or interruption and write their observations on the baby and on the way the examination is conducted
- **Make sure that the participant washes his/her hands before touching the baby.**
- **Make sure that the small baby is kept warm during the examination.**
- Discuss what was done correctly and what could be improved
- Discuss possible treatment and observation.

Activity 6 – Demonstration of Cup-feeding of a Small Baby (30 min)

Every facilitator should demonstrate cup-feeding to his/her sub-group, using the following recommendations. If possible the facilitator should to demonstrate cup feeding on a real small baby (**after getting the authorization from the mother and from the staff in charge of the baby**) but if it not possible the facilitator has to do a demonstration with a doll.

One of the facilitator plays the role of mother. Imagine a baby born 5 days ago; his birth weight was 1,800g.

- **Wash your hands**
- Measure the necessary quantity of milk 30 ml.
- Hold the baby in semi-vertical position
- Touch the baby's lips so that milk just slightly reaches the lips
- Do not pour the milk into the mouth.
- The baby laps the milk or may sip it. Allow time for the baby to swallow the milk

- The trainer should ask the participants to observe the cup-feeding role play or demonstration without making comments or interruption.
- Then ask participants if they practice cup feeding in their facilities.
- What the problems do they faced with cup feeding technique?
- How do they counsel the mother to use this technique?

Activity 7 – Demonstration - Inserting a gastric tube (15 min)

Every facilitator should demonstrate how to insert a gastric tube, or a least how to measure it, and how to confirm the proper placement of a gastric tube.

SUPPLIES

- Clean examination gloves
- Clean plastic tube or catheter appropriate for baby's weight:
 - If the baby weighs less than 2 kg, use a 5-F tube
 - If the baby weighs 2 kg or more, use an 8-F tube
- Writing pen or flexible tape measure
- 3- to 5-ml syringe (for aspiration)
- Stethoscope
- Sterile syringe
- Cap for gastric tube (if the tube will be used for feeding)
- Adhesive tape

PROCEDURE

- Gather necessary supplies.
- **Wash hands, and put on clean examination gloves.**
- Estimate the required length of tube:
- Hold the tube so that it mimics the route that it will follow once inserted (i.e. from the mouth or the tip of the nostril to the lower tip of the ear lobe and then to the stomach, just below the rib cage. Place a mark on the tube with a pen or a piece of tape)
- Alternatively, estimate the distance using a flexible tape measure, and mark the distance on the tube with a pen or a piece of tape.
- Flex the baby's neck slightly and gently pass the tube through the mouth or through one nostril to the required distance.
 - If the tube does not slide easily into the nostril, try the other nostril.
 - If the tube still does not slide easily into the nostril, use the oral route.
- **Never force the gastric tube into the nostril if you encounter resistance**
- Secure the tube in position with adhesive tape

CONFIRMING PROPER PLACEMENT OF GASTRIC TUBE

To confirm proper placement of the tube:

- Fill a syringe with 1 to 2 ml of air and connect it to the end of the tube. Use a stethoscope over the stomach to listen as air is quickly injected into the tube
- If a whistling sound is heard through the stethoscope as the air is injected, the end of the tube is correctly positioned in the stomach
- If a whistling sound is not heard, the tube is not properly positioned. Remove the tube and repeat the procedure
- Use a syringe to aspirate some fluid
- Replace the tube with another clean gastric tube after three days, or

- Earlier if it is pulled out or becomes blocked

FEEDING THROUGH GAVAGE

- Determine the required volume of the milk according to the baby weight.
- Connect the barrel of the syringe to the end of gavage.
- Pour the required volume of milk for the feed into the syringe.
- Hold the syringe 5-10 cm above the baby or suspend the gavage above baby and allow the milk to run down the gavage with gravity; do not force milk through the gavage using the plunger.
- Each feeding should last for 10-15 minutes.
- During the feeding baby's condition must be monitored closely: colour of skin and mucous membranes; respiratory rate and character of breathing; baby's anxiety.
- After feeding disconnect syringe and gastric tube and close the tube with the plug. The head of doll must be elevated.
- The facilitator should stress that the mother has to be involved in gavage feeding by holding her baby in her arms.

Activity 4

Case Study 1: *Denis and His mother Maria*

Maria gave birth to Denis at 35 weeks of gestation. Denis did not need resuscitation at birth. Immediately after birth he was placed on a table and assessed by the neonatologist. Then a nurse weighted him (he weighed 2,000g) dressed him and give him back to his mother.

After 15 minutes of incomplete skin to skin contact, the nurse told Maria that it was time to breastfeed Denis and the nurse tried to attach Denis who was sleeping calmly. He didn't show any interest in breastfeeding. After 10 minutes of unsuccessful attempts, the nurse took Denis away from Maria, swaddled him and placed him in the cot beside Maria's bed. After 30 min Denis' temperature was 35⁰ C.

Questions for discussion:

1. What information do you get from Denis's story?
2. Classify Denis using the gestational age graph.
3. What treatment does Denis require? What would you recommend that Maria do over the next 2 hours?
4. When does Denis's next assessment to be done and what needs to be assessed ?
5. When Denis can be discharged from the maternity?

Case Study 2: Anna and Her mother Svetlana

Svetlana gave birth to Anna at gestational age of 34 weeks. Anna's weight was 1,975 g.

Anna was sucking poorly during the first week. The mother began cup-feeding her 8 times a day starting the day she was born according to the neonatologist's recommendation.

On day 7th Anna's health state was good, she had a stable temperature (36,7 to 37,1°C), she started breastfeeding and she didn't have breathing difficulties. She was jaundiced on her chest and abdomen from day 3 until day 6.

Anna was weighed daily and by day 4 her weight was 1,905 g (she lost 70 g in the first 4 days after birth). By day 6 she weighed 1,920 g, on day 7 1,950g, on day 9 1.970g and on day 10 1990 g.

The baby was slowly gaining weight and by the day 11 she weighed 2000g and she was breastfeeding 10 times a day.

Anna was immunized against hepatitis B (HB-1) and BCG on day 10. Data on immunization were written in the baby's medical card.

Svetlana does not feel confident about caring for Anna and she is afraid to take her home.

Questions for discussion:

1. Classify Anna using the gestational age graph
2. Is Anna ready to be discharged from the maternity on day 11?
3. What recommendations would you give to Svetlana when Anna is discharged from the maternity?
4. It seems that Anna was gaining weight poorly the first week of her life. What could have been done differently?
5. On day 3 Anna received 15 ml of milk for each feed – was that enough?

Case Study 3: Stephan and His Mother Sofia

Stephan was born without any problem after 35 weeks of gestation. Stephan was very small, nevertheless immediately after birth he was placed on his mother's chest for a few minutes "to be colonised by the mother's flora" as the nurse explained. Then he was assessed and weighted. After 30 minutes his temperature was 36,3°C.

Stephans' weight was 1530 g. Stephan was dressed and tightly swaddled "to keep him warm " the nurse said .Mother and the baby were left alone for two hours in the birth room where the temperature was 25°C. The nurse said that the baby didn't need a blanket as it was warm enough in the room, and she also told the mother to feed Stephan if the baby seemed hungry.

The neonatologist examined Stephan after 2 hours under a radiant heater. She counted the breathing rate and found 70 breaths per minute and heard grunting when the baby breathed out. She recounted and found 65 breaths per minute. Stephan was pale and cold. His temperature was 35.4°C. During the 2 hours in the birth room Stephan was not fed as he didn't show any interest in breastfeeding. The nurse had said "Never force a baby to eat".

Questions for discussions:

1. Classify Stephan using the gestational age graph.
2. List the what should have been done for Stephan in the birth room.
3. Describe what should be done for Stephan and his mother during and after their transportation to the paediatric department.

References:

1. Alain Dabadie. Alimentation de l'enfant.1999.
2. Bull J, Mulvihill C, Quigley R. Prevention of low birth weight: assessing the effectiveness of smoking cessation and nutritional interventions: evidence briefing. 2003.
3. Cochrane review relevant to the module: Ad libitum or demand-semi-demand feeding versus scheduled interval feeding for preterm infants.
4. Cochrane review relevant to the module: Cup feeding versus other forms of supplemental enteral feeding for newborn infants unable to fully breastfeed.
5. Cochrane review relevant to the module: Developmental care for promoting development and preventing morbidity in preterm infants.
6. Cochrane review relevant to the module: Early developmental intervention programs post hospital discharge to prevent motor and cognitive impairments in preterm infants.
7. Cochrane review relevant to the module: Formula milk versus donor breast milk for feeding preterm or low birth weight infants.
8. Cochrane review relevant to the module: Interventions to prevent hypothermia at birth in preterm and-or low birth weight infants.
9. Cochrane review relevant to the module: Kangaroo mother care to reduce morbidity and mortality in low birthweight infants.
10. Cochrane review relevant to the module: Massage for promoting growth and development of preterm and-or low birth-weight infants.
11. Cochrane review relevant to the module: Non-nutritive sucking for promoting physiologic stability and nutrition in preterm infants.
12. Edwin Chandraharan, Sabaratnam Arulkumaran. Recent advances in management of preterm labor. J Obstet Gynecol India Vol. 55, No. 2: March/April 2005 Pg 118- 124.
13. Essential Antenatal, Perinatal and Postpartum Care. WHO Euro, 2002.
14. Essential new born care and Breastfeeding PEPC WHO 2002
15. Essential Newborn Care Course Training Manual (Draft) WHO, Geneva. 2006.
16. European Resuscitation Council Guidelines for Resuscitation. Section 6: Paediatric life support, Resuscitation of babies at birth, 2005:S115-S133
17. Guideline for hand Hygiene in Health-Care Settings. CDC, MMWR, October 25, 2002/Vol.51/No. RR-16

18. Guideline for hand Hygiene in Health-Care Settings. CDC, MMWR, October 25, 2002/Vol.51/No. RR-16
19. Health For All, Database, 2006.
20. Karen Edmond, Rajiv Bahl. Optimal feeding of low-birth-weight infant. WHO Technical review, 2007.
21. Kangaroo Mother Care: A practical guide. WHO, Geneva. 2003
22. Lumley J, Oliver S, Waters E. Smoking cessation programs implemented during pregnancy. Cochrane review. Evidence-Based Nursing 1999; 2:42.
23. Managing Newborn Problems: A guide for doctors, nurses and midwives. WHO, Geneva, 2003
24. McGuire W, Anthony MY. Donor human milk versus formula for preventing necrotizing enterocolitis in preterm infants: systematic review. Arch Dis Child Fetal Neonatal Ed.
25. Pishva N., Hemmati F. Comparison of Protein, Fat, Sodium and Calcium in the Milk of Mothers of Preterm and Full term Infants. Shiraz E-Medical Journal Vol. 5, No. 4, October 2004.
26. Pregnancy, Childbirth, Postpartum and Newborn Care: A guide for essential practice. WHO, Geneva, 2006.
27. Premji S, Chessell L. Continuous nasogastric milk feeding versus intermittent bolus milk feeding for premature infants less than 1500 grams (Cochrane Review), May 2002.
28. The Cochrane library, Issue 1,2004.
29. The Changing Concept of Sudden Infant Death Syndrome: Diagnostic Coding Shifts, Controversies Regarding the Sleeping Environment, and New Variables to Consider in Reducing Risk. Policy statement AAP. November 2005.
30. Thermal Protection of the Newborn: a practical guide. WHO, Geneva, 1997.Vol. 5, No. 4, October 2004.
31. William McGuire, Ginny Henderson and Peter W Fowlie. Feeding the preterm infant. BMJ 2004;329;1227-1230.

