REPUBLIC OF KENYA
MINISTRY OF HEALTH

Comprehensive Newborn Care Protocols

Integrating Technologies with Clinical Care

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Integrating Technologies with Clinical Pathways

November 2022

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FOREWORD

To end preventable newborn deaths globally, all countries have committed to reduce neonatal mortality to at least as low as 12 deaths per 1000 live births by 2030. This sustainable development goal (SDG) target requires countries to transform the provision of newborn care especially to the most vulnerable small and sick newborns.

Globally, up to 30 million newborns with complications from prematurity, intrapartum brain injury, severe bacterial infection, pathological jaundice and congenital conditions require inpatient care each year. This creates a need to build on essential newborn care by standardizing and mainstreaming inpatient care for all newborns especially the small and sick. Everything that happens to the newborns in hospital matters as it increases their chances of survival, influences their brain development, and can affect their entire life course. In Kenya, a comprehensive approach to improve the survival of newborns by reducing the current neonatal mortality rate of 22/1000 live births by half by 2030 while ensuring they thrive is needed. This approach focusses on the adoption of public health approaches in the health system; improved pregnancy, birth and essential newborn care; and creation of comprehensive care units which integrate best practices and use of rugged robust technologies. This will ensure that every newborn has the highest attainable standard of health and health care based on the previously launched Kenya MoH maternal and newborn health (MNH) quality of care (QoC) standards and adapted WHO PQoC standards for SSNB.

This comprehensive care guidelines target all secondary level newborn units and will facilitate and support the provision of thermal care; comfort and pain management; kangaroo mother care; assisted feeding for optimal nutrition (cup feeding and nasogastric feeding); safe administration of oxygen; prevention of apnoea; detection and management of neonatal infection; detection and management of hypoglycaemia, jaundice, anaemia and neonatal encephalopathy; seizure management; and safe administration of intravenous fluids. The guidelines also include use of continuous positive airway pressure (CPAP) as transition to intensive care. It is my hope that this guidance document provides the much-needed stepwise approach to providing evidence-based routine newborn care and management of complications while integrating the use of essential technologies

Dr Patrick Amoth (EBS)
Director General
Ministry of Health

PREFACE

This Comprehensive Newborn Care Protocols provide guidance on newborn care to clinicians and nurses. These protocols in this handbook are underpinned on the 'Newborn Care Quality Statements' outlined in this handbook.

The development of this handbook was inspired by the NEST360 clinical modules (https://nest360.org/education/). This handbook is an advancement of and complimentary to the Basic Paediatric Protocols and Emergency Triage Assessment & Treatment, *plus* Admission care of the critically ill child (ETAT+) 2016 guidelines. It integrates use of technologies with newborn clinical pathways . The protocols are evidence-based and were adapted from latest WHO guidance, clinical guidelines from other institutions and emerging scientific evidence.

The Comprehensive Newborn Care Protocols consist of three chapters.

Chapter 1) Newborn Care Clinical Pathways: It consists of pathways of care of the common newborn conditions including newborn resuscitation, respiratory support for newborn with breathing problems, feeding and treatment for the small and sick newborns, prevention and management of early neonatal hypoglycaemia, management of seizure and neonatal sepsis. Also included are nomograms to provide guidance for treatment of neonatal jaundice and the Comprehensive Newborn Monitoring Chart to aid in documentation of care provided to the small and sick newborns.

Chapter 2) Standard Operating Procedures (SOPs): It consists of Standard Operating Procedures (SOPs) for the common equipment that are essential in managing the small and sick newborns. These include radiant warmer, suction machine, newborn glucometer, bubble continuous positive airway pressure (bCPAP), oxygen concentrator and oxygen flow splitters, pulse oximeter, LED phototherapy lights and light meter. The SOPs are aligned to the brands of equipment available for training practical sessions for dissemination of these protocols. The handbook therefore focuses on the practical principles of how equipment function and how they are used. Readers are advised to follow specific manufacturers' guidance for use and maintenance of all the equipment.

Chapter 3) Common Clinical Procedures performed on small and sick newborns: These include: newborn resuscitation, use of plastic wraps to keep newborns warm, administering oxygen, feeding the small and sick newborn including guidance on breastfeeding techniques and expressing breastmilk, cup-feeding, inserting gastric tubes, administering buccal glucose, heel prick and inserting intravenous line. The protocols emphasize family centred care and observation of appropriate infection

prevention and control measures. The Comprehensive Newborn Care Protocols target management of the seriously ill newborn in the first one week of life, recognizing that over 90% of the newborns in the Kenyan Newborn Units (NBUs) are admitted to the units on their first day of birth or the following day. The handbook is aimed at paediatricians, doctors, clinical officers, nurses and other health workers responsible for the care of the small and sick newborns at intermediate (secondary) level newborn units. It is useful for tertiary or university teaching hospitals for defining basic evidence informed care to students in medical schools and other health training institutions. The guidelines presume newborn units that provide care have minimum resources to provide quality care. These include; all the equipment and their accessories, essential drugs, and capacity to do essential investigations for common serious conditions and illnesses among the small and sick newborns. The complexity of care envisaged in the intermediate level NBU requires adequate and skilled health care workers dedicated to providing quality care to the small and sick newborns.

The simplified algorithms in this handbook may be enlarged and used as job aides in the NBUs and delivery rooms. These guidelines will undergo periodic revision to keep abreast with emerging evidence and technologies and hence continue to deliver quality care to the newborns of this nation. Updates or additional materials can be found at the websites: https://kenyapaediatric.org/nest360/ and https://nest360.org/education/. These Comprehensive Newborn Care Protocols are disseminated through the Newborn ETAT+ Provider course commonly known as NEST Training. This is a five-day course that comprises of theory sessions on disease processes and management, demonstrations of how the equipment work and how to use the equipment on a patient. The course has dedicated time for hands on experience on using the clinical pathways, assembling the required technologies using the SOPs in the protocols, preparing patients using the clinical procedure guidelines outlined in the protocols and prevention and managing common complications that result from use of the technologies.

The training materials for the Newborn ETAT+ Provider course, including audio recorded power point presentations are available in the websites.

Dr Andrew Mulwa
Director
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ACKNOWLEDGEMENT

Ministry of Health under the leadership of the Director General for Health - Dr. Patrick Amoth, Director Medical Services, Preventive and Promotive Health - Dr Andrew Mulwa, Head, Department of Family Health - Dr. Issak Bashir, Head, Division of Neonatal and Child Health - Dr. Caroline Mwangi and Program Manager Division of Neonatal Health - Allan Govoga, acknowledges the contributions of many individuals, stakeholders and institutions in the preparation of the Comprehensive Newborn Care Protocols; the development of the provider course for disseminating the protocols; and the instructors course.

Preparation of Comprehensive Newborn Care Protocols: Special thanks go to the Newborn Technical Working Group - Prof Grace Irimu, Edith Gicheha, Dolphine Mochache, Vincet Otieno, Dr Mary Waiyego, Dr Jalemba Aluvaala, Dr Audrey Chepkemoi, Dr Wairimu Kimani, Alex Macharia, Odessa Omanyo and Jane Namu. We are grateful to Prof Rachel Musoke, Prof Aggrey Wasunna, Prof Mike English, Dr Brian Maugo, Dr Joyce Jebet, Dr Sarah Bett, Marion Gakuna, Janet Wali, Ann Njoroge and Jane Kainyu who edited the final document. We acknowledge other experts and practitioners from various health care delivery and training institutions including Kenya Paediatric Association (KPA), Association of Neonatal Nurses Kenya (ANN_Kenya), development and implementing partners who made invaluable contributions to this handbook.

Development of the course for disseminating the protocols: Special thanks to the ETAT+ trainers from University of Nairobi, Department of Paediatrics and Child Health for their contribution in development and piloting the training programme for dissemination of the Comprehensive Newborn Protocols. We acknowledge the efforts of Prof Grace Irimu, Edith Gicheha, Dr Fareen Musa, Dolphine Mochache and Vincent Otieno (CPHD) who coordinated ETAT+ UoN Webinars that helped create awareness of integrating evidence-based newborn care with technologies. We appreciate all the UoN ETAT+ instructors who prepared well researched power point presentations for the webinars and that are currently used for the Newborn ETAT+ provider course. They include Dr Roy Ndezwa, Dr Sylvia Mwathi, Dr Allan Kayiza, Dr Maryanne Murugami, Dr Joy Odhiambo, Dr Rachel Kanguha, the late Dr Lydia Kanyoro, Dr Mariam Dawood, Dr Abdullahi Hassan, Dr Hildy Nvonako, Dr Emma Mwaura, Dr Esther Tabalya, Dr Betty Mburu, Dr Zanuba Mohammed, Dr Duncan Tumwa, Dr Muthoni Ogola, and Dr Felicitas Makokha. We appreciate the neonatal nurses who participated in these webinars; including Nancy Awili, Samson Tamba and Simon Pkemoi. We acknowledge the Centre for Public Health and Development for their support towards the development of the training materials in particular Dr Steve Adudans, Samuel Wachira, Vincent Onyango and Michael Njuguna.

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We acknowledge and thank NEST 360 Programme for providing the technical materials that informed the SOPs and financial support for this work as well as providing 13 County and County Referral Hospitals with all the pieces of equipment that are discussed in this handbook.

We acknowledge and thank Samuel Waweru for creating the graphic designs and hyperlinking the handbook.

Comprehensive Newborn Care Protocols; Integrating Technologies with Clinical Care.

Ministry of Health, Kenya.

Dr. Issak Bashir
Head, Department of Family Health

Disclaimer: The mention of certain manufacturers' products does not imply they are recommended or endorsed by MoH in preference to others of a similar nature that are mentioned.

CONTENT

Newborn Care Quality Statements

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These nine standards of care should be appropriately implemented to give high quality care to newborns. Eight of the quality statements are adapted from the standards for improving the quality of care for small and sick newborns in health facilities – WHO 2020. The corresponding input and process quality measures are found in the WHO 2020 publication https://www.who.int/publications/i/item/9789240010765. A ninth quality statement is added to further support safe use of technologies in the care of the small and sick newborns.

STANDARD 1:

Every small and sick newborn receives evidence-based routine care and management of complications according to WHO guidelines.

Quality statements

A. Care for all newborns

1.1 All newborns receive care with standard precautions to prevent health care-associated infections, including implementing additional measures required during outbreaks and pandemic situations.

Observing the five moments for hand-hygiene, early and exclusive breastfeeding and skin-to-skin contact are important in preventing infection.

1.2 Each newborn receives care at birth from a qualified healthcare worker competent in providing immediate care of the newborn including resuscitation of babies with no spontaneous respiration.

1.3 All high-risk mothers are identified before child-birth. The birth is attended by two healthcare workers competent in providing care to the mother and immediate care of the newborn including resuscitation of babies with no spontaneous respiration.

1.4 The health facility has local arrangements and a mechanism to maintain a documented room temperature in the labour and childbirth areas at or above 25°C and free of draught.

1.5 All newborns are assessed immediately while receiving essential newborn care.

1.6 All referred newborns are triaged, promptly assessed for danger signs or injuries to determine whether they require resuscitation and receive appropriate care according to MoH guidelines.

1.7 All newborns receive routine postnatal care, including weighing and temperature measurement.

1.8 All newborns are assessed for immunization status and receive recommended vaccinations as per national immunization schedule.

1.9 All newborns are given cord care, vitamin K and vaccines according to national guidelines. Bathing is delayed 24hrs for Newly born infants.

1.10 All newborns are protected from unnecessary or harmful practices, including sharing an incubator/ radiant warmer/phototherapy canopy, prolonged hospital stays or separation from their mothers and families during their care.

1.11 All newborns are screened for evidence of maltreatment, including neglect and violence, and receive appropriate care.

1.12 All newborns are assessed for congenital abnormalities, managed appropriately and referred in a timely manner.

1.13 All newborns whose gestational age is unknown are assessed using Ballard score before 24 hrs of age and recorded.

1.14 All newborns are assessed for suspected infection or risk factors for infection and, if required, investigated and given the correct antibiotic treatment (choice of antibiotic, dose and frequency) according to MoH guidelines, avoiding overuse of antibiotics. All newborns suspected to have neonatal sepsis have antibiotics administered within 30minutes of making diagnosis.

1.15 All newborns at risk of congenital syphilis are assessed, investigated and managed according to MoH guidelines.

1.16 All newborns receive eye prophylaxis, are assessed for ophthalmia neonatorum and, if required, managed according to MoH guidelines.

1.17 All newborns at risk for tuberculosis and/or HIV infection are correctly assessed, investigated and managed appropriately according to MoH guidelines.

1.18 All newborns at risk of early hypoglycaemia (e.g. asphyxia, small-for-gestational age and maternal diabetes) are assessed to identify and manage hypoglycaemia.

1.19 All small and sick newborns at risk of retinopathy of prematurity are appropriately identified, screened and treated.

1.20 All newborns are routinely monitored for jaundice; bilirubin is measured in those at risk and treatment initiated in those with hyperbilirubinaemia according to MoH guidelines.

B. Care for small and sick newborns

B1. Care for respiratory conditions

1.21 Small and sick newborns are assessed for signs of respiratory compromise, and a neonatal pulse oximeter is used to detect hypoxemia or hyperoxia and to guide administration of supplemental oxygen according to MoH guidelines.

1.22 Newborns who require resuscitation at birth are ventilated with room air (or 21% -30% oxygen), and the need for increasing oxygen concentrations is reviewed to ensure oxygen saturation between 90% and 95%.

1.23 Small and sick newborns who require supplemental oxygen therapy receive it safely through appropriate neonatal equipment, including neonatal nasal prongs, low-flow meters, air–oxygen blenders, humidifiers and a pulse oximeter.

1.24 Small and sick newborns are assessed and managed for apnoea, and preterm newborns are managed to prevent apnoea according to MoH guidelines.

1.25 Newborns with respiratory distress are treated with continuous positive airway pressure (CPAP) as soon as the diagnosis is made, according to MoH guidelines.

B2. Nutritional support for newborns

1.26 Small and sick newborns are fed appropriately, including assisted feeding with the mother's milk when possible. All mothers are educated on best breastfeeding practices: to initiate breastfeeding immediately after birth, breastfeeding techniques, expressing and storage of breast milk and cup feeding when mother is not able to breastfeed.

1.27 Small and sick newborns who cannot tolerate enteral feeding or for whom enteral feeding is contraindicated are provided with parenteral nutrition in correct amounts and composition according to standard guidelines.

1.28 All newborns of HIV-infected mothers are fed appropriately according to MoH guidelines.

1.29 All very-low-birth-weight newborns are given vitamin D, calcium, phosphorus and iron supplements according to standard guidelines.

B3. Clinical monitoring and supportive care

1.30 Small and sick newborns, especially those who are most seriously ill, are adequately monitored, appropriately reassessed and receive supportive care according to MoH guidelines.

1.31 Small and sick newborns are given antibiotics and other medications only if indicated, by the correct route; the dose checked in the protocols (or calculated) and documented when given in the treatment chart. The need for medication is regularly reassessed, and any adverse reaction is appropriately managed and recorded.

1.32 Small and sick newborns who cannot tolerate full enteral feeds are given intravenous fluids containing glucose or safe, appropriate parenteral nutrition; fluids are administered through an infusion pump and a neonatal burette, the volume is recorded, and the intravenous site is checked with other routine observations.

1.33 Small and sick newborns are given blood transfusions when indicated, the blood given is appropriate, the volume is recorded, and the newborn is monitored before, during and after the transfusion.

B4. Pain management and palliative care for newborns

1.34 All small and sick newborns are assessed routinely for pain or symptoms of distress and receive appropriate management according to MoH guidelines. For short painful procedures neonate is breastfed and placed skin to skin with carer.

1.35 Small and sick newborns have access to appropriate palliative care.

B5. Care and advice at discharge

1.36 Each small and sick newborn has a completely filled discharge summary. Newborn weight at discharge is taken and documented in the summary notes.

1.37 Small and sick newborns are discharged from hospital when home care is considered safe and carers have received a comprehensive discharge management plan and are competent in the care of their newborn. Carer is counselled on best breastfeeding practices, appropriate sunlight exposure to prevent rickets and also to recognize danger signs in a sick newborn.

STANDARD 2:

The health information system enables collection, analysis and use of data to ensure early appropriate action to improve the care of every small and sick newborn.

Quality statements

2.1 Every small and sick newborn has a complete, accurate, standardized, up-to-date medical record (Newborn Admission Record-NAR), which is accessible throughout their care, on discharge and on follow-up.

2.2 Every health facility has a functional mechanism for collecting, analysing and using data on newborns as part of monitoring performance and quality improvement.

2.3 Hospitals with newborn units shall constitute a multidisciplinary Clinical Audit Team that will conduct regular in-depth review of newborn deaths, identify opportunities for improvement of newborn care, feasible solutions and an implementation strategy of the solutions.

2.4 Every health facility has a mechanism for collecting, analysing and providing feedback on the newborn services provided and the perceptions of families of the care received.

2.5 All live newborns regardless of their gestation age and birthweight have their birth notified and have an identity.

2.6 All newborns who die, and all stillbirths have their death notified.

2.7 Every Newborn Unit submits a completed NBU Register Summary form to the Sub-County Office by the given date.

2.8 Every newborn has an appropriately complete and accurately filled MoH Mother and Child Handbook and use of the handbook is explained to the carer.

STANDARD 3:

Every small and sick newborn with a condition or conditions that cannot be managed effectively with available resources receives appropriate, timely referral through integrated newborn service pathways with continuity of care, including during transport.

Quality statements

3.1 Every small and sick newborn who requires referral receives appropriate pre-referral care, and the decision to refer is made without delay.

3.2 Every small and sick newborn who requires referral receives seamless, coordinated care and referral according to a plan that ensures timeliness.

3.3 For every newborn referred or counter-referred within or between health facilities, there is appropriate information exchange and feedback to relevant health care staff.

3.4 Every health facility that provides care for small and sick newborns has been designated according to a standard level of care and is part of an integrated newborn network with clear referral pathways, a coordinating referral centre that provides clinical management support, protocols and guidelines.

3.5 Newborn transfer services provide safe, efficient transfer to and from referral neonatal care by experienced, qualified personnel, preferably specialist transport teams, in specialist transport vehicles.

3.6 Every newborn who requires referral is transferred in the kangaroo mother care position with their mother, when possible.

STANDARD 4:

Communication with small and sick newborns and their families is effective, with meaningful participation, and responds to their needs and preferences, and parental involvement is encouraged and supported throughout the care pathway.

Quality statements

4.1 All carers of small and sick newborns are given information about the newborn's illness and care, so that they understand the condition and the necessary treatment.

4.2 All small and sick newborns and their carers experience coordinated care, with clear, accurate information exchange among relevant health and social care professionals and other staff.

4.3 All carers are enabled to participate actively in the newborn's care through family-centred care and kangaroo mother care, in decision-making, in exercising the right to informed consent and in making choices.

4.4 Carers of small and sick newborns and staff understand the importance of nurturing interaction with the newborn, recognize and respect the newborn's behaviour and cues, and include them in care decisions.

4.5 All carers receive appropriate counselling and health education about the current illness of the newborn, transition to kangaroo mother care follow-up, community care and continuous care, including early intervention and developmental follow-up.

4.6 In humanitarian and fragile settings, including outbreak and pandemic situations, special consideration is given to the specific psychosocial and practical needs of small and sick newborns and their families.

STANDARD 5:

Newborns' rights are respected, protected and fulfilled without discrimination, with preservation of dignity at all times and in all settings during care, transport and follow-up.

Quality statements

5.1 All newborns have equitable access to health care services, with no discrimination of any kind.

5.2 The carers of all newborns are made aware of and given information about the newborn's rights to health and health care insurances e.g. the National Insurance Hospital Fund and Linda Mama.

5.3 All newborns and their carers are treated with respect and dignity, and their right to privacy and confidentiality is respected.

5.4 All newborns are protected from any physical or mental violence, injury, abuse, neglect or any other form of maltreatment.

STANDARD 6:

All small and sick newborns are provided with family-centred developmental supportive care and follow-up, and their families receive emotional and psychosocial support that is sensitive to their needs and strengthens their capability.

Quality statements

6.1 All small and sick newborns stay with their carers, with minimal separation, and the role of carers is recognized and supported at all times during care, including rooming-in during hospitalization.

6.2 All newborns born preterm or with a low birth weight receive kangaroo mother care as soon as possible after birth, and the parents are supported in its provision.

6.3 All small and sick newborns receive appropriate developmental supportive care, and their families are recognized as partners in care.

6.4 All families receive care in an environment in which their socioeconomic, emotional and cultural needs are respected and supported.

6.5 All small and sick newborns receive appropriate, coordinated developmental follow-up with minimal disruption to family life and routines.

STANDARD 7:

For every small and sick newborn, competent, motivated, empathetic, multidisciplinary staff are consistently available to provide routine care, manage complications and provide developmental and psychological support throughout the care pathway.

Quality statements

7.1 All small and sick newborns have access to a sufficient multidisciplinary workforce, including health professionals, allied health and support staff, at all times according to standard levels of care.

7.2 Health professionals and allied health and support staff have appropriate skills to support the health and the psychological, developmental, communication and cultural needs of newborns and their families.

7.3 All staff working in neonatal units of a health facility have the necessary knowledge, skills and attitudes to provide infection prevention and control, basic resuscitation, kangaroo mother care, safe feeding and medications and positive interaction with newborns and communication with carers. The staff have refresher courses in each of these domains of care at least once a year.

7.4 Every health facility that provides care for small and sick newborns has managerial leadership for developing and implementing policies and legal entitlements, data-driven decisions, clinical governance, fostering an environment for continuous quality improvement and enhancing teamwork.

STANDARD 8:

The health facility has an appropriate physical environment, with adequate water, sanitation, waste management, energy supply, medicines, medical supplies and equipment for routine care and management of complications in small and sick newborns.

Quality statements

8.1 Small and sick newborns are cared for in a safe, secure, well-maintained, organized physical environment that is appropriately designed to provide kangaroo mother care and family-centred care according to standard levels.

8.2 Water, sanitation, hand hygiene and waste disposal facilities are easily accessible, functional, reliable, safe and sufficient to ensure strict infection control and meet the needs of newborns, carers and staff. All NBUs have power back-up to ensure instantaneous uninterrupted power supply during blackout.

8.3 Adequate stocks of medicines and medical supplies specific for small and sick newborns (e.g 1 mg vials of vitamin K, 10mg/20mg gentamicin vial) are available in the NBU.

8.4 All carers of small and sick newborns have a dedicated area with supportive elements, including adequate space for kangaroo mother care, family-centred care, privacy for mothers to express breast milk and facilities for hygiene and laundry.

8.5 Hospitals with newborn units shall constitute a multidisciplinary IPC team that will ensure strict IPC standards in the NBU and conduct regular surveillance for infections through review of lab data and regular swabbing. Health care staff in the childbirth and neonatal areas of the maternity unit receive training in standard infection control practices at least once every 12months.

STANDARD 9

All essential newborn technologies are used and maintained as per MoH protocols/manufacturer's instructions to ensure they are safe for use.

Quality Statements

9.1 All pieces of equipment must have a user manual from the manufacturer in the country's official language and should be accessible to the users.

9.2 All pieces of equipment are used as per the standard operating procedures (SOPs) and/or manufacturers recommendations.

9.3 All pieces of equipment have verifiable planned preventive maintenance (PPM) as per the manufacturer's recommendation.

9.4 All pieces of equipment are cleaned after use as per the SOPs and/or manufacturer's recommendation.

9.5 Proper forecasting of the need for accessories, spare parts and consumables is done to avoid out-of-stock periods.

9.6 Ensure that staff are competent in the correct and timely use of the available of equipment.

CHAPTER 1

NEWBORN CARE CLINICAL PATHWAYS

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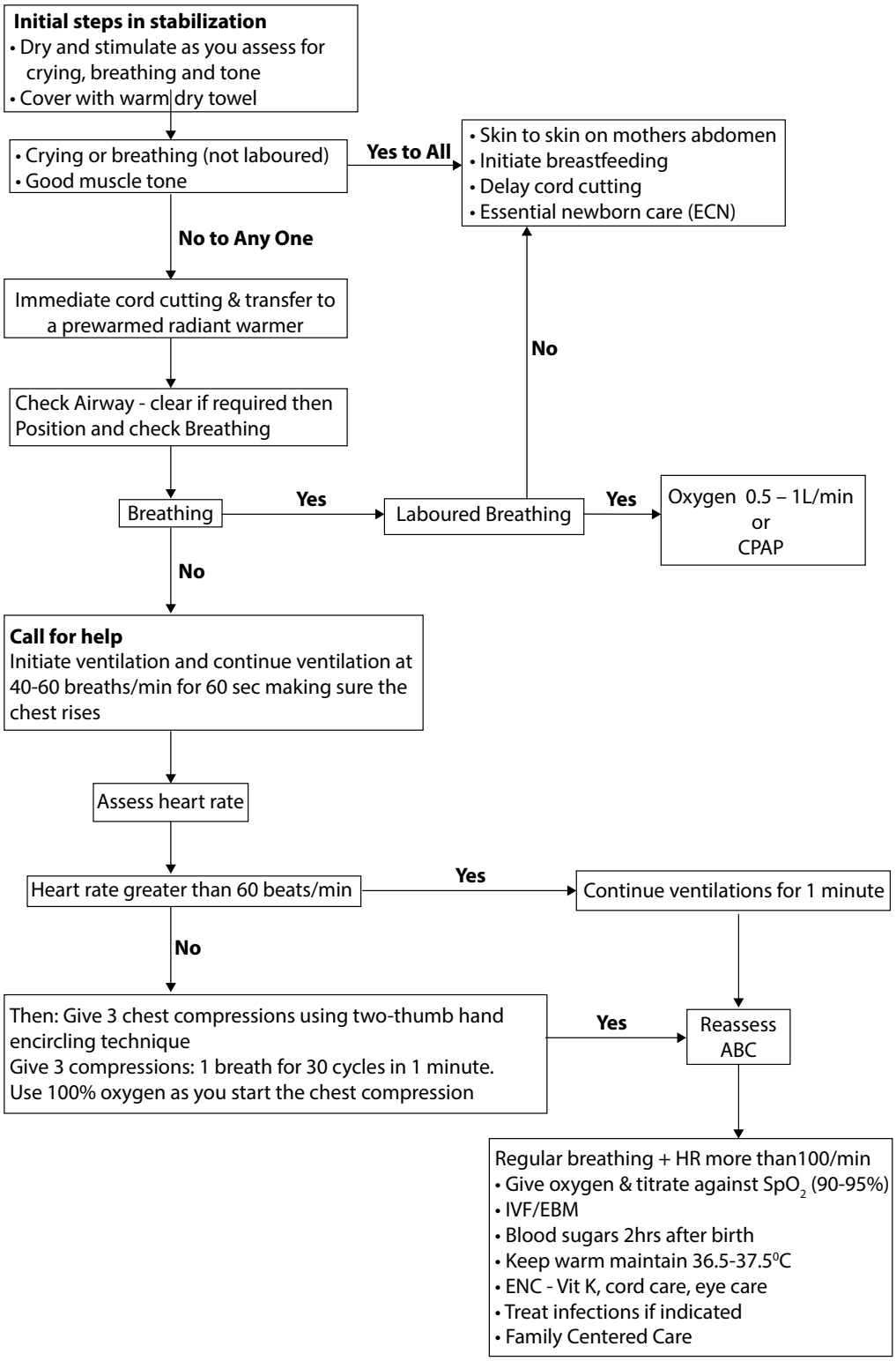
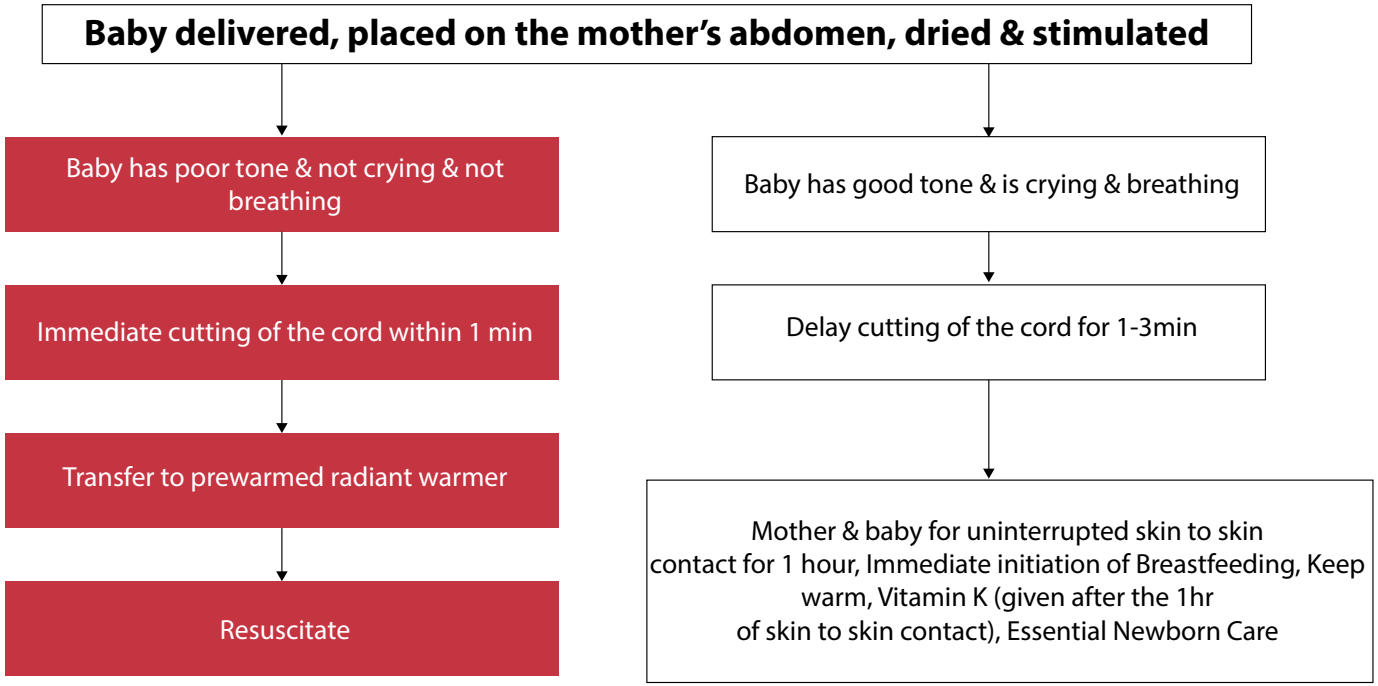
1.1 Newborn Resuscitation (Gestation age below 32 weeks use plastic wraps - see section 3.2)



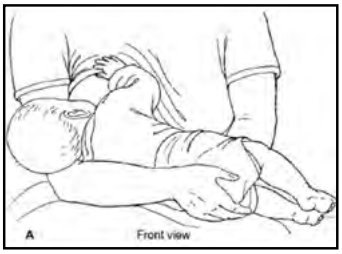
1.2 Birth and Cord cutting



Thermoregulation in preterms <2000grams

1. Wrap all preterm babies less than 32 weeks gestation age (GA) in plastic wrap immediately infant is born. Don't dry! Transfer to the radiant warmer for immediate newborn care and then to NBU while in plastic wrap. Remove plastic wrap once temperature is controlled (36.5-37.5^{0}C), nurse in KMC or incubator see section 3.2.
2. All clinically stable preterms more than 32 weeks GA to be put in skin-to-skin contact with the mother soon after birth and after drying them thoroughly.
3. Bathing should be delayed to after 24hrs.

1.3 Breastfeeding Techniques – Good Positioning and Attachment



Clean hands
(Do not wash breasts for purpose of breastfeeding)

→

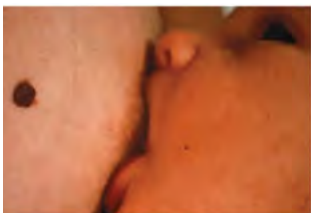
Mother's position
Mother relaxed and comfortable.
Pain controlled

→

Baby in correct position
1. Baby's nose at the level of the breast
2. Baby close to the mother
3. Head and the trunk in a straight line
4. Baby's whole body supported

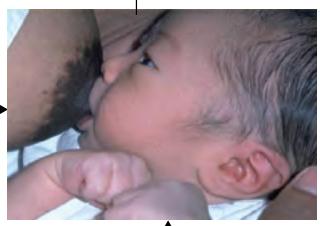
Attach breast into baby's mouth
1. Hold breast using a C- grip
2. Stimulate baby to open mouth wide
3. Introduce breast into the mouth

Break the feed then check mother's position & baby's position



Signs of Good Attachment
1. Chin touching breast
2. Mouth open (more than 120⁰)
3. More areola above the nipple
4. Lower lip turned out

No to any



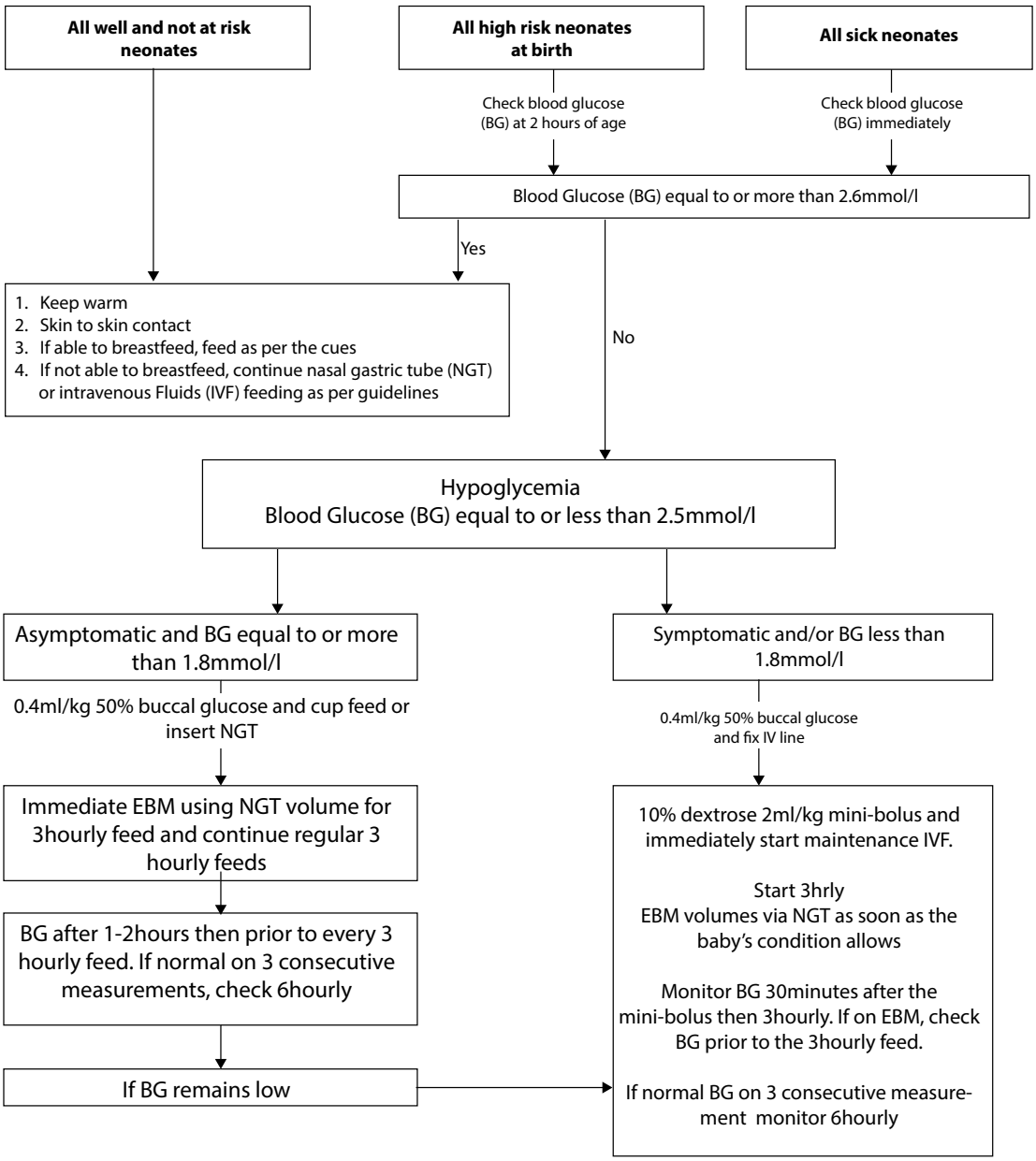
Yes to all

Effective Suckling
1. Baby takes slow deep suckles sometimes pausing and you may be able to see or hear the baby swallowing
2. No dimpling
3. Suckling is comfortable and pain free for mom

No to any

- Importance and management of breastfeeding should be discussed with pregnant women and their families during antenatal period.
- Facilitate immediate and uninterrupted skin-to-skin contact and support mothers to initiate breastfeeding as soon as possible after birth.
- Support mothers to initiate and maintain breastfeeding and manage common difficulties
- Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day.
- Support mothers to recognize and respond to their infants' cues for feeding

1.4 Prevention and Treatment of Hypoglycemia



Symptoms and Signs associated with hypoglycaemia		Mild-Moderate (Don't miss these signs!)	Severe
	CNS	Jitteriness, Irritability, High Pitched Cry, Lethargy, Hypotonia, Tremors, Hypothermia	Seizures, Coma and even sudden Death
	RS	Tacypnoea	Apnoea, Cyanosis
	CVS	Tachycardia, Sweating	Pallor, Circulatory Collapse
	GI	Poor feeding, Vomiting	

1.5 Feeds and Fluids

Is the baby unstable? Characteristics of an unstable newborn include; Convulsions, Unconscious, severe respiratory distress, Distress evidenced by severe chest wall indrawing, absent bowel sounds.

Can the baby breastfeed? From weight 1500grams breastfeed, if not able to breastfeed, feed by cup. Health workers must have the skill of cup feeding and must teach the same to the mothers (section 3.5). If using EBM, show mother how to express breastmilk (section 3.5).

The Aim

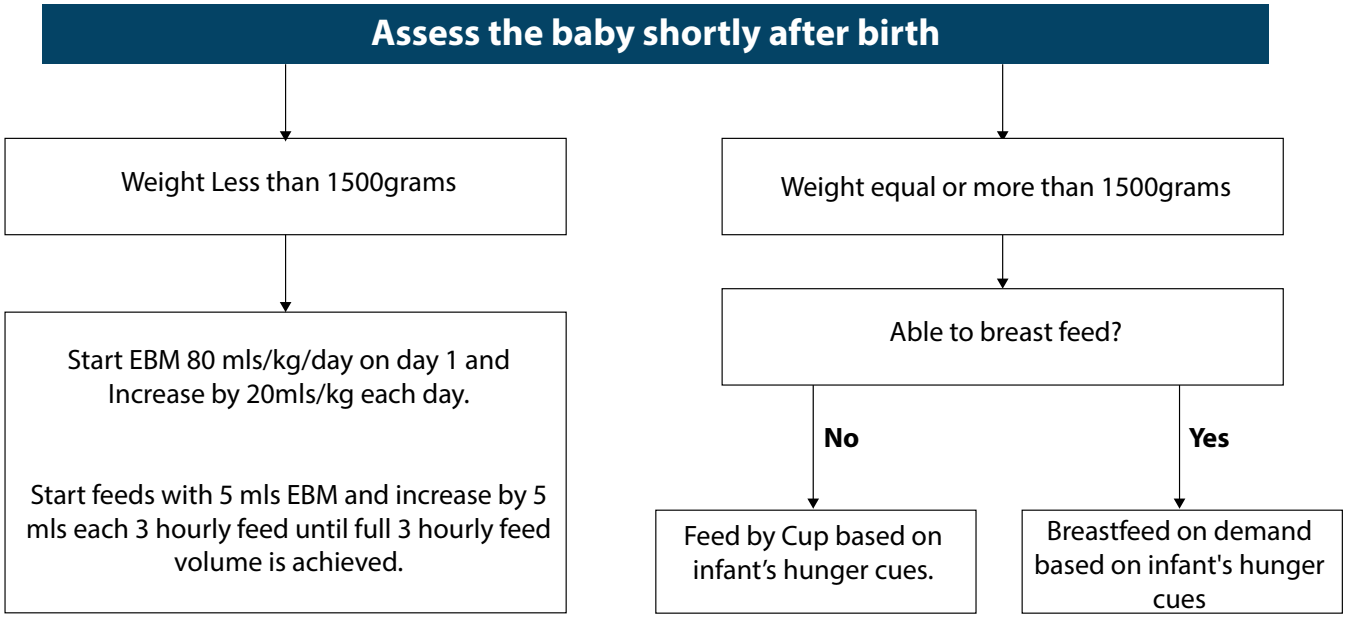
1. Weight gain – 15grams/kg/day
2. Appropriate time taken to reach full enteral feeds - Neonates <1000grams at birth – 2 weeks & neonates with birthweight 1000-1500grams – 1 week

a) **Feeding STABLE AND WELL babies birth weight less than 1.5 kg and equal or over 1.5kg**
Stable babies are well, without respiratory distress and do not have a congenital malformation as a contraindication to enteral feeding.

Stable babies' birthweight less than 1.5kg: Start with EBM 80mls/kg/day on day 1 and increase by 20mls/kg each day to max 180mls/kg/day. It may be possible to increase volumes further to as much as 200mls/kg/day but seek expert advice.

Stable babies' birthweight equal to or over 1.5kg: Assess ability to breastfeed.

1.5 a) Feeding Stable and Well Babies - birth weight less than 1.5 kg vs equal to or more than 1.5kg



Example: 1000gm baby
Day 1: 80mls/kg/day → 1kg X 80 = 80ml ÷ 8 feeds/day = 10mls 3hrly feeds. First feed 5mls, then 10mls 3hrly
Day 2: 100ml/kg/day
Day 3: 120ml/kg/day
Day 4: 140ml/kg/day
Day 5: 160ml/kg/day
Day 6: 180ml/kg/day

Three hourly NGT EBM feed volumes in milliliters (mls) for stable newborns with birth weight 1000 - 1499grams (Table includes NGT feed volumes for birthweight less than 1000grams if unsafe to give IVF)

Age	0.6kg	0.7kg	0.8kg	0.9kg	1.0kg	1.1kg	1.2kg	1.3kg	1.4kg	1.5kg
Day 1	6	7	8	9	10	11	12	13	14	15
Day 2	8	9	10	11	13	14	15	16	18	19
Day 3	9	11	12	14	15	17	18	20	21	23
Day 4	11	12	14	16	18	20	21	23	25	26
Day 5	12	14	16	18	20	22	24	26	28	30
Day 6	14	16	18	20	23	25	27	29	32	34

b) Feeds and Fluids for UNSTABLE neonates

- **Unstable newborn** - Sick baby (convulsions, unconscious, severe respiratory distress evidenced by severe chest wall indrawing, absent bowel sounds)
- **Day 1:**
  - ✔ Start IV 10% Dextrose for 24hrs.
    - V Birthweight less than 1.5kg start with 80ml/kg/day.
    - V Birthweight equal or greater than 1.5kg start with 60ml/kg/day
  - ✔ To stimulate the gut, give 2ml/kg of colostrum via NGT every 3hours – to be started when A, B and C are stabilized— do not deduct this from the IVF. (If you think it is unsafe to give IV fluids then start immediate NG feeding with colostrum)
- **Day 2:**
  - ✔ Start feeding with EBM via NGT at 30mls/kg/day EBM.

- ✔ Increase the EBM feeds by 30mls/kg/day and reduce IV fluids to keep within the total daily volume until IVF stopped i.e. until full 3 hourly enteral feed volume achieved appropriate for weight and postnatal age in days.
- ✔ Increase total feeds (IVF + EBM) by 20mls/kg/day to max of 150mls/kg/day. Once no longer on IVF increase EBM to max of 180mls/kg/day, but it may be possible to increase volumes further to as much as 200mls/kg/day but seek expert advice.

- Example - equal or greater than 1.5kg
  - ✔ Day 1: Total intake - 60mls/kg/day IVF
  - ✔ Day 2: Total intake - 80mls/kg/day (30mls/kg/day EBM + 50mls/kg/day IVF)
  - ✔ Day 3: Total intake - 100mls/kg/day (60mls/kg/day EBM + 40mls/kg/day IVF)
- Always feed with EBM unless contra-indicated
- For babies who have hypoglycemia, after correction measure, monitor blood glucose prior to feeding. If 3 consecutive blood glucose measurements are normal then monitor 6hrly
- Prescribe daily the type and volume of IVF to be given per hour PLUS the EBM to be given 3hourly.
- IVF and EBM intake should be monitored using the feeding charts, ensuring that there is no unexplained deficit that would make the neonate be dehydrated or/and fail to gain weight as expected.

1.5 b) Feeding Unstable Babies

Three hourly NGT EBM feeds and ONE hourly IVF for UNSTABLE NEWBORNS with birth weight less than 1500grams

Age	0.6kg		0.7kg		0.8kg		0.9kg		1.0kg		1.1kg		1.2kg – 1.3kg		1.4kg – 1.5kg		Total daily fluid/ milk volume
	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	
Day 1		2		2		3		3		4		4		4		5	80ml/kg/day
Day 2	2	2	3	2	3	2	3	3	4	3	4	3	5	4	5	4	100ml/kg/day
Day 3	5	2	5	2	6	2	7	2	8	3	8	3	9	3	11	4	120ml/kg/day
Day 4	7	1	8	1	9	2	10	2	12	2	12	2	14	3	16	3	140ml/kg/day
Day 5	9	1	11	1	12	1	14	1	16	1	16	1	19	2	22	2	160ml/kg/day
Day 6	11	0	13	0	15	0	17	0	20	0	20	0	23	0	27	0	180ml/kg/day
Day 7	14	0	16	0	18	0	20	0	24	0	24	0	28	0	33	0	180ml/kg/day

Day 1– Give 2mls/kg of colostrum every 3 hours as trophic feeds on Day 1 after A, B and C are stabilized – DO NOT SUBTRACT THIS FROM THE IVF, THUS IVF REMAINS AS SHOWN IN THE CHART 80mls/kg/day

Three hourly NGT EBM feeds and ONE hourly IVF for UNSTABLE NEWBORNS with birth weight 1500grams – 3000grams

Age	1.5 – 1.6kg		1.7 – 1.8kg		1.9 – 2.0kg		2.1 – 2.2kg		2.3 – 2.4kg		2.5 – 2.6kg		2.7 – 2.8kg		2.9 – 3.0kg	
	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr
Day 1		4		4		5		5		6		6		7		7
Day 2	6	3	7	4	7	4	8	4	9	5	10	5	10	6	11	6
Day 3	12	3	13	3	15	3	16	4	18	4	19	4	21	5	22	5
Day 4	17	2	20	2	22	2	24	3	26	3	29	3	31	3	33	4
Day 5	23	1	26	2	29	2	32	2	35	2	38	2	41	2	44	2
Day 6	29	1	33	1	37	1	40	1	44	1	48	1	52	1	55	1
Day 7	35	0	39	0	44	0	48	0	53	0	57	0	62	0	66	0

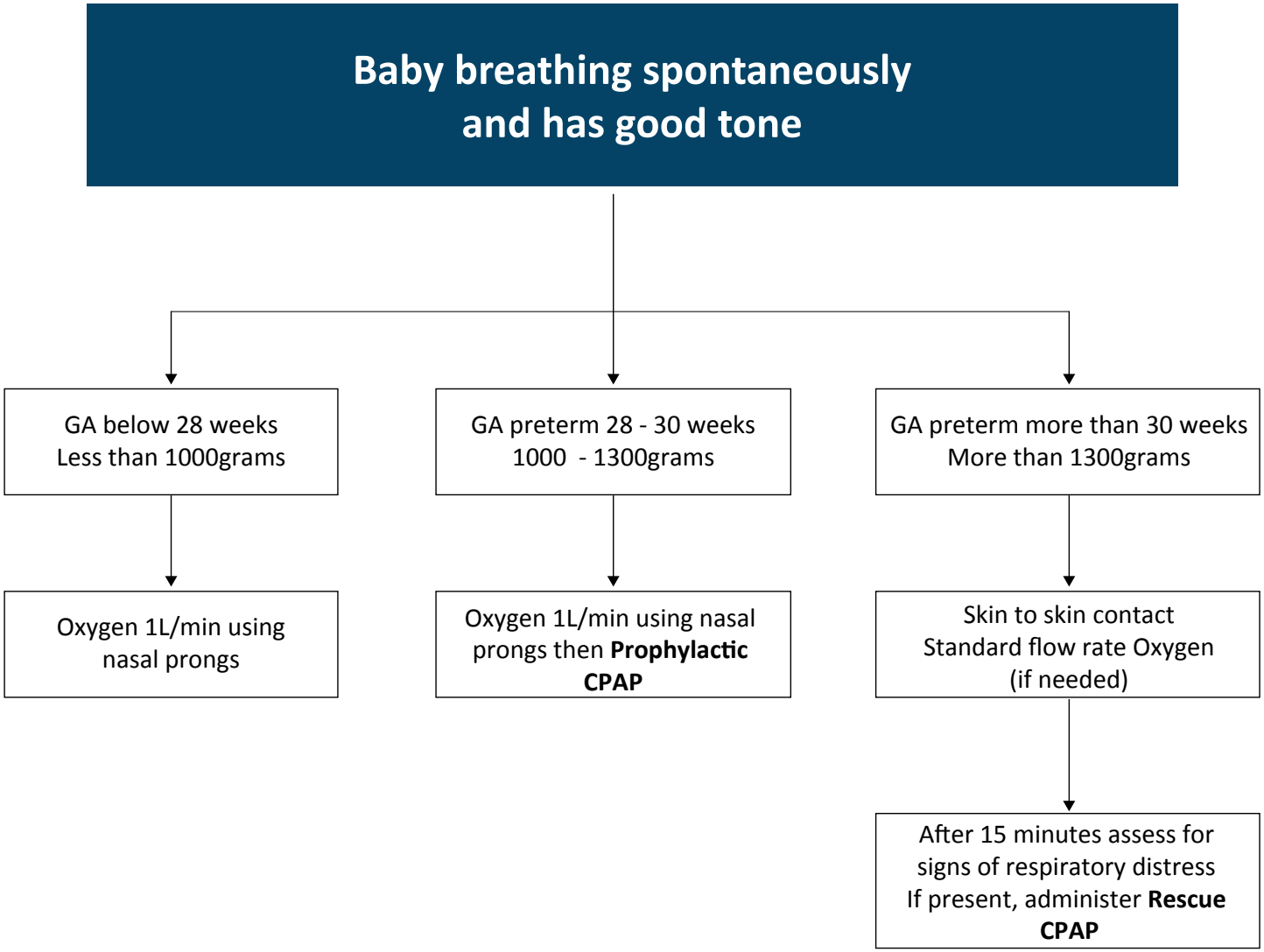
Day 1– Give 2mls/kg of colostrum every 3 hours as trophic feeds on Day 1 after A, B and C are stabilized – DO NOT SUBTRACT THIS FROM THE IVF, THUS IVF REMAINS AS SHOWN IN THE CHART 60mls/kg/day

Three hourly NGT EBM feeds and ONE hourly IVF for UNSTABLE NEWBORNS with birth weight 3100grams – 4000grams

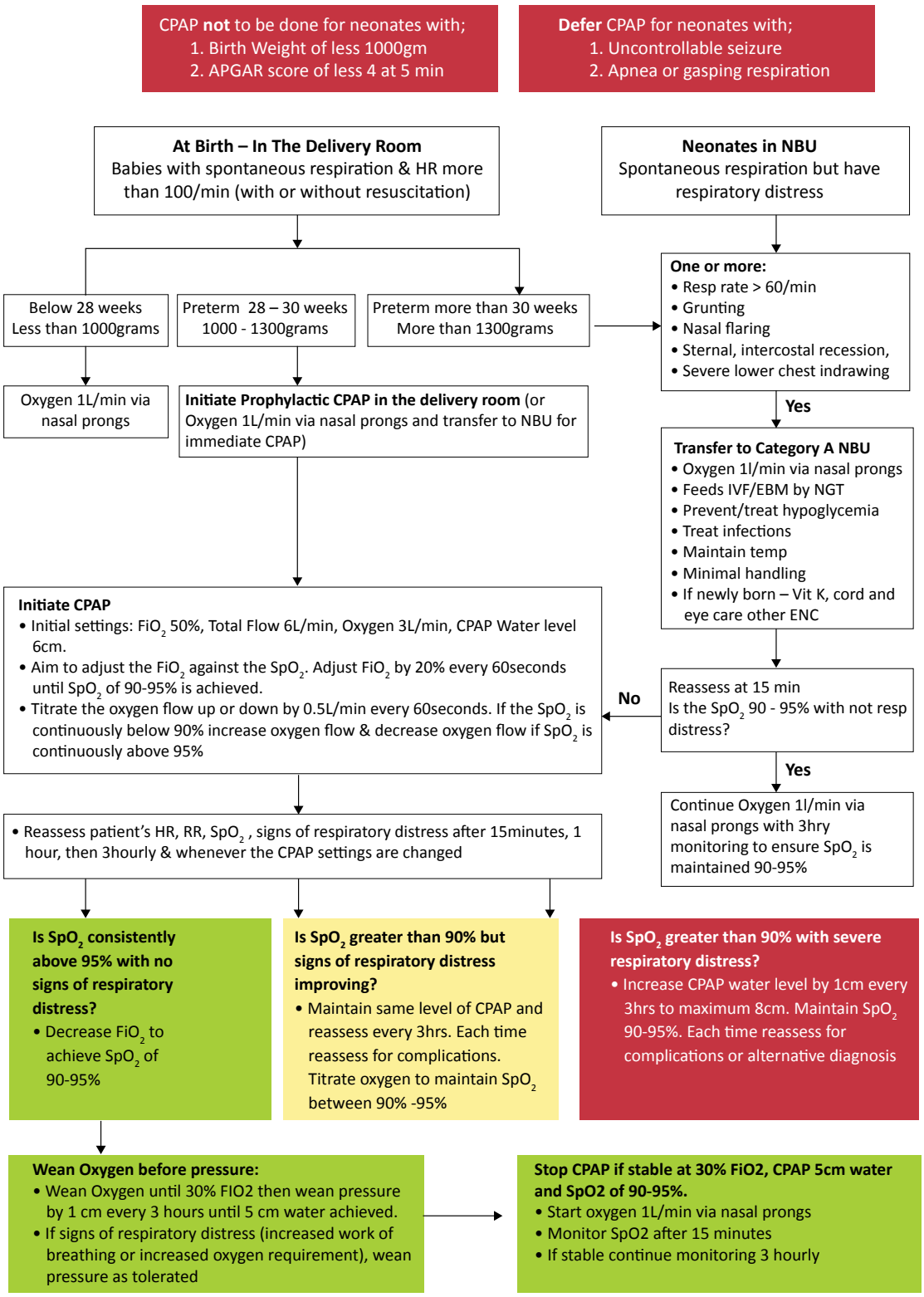
Age	3.1– 3.2kg		3.3 – 3.4kg		3.5 – 3.6kg		3.7 – 3.8kg		3.9 – 4.0kg	
	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr	EBM 3hrly	IVF mls/hr
Day 1		8		8		9		9		10
Day 2	12	7	13	7	13	7	14	8	15	8
Day 3	24	5	25	5	27	6	28	6	30	7
Day 4	35	4	38	4	40	4	42	5	44	5
Day 5	47	3	50	3	53	3	56	3	59	3
Day 6	59	1	63	1	67	1	70	2	74	2
Day 7	71	0	75	0	80	0	84	0	89	0

Day 1– Give 2mls/kg of colostrum every 3 hours as trophic feeds on Day 1 after A, B and C are stabilized – DO NOT SUBTRACT THIS FROM THE IVF, THUS IVF REMAINS AS SHOWN IN THE CHART 60mls/kg/day

1.6 Supporting respiratory efforts in a preterm baby breathing spontaneously and has good tone



1.7 Supporting respiratory efforts – Use of Oxygen and Continuous Positive Airway Pressure (CPAP)



1.8 Treatment Failure & Complications of Continuous Positive Airway Pressure (CPAP)

Signs of Improvement

1. Reduced respiratory distress (work of breathing) as indicated by decrease in;
   - Respiratory rate
   - Grunting
   - Sternal/intercostal indrawing
   - Nasal flaring
2. Stabilization or reduction in oxygen requirement to maintain SpO2 between 90-95%
3. Patient looks more comfortable

Signs of Treatment Failure

1. Increased work of breathing (sternal and intercostal recession, grunting, tachypnoea)
2. Oxygen requirement greater than 40% to maintain SpO2 between 90-95% in 8cm water level of CPAP
3. A rapid rise in oxygen requirement (an increase of 10% FiO2 to maintain SpO2 90-95% within a 3-hour period)
4. Recurrent apneic episodes requiring stimulation

Actions to take in Treatment Failure

1. Assess patient for complications - include a chest X-ray
2. Perform transillumination for babies less than 32 weeks gestation
3. Refer to a higher level facility

Family Centered Care

Always Involve the parents.

Give them information regarding the disease process and treatment

Complications of CPAP and Preventive Measures

1. Pressure injury:

- Necrosis of nasal septum, distortion of nasal nares or ears.

Prevention:

- Measure and size nasal prongs correctly
- Prongs should fit the nares snuggly but no blanching the skin.
- Ensure nasal prongs are not in contact with septum or columella – leave 2mm, ensure the 2 lines on nasal prongs are visible!
- Check ears for pressure areas, creases or folds

2. Abdominal distension:

- Gas delivered enters the stomach

Prevention:

- Use lowest possible flow of gas
- Use orogastric tube on free drainage (if feeding through OGT, then open OGT to free drainage 1/2hr after a feed.)

3. Air leak syndromes e.g. Pneumothorax:

- May be due to the disease process or high pressures of above 8cm/water. Clinical signs; Increasing respiratory distress, Asymmetrical chest movement or appearance, Decreased air entry, Hyperresonance on auscultation, Positive illumination

Prevention:

- Do not exceed 8cm/water

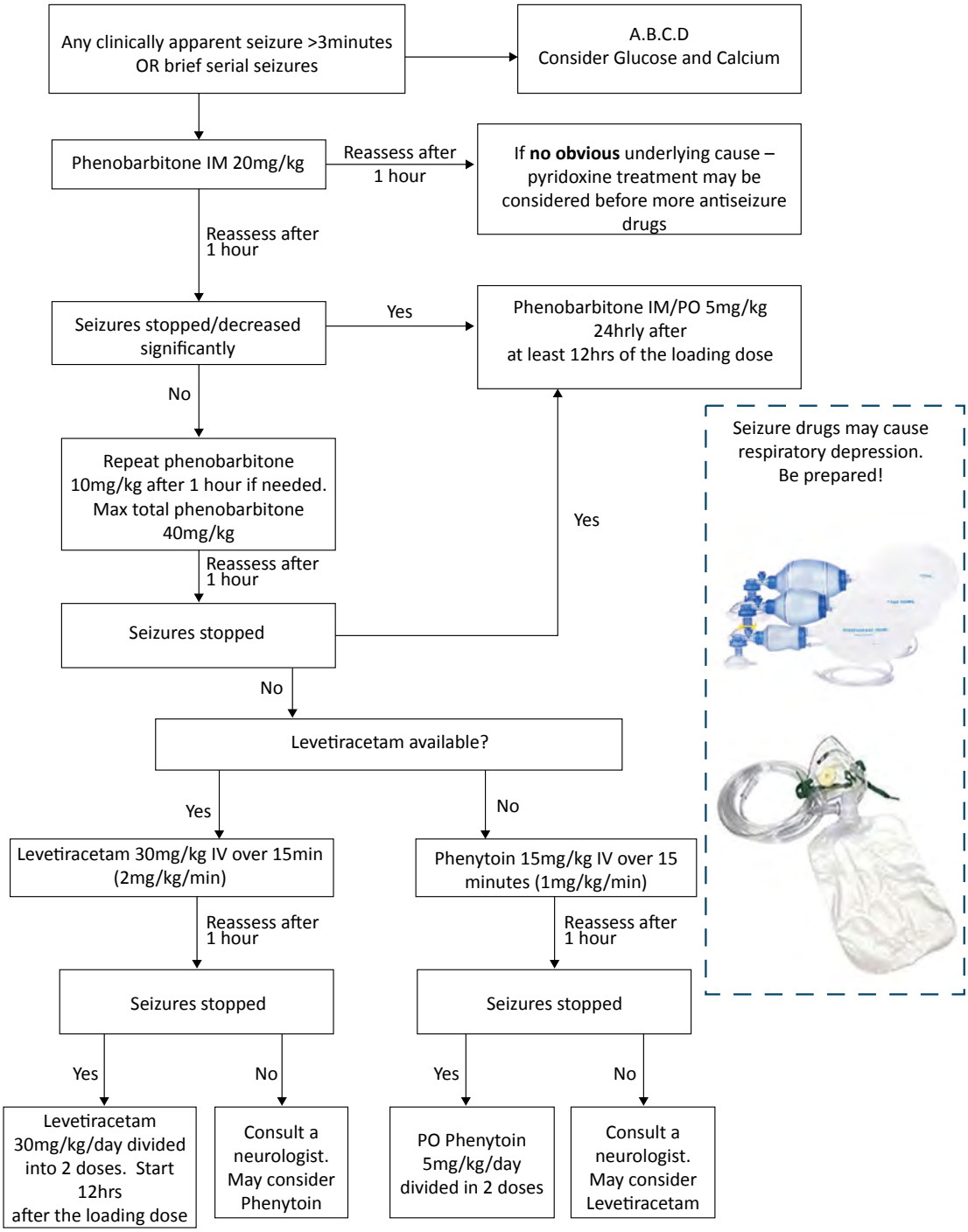
4. Hypoxia or oxygen toxicity:

- SpO2 below 90% or above 95%

Prevention:

- Maintain SpO2 90 - 95%

1.9 Neonatal Seizures

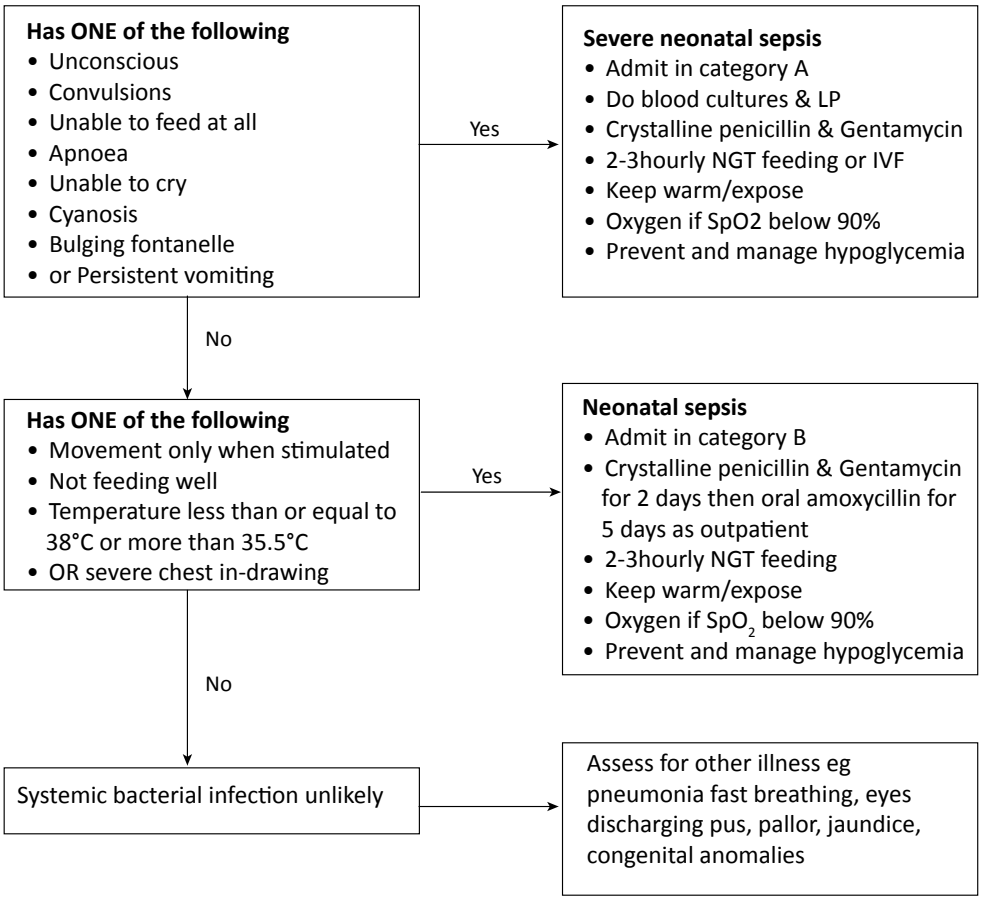


In the absence of clinical seizures, neonates with hypoxic-ischaemic encephalopathy need not to be given prophylactic treatment with phenobarbitone

When to stop anticonvulsant drugs

1. In neonates with normal neurological examination and/or normal electroencephalography, consider stopping antiepileptic drugs if neonate has been seizure-free for more than 72 hours; the drug(s) should be reinstituted in case of recurrence of seizures.
2. In neonates in whom seizure control is achieved with a single antiepileptic drug, the drug can be discontinued abruptly without any tapering of the doses.
3. In neonates requiring more than one antiepileptic drug for seizure control, the drugs may be stopped one by one, with phenobarbital being the last drug to be withdrawn.

1.10 Assessing for possible Bacterial Infection



- Metronidazole or clindamycin may be added when necrotizing enterocolitis is suspected
- Cloxacillin and gentamicin – in suspected staphylococcal septicemia; neonates with signs of sepsis and also has :extensive skin pustules, abscess or omphalitis

Antibiotic Prophylaxis for newly born

Prophylactic antibiotic should be given as soon as possible after birth to all newborns (term and preterms) with any one of the following risk factors:

- Membrane rupture more than >18 hours before delivery
- A mother with fever (Temperature > 38^{o} C) before delivery or during labour
- Suspected or confirmed chorioamnionitis – amniotic fluid foul smelling or purulent

Do blood culture. Benzyl Penicillin and Gentamicin standard dose Treatment should be started immediately and be given for 48-72 hours (at least 4 doses of Penicillin + 2 doses of gentamicin). Reassess after two days – continue treatment only if there is positive blood culture OR there are features of sepsis. Stop antibiotics if the baby has remained entirely well during this period.

1.11 Newborn antibiotic doses

Antibiotic doses for Newborns aged 0-6days

	Intravenous / Intramuscular antibiotics aged <7 days						
Weight (kg)	Penicillin (50,000 i.u/kg)	Ampicillin / Flucloxacillin /cloxacillin (50mg/kg)	Gentamycin (3mg/kg < 2kg, 5mg/kg > 2kg)	Ceftriaxone For sepsis (50mg/kg)	Ceftriaxone* For meningitis (80mg/kg)	Metronidazole** (7.5mg/kg)	Ceftazidime 50mg/kg
	I.V / I.M	I.V / I.M	I.V / I.M	I.V / I.M	I.V / I.M	I.V	I.V / I.M
	12 hrly	12 hrly	24 hrly	24 hrly	24 hrly	12 hrly	12 hrly
1.00	50,000	50	3	50	80	7.5	50
1.25	75,000	60	4	62.5	100	10	60
1.50	75,000	75	5	75	120	12.5	75
1.75	100,000	85	6	75	140	12.5	85
2.00	100,000	100	10	100	160	15	100
2.50	150,000	125	12.5	125	200	20	125
3.00	150,000	150	15	150	240	22.5	150
4.00	200,000	200	20	200	320	30	200

- ✓ **Gentamycin** – Dose already adjusted for **weigh and age in DAYS**
- ✓ **Gentamycin** used OD should be given **IM or as a slow IV push** – over 2-3 mins.
- ✓ If a baby is not obviously passing urine after more than 24 hours consider stopping gentamycin
- ✓ **Penicillin** dosing is **12hrly** in babies aged < 7days and **6hrly** for those aged 7days and over
- ✓ **Ceftriaxone** is not recommended in obviously jaundiced newborns – Cefotaxime / Ceftazidime are safer cephalosporins in the first 7 days of life
- ✓ ***Ceftriaxone** for meningitis or severe infection Loading dose of 100 mg/kg once, then 80 mg/kg every 24 hours
- ✓ **Amoxycillin dispersible table – 50mg/kg/dose 12hrly i.e. 100mg/kg/day divided in 2 doses**
- ✓ ****Metronidazole**: 15 mg/kg IV as a single dose, then 7.5 mg/kg every 12 hours

Ophthalmia Neonatorum:
Swollen eye lids with pus should be treated with a single dose of:

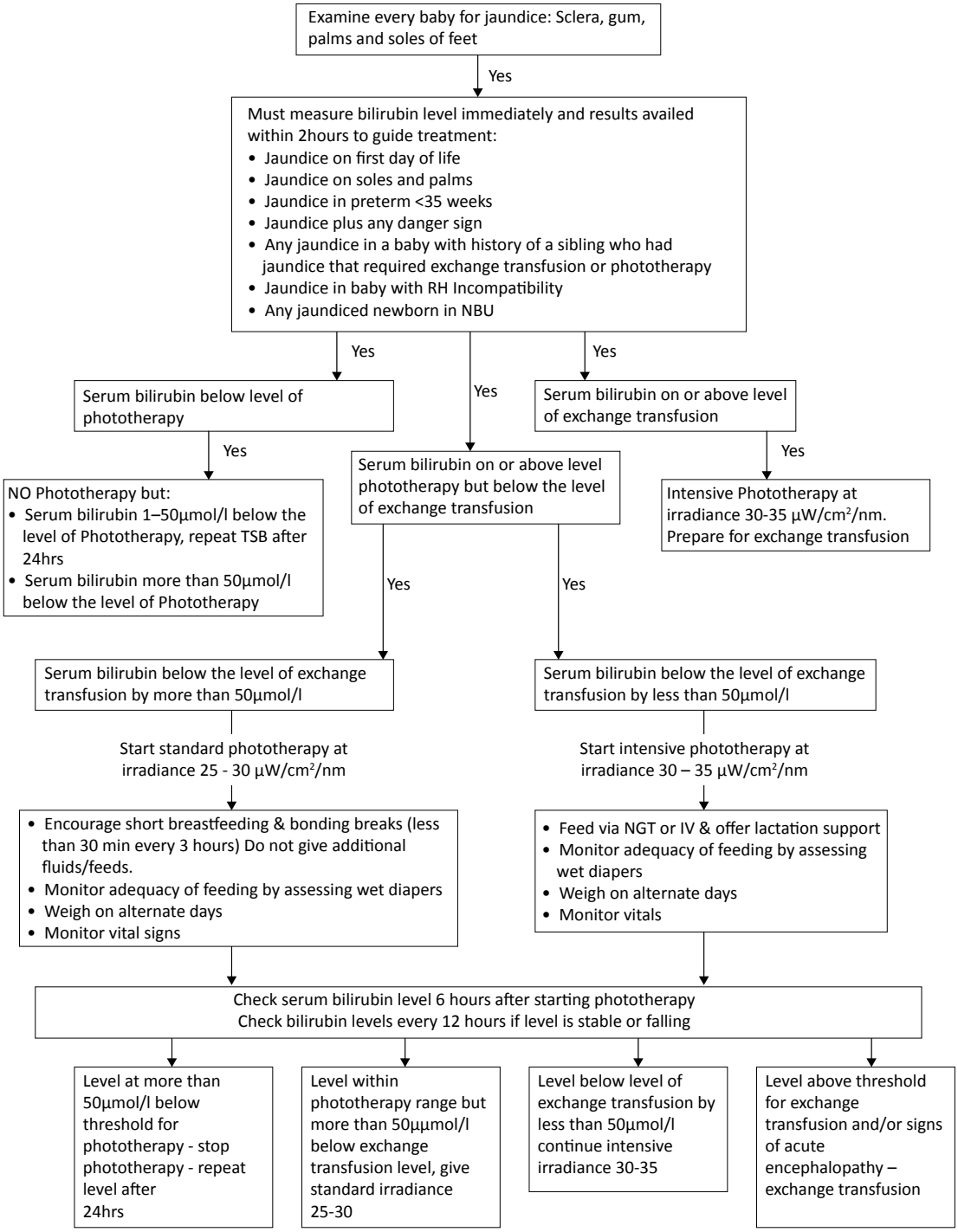
- ✓ Kanamycin or Spectinomycin 25mg/kg (Max 75 mg) IM, or
- ✓ Ceftriaxone 50mg /kg IM

Antibiotic doses for Newborns aged 7 days & over

		Intravenous / Intramuscular antibiotic doses Neonates aged ≥ 7 days					
Weight (kg)	Penicillin* (50,000 i.u/kg)	Ampicillin or Flucloxacillin 50mg/kg /Cloxacillin	Gentamycin 7.5 mg/kg	Ceftriaxone for sepsis 50mg/kg	Ceftriaxone * for meningitis or severe infection 80mg/kg	Metronidazole** 7.5 mg/kg	Ceftazidime 50mg/kg
	I.V / I.M	I.V / I.M	I.V / I.M	I.V / I.M	I.V / I.M	I.V	I.V / I.M
	6 hrly	8 hrly	24 hrly	24 hrly	24 hrly	8 hrly	8 hrly
2.5	125,000	125	20	125	200	20	125
3.0	150,000	150	20	150	240	20	150
4.0	200,000	200	30	200	320	30	200
5.0	250,000	250	35	250	400	35	250

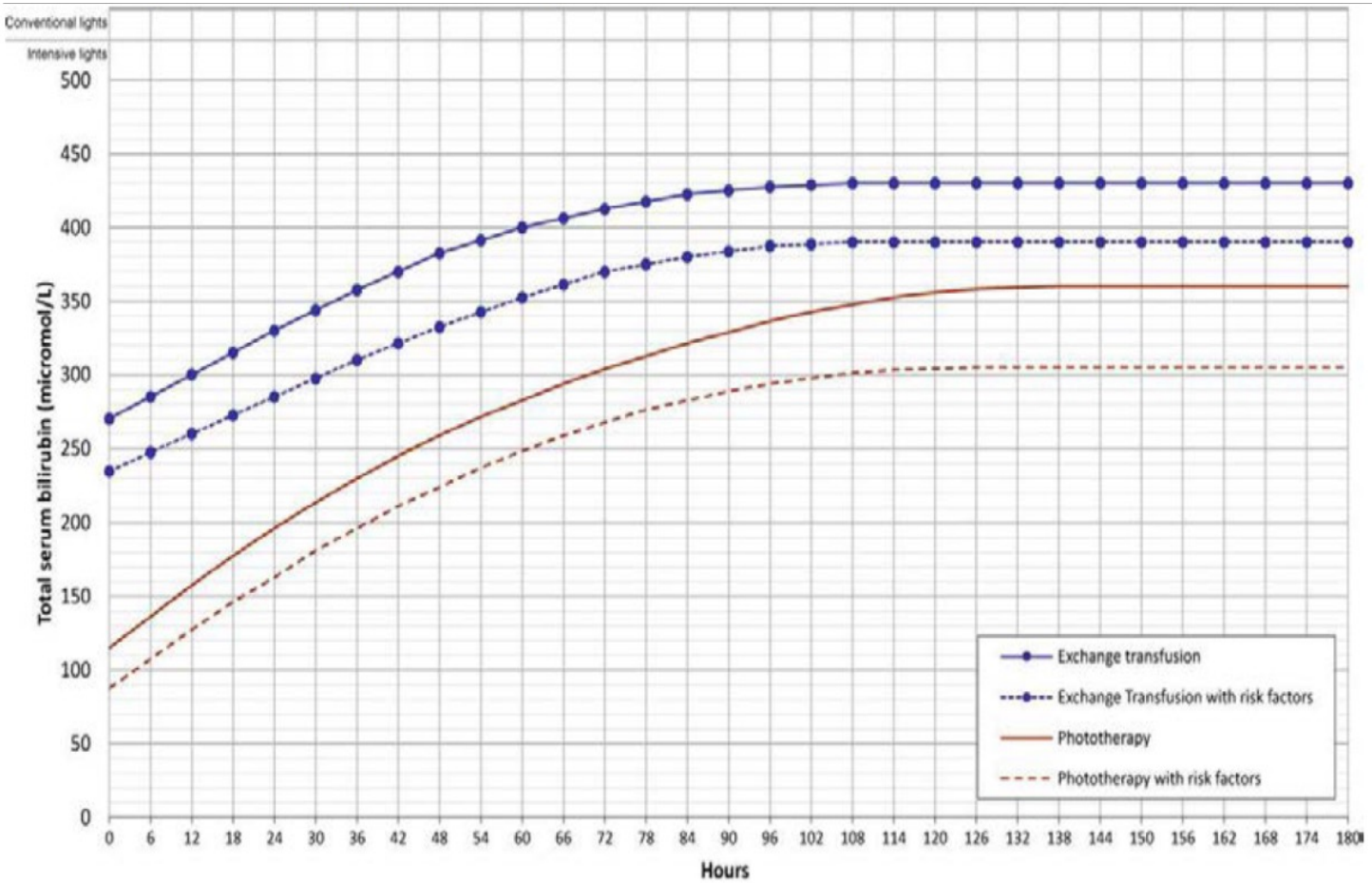
**Ceftriaxone for meningitis or severe infection Loading dose of 100 mg/kg once, then 80 mg/kg every 24 hours*
*** Metronidazole: 15 mg/kg IV as a single loading dose, then 7.5 mg/kg/dose every 8 hours*

1.12 Assessing Severity of Jaundice & Giving Correct Treatment



Risk factors for bilirubin encephalopathy : dehydration, preterm births, respiratory distress, sepsis, hypoxia, seizures, acidosis, rate of increase of bilirubin level.

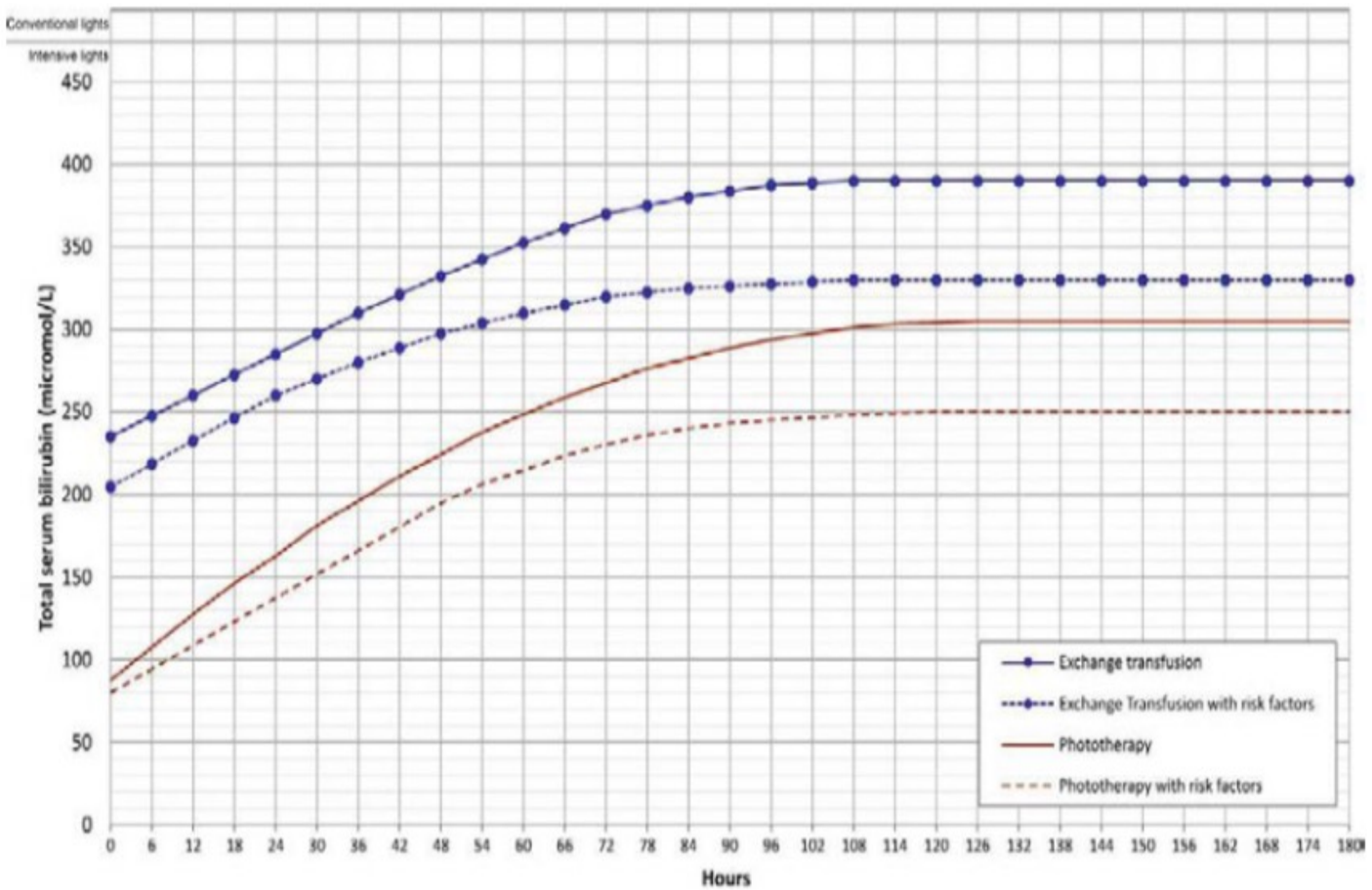
Nomogram A: Jaundice management for baby greater than 38 weeks gestation
In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.



Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

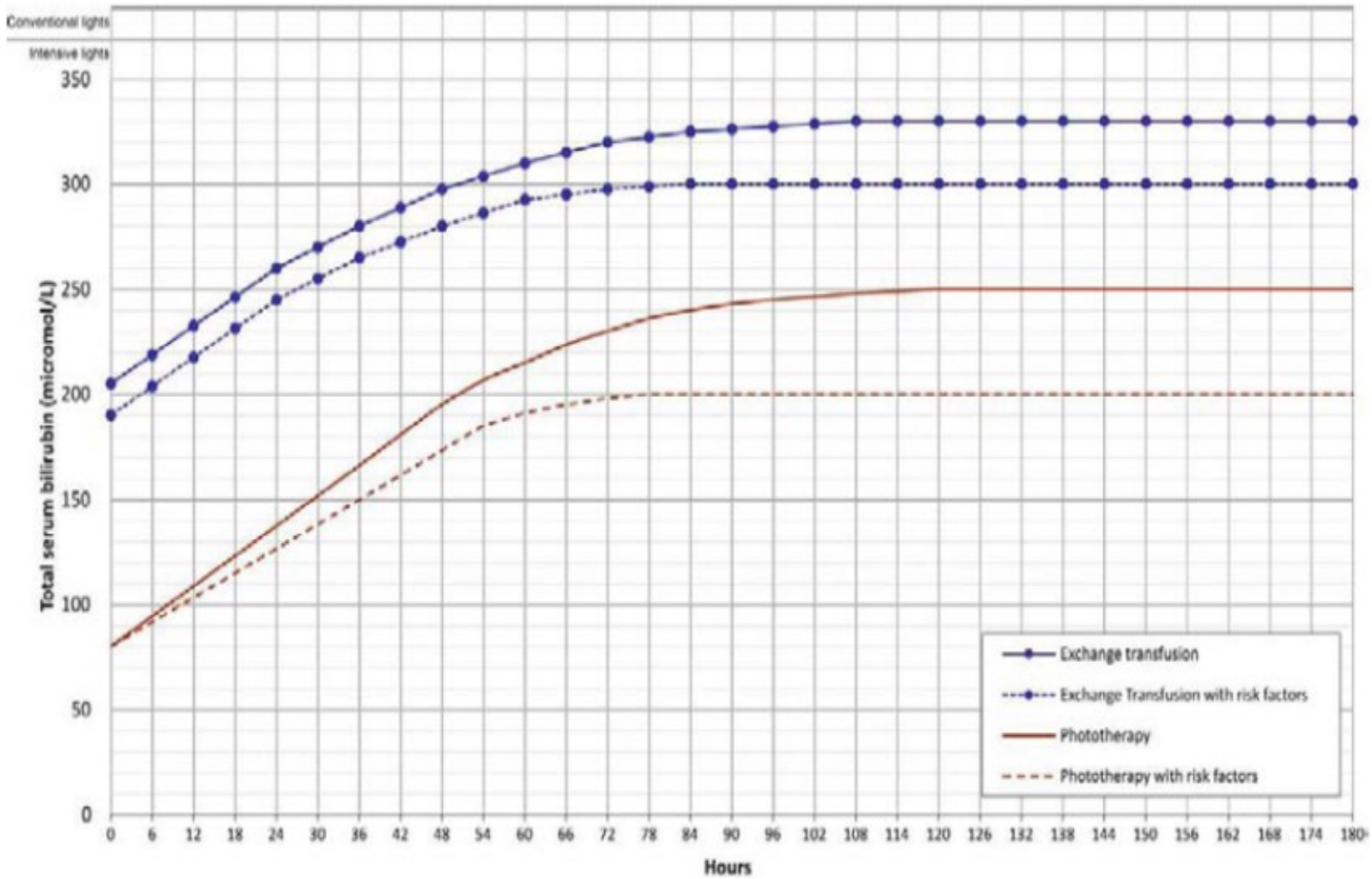
Nomogram B: Jaundice management for baby greater than 35 weeks and less than 37 completed weeks gestation In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.



Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

Nomogram C: Jaundice management for baby less than 35 weeks and greater than 1999grams birth weight In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.

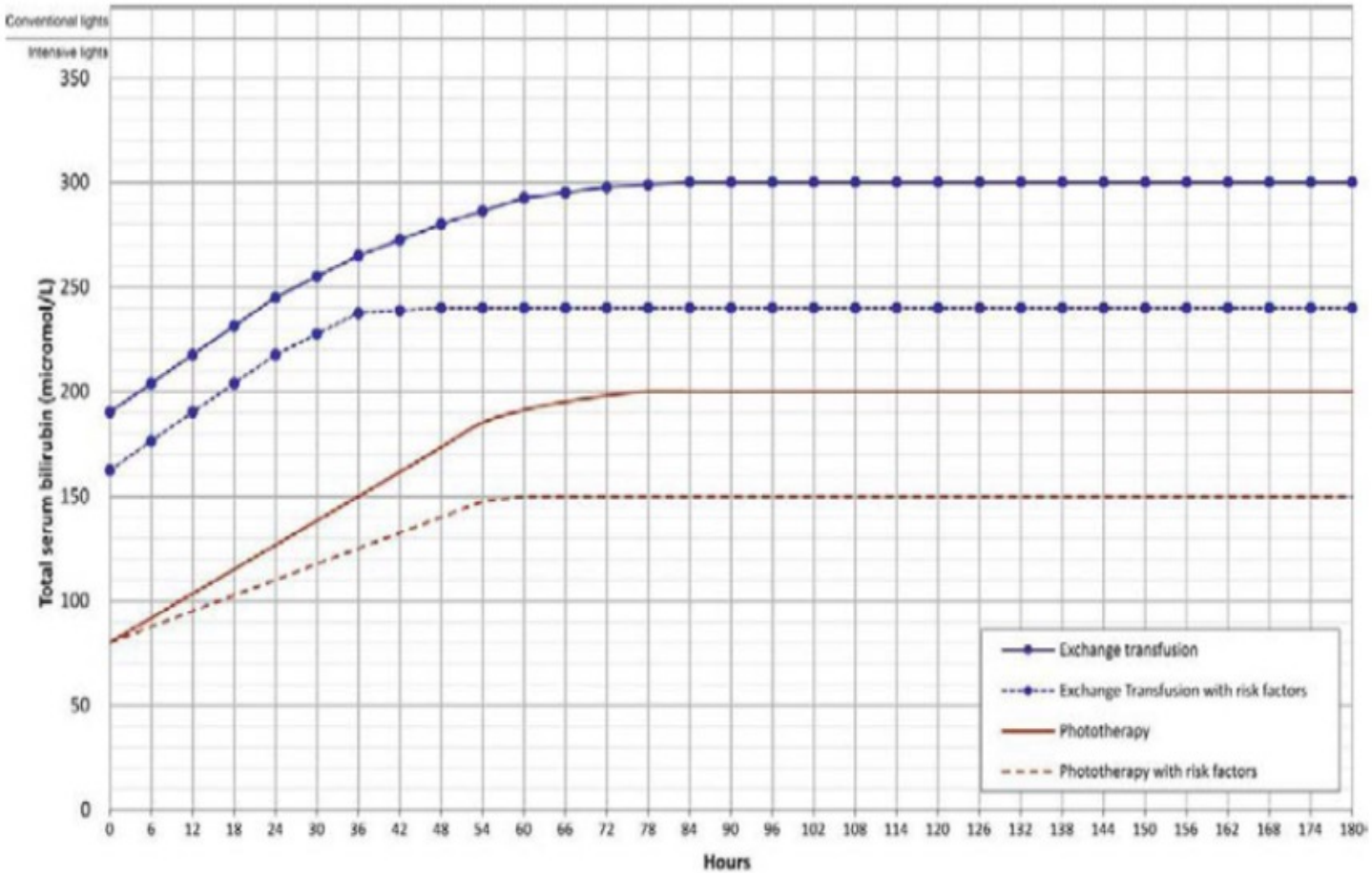


Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

Nomogram D: Jaundice management for baby less than 35 weeks and 1500 - 1999grams birth weight

In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.

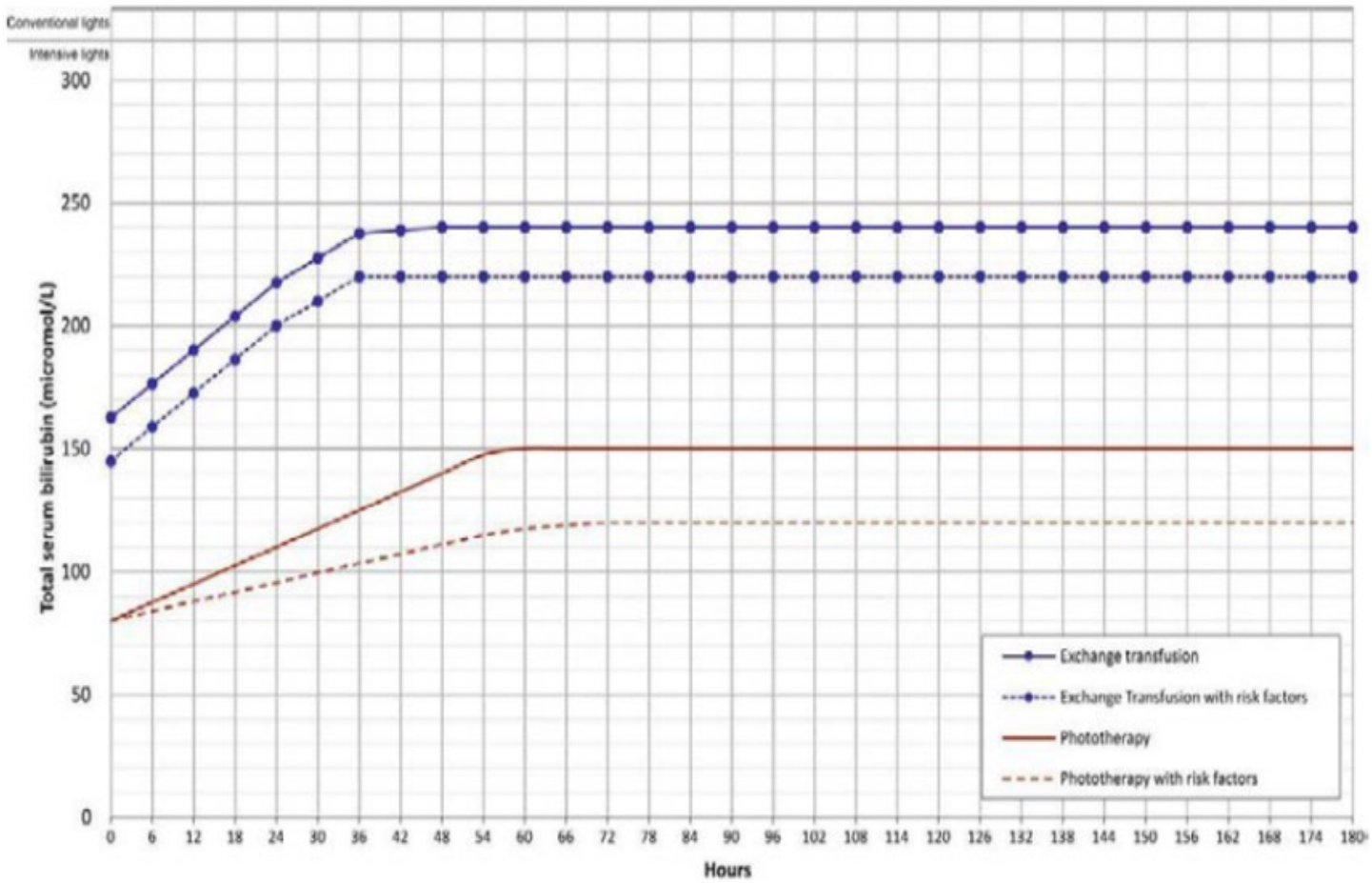


Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

Nomogram E: Jaundice management for baby less than 35 weeks and 1000 – 1499grams birth weight

In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.

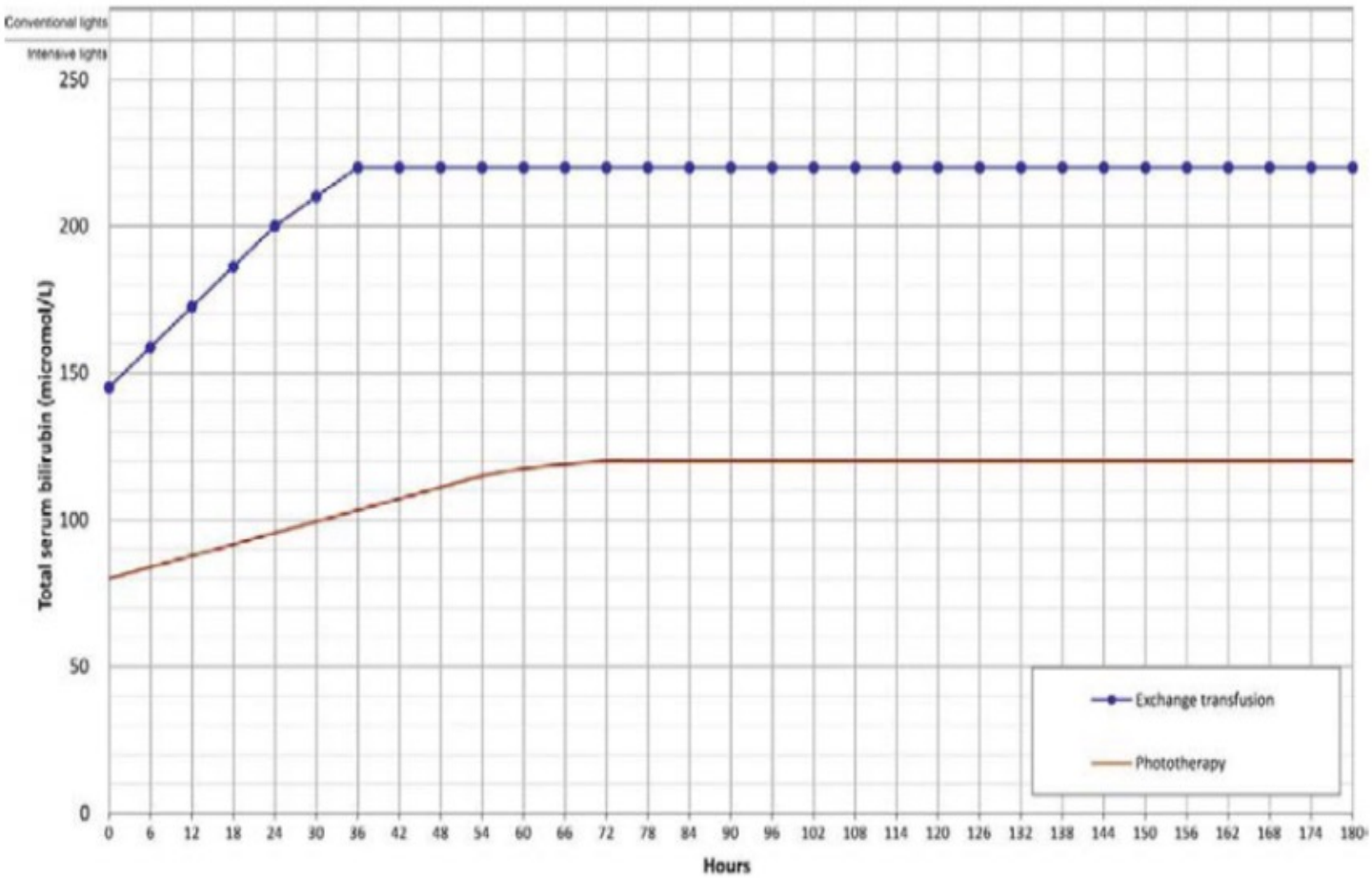


Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

Nomogram F: Jaundice management for baby less than 35 weeks and less than 1000grams birth weight

In the presence of risk factors (sepsis, hemolysis, acidosis or asphyxia) use the lower line.



Date and time	Total Serum Bilirubin

1. Serum bilirubin within 1–50 µmol/l below the level of phototherapy repeat bilirubin measurement after 24hrs
2. Serum bilirubin below level of exchange transfusion by less than 50µmol - give intensive phototherapy.
3. While on phototherapy treatment, stop phototherapy if bilirubin is more than 50µmol/l below threshold for phototherapy and repeat bilirubin level after 12hrs.

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CHAPTER 2

STANDARD OPERATING PROCEDURES (SOPs)

TABLE OF CONTENT

2.1 Using the Radiant Warmer

2.1.1 Indications for use of the Radiant warmer

- Newborn Resuscitation
- Short term Procedures

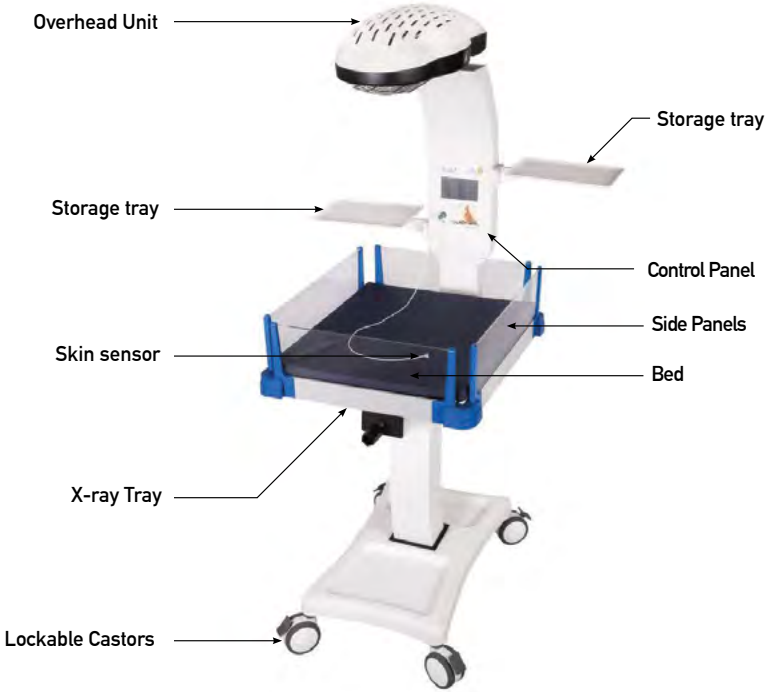
2.1.2 Family centered care

- Talk to the mother (parents) about keeping the baby warm at all times. Emphasize that when the baby gets cold at any point, their chances of getting unwell and dying are increased by 28% by every degree below 36.5°C.
- Explain the procedure being done on the radiant warmer. Emphasize that the radiant warmer will keep the baby warm during the procedure even if all the baby's clothes are removed.
- Answer any questions/concerns they may have

2.1.3 Items required when using the radiant warmer

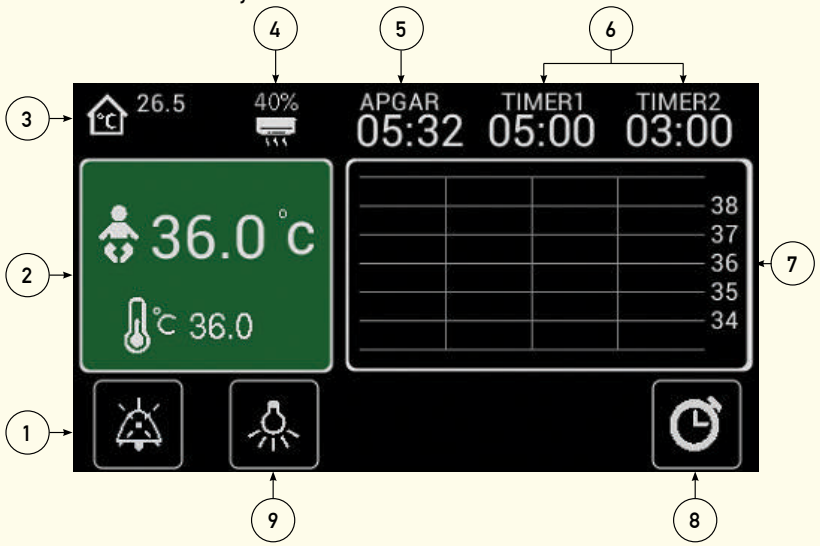
Machine Preparation Checklist	Baby Preparation Checklist
Direct power source	Alcohol based hand rub
Temperature sensor (probe)	Medical adhesive tape
Clean mattress	A thermometer
Linen to cover the mattress	Plastic Wrap (if below 32 weeks GA)
Cotton swabs with 70% alcohol	Items for the specific procedure

2.1.4 Parts of a radiant warmer



Control Panel

Functions are controlled by touch screen.



1	Alarm Mute	6	Procedure Timer
2	MODE Selection Panel	7	Temperature History Chart
3	Ambient Temperature	8	Timer
4	Heater Power	9	Examination Light
5	APGAR Timer		

Fig 2.1.4a Parts of a radiant warmer with digital controls

2.1.5 Selecting Warming Modes to Use

- Follow manufacture's instructions on where to locate the modes.
- There are 3 modes on a radiant warmer: Prewarm and baby modes are the preferred modes for use.

Fig 2.1.5a Selecting Prewarm Mode

Fig 2.1.5b Selecting Baby Mode

a) Prewarm Mode

- This mode provides low power background warming in preparation to receive the newborn. Select this mode at least **5 minutes** before the baby is placed on the warmer. Warm the linen/towels for receiving the baby in the delivery room by placing them on the mattress of the warmer.

To use prewarm mode;

- Ensure the temperature probe is attached to probe port

- Select PREWARM MODE from the MODE Selection screen. See fig 2.1.5a above
- Ensure the warmer displays prewarm on the screen.

Baby Mode

Also known as servo mode or automatic mode. Provides stable control of the baby's skin temperature by automatically adjusting the heater power to compensate for varying metabolic and environmental conditions. It measures and updates the baby's temperature five times per second. It is the preferred mode for maintaining the baby's body temperature.

To use Baby mode;

- Select BABY MODE from the MODE Selection screen. See fig 2.1.5b above
- Set the desired skin temperature between 36.5°C and 37.5°C by adjusting the up/down arrows on the front panel. Ensure the temperature probe is securely attached on the baby

Manual Mode

Provides user-adjustable heater power. Provides the option to monitor the baby's temperature using skin sensor. Babies must NEVER be left unattended because the temperature is controlled manually

To use manual mode

- Select MANUAL MODE from the MODE Selection screen.
- Set the desired heater power level between 0% and 100% by adjusting the up/down arrows on the front panel. The heater power level is displayed next to the heater power symbol on the control panel.
- Monitor the baby's temperature
- If the warmer is in MANUAL MODE for longer than 15 minutes, there will be an alert alarm and the heater power will reduce to that of the prewarm mode.

2.1.6 Setting Apgar And Procedure Timers

- Follow the manufacturer's instructions
- Adjust the timer symbol to access the APGAR and Procedure Timer selection screen. See fig 2.1.6 below
- Initiate the APGAR timer clock immediately the baby is delivered to start the APGAR timer. It will give an alarm at 1 min, 5min, 10min, 15 min automatically

- Adjust and set the APGAR and or procedure timer if available

Fig 2.1.6 Setting the APGAR and Procedure Timer

2.1.7 Using Examination Lights

- Follow the manufacturer's instructions
- Adjust the examination light symbol to access the light adjustment screen. See fig 2.1.7 below

Touch the bars shown to increase or decrease the light intensity.

Fig 2.1.7 Adjusting examination Lights

2.1.8 Preparing the Radiant Warmer for Use

- Follow hand hygiene protocol.
- Plug the power cable to the machine and attach to a single power source. Do not use an extension cable.
- Place or ensure the back of radiant warmer is on a wall with the front facing the nurse's station or the center of the room/unit
- Secure the warmer in place by locking the wheels to avoid unnecessary movement
- Place or ensure the storage side trays are secured in their place. Ensure all the side panels are firmly secured in place and none is broken or missing
- Cover the clean radiant warmer mattress with a clean linen
- Plug the temperature probe into the probe port.
- Turn on the machine and test if the probe is working by bring it close to the heater elements and checking if the temperature is rising. Place probe on the covered mattress

Fig 2.1.8 Insert temperature probe and test functioning

- Ensure the room temperature is 25°C – 28°C and draught free; you will need a warm environment as you move the baby to the radiant warmer. Select prewarm mode at least 5 minutes before receiving the baby.
- Place 2 linen towels to receive the baby at delivery on the clean covered radiant warmer mattress. Place other resuscitation items or other items specific to the designated procedure to be performed on the radiant warmer side trays or trolley.

- If expecting the delivery of a preterm less than 32 weeks, prepare to use a plastic wrap by spreading it on the mattress (section 3.2).
- As soon as the baby is born, start the APGAR timer

2.1.9 Preparing the Baby

- For asphyxiated babies, reduce the heat of the radiant warmer to 0% or switch off the heat of the radiant warmer & maintain room temperature. Subsequent temperature management will depend on your hospital policy. For preterms below gestation age of 32 weeks, initiate strict temperature regulation during resuscitation by use of plastic wraps, in addition to warmth provided by the radiant warmer.
- Position the baby naked, in the middle of radiant warmer covered mattress. One radiant warmer should be used for one baby.
- Follow resuscitation protocols (section 3.1)
- To monitor the temperature, locate the site to place and secure the temperature probe
  - ✔ Draw a right imaginary midclavicular line
  - ✔ Draw an imaginary horizontal line from the level of the xiphisternum, such that this line meets the midclavicular line at 90° (over the liver)
  - ✔ Clean this point where the two lines meet with alcohol swabs and let it dry.
  - ✔ Place the shiny flat part of the skin sensor on the temperature probe at this point
  - ✔ Secure the skin sensor with medical adhesive tape
  - ✔ Select the mode to use (Baby mode is preferred)
  - ✔ Ensure the baby's temperature is maintained between 36.5°C – 37.5°C

2.1.10 Alarms & Monitoring

- All alarms are displayed on the mode selection panel. When any of these alarms sound, correct the problem or institute alternative methods to keep the baby warm
- The alarms include;
  - ✔ High skin temperature alarm – when the skin temperature is higher than set temperature by 1°C when in **baby mode** and when higher than 38°C when in **manual mode**
  - ✔ Low skin temperature alarm – when the skin temperature is lower than set temperature by 1°C when in baby mode

- ✔ Sensor disconnect alarm – when sensor is unplugged or faulty when in baby mode
- ✔ Power Failure alarm – When the power supply to the warmer goes off
- ✔ Error alarm – When there is software or hardware failure. Must be serviced by biomedical technician/ engineer

- Always monitor the temperature of the room, the radiant warmer and the baby every hour until stable then every 3-4 hours
- Document all assessments and interventions in the baby's file, nurses cardex or comprehensive newborn monitoring chart as appropriate

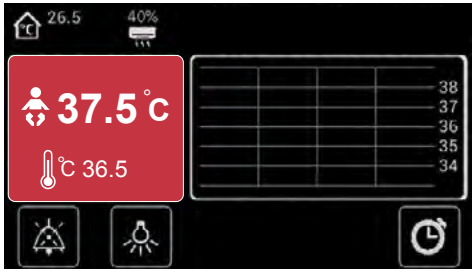


Fig 2.1.10a High temperature alarm

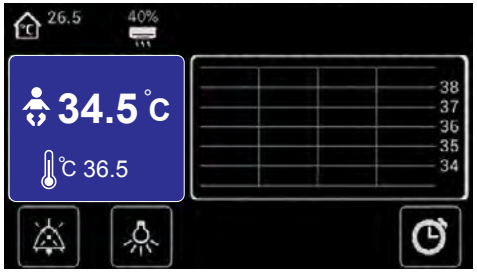


Fig 2.1.10b Low temperature alarm

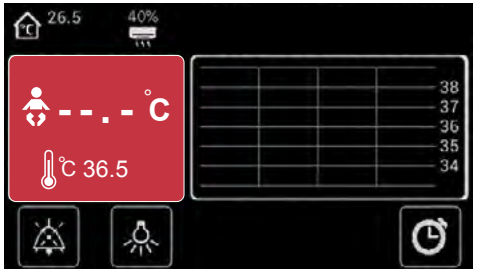


Fig 2.1.10c Probe Failure alarm

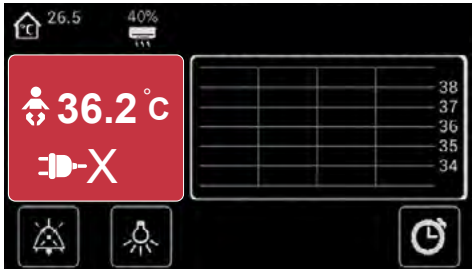


Fig 2.1.110d Power Failure alarm

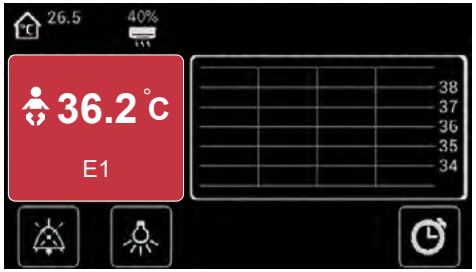


Fig 2.1.110e System error alarm

2.1.11 Removing the baby from the radiant warmer

- Ensure other methods of keeping the baby warm e.g. KMC, incubator care are available.
- Gently remove the adhesive tape on the temperature probe and transfer the baby to the mother for skin to skin/KMC or a warm cot or incubator.
- Turn off and unplug radiant warmer.
- Check baby's temperature after 30 minutes to ensure normal body temperature is maintained.
- Clean and disinfect the radiant warmer according the manufacturers' instructions.
- Document all assessments and interventions in the baby's file, nurses cardex or the comprehensive newborn monitoring chart as appropriate.

2.1.12 Likely Complications and Prevention Measures

Complications	Prevention Measures
Hypothermia & cold stress	Patients should never be left unattended under the radiant warmer especially when using the manual mode. Use temperature probe to maintain the temp of 36.5-37.5ºC. Ensure heater head is directly over the patient (ONE radiant warmer, ONE Baby)
Hyperthermia & heat stress	Ensure the temperature probe is well secured to monitor baby's temperature in baby mode and in manual mode.
Pressure sores	Turn the baby every 2 hours to avoid pressure sores

2.1.13 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- For the nonmetallic parts of the radiant warmer i.e. the control panel, power button, mattress, cot walls/ side panels, wipe with a cloth/gauze soaked in 0.05% sodium hypochlorite (one part 3.5% Jik to 69 parts of water)
- For the metallic items including the temperature probe and sensor, wipe with 70% alcohol.

2.3.14 Preventive Maintenance

- Do not place any linen on the overhead unit of the radiant warmer as it will interfere with the ventilation system of the heater elements.

- Test the heating elements and temperature probe weekly if the radiant warmer is not in use.
- Confirm weekly that the power loss alarm is working accurately - while the radiant warmer is plugged in and turned on, turn off power at wall socket, the alarm will be turned on.

2.2 Use of the suction machine for nasopharyngeal and oropharyngeal suctioning

2.2.1 Indications for nasopharyngeal or oropharyngeal suctioning

- Babies with secretions or blood in the mouth, nostrils or upper airway
- If meconium stained liquor is present at delivery, dry and stimulate the baby then inspect the nose and mouth for secretions. If secretions are present, suction.

2.2.2 Family centered care

- Talk to the mother (parents) about the procedure.
- Emphasize that suctioning will remove any secretions in the baby's airways hence allowing for better air entry during breathing.
- Explain what the procedure involves in simple terms – The machine creates a vacuum which sucks out excess secretions, the suction tube is soft and is inserted just into upper airway
- Explain that the procedure is safe when done correctly
- Answer any questions/concerns they may have

2.2.3 Two types of nasopharyngeal and oropharyngeal suctioning devices

Fig 2.2.3a Manual Suction using a penguin or bulb sucker

Fig 2.2.3b Suction using a suction machine attached to a wide bore sucker (yankheur) or a suction catheter

2.2.4 Items required when using a suction machine

Machine Preparation Checklist	Baby Preparation Checklist
Suction machine	Oxygen prongs
Short (vacuum) tube	Oxygen source
Long (patient) tube	Pulse Oximeter
Collecting reservoir	2cc syringe
Yankheurs (wide bore sucker)	Normal saline
Suction catheter size 6 & 8	
Sterile water in a kidney dish/gully pot	
Clean gloves	
Marker pen/tap/ adhesive tape	
Clock	

Clinical waste disposal bin/liner	
A sink with running water	
Power source and power cables	
Penguin sucker	

2.2.5 Parts of a suction machine

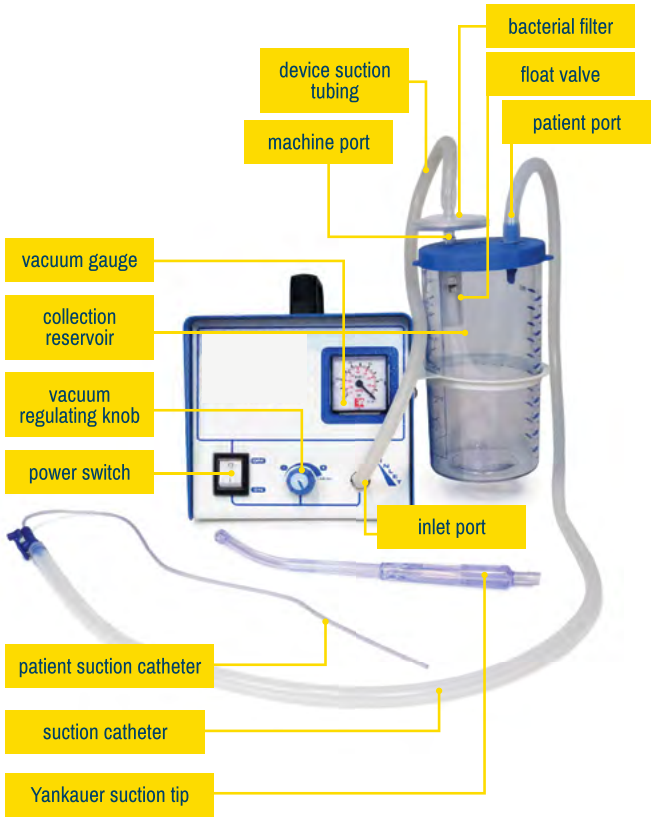


Fig 2.2.5 Parts of the Suction Machine

2.2.6 Preparing the Suction Machine for use

- Follow hand hygiene protocol and wear appropriate personal protective equipment (PPE)
- Plug the suction machine to power and test functionality
- Attach the short tubing between suction machine and machine port on the lid of the reservoir
- Attach the long tubing on the patient port on the lid of the reservoir
- Turn the machine on
- Using the pressure regulator on the machine, adjust the suction vacuum to a pressure of negative 80 -100mm/Hg.
- Test that the suction machine is functioning by suctioning sterile water or normal saline in a kidney dish.

2.2.7 Preparing and performing oropharyngeal suctioning

- Visually inspect the baby's oral and nasopharyngeal cavities for secretions or blood to determine need for suctioning
- Ensure baby is attached to a pulse oximeter. Note the baby's SpO_2, respiratory rate & heart rate before beginning the procedure. Ensure there is an oxygen source and nasal prongs available
- Decide the type of suctioning to perform - Manual suctioning using a penguin or bulb sucker or suctioning with a machine

a) When performing manual suctioning using a penguin sucker or single use bulb sucker;

- ✔ Position the baby in slightly extended position (sniffing position)
- ✔ Squeeze the sucker and introduce it into the mouth
- ✔ Release the sucker while in the mouth to create negative pressure
- ✔ Suck the secretions out and pour the secretions on a gauze
- ✔ Repeat this procedure until all secretions are removed

Sniffing position

Squeeze and Introduce

Release and suck out

Fig 2.2.7a Steps to suction using a Bulb or Penguin sucker

b) Using suction machine

If using a suction machine; Use a Yankheur (wide bore sucker) for thick secretions such as thick meconium. No need for sizing this. Use suction catheter Fr size 6-8 for thin secretions. Select a suction catheter that approximates the diameter of the baby's nostril. Do not use nasogastric tubes for suctioning.

i) When using a wide bore sucker

- ✔ Connect the wide bore sucker to the suction machine
- ✔ Ensure the pressure is set at 80 – 100mm/Hg
- ✔ Only suck what is visible in the mouth.
- ✔ If secretions are very thick, apply 1-2 drops of normal saline in to the mouth to make the secretions thinner and reduce trauma.
- ✔ Suction for 10 seconds then allow the baby 30 seconds to visibly recover from the procedure or for the SpO_2 to return to above 90% if baby already connected to a pulse oximeter
- ✔ Rinse the catheter with sterile water/saline in a kidney dish and repeat the procedure until the airway is clear

ii) When using a suction catheter

- ✔ Select the appropriate size of suction catheter to use (Fr Gauge 6 or 8) & attach catheter to the suction machine.
  - ♦ Ensure the machine pressure is set at 80 – 100mm/Hg
  - ♦ Determine the suction depth for oropharyngeal suctioning;
  - ♦ Measure the distance from the side of the nose to the tragus of the ear
  - ♦ Mark this distance on the suction catheter with a small piece of adhesive tape /marker.
  - ♦ Place the baby in a slightly extended (sniffing) position to ensure effective suctioning.
  - ♦ With the thumb control valve open, gently insert the catheter into the patient's mouth first then the nostrils to the point marked by the tape/marker.
  - ♦ Occlude the thumb control valve on the catheter and slowly & gently withdraw the catheter from the mouth or nostril. Use a 360° rotation (spiral) motion until the catheter is completely removed.
  - ♦ Rinse the catheter by suctioning sterile water/saline and repeat the procedure until the airway is clear
- ✔ Suction for 10 seconds then allow the baby 30 seconds to breath.

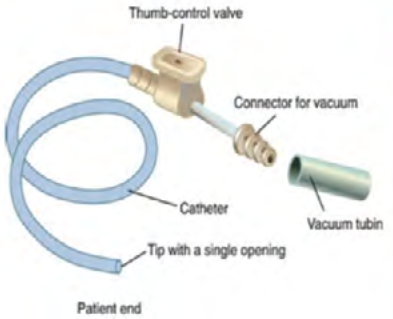


Fig 2.2.7b Parts of the suction catheter

Fig 2.2.7c Steps while using a suctioning catheter

iii) When using the suction machine with either yankheur or suction catheter;

- ✔ Suction only until the reservoir of the suction machine is ¾ full

- ✔ Remember;
  - ♦ Be gentle! Do not suction too vigorously!
  - ♦ Do not suction for too long! Just 10 seconds and a break for 30 seconds! Otherwise you cause hypoxemia
- ✔ Observe suctioned contents carefully whilst suctioning procedure is taking place. Fresh blood may indicate trauma from the suctioning. Stomach contents may indicate suction from the stomach
- ✔ Observe the baby's change in color and drop in SpO_2, respiratory rate & heart rate for a patient connected to a monitor as you suction. Stop if SpO_2, respiratory rate & heart rate are dropping and start baby on oxygen
- ✔ When all visible secretions are removed, gently withdraw the suction catheter from the patient's nose and mouth
- ✔ Discard the suction catheter and empty the suction machine's collection reservoir immediately after the procedure
- ✔ Document all assessments and interventions in the baby's file, nurses cardex and comprehensive newborn monitoring chart as appropriate

2.2.8 Likely Complications and Prevention Measures

Complications	Prevention Measures
Hypoxia	Monitor SpO_2, Have O_2 ready, suction for 10 seconds then allow baby to recover
Trauma	Be gentle, use negative pressure of 80 -100mm/Hg
Vomiting	Measure correct suctioning depth
Vagal Stimulation	Suction no more than10 seconds, use correct suctioning depth

2.2.9 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Discard the bulb sucker and the suction catheter after use
- Autoclave the Penguin sucker
- Wipe the metallic parts of the suction machine with a cloth soaked in 70% alcohol
- Immerse and scrub/wash the plastic wide bore sucker, suction machine reservoir & its tubings into soapy

water then rinse with clean water. Immerse the items again in 0.5% sodium hypochlorite (one part 3.5% Jik to 6 parts of water) for 30 minutes then rinse with clean water and air dry

Fig 2.2.9a Empty the suction machine's collection reservoir

2.2.10 Preventive Maintenance

- If a suction pump is battery powered, it should be taken off its charger only as necessary to ensure that it is charged for use in the event of a power blackout.
- The suction pump should be turned on and allowed to run for at least 15 minutes every week if it has not been in use.

2.3 Providing Bubble Continuous Positive Airway Pressure (bCPAP)

2.3.1 Indications for CPAP

a) Prophylactic CPAP - Preterm babies gestation age 28 - 30 weeks or birth weight 1-1.3kg;
b) Rescue CPAP - Babies above gestation 30 weeks or birthweight more 1.3kg with;
   - Respiratory distress (respiratory rate above 60/min, nasal flaring, grunting, sternal retractions or severe lower chest wall in-drawing)
   - Oxygen saturations of less than 90% after ensuring a clear airway and proper positioning on oxygen 1L/min
   - Heart rate above 100/min

2.3.2 Family Centered Care

- Inform the mother (parents) that their baby needs CPAP to be able to breathe better.
- Explain what the procedure involves in layman terms – the connections to the machine, other tubings such as the oral gastric tube (OGT), nasal prongs etc.
- Explain that the procedure is safe and CPAP has been shown to improve newborn outcomes.
- Answer any questions/concerns they may have
- Ensure the baby is on oxygen via nasal prongs 1L/min as you explain all this to the parents

2.3.3 Items required to initiate bCPAP

Machine Preparation Checklist	Baby Preparation Checklist
bCPAP machine	Hat, stockinette or gauze for CPAP - appropriate size
Power cable	Hat clips
Inspiratory (patient) tubing	Neonatal size oral gastric tube – size 6 or 8
Expiratory (bottle) tubing	Marker or tape
Oxygen non-crush tubing	5cc syringe
Oxygen source	Blue litmus paper
CPAP pressure generating bottle	Clear adhesive medical tape

Distilled water	Kidney dish or procedure tray
50cc syringe	Penguin sucker or suction tubes – size 6 or 8 if using a suction machine
Assorted sizes CPAP nasal prongs	Normal saline in 2 cc syringe
Elbow connectors	Stethoscope
Trolley	Pulse Oximeter
Firm surface	Hand sanitizer

2.3.4 Parts of the bCPAP

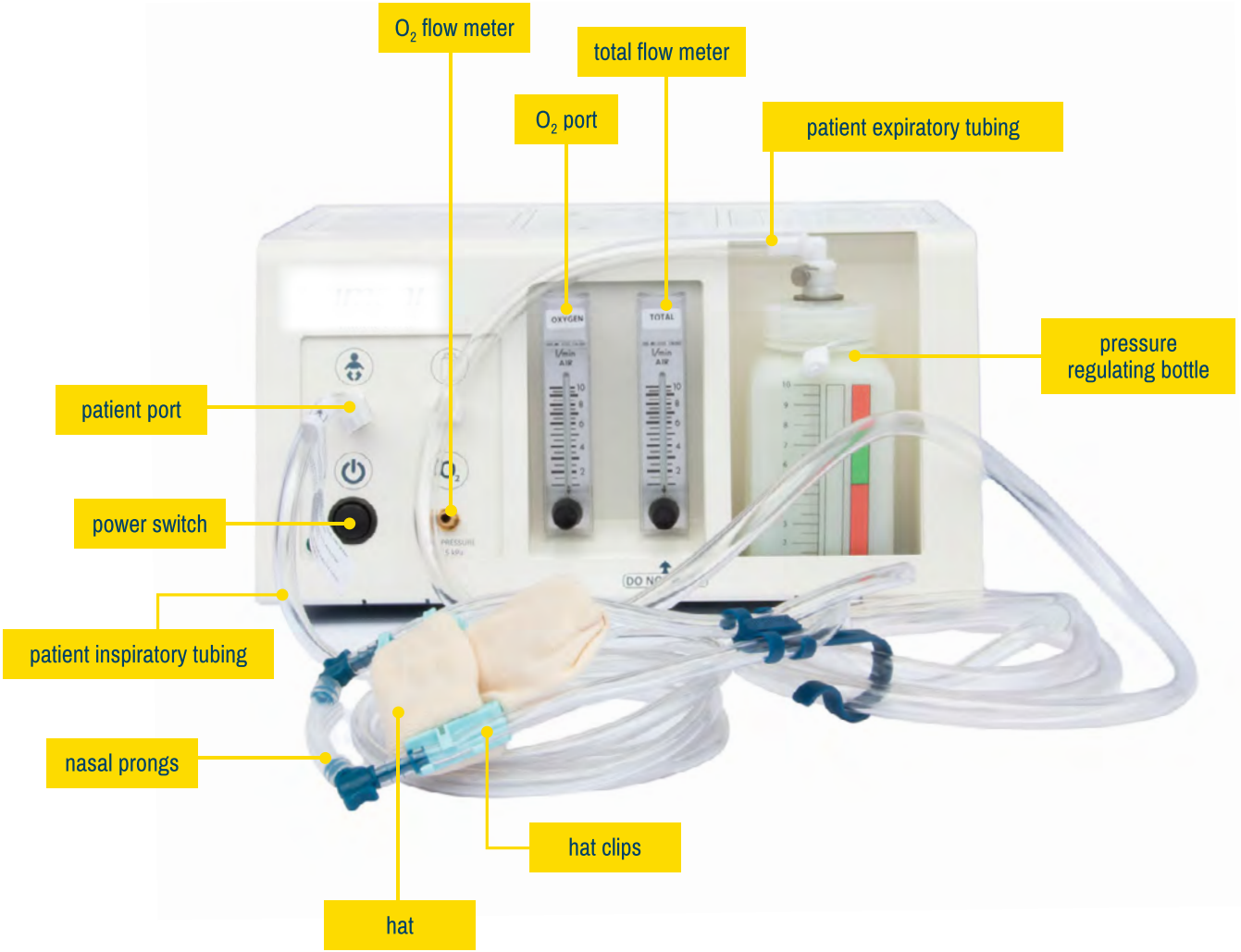


Fig 2.3.4a Outer Parts of a bCPAP

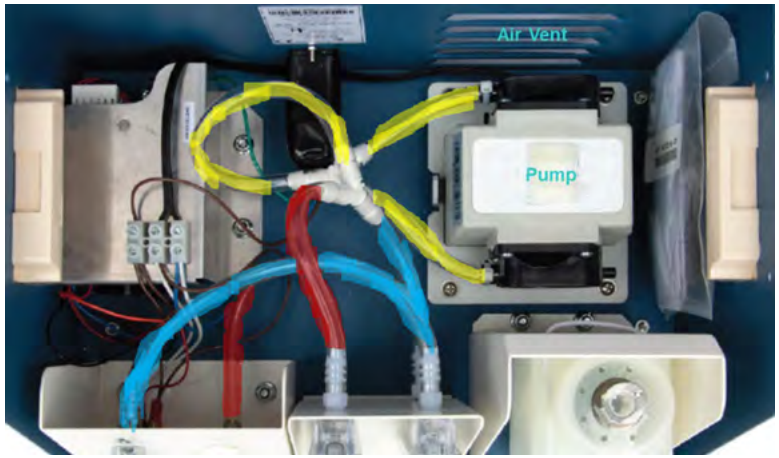


Fig 2.3.4b Inner tubings to blend oxygen in a bCPAP

2.3.5 Preparing a bCPAP machine for use

Step 1. Follow hand hygiene protocol.

Step 2. Position the bCPAP device on a firm flat surface near the patient and connect the machine to a power source.

- Place the bCPAP machine as recommended by the manufacturer. For those with air vents at the back of the machine, place 30cm from the wall



Fig 2.3.5a Place the Pumani CPAP on a firm surface allowing airflow through the vents and connect to power

Step3. Prepare the pressure generating bottle.

- Fill the pressure generating bottle with distilled water to the level of 6cm of water or as recommended by the manufacturer. Secure the filled bottle to hold it in place.

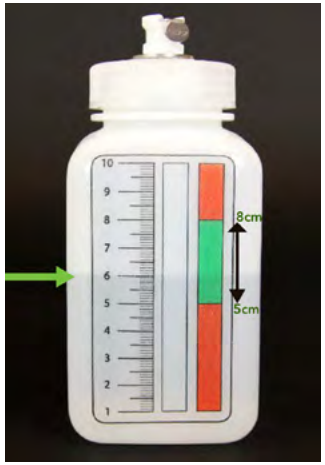


Fig 2.3.5b Fill the bottle to 6 cm

Step 4. Connect the bottle tubing (expiratory tube) to the bottle tubing port. Connect the patient tubing (inspiratory tube) to the patient port.

Step 5. Connect the correctly sized nasal prongs to the patient tubing and the bottle tubing using right and left elbows. Connect the right elbow to the patient tubing. Connect the left elbow to the bottle tubing

Fig 2.3.5c Connect the Patient & Bottle tubings to the machine

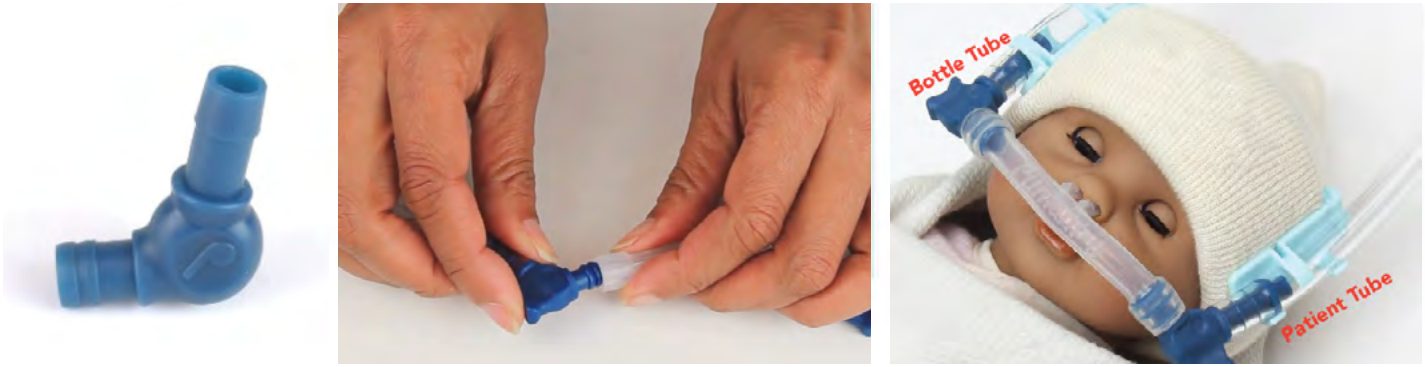


Fig 2.3.5d Connect the bottle tube and the patient tube to the nasal prong using a right & left elbow connector

Step 6. Connect an Oxygen Source to the CPAP machine as recommended by the manufacturer.

- Attach an oxygen tubing from the oxygen concentrator (or piped oxygen) to the oxygen port on the CPAP machine if indicated.
- Ensure the humidifier is filled with distilled water to appropriate level. Turn on the oxygen concentrator (see section 2.4) or open the piped oxygen

Fig 2.3.5e Attach to an oxygen source

Step 7. Turn on the bCPAP machine.

- The power light should turn green.

Step 8. Determine the oxygen flowrate to use;

- Using the blending table, read value where the total (blended)flow rate of 6L/min meets 50% FiO_2.
- Set value read (3L/min) on the oxygen flowmeter on the oxygen source

Start CPAP
1. Blended flow rate 6l/mim
2. FiO_2 50%
3. Pressure - 6cm/water

Step 9. Test functionality of the bCPAP machine and circuit

- Pinch/occlude the prongs of the nasal prongs with your clean fingers
- Observe the water in the pressure generating bottle. **It should bubble**
- The machine is ready for use. You may turn it off as you prepare the baby

Oxygen Blending Table

BLENDED OXYGEN FLOW RATE (L/Min)		Fraction of Inspired Oxygen (FIO_2) %							
		20	30	40	50	60	70	80	90
Total Flow Rate (L/min)	10	0	25	3.5	5	6	7	7.5	8.5
	9	0	2	3.5	4.5	5.5	6	7	7.5
	8	0	2	3	4	5	5.5	6	7
	7	0	1.5	2.5	3.5	4.5	5	5.5	6
	6	0	1	2.5	3	3.5	4	4.5	5
	5	0	1	2	2.5	3	3.5	4	4.5

Fig 2.3.5f Use the Oxygen blending table to determine oxygen flowrate

2.3.6 Preparing the Baby for bCPAP

Step 1. Determining correct size of the hat to use and its placement: (see image on page 111)

- Choose a hat depending on the baby's head and weight.
- Ensure the hat is snuggly fitting on the baby's head.
- A stockinette may be used to make a hat if a hat is not available.

Step 2 Clear the patient's nose and mouth

- Use a penguin sucker or an appropriately sized suction catheter attached to a suction machine if clinically indicated. *(See procedure on page 55)*

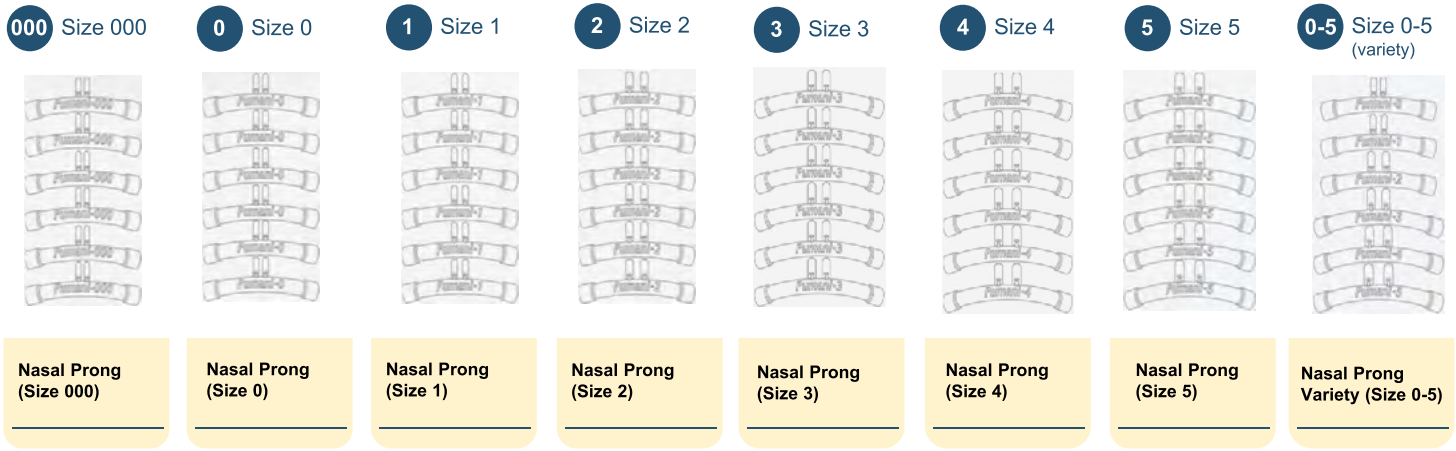
Step 3 Size, insert and secure an oral gastric tube

- *(See procedure on page 141)*

Step 4 Confirm the bCPAP machine is turned on and the flow rates and pressure are set correctly

Step 5 Size the appropriate CPAP nasal prong to use based on the baby's weight.

Step 6 Connect the correctly sized nasal prongs to the patient tubing and the bottle tubing . (See Fig 2.3.6b)



Nasal Prong sizes based on weight

Patient Weight Range	Nasal Prong Size
Less than 1,000 grams	000 or 0
1,000 grams to 1,250 grams	1
1,250 grams to 2,000 grams	2
2,000 grams to 3,000 grams	3
3,000 grams to 4,000 grams	4
Over 4,000 grams	5

Hat sizes based on weight

Patient Weight Range	Hat Size
Less than 1,500 grams	Small
1,500 grams to 3,000 grams	Medium
Over 3,000 grams	Large

Fig 2.3.6b Assorted nasal prongs, hat sizes and corresponding weight

Step 7 Add a normal saline drop in each nostril using a 2cc syringe

Step 8 Insert the CPAP prongs until the line on the prongs is just visible. This will leave 2 mm of space between the prongs and the nasal septum to ensure prongs are not against the columella

- Confirm the size chosen is the correct size for the baby. The prongs should fill the entire nare without blanching the external nare.
- If the size is too big or too small, immediately remove the prongs from the baby's nares, continue the baby on oxygen and choose the next appropriate size.

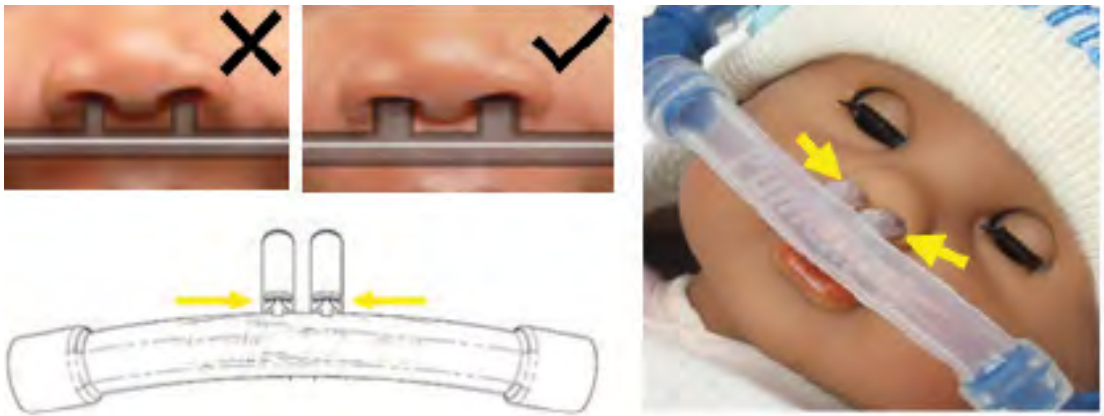


Fig 2.3.6c Insert nasal prong to marked distance

Step 9 Secure the CPAP nasal prong, connected to the tubings, on the baby's face using hat clips.

- Determining where to place the clips on the hat and place the hat clips. Ensure the hat clips are placed on the folds of the hat and are not touching the baby's skin.
- Secure the bottle and patient tubings on the hat clips
- bCPAP has been initiated.

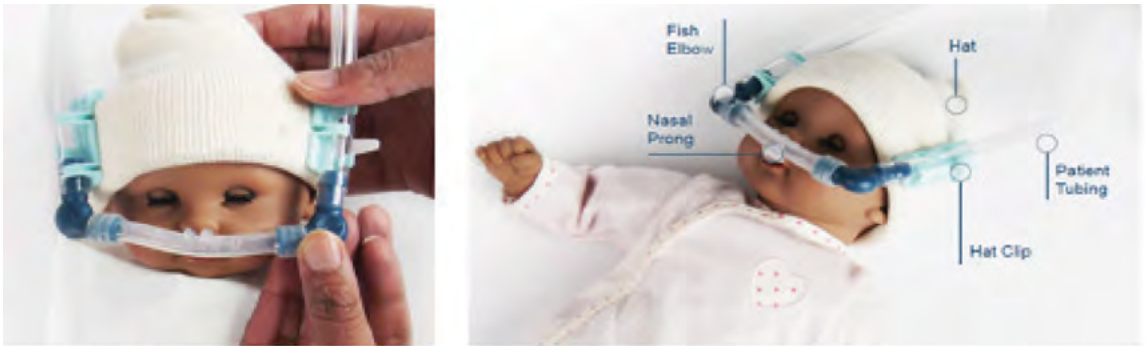


Fig 2.3.6d Secure the prongs using hat clips and ensure the circuit is complete and all tubes are secured in place

Step 10 Check for effective functioning of the bCPAP (water bubbling)

Step 11 Attach a pulse oximeter at an appropriate site on the baby

step 12 Check baby's response to bCPAP (assess work of breathing, HR and SpO_2)

- Increase oxygen flow rate by 1liter/min every 60 seconds to achieve SpO_2 of 90-95%.

Step 13 Institute other supportive care – warmth, feeds & fluids, blood sugar

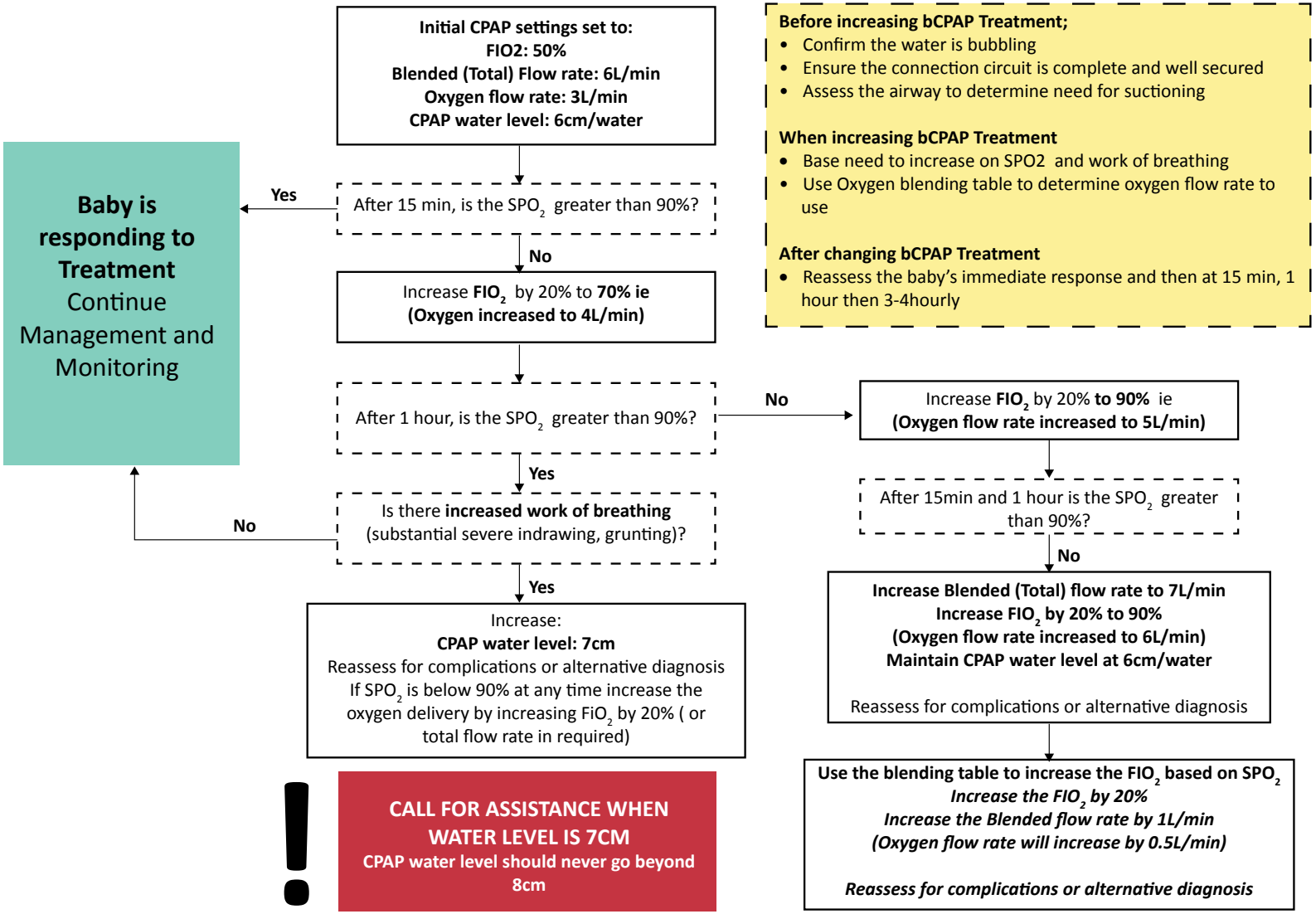
Step 14 Check patient response to bCPAP at 15 minutes. Check;

- Vital signs (RR, SpO_2, HR)
- Work of breathing (grunting, sternal, intercostal and lower chest wall in drawing, and nasal flaring)
- Nasal blockages
- Abdominal distension

Step 15 Decide best action based on the clinical assessment - Continue with current treatment or Increase treatment based on baby's response to the bCPAP Aim at increasing the oxygen delivery flow rate before increasing the pressures where possible.

- **Increased oxygen delivery** is achieved by increasing the oxygen flow rate at a given total flow rate. Once FiO of 90% is achieved increase the total flow rate from 6 to 7 l/min and gradually increase the FIO_2 again until SPO_2 90-95% is achieved,.

2.3.7 Increasing bCPAP Treatment



2.3.8 Monitoring

Step 1 Monitor the CPAP Treatment;

- Vital signs (respiratory rate, heart rate, SpO_2 and temperature)
- Work of breathing (respiratory distress – severe lower chest wall indrawing, grunting)
- Nasal blockages - Provide a few drops of normal saline to each nostril
- Abdominal distension – ensure oral gastric tube is in situ and open.

Step 2 Check patient attachment (prongs, tubes & hat)

- Check position of the prongs – Prongs should not be against the columella
- Check nasal columella for skin compromise
- Check tubing - Tubing should not be kinked or misplaced
- Check that the hat is not loose; if it is loose, replace with new hat

Step 3 Monitor function of the equipment

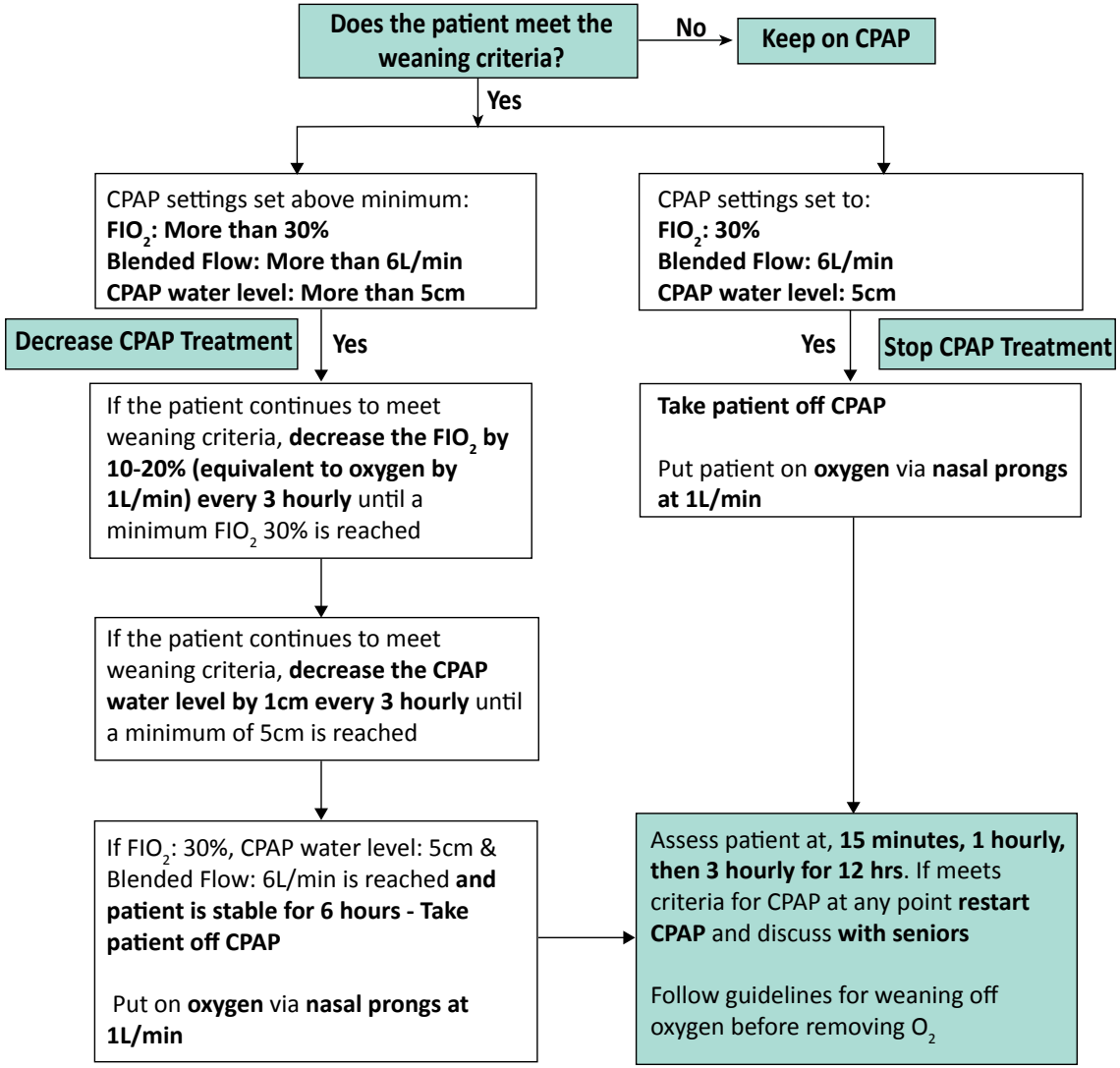
- Check water level: If water level is below or above the target treatment level, add or remove the water from bottle cap holes using a syringe and an NG tube. Decrease or increase water level by 1cm of H_2O.
- Check that the CPAP is bubbling. If not, may be due to the patient's mouth being open or nasal prongs not fully fitting the patient's nostrils.

Fig 2.3.8 Add or remove water from pressure generating bottle as needed

- Check that the seal at the patient port is not cracked
- Check that oxygen and total flow settings are correct

Step 4 Document all assessments and interventions in the baby's file, nurses cardex and comprehensive newborn monitoring chart as appropriate

2.3.9 Decreasing & Stopping bCPAP Treatment



Criteria for weaning CPAP Treatment

- Baby has been on CPAP for at least 24hours
- RR less than 60/min for at least 6 hours
- Oxygen saturation consistently greater than 90% for at least 6 hours
- No significant grunting, indrawing, nasal flaring, apnoea or bradycardia for at least 6 hours

2.3.10 Likely Complications and Prevention Measures

Complications	Prevention Measures
Nasal blockage	Nasal saline drops every 3 hours
Necrotic nasal septum	Use correct size of nasal prongs
Gastric distention	Insert an OGT and keep it open
Pneumothorax	Maintain water level between 5 – 8 cm/H_2O
Decreased cardiac output	Maintain water level between 5 – 8 cm/H_2O

2.3.11 Infection Prevention & Control

- Turn off the bCPAP and dispose the water in the pressure regulating bottle
- Disconnect all the tubings and segregate the items used for decontamination and disinfection
- Clean the hat, hat clips, pressure generating bottle and the tube hanger with soap and water, rinsed in clean water then air dry
- Perform high level disinfection for the elbow connectors and, patient and bottle tubings using 0.5% sodium hypochlorite
- Wipe all the metallic parts of the CPAP machine with a cloth soaked in 70% alcohol
- Autoclave the Silicon Nasal Prongs

2.3.12 Preventive Maintenance

- If not in use, the CPAP machine should be turned on weekly to a total flow of 10 L/min and allowed to run while connected to an oxygen source for at least 15 minutes.

2.4 Use of the Oxygen Concentrator

2.4.1 Indications for oxygen therapy

- Oxygen saturation (SpO_2) less than 90%
- Increased work of breathing – evident use of accessory muscles; severe lower chest wall in drawing, sternal retractions
- NOTE: Some babies may require positive pressure ventilation including continuous positive airway pressure (CPAP). See Indications for CPAP (section 2.3.1)

2.4.2 Family centered care

- Talk to the mother (parents) about starting the baby on oxygen
- Emphasize that the oxygen therapy will help improve their breathing
- Explain that the oxygen will be given using a safe delivery method and the oxygen concentration will be measured and titrated according to what the baby needs
- Answer any questions/concerns they may have appropriately

2.4.3 Items required for oxygen therapy

Machine Preparation Checklist	Baby Preparation Checklist
Oxygen source – oxygen concentrator	Alcohol based hand rub
Neonatal size nasal prongs/ nasal catheter	Pulse oximeter
Transpore medical adhesive tape	Oxygen non-crush tubing
All items needed for suctioning – see (section 2.2.4)	
Power cable	
Power source	

2.4.4 Parts of an oxygen concentrator

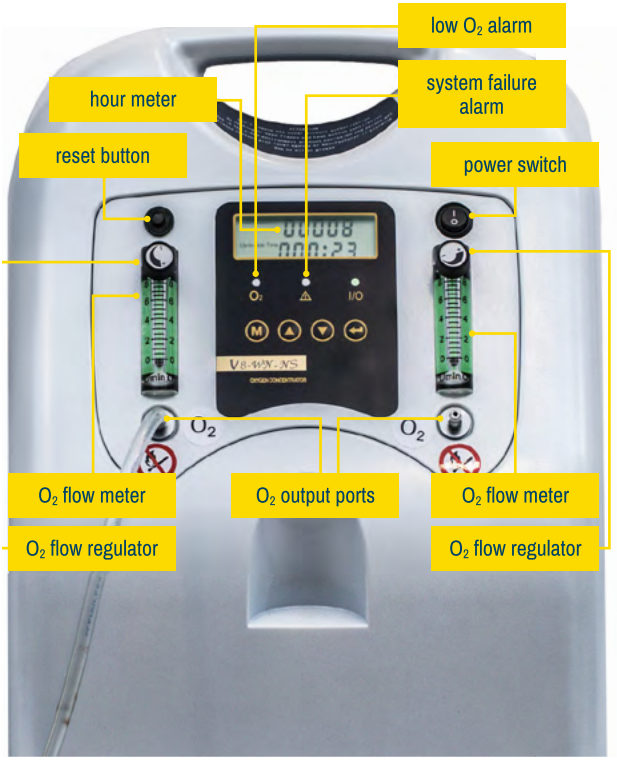


Fig 2.4.4a Front view of an oxygen Concentrator

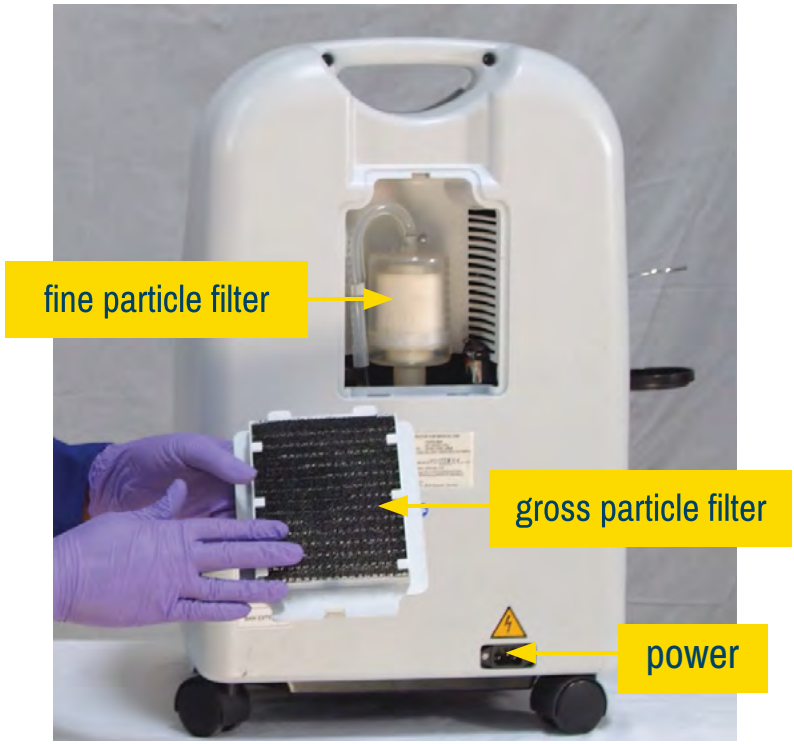


Fig 2.4.4b Back view of an oxygen Concentrator

2.4.5 Preparing an oxygen concentrator for use

- Follow hand hygiene protocol
- Place the concentrator at least 30cm from the wall or as recommended by the manufacturer. If an oxygen flow rate splitter is to be used, the oxygen concentrator should be located near the splitter
- Plug the concentrator into a power source and turn on.
- Keep the concentrator on for 5 minutes OR until the purity indicator light turns GREEN indicating that oxygen purity of 85% and above is achieved.

Fig 2.4.5a Plug concentrator into a power source and turn on

- Connect the humidifier and its tubings if needed. The humidifier should be below the level of the baby's head
- Connect correctly sized oxygen nasal prongs/catheter or non-rebreather mask to the oxygen port as shown in figure 2.4.5b below
- Open the oxygen flowmeter in use to the desired flow rate - Read the flow rate in the middle, above or below the ball as recommended by the manufacturer as shown in figure 2.4.5b below
- Confirm oxygen is flowing through the method of delivery chosen. For nasal prongs and catheters, ensure that oxygen is flowing by bubbling through water
- Attach the nasal prongs to the baby. See steps for oxygen administration on section 3.1

Fig 2.4.5b Connect the humidifier and nasal prongs, adjust flowmeter and confirm oxygen flow

2.4.6 Monitoring and Weaning Off Oxygen

- When oxygen is started, titrate every 15-30mins by 0.5L/min until SpO_2 is 90-95%.
- Change the oxygen delivery methods and flow rates based on need.
- If baby requires more than 1 L/min of oxygen (term baby 2L/min), consider changing treatment to CPAP
- Stop titrating and begin close monitoring if the baby is clinically stable – no emergency signs, SpO_2 between 90 – 95% and no increase in work of breathing
- Every 3 hours monitor;
  - ✔ Vital signs – SpO_2, respiratory rate, heart rate, BP, Temperature
  - ✔ Work of breathing - Lower chest wall in drawing, sternal retractions
  - ✔ Nasal patency - assess for secretions and suction if necessary
  - ✔ Nasal mucosa for dryness - administer nasal saline drops if necessary
  - ✔ Oxygen delivery method (nasal prongs, catheter) to ensure it is correctly placed and secured

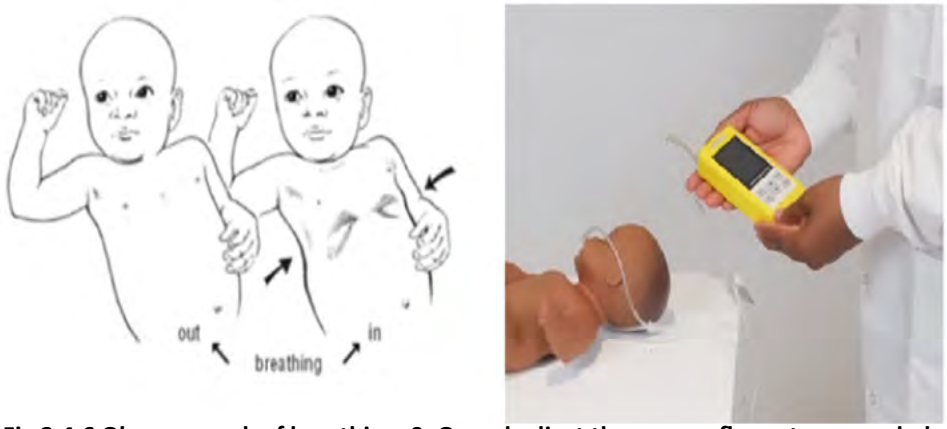


Fig 2.4.6 Observe work of breathing, SpO_2 and adjust the oxygen flowrate as needed

- Wean off oxygen slowly by reducing the flow rate by 0.5L/min every 15 – 30 min while maintaining SpO_2 between 90-95%.
- Carefully examine for changes in the work of breathing and SpO_2 to assess whether supplemental oxygen is still required.
- Once oxygen is stopped, recheck SpO_2 after 1hr, as late desaturation can sometimes occur
- Document all assessments and interventions in the baby's file, nurses cardex and comprehensive newborn monitoring chart as appropriate

2.4.7 Likely Complications and Prevention Measures

Complications	Prevention Measures
Hypoxia	Maintain SPO_2 90-95%
Hyperoxia	Maintain SPO_2 90-95%
Nasal blockage	Saline drops at every 3 hours
Nasal septum necrosis	Correct size of nasal prongs
Pressure sore	Properly secure tubings/probes

2.4.8 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Change the distilled water in the humidifier **daily** (every 24 hours)
- Immerse and scrub/wash the humidifier & all its nonmetallic parts/tubings, all oxygen non-crush tubings and the gross particle filter with soapy water then rinse with clean water. Immerse the items again in 0.5% sodium hypochlorite for 10 minutes then rinse with clean water and drip air dry
- Wipe the non-metallic parts of the concentrator with a cloth soaked in 0.05% sodium hypochlorite before first use and between patients
- Wipe the metallic parts of the concentrator and the humidifier with a cloth soaked in 70% alcohol before first use and between patients
- Clean the gross particle filter in the concentrator **weekly**. Do not wash the fine particle filter in water - It should be checked weekly by the maintenance department
- Discard the nasal prongs, catheter and non-breather mask after use

2.4.9 Preventive Maintenance and trouble shooting

- Gross particle intake filter - to be checked weekly and if dusty clean with soap and water and rinse throughly. Fine particle intake filter - if the filter is visibly dusty/dirty it requires to be changed; consult the biomedical technician.
- Oxygen concentrators should be turned on and allowed to run for at least 15 minutes every week if it has not been in use
- If the oxygen concentrator is not turning on; check that the power cable is plugged into a socket, check that socket is turned on and has electricity or push the reset button
- If the oxygen concentrator is turning on but there is no flow; connect nozzle to oxygen port or check the oxygen port for debris or blockages. If debris is seen, clean using cotton buds or forceps wrapped in gauze and soaked in alcohol
- If the low oxygen concentration alarm is on; check the gross particle filter for dust and debris - If dirty, replace filter with spare, clean filter, check if set flow rate (L/min) is within maximum machine specifications - If the set flow rate exceeds capacity, lower flow rate to within capacity limits. If alarm still sounds after reducing within capacity limits OR fine particle filter appears dirty, contact the maintenance department

2.5 Use Oxygen Flow Rate Splitters

2.5.1 Indications for use oxygen flow rate splitters during oxygen therapy

- Need to deliver oxygen to multiple babies using one oxygen source at independent flow rates

2.5.2 Family centered care

- Talk to the mother (parents) about starting the baby on oxygen
- Emphasize that the oxygen therapy will help improve their breathing
- Explain that the oxygen will be given using a safe delivery method and the oxygen concentration will be measured and titrated according to what the baby needs
- Answer any questions/concerns they may have appropriately

2.5.3 Items required for oxygen therapy to multiple babies

Machine Preparation Checklist	Baby Preparation Checklist
Oxygen source	Alcohol based hand rub
Oxygen flow rate splitter	Pulse oximeter
Neonatal size nasal prongs/ nasal catheter	Oxygen non-crush tubing
Transpore medical adhesive tape	
All items needed for suctioning – see section 2.2.4	
Power cable	
Power source	

2.5.4 Parts of an oxygen flow rate splitter

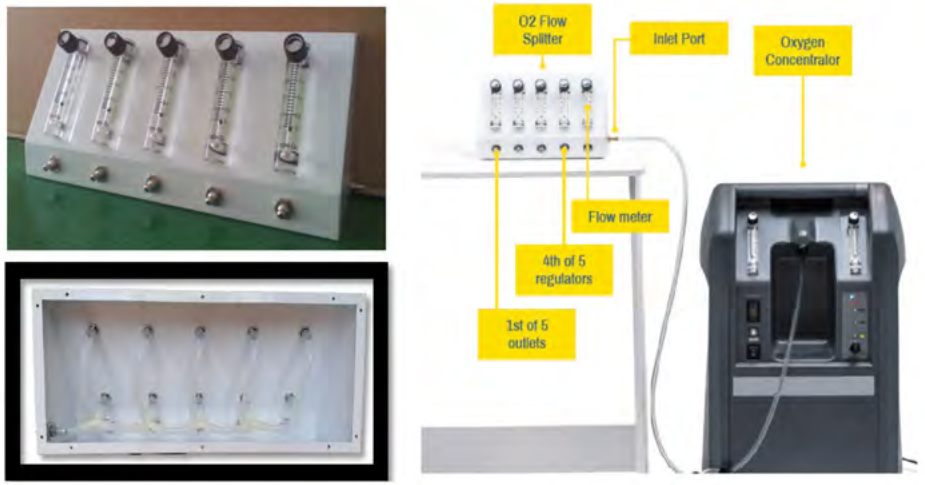


Fig 2.5.4 Parts of the Oxygen Splitter and how to place it at an oxygen source

2.5.5 Preparing the oxygen splitter for use

- Follow hand hygiene protocol
- Place the oxygen splitter of a firm surface next to an oxygen source as shown on fig 2.5.4 above
- Connect the splitter to the oxygen source using a non-crush oxygen tubing
- Determine flow rate to set on oxygen source flowmeter by adding the total oxygen for all the babies to use the splitter then add 1 extra L/min. For example; to give 4 babies each at 2L/min, total required oxygen is 4*2L/min=8L/min. Add 1L/min. Set 9L/min on oxygen source flow meter
- Open the oxygen flowmeter on the oxygen source at calculated flow rate
- Open all the flowmeters on the splitter to maximum flow rate (2L/min) and confirm oxygen is flowing by feeling for air flow on each of the splitter outlets
- Close all splitter flowmeters not in use after confirming flow on each outlet

Fig 2.5.5 Confirm oxygen is flowing by feeling for air flow on each of the splitter outlets

2.5.6 Administering oxygen to multiple babies using an oxygen flow splitter

- Connect correctly sized oxygen nasal prong or catheter to the splitter outlets of each flowmeter. Splitters should never be used with a non-breather mask as their maximum flow rate is 2L/min
- Adjust the flowrate to the desired volume on each splitter flowmeter by reading the flow rate at the middle of the ball in the splitter flowmeters. Confirm oxygen is flowing through the method of delivery chosen in the middle, above or below the ball as recommended by the manufacturer. For nasal prongs and catheters, ensure that oxygen is flowing by bubbling through water through water
- Mark each baby's flowmeter so each gets the individually prescribed oxygen flow rate
- When you adjust one flowmeter check that the other four have remained as desired

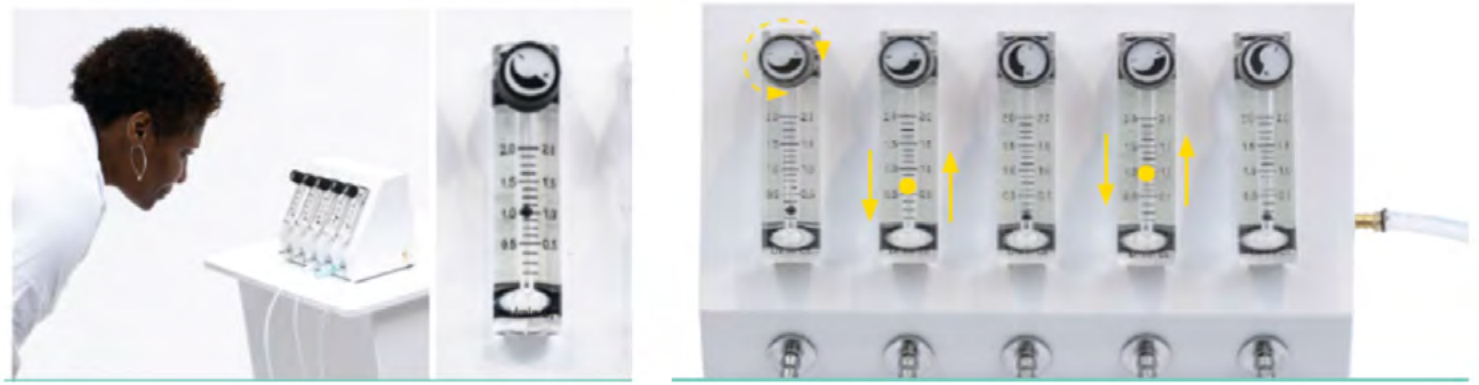


Fig 2.5.6a Read the flow rate at the middle of the ball in the splitter flowmeters. Adjust all flow meters as needed

- Connect and secure the oxygen delivery method on the babies and follow oxygen therapy guidelines. See section 3.1
- Ensure the splitter is well placed on a firm surface so it doesn't fall on the baby. Also ensure the tubings are not entangled on the baby
- Document all assessments and interventions in the baby's file, nurses cardex and comprehensive newborn monitoring chart as appropriate

Fig 2.5.6b Secure the nasal prongs on the baby and avoid entangling the oxygen tubing

2.5.7 Likely Complications and Prevention Measures

Complications	Prevention Measures
Hypoxia	Monitor SpO_2
Hyperoxia	Monitor SpO_2
Nasal blockage	Saline drops at every 3 hours
Nasal septum necrosis	Correct size of nasal prongs
Pressure sore	Properly secure tubings/probes

2.5.8 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Wipe the metallic parts of the splitter with a cloth soaked in 70% alcohol before first use and between patients
- Discard the nasal prongs and catheter after use

2.5.9 Preventive Maintenance and trouble shooting

- The splitter should be connected to an oxygen source and allowed to run for at least 15 minutes every week if it has not been in use.
- If there is no flow from all ports of the flow splitter; check that the oxygen source is on and that oxygen is flowing from the outlet port. Also check that the flow splitter tubing is securely connected to the oxygen source
- If there is no flow from one port of the flow splitter but other ports are functional; check the outlet port of the flow splitter for visible blockages like dirt or other debris - If debris are visible, use a test tube brush or thin rod covered with gauze to remove. Disinfect the port with alcohol after debris has been removed. Check with your hand that oxygen is now flowing
- If oxygen is flowing from the flow splitter port, but not from the oxygen tubing or nasal prongs; visually check the tubing for kinks, blockages or bends - If you see any of these obstructions, replace the tubing or nasal prongs. Test flow coming from nasal prongs by bubbling in water
- Contact a technician or maintenance department if device continues to not work properly after addressing the common issues

2.6 Using a Pulse Oximeter

2.6.1 Indications for pulse oximetry

- To determine need for oxygen therapy
- Regular monitoring when on oxygen therapy including when providing continuous positive airway pressure (CPAP)
- Regular monitoring of heart rate and oxygen saturation of sick babies when off oxygen

2.6.2 Family centered care

- Talk to the mother (parents) about starting the baby on oxygen and monitoring response to oxygen therapy using a pulse oximeter
- Emphasize that the oxygen therapy will help improve baby's condition
- Explain that the monitoring of oxygen with a pulse oximeter will ensure proper measurement and titration of oxygen concentration to suit what the baby needs, avoiding under dose or overdose of oxygen
- Answer any questions/concerns they may have appropriately

2.6.3 Items required for pulse oximetry

Machine Preparation Checklist	Baby Preparation Checklist
Pulse Oximeter charged or with batteries	Alcohol based hand rub
Attachment probe – neonatal size	
Alcohol swabs	

2.6.4 Parts of a Pulse Oximeter

Fig 2.6.4 Parts of a Pulse Oximeter

2.6.5 Preparing the pulse oximeter

- Follow hand hygiene protocol
- Check that you have the machine and an external newborn attachment probe sensor. Check that the battery/dry cells are well placed
- Attach the probe to the machine by ensuring that the shape of the pulse oximeter port corresponds to that of the attachment probe as shown on fig 2.6.5a below
- If the shapes are not the same size, connect with an adapter. This should be provided with the pulse oximeter.
- Turn on the pulse oximeter by long pressing the power button as shown below in fig 2.6.5b
- Check for a red light on the probe as shown on fig 2.6.5c

Fig 2.6.5a Connect the probe

Fig 2.6.5b Turn the Oximeter On

Fig 2.6.5c Check for red light on sensor

- Check that the pulse oximeter settings are in neonatal mode
- Set Alarm limits; oxygen saturation – 90 – 95% heart rate – 110 – 180 beats/min
- Set display variables – what will be viewed on the pulse oximeter screen as recommended by the manufacturer. Ensure date and time are set correctly
- Clean the pulse oximeter probe thoroughly using 70% alcohol-soaked cotton swab and let it dry.
- Prepare the baby for pulse oximetry

2.6.6 Preparing the baby for Pulse Oximetry

- Position the baby in a comfortable position on an area that avoids excessive lighting on the pulse oximeter
- Choose an assessment site/extremity which is warm, well perfused and with minimal movements. Usually the foot or the wrist
- Ensure the probe to be used is the appropriate size for the selected assessment site/extremity.
- Clean the site with a cotton wool soaked in 70% alcohol and let it dry
- Wrap and snuggly secure the probe on the assessment site. Ensure the light source and the sensor line up as shown below on fig 2.6.6a

Fig 2.6.6a Correctly attach and secure the probe on the selected site

- Allow the baby's trace to establish. Look for the normal signal

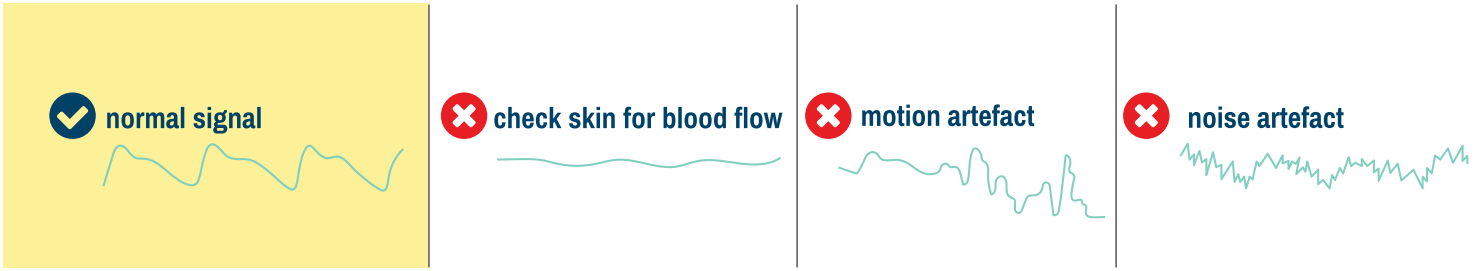


Fig 2.6.6b Pulse Oximeter Signal Tracings

- Read the oxygen saturation, wave form and heart rate
- Confirm that the device is reading accurately by manually assessing the pulse rate and comparing with what is displayed on the pulse oximeter

Fig 2.6.6c Confirm Pulse Oximeter readings are accurate

- If the oxygen saturation (SpO_2) is less than 90%, initiate oxygen therapy
- Ensure the probe is cleaned with 70% alcohol before attaching it to the next patient
- Document all assessments and interventions in the baby's file, nurses cardex or comprehensive newborn monitoring chart as appropriate

2.6.7 Likely Complications and Prevention Measures

Complications	Prevention Measures
Misdiagnosis due to poor trace	Always use the most perfused site with least movements
Pressure sores or skin damage	Avoid applying the probe too tightly
Patient movement disrupting	Apply the probe on a limb with minimal movement
Strong light interference	Reduce amount of light in the examination area

2.6.8 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Always wipe the pulse oximeter and its probe with 70% alcohol using gauze or cotton swab before first use and between patients.

2.6.9 Preventive Maintenance and trouble shooting

- For preventive maintenance, turn on the device and check for a red light on the probe. Then connect the probe and test readings on your finger for normal saturations.
- If the pulse oximeter is not turning on - Press and hold the power button for at least 5 seconds. Check the battery level, if low, plug in the device to charge or get new batteries
- If the pulse oximeter is turning on but is not displaying a trace - Check the probe for a flashing red light. If there is no light, check that the probe is properly connected to the pulse oximeter.
- If the probe is connected and no light is showing, try replacing the probe
- If the probe is connected and the red light is showing, but no probe is detected or no trace is displayed, replace the probe with a different probe
- If the pulse oximeter is turning on but taking time to stabilize the trace - Check that no powerful light sources are shining on the pulse oximeter probe. Confirm that the patient is not moving and the probe is still securely attached. Confirm the probe is dry and clean. Choose an extremity that is warm, dry, and well perfused. Wait at least 1 minute for the signal to stabilize before trying an alternate extremity
- Contact a technician or maintenance department if device continues to not work properly after addressing the common issues

2.7 Using light emitting diode (LED) phototherapy lights

2.7.1 Indications for Phototherapy

- Neonatal jaundice requiring treatment
  - ✔ Assess baby for jaundice – the sclera, skin including the palms and soles.
  - ✔ Measure bilirubin levels for a baby with any one of the following;
    - ♦ Jaundice on day 1 of life
    - ♦ Jaundice on palms and soles of feet
    - ♦ Jaundice in a preterm, gestation age equal of less than 35 weeks
    - ♦ Jaundice in a baby with a danger sign
    - ♦ Jaundice in any baby admitted in the NBU
    - ♦ Jaundice in a baby with Rhesus Incompatibility
    - ♦ History of a sibling who had jaundice that required phototherapy or exchange transfusion
  - ✔ Determine if baby has risk factors for bilirubin encephalopathy
    - ♦ Sepsis (likely to manifest as any danger signs)
    - ♦ Hemolysis (likely to manifest as jaundice in the first 24hrs of birth)
    - ♦ Acidosis or asphyxia
  - ✔ Determine if bilirubin levels are within phototherapy threshold

2.7.2 Family centered care

- Inform the mother (parents) that their baby needs phototherapy to prevent brain damage by the high bilirubin levels.
- Explain what the procedure involves in layman terms – the blue light, the eye shields, why the baby is naked, breastfeeding or NG tube feeding intervals, duration of phototherapy
- Discuss with the mother/caregiver the: action & outcomes of phototherapy; the need to cover the baby's eyes; the need to expose as much skin as possible; the feeding plan; the need for periodic assessment & blood sampling; and potential complications
- Answer any questions/concerns they may have

2.7.3 Items required for phototherapy

Machine Preparation Checklist	Baby Preparation Checklist
Phototherapy unit	Alcohol based hand rub
Light meter	Room heater/ radiant warmer
Cot/incubator/crib/radiant warmer	Eye shield/eye patch
Linen	Nasal gastric tube
	Clear adhesive tape
	Marker pen
	5cc syringe
	Blue litmus paper
	Stethoscope
	Pulse oximeter
	Thermometer

2.7.4 Parts of LED Phototherapy Lights and Light Meter

Fig 2.7.4a Parts of the LED Phototherapy Lights with adjustable head and attached light meter

Fig 2.7.4b Parts of LED Phototherapy Lights with canopies with separate light meter

2.7.5 Determining the Irradiance or type of phototherapy to use

- Determine which nomogram to use based on the baby's gestation and weight. Can be nomogram A, B, C, D, E or F. See section 1.12
- Determine which curves on the nomogram to use based on the presence or absence of risk factors.
  - ♦ Use the continuous red & blue curves when the risk factors are absent.
  - ♦ Use the broken red & blue curves when risk factors are present, this is 'intensive phototherapy'.

Nomogram A: Jaundice management for a baby greater than 38 weeks gestation

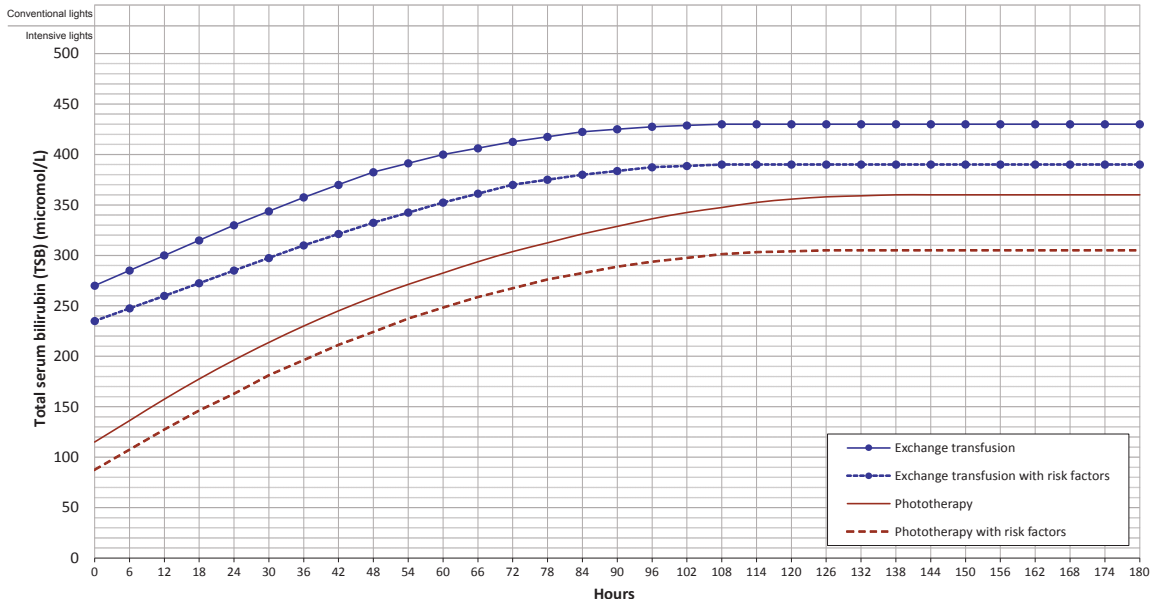


Fig 2.7.5a A nomogram

https://www.health.qld.gov.au/__data/assets/pdf_file/0019/1040365/o-jaundice-nomogram-38w.pdf

- Mark the level of the total serum bilirubin (TSB) on the Y axis of the nomogram. Each small box = 10µmol/l
- Mark the age of baby in hours on the X axis of the nomogram. Each big box = 6hours

- Mark where the total serum bilirubin (TSB) level and age in hours meet on the phototherapy (red) or exchange transfusion (blue) threshold/level
- Determine the irradiance to use based on the level of the total serum bilirubin (TSB) in relation to the curve threshold
  - ♦ More than 50µmol/l below phototherapy level – No phototherapy. Observe the baby. There is no likely risk of developing kernicterus
  - ♦ Less than 50µmol/l below phototherapy level – No phototherapy. Repeat Total Serum Bilirubin (TSB) levels within 6 - 24 hours
  - ♦ On the phototherapy line – Initiate standard phototherapy at 25 – 30µW/cm^2/nm
  - ♦ More than 50µmol/l below exchange transfusion level - Initiate standard phototherapy at 25 – 30 µW/cm^2/nm
  - ♦ Less than 50µmol/l below exchange transfusion level – Prepare for exchange transfusion. Commence intensive phototherapy at 30 – 35µW/cm^2/nm to lower TSB levels and avoid exchange transfusion
  - ♦ At and above exchange transfusion level - Commence exchange transfusion. Initiate intensive photo therapy as you prepare if TSB close to the exchange transfusion threshold, repeat a TSB before the exchange transfusion to check if it is still indicated.

2.7.6 Preparing the baby for phototherapy

- Observe hand hygiene protocol
- Turn on the radiant warmer or room warming system to ensure the temperature in the room where the phototherapy will take place is 25°C – 28°C
- Assess baby's vital signs & risk factors
- Remove all the baby's clothes except for a small size diaper
- Ensure the diaper covers only the genital region for hygiene purposes. Fold it if it is covering more.
- Insert a nasal gastric tube if intensive phototherapy is indicated (See section 3.5)
- Place an eye shield on the baby and ensure the eye shield is snuggly fitting and covers the eyes completely. See fig 2.7.6
- Place the baby in the center of the cot/incubator/radiant warmer

Fig 2.7.6 Expose the baby and ensure the eyes are covered completely

2.7.7 Preparing the phototherapy machine and initiating phototherapy

- Observe hand hygiene protocol
- Position the phototherapy lights above the baby's cot/incubator/radiant warmer
- Plug the power cable and turn on the machine
- Rotate the adjustable unit head or canopy to direct the light field to cover the baby's whole body (50cm by 25cm area) as recommended by the manufacturer
- On the control panel, select the irradiance mode to use – standard or intensive mode
- Adjust the height of the lights to achieve the irradiance chosen based on the baby's bilirubin levels

Fig 2.7.7a Position

Fig 2.7.7b Ensure light covers baby's whole body

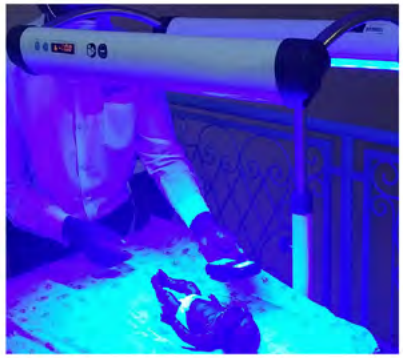


Fig 2.7.7c Ensure the desired irradiance covers the baby's whole body

- Ensure the baby's head, trunk, hands and feet receive the desired irradiance. Use the light meter to confirm the irradiance. Follow the manufacturer's instructions on how to use the light meter.
- Set or reset the timer to keep track of time phototherapy was initiated

Fig 2.7.7d Irradiance levels in µW/cm²/nm for a baby on standard phototherapy

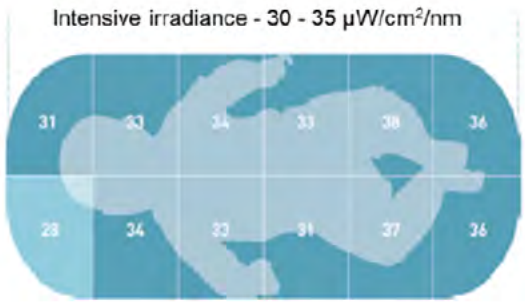


Fig 2.7.7f Irradiance levels in µW/cm²/nm for a baby on intensive phototherapy

2.7.8 Monitoring the Baby

- Monitor vital signs (HR, RR, SpO_2, Temp every 3 hours or as per hospital policy)
- Maintain 3 hourly breastfeeding (BF) for standard phototherapy or NGT feeding for intensive phototherapy
- Four or more wet nappies per day by 72 hours of age implies adequate milk intake
- Weigh the baby on alternate days
- Check for development of signs suggestive of bilirubin encephalopathy (lethargy, poor feeding, seizures, vomiting) this will require immediate exchange transfusion if observed
- Check serum bilirubin level 6 hours after starting phototherapy and decide on best course of action based on results (Expected decrease of 34 µmol/l in the first 6hours)
- Check bilirubin level every 12hrs if level stable or falling
- Document all assessments and interventions in the baby's file, nurses cardex or comprehensive newborn monitoring chart as appropriate

2.7.9 Stopping Phototherapy

- Check total serum bilirubin levels. If the serum bilirubin level is 50µmol/l or below the phototherapy threshold/level, turn off the phototherapy light and unplug the machine from the power source
- Gently remove the eye shield from the patient.
- Keep baby warm
- Advice on most appropriate mode of feeding
- Explain to the mother the therapy is over
- Document date and time when phototherapy is stopped, the level of bilirubin and condition of the baby

2.7.10 Likely Complications and Prevention Measures

Complications	Prevention Measures
Dehydration	Ensure adequate volume and frequency of feeds – BF or NGT
Hypothermia	Keep warm (LED lights do not generate heat)
Retinal damage	Cover the eyes completely
Kernicterus	Monitor bilirubin levels and regularly assess for signs of bilirubin encephalopathy and provide immediate exchange transfusion if required. Provide intensive phototherapy when the TSB level is below but near the threshold for exchange tranfussion.

2.7.11 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Always wipe the phototherapy unit and the light meter with 70% alcohol using gauze or cotton swab before first use (new machines) and between patients.
- Discard all nasal gastric tubes after removal

2.7.12 Preventive Maintenance and trouble shooting

- If not using the unit, test the capacity of the phototherapy once a week to ensure that the phototherapy light is still providing a therapeutic range (25 – 35 µW/cm^2/nm).
- If the light is not turning on - Check that the power cable is securely attached to the phototherapy device. Also check that the switch and power outlet are turned on
- If the light turns on but only some bulbs are working - Contact your maintenance department to ask for replacement bulbs
- Contact a technician or maintenance department if device continues to not work properly after addressing the common issues.

2.8 Using a Glucometer

2.8.1 Indications for random blood sugar testing

- As routine assessment for all sick neonates at admission to NBU
- In high risk infants at 2 hours after birth (Not later than 3 hours)
- In all neonates with signs and symptoms suggestive of hypoglycemia

2.8.2 Family centered care

- Talk to the mother (Parents) about checking the baby's blood glucose levels
- Emphasize that glucose levels will direct on going management of the baby. Explain that the baby will feel some pain when collecting the small blood sample but the mother will participate in managing it through breast feeding
- Answer any questions / concerns they may have appropriately

2.8.3 Items required for blood glucose testing

Machine Preparation Checklist	Baby Preparation Checklist
Glucometer	Alcohol based hand rub
Glucometer strips that are not expired	Alcohol swabs
Control solutions	Dry cotton swabs
	Lancets
	Gloves

2.8.4 Parts of a Glucometer

Fig 2.8.4 Parts of a glucometer

2.8.5 Preparing a glucometer for use

- Follow hand hygiene protocol
- Collect the glucometer, glucometer strips, control solutions and all the items that will be needed to do a heel prick

Fig 2.8.5a Assemble all the items needed to use a glucometer

- Turn on the glucometer by pressing the power button or inserting a glucometer strip into the port until you feel a click. See fig 2.8.5b
- Ensure that a quality control test has been conducted as scheduled and as recommended by the manufacturer (see section 2.8.7)
- The glucometer is ready for use

Fig 2.8.5b Insert strip, place control solution on strip, wait a few seconds, PASS result will show

2.8.6 Preparing the baby for blood glucose testing

- Follow hand hygiene protocol and wear gloves
- Manage pain by breastfeeding the baby 2 minutes before the procedure, during and after the procedure. Administer 2ml/kg of expressed breast milk (EBM) into the mouth, if the baby can not feed breastfeed. Give 0.4ml/kg of oral 50% glucose if there is no EBM available
- Clean the skin on the outer or inner (lateral or medial) side of edge of the baby's heel using cotton wool soaked in 70% alcohol. Allow the alcohol to dry. Blood glucose samples should never be taken from the finger of a neonate. Avoid areas of skin which are poorly perfused, oedematous, inflamed or infected.
- Using the lancet, prick the disinfected outer or inner edge of the heel. A blood drop should form. The patient may cry during blood collection as use of the lancet can be painful.
- Wipe the first drop from the patient's skin and generate an additional blood drop. Collect the second blood drop on the tip of the glucometer strip as shown on fig 2.8.6a. The glucometer should automatically absorb the blood drop.

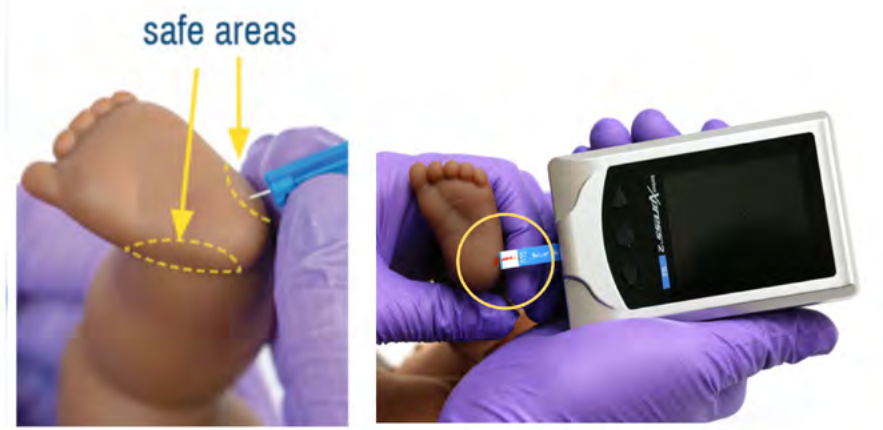


Fig 2.8.6a Clean the outer edges of the heel and collect the second drop on the tip of the glucometer strip

- Using a dry cotton swab, apply pressure to the heel to stop the bleeding.
- Blood glucose level will be displayed as a number on the glucometer screen. Read and record the glucose levels. If the measurement is not in accord with the clinical condition of the patient, repeat the test. Treat

Fig 2.8.6b Apply pressure, read & record the blood sugar

for hypoglycemia if glucose is less than 2.6 mmol/l as outlined in section 1.4

- Document all assessments and interventions in the baby's file, nurses cardex or comprehensive newborn monitoring chart as appropriate

2.8.7 Quality Control

- A quality control test should be conducted and as recommended by the manufacturer or when opening a new vial of glucometer strips using a control solution provided with the glucometer
- NOTE: The control solution should be used **within 3 months** after opening the vial, beyond which it should be discarded.

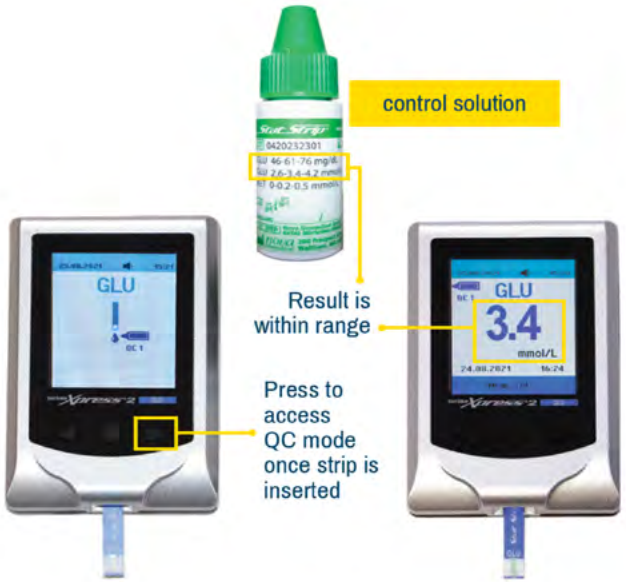


Fig 2.8.7 Allow the strip to absorb the QC solution then compare result with set range of the QC solution

2.8.8 Likely Complications and Prevention Measures

Complications	Prevention Measures
Related to glucometer	
Inconsistent blood glucose results	• Ensure calibration or a quality control test on the glucometer with control solution is performed DAILY or when changing glucometer strip containers • If blood results are inconsistent: ✔ Check the expiry date of the strips if expired use non-expired strips ✔ Perform a quality control test with a control solution
Blood results inconsistent with the clinical presentation	• Check expiry date of glucometer strips. If they are expired use non-expired strips • Compare with laboratory results of a venous or arterial sample • Inaccurate results may be obtained if patient has compromised capillary blood flow.
Glucometer is not turning on	• Try inserting a glucometer strip until you feel a click, if still not turning on, replace the batteries
Persistent errors	• Ensure an adequate sample is applied directly on the tip of the strip.
Having the strip for long period out of the vial	• Remove the test strip ONLY when ready to use
Related to heel prick	
Bruising, bleeding, nerve damage, bone damage	• Correctly identify site to perform heel prick and use correct procedure for heel prick
Pain	• Observe measure to control pain
Infection	• Observe IPC measures

2.8.9 Infection Prevention & Control

- Follow the manufacturers cleaning instructions
- Follow hand hygiene protocol before and after handling glucometer materials that will be used on the patient
- After disinfecting the heel with alcohol, wait for the alcohol to dry before pricking.
- Always wipe the glucometer with 70% alcohol between patients. DO NOT spray the alcohol directly on the glucometer. DO NOT allow the any liquid to enter the strip port connector or allow pooling of the liquid on the LDC screen.
- Dispose of strip in hazardous waste container
- Dispose of used lancets in sharps container

2.8.10 Preventive Maintenance and trouble shooting

- For preventive maintenance, a quality control test should be performed as recommended by the manufacturer

bCPAP hat sizes

Hat Size Selections Chart	
Patient Weight Range	Hat Size
Less than 1,500 grams	Small
1,500 grams to 3,000 grams	Medium
Over 3,000 grams	Large

Choose the most snuggly fit hat

Making a hat from a stockinette

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CHAPTER 3

COMMON CLINICAL PROCEDURES PERFORMED ON NEWBORNS

TABLE OF CONTENT

3.1 Newborn Resuscitation

- Each newborn should be delivered by a qualified health worker
- All high-risk mothers should be identified before child-birth.
- There should be two competent health workers available at delivery to provide both immediate newborn care (including resuscitation for babies with no spontaneous respiration) and care of the mother.

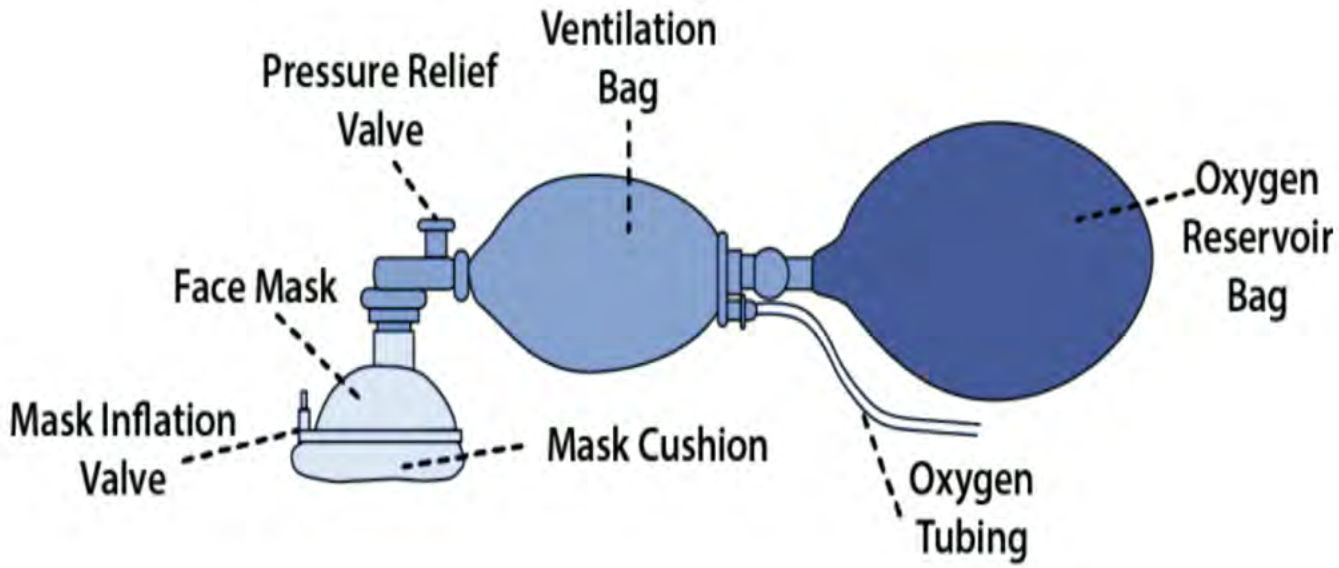


Fig 3.1.1 Parts of the Bag Valve Mask (BVM) Device
Image from https://airwayjedi.com/2017/03/26/manual-ventilation-self-inflating-vs-free-flow-bag

3.1.1 Items required

• Prewarmed radiant warmer with a temperature probe	• 200 – 300ml Bag valve mask (BVM) device
• 2 Warm and sterile towels or blankets	• Different sizes (00, 0,1,2) BVM Masks
• Hat	• Oxygen source and oxygen tubing
• Plastic bag or plastic wrap (for preterm infants <32 weeks' gestation)	• Neonatal size nasal prongs and non-rebreather mask
• Clock	• Stethoscope
• Penguin sucker or bulb sucker	• Pulse oximeter
• Size 6 or 8 Suction catheters with a functioning suction machine	• Alcohol based hand rub & gloves

3.1.2 Steps to follow during newborn resuscitation (see section 1.1)

Step 1 **Ensure safety;**

- Warm delivery room (25-28°C)
- Observe hand hygiene and use of gloves protocol
- Ensure availability of essential drugs and equipment as per the check list above
- Ensure the environment is safe i.e. clean, there are no sharps or clinical waste lying on surfaces or floor, there are no broken pieces of devices lying on surfaces where resuscitation will be performed
- Ensure the suction machine is ready for use - clean, pressure set 80 -100mmHg, suction tubes and wide bore catheter ready for use. Test if suction machine is working (see section 2.2)
- Prepare the radiant warmer for use: (see section 2.1)
  - ✔ Ensure the radiant warmer is clean and the mattress is covered with a clean linen
  - ✔ Plug power cable to the machine
  - ✔ Plug temperature probe into baby probe port on the machine.
  - ✔ Turn on the machine
  - ✔ Test the temperature probe and place it on the mattress
  - ✔ Select the pre-warm mode and place the two towels on the mattress at least 5 min before receiving the baby

- ✔ Turn on the examination light
- ✔ Start APGAR timer on as soon as baby is born

Step 2 **Perform initial steps in stabilization**

- Dry and stimulate the baby, while on the mother's abdomen. Remove the wet towel and cover with a warm dry towel
  - ✔ Assess; is the baby crying/breathing? Does the baby have a good tone?
  - ✔ If No to any of these, immediately cut the cord and place the baby in the middle of the long axis of the radiant warmer mattress and stand at the foot of the radiant warmer

Step 3 **Airway**

- Open the airway into the slightly extended (sniffing) position using the head tilt and chin lift maneuver and look into the mouth
  - ✔ If there are secretions, suction only what is visible. See section 2.2.6

Step 4 **Breathing**

- Look, listen and feel for breathing for 5 seconds.
  - ✔ Look at the chest for movements
  - ✔ Listen for breath sounds
  - ✔ Feel for warm air on your cheek
- If the baby is not breathing, shout for help and begin ventilations;
  - ✔ Size for the correct BVM mask to use – should cover nose and mouth
  - ✔ Using room air
  - ✔ Give 40-60 continuous ventilations in 60 seconds ensuring a good C & E grip. To maintain a good rate count out loud 'BREATH, TWO THREE'.
  - ✔ Ensure the chest rises

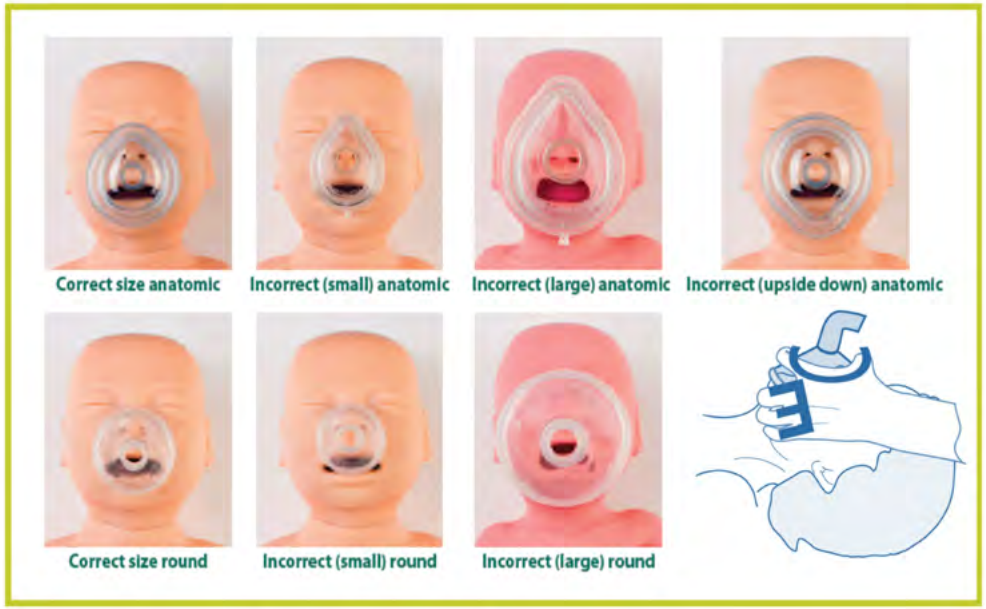


Fig 3.1.2a Sizing and placing the Bag Valve Mask (BVM) device Mask
Image Source: Resuscitation and stabilization of babies born preterm. In: Weiner GM, Zaichkin J, eds. Textbook of Neonatal Resuscitation. 7th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2016:225–241

Step 5 **Circulation**

- Feel the umbilical cord stump for pulsation for 5 -10 seconds.
  - ✔ If the heart rate is above 60beats/min, continue 40-60 ventilations for another 60 seconds then reassess Airway, Breathing & Circulation. If the airway is clear and spontaneously breathing, put on oxygen via nasal prongs at 0.5L/min. Titrate oxygen flow rate to achieve the desired SpO_2
  - ✔ If the heart rate is below 60beats/min, begin chest compressions at a rate of 3 compressions to 1 ventilation for 1-minute. Rescuer 1 should give ventilations and Rescuer 2 should give chest compressions!
  - ✔ When giving chest compressions;

- Use the 2-thumb hand encircling technique
- Locate and give the compressions on the lower 1/3 of the sternum
- Compress 1/3rd of the anterior posterior (AP) diameter
- Allow for chest re-coil
- As you start compression **connect BVM to 100% oxygen**
- To ensure 120 events/min (90 compressions and 30 ventilations) say aloud the phrase - 'ONE and TWO and THREE and BREATH'

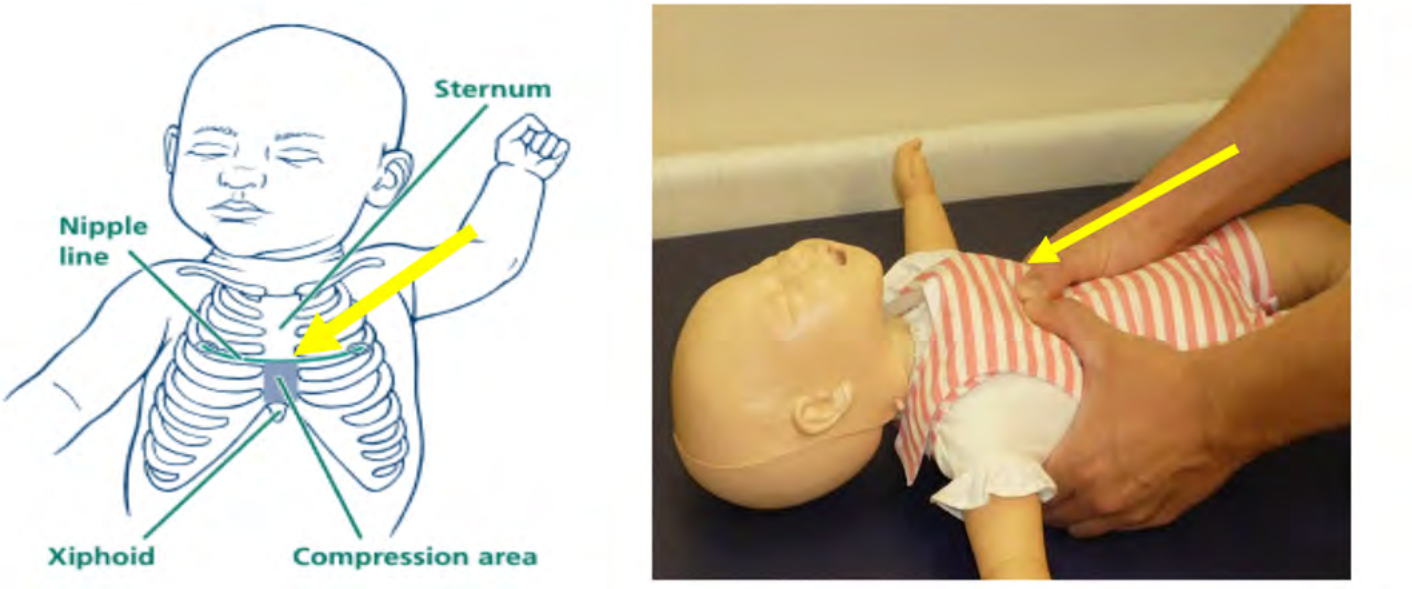


Fig 3.1.2b Location & Technique of performing 2 thumb hand encircling technique

Image borrowed from https://www.semanticscholar.org/paper/Cardiopulmonary-resuscitation-(CPR)-related-rib-in-Franke Pingen/b69fc74ba1e10861c8dd68f7b99f76779e28e85a/figure/0 Neonatal Resuscitation2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Step 6 **Reassess Airway, Breathing & Circulation after 1 minute.**

- Repeat the steps until return of spontaneous breathing & circulation.

Step 7 **Give oxygen**

- Administer oxygen using nasal prongs at 0.5 – 1L/min if baby did not require chest compression
- Administer oxygen using a non-rebreather mask at 10 -15L/min if chest compressions were performed using 100% oxygen.

Step 8 **Ensure the baby is kept warm** (see section 2.1.9)

- Locate site to place and secure the temperature probe on the baby
- Change the radiant warming mode from prewarm to baby mode (also called servo or automatic mode).
- Set the desired skin temperature between 36.5-37.5^{o}C
- For asphyxiated babies: Reduce the heat of the radiant warmer to 0% or or as per hospital policy for therapeutic cooling

Step 9 **Monitor SpO_2**

- Connect to pulse oximeter (see section 2.6.6)
- Titrate oxygen flow rate to achieve the desired SpO_2.
- When baby is stable, provide Essential Newborn Care and Family Centered Care.
- Document care provided

3.2 Use of Plastic Wraps for Preterms less than 32 weeks at birth

- Preterms less than 32 weeks should be resuscitated using the same steps as listed in section 3.1 above except initial stabilization.
- The preterms will not be dried but will be wrapped in a plastic to keep the baby warm

3.2.1 Items required

• Polyethylene paper/wrap – transparent, low density (saran), 50cm wide. Can be commercial or food grade cling film
• Cord clump
• Hat

• Stethoscope
• Radiant warmer
• Clean gloves & surgical masks

3.2.2 Steps to follow when using plastic wraps

Fig 3.2.1.a Neo HeLP heat loss bag

Fig 3.2.1.b Food Grade Plastic Wrap (Alternative)

Step 1 Ensure the delivery room is warm (25°C - 28°C) and draught free

Step 2 Spread the occlusive plastic wrap over the bed of the pre-warmed radiant warmer. Do not allow plastic to overheat if under a radiant warmer. Place on radiant warmer 5 - 10min before the expected delivery then place the prewarmed plastic wrap on the mother's side (for C/S consider other IPC measures).

Step 3 Receive & carefully place the newborn on the occlusive plastic wrap without drying and fold the wrap over the infant covering the entire body excluding the head (fig 3.2.2)

Step 4 Dry the head and cover it with a hat.

Step 5 Transfer the baby immediately to the radiant warmer. Perform clinical assessment and resuscitation interventions through the plastic wrap/bag.

Step 6 Attach temperature probe skin sensor on the baby's skin and maintain the baby's temperature between 36.5°C – 37.5°C. To avoid hyperthermia/heat stress, ensure the temperature probe is well secured to monitor the baby's temperature and remove the plastic wrap/bag when baby has been stabilized in the NBU. To avoid pressure sores, turn the baby hourly

Step 7 Remove the plastic wrap/bag when the newborn has been stabilized and an alternative method of keeping baby warm are available. usually 1-2 hours after birth and an alternative method of keeping baby warm are available.

Fig 3.2.2 Wrap the baby's body without wiping the liquor and cover the head with a cap

3.2.3 Removing the plastic wrap

1. Ensure the temperature in the room is warm and that other methods of keeping the baby warm are available
2. Gently open the plastic bag or tear off the plastic wrap from the baby's body
3. Dry the baby's body
4. Immediately institute other methods of keeping the baby warm e.g. kangaroo mother care or incubator care
5. Check baby's temperature 30 minutes after removing the plastic bag/wrap to ensure normal body temperature is maintained.
6. Discard the plastic wrap

3.3 Administering Oxygen

3.3.1 Indications for Oxygen Therapy

1. Oxygen saturations (SpO_2) are less than 90% (for babies less than 10minutes old check the target SpO_2) OR Increased work of breathing – evident use of accessory muscles; severe lower chest wall in drawing, sternal retraction
2. NOTE: Some babies may require positive pressure ventilation including Continuous Positive Airway Pressure (CPAP). See chapter 2 section 2.3 for Indications for CPAP

3.3.2 Items required

• Alcohol based hand rub	• Marker pen if using a nasal catheter
• Oxygen source – piped, cylinder or concentrator	• Nasal gastric tube if using a nasal catheter
• Oxygen flow rate splitter - if administering to multiple babies	• Transpore medical adhesive
• Penguin sucker or suction catheter size 6 or 8	• Normal saline
• Neonatal Nasal prongs or nasal catheters	• 2 or 5cc syringe
• Neonatal non-rebreather mask	• Distilled water
• Pulse Oximeter	• Kidney dish or procedure tray

3.3.3 Preparing to administer Oxygen

1. Determine the oxygen flow rate to be delivered based on clinical assessment
   - Standard flow rate – Neonates: 0.5–1 L/min;
   - High flow rate – Preterm Neonates: 1 L/min; Term neonates: 2 L/min
2. Determine if humidification is needed - required ONLY for high flow rate oxygen
3. Determine source of oxygen. Can be;
   - Piped oxygen
   - Oxygen cylinder
   - Oxygen concentrator

4. Determine if oxygen flow rate splitter is required - it may be used with any of the oxygen sources. (see section 2.5.5)
5. Determine mode of oxygen delivery
   - Use appropriately sized nasal prongs, nasal catheters or Non-rebreather Mask.
     (Facemasks, head boxes, incubators and tents are not recommended because they waste oxygen and are potentially harmful).

3.3.4 Initiating Oxygen Therapy

- Assess the baby's airway for secretions and suction if necessary. See chapter two Section 2.2.7
- Lubricate the nostrils with a drop of normal saline in each nostril.

a) When using Nasal Prongs (nasal cannula)

- ✔ Insert the nasal prongs into the nostrils. The distal prong should , the prongs should occupy about half the diameter of the nostrils to allow ambient air in around the prongs. Thus, diameter for the prongs - preterm babies 1mm and term babies 2mm. See fig 3.3.4 a and fig 3.3.4b
- ✔ Secure the prongs in place on both cheeks with tape. See fig 3.3.4c
- ✔ Adjust loop adjustment slider at the back of the baby to hold nasal prongs in place securely
- ✔ Protect the sides of the nose and cheek where the tubing could rub and injure the skin.
- ✔ Adjust flow rate accordingly. See table below

Flow Rate	Age Group	Volume	FIO_2
Standard	Preterm	0.5L/min	30 - 35%
	Term	1L/min	30 -35%
High	Preterm	1L/min	45 - 55%
	Term	2L/min	45 - 55%

Fig 3.3.4.a Assorted sizes of nasal prongs

Fig 3.3.4.b Neonatal size nasal prongs

Fig 3.3.4.c Correctly positioned and secured nasal prongs

b) When using a Nasal catheter

- ✔ Use French size 8 oxygen catheter with lateral eyes to disperse oxygen (fig 3.3.4d)
- ✔ Measure the appropriate depth to insert - Length between the inner margin of the eyebrow to the side of the nose (fig 3.3.4e)
- ✔ Insert the nasal catheter to the marked depth gently into the nostril. It should easily slide into the nostril, if you feel resistance, remove and try the other nostril.
- ✔ Secure the catheter with tape above the upper lip (fig 3.3.4e).
- ✔ A nasogastric tube should also be inserted when using high flow oxygen to help release excess air from the stomach. NG tube should be inserted in the same nostril so as not to obstruct both nostrils (fig 3.3.4e).
- ✔ Adjust flow rate as for nasal prongs (table 3.3.4 above)

Fig 3.3.4.d Nasal Oxygen Catheter with lateral eyes to disperse oxygen

Fig 3.3.4.e Correct distance and insertion of the nasal catheter

C) When using a Non-rebreather mask (NRM)

- ✔ Use in the post resuscitation period to achieve over 85% oxygen concentration in the inspired air/ oxygen
- ✔ Ensure airway is clear – suction if necessary, position in the baby in sniffing position
- ✔ Choose the correct size of mask – one that covers nose and mouth (Not the eyes or below the chin)
- ✔ Connect the mask to the oxygen source and ensure the reservoir is filled with oxygen before placing mask on the baby (fig3.3.4f)
- ✔ Adjust flow rate to 10 - 15L/min to achieve target SpO_2

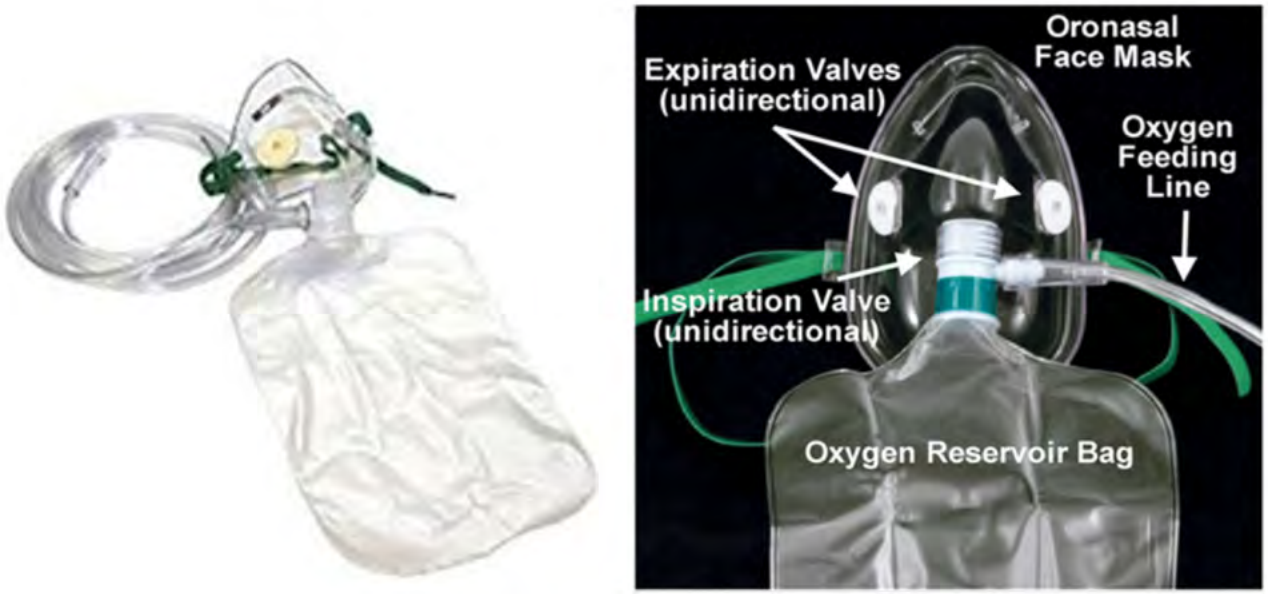


Fig 3.3.4.f The Non – Rebreather Mask

3.3.5 Titrating, Monitoring & Stopping Oxygen therapy

- When oxygen is started, titrate every 15-30mins by 0.5L/min until SpO_2 is 90-95% (for the first 10minutes check the target SpO_2). Change the oxygen delivery methods and flow rates based on need
- If baby requires more than the high flow rate oxygen (preterm 1 L/min &term baby 2L/min), consider changing treatment to CPAP
- Stop titrating and begin close monitoring if the baby is clinically stable – no increased work of breathing, SpO_2 between 90 – 95% and no increase in work of breathing
- Monitor every 3 hours;
  - ✔ Vital signs – SpO_2, respiratory rate, heart rate, temperature and tem
  - ✔ Work of breathing - Lower chest wall indrawing, sternal retractions

- ✔ Nasal patency - assess for secretions and suction if necessary
- ✔ Nasal mucosa for dryness - administer nasal saline drops if necessary
- ✔ The oxygen delivery method (nasal prongs, catheter, non-breather mask) to ensure it is correctly placed and secured.

- Wean off oxygen slowly by reducing the flow rate by 0.5L/min every 15 – 30 min while maintaining SpO_2 between 90-95%. Carefully examine for changes in the work of breathing and SpO_2 to assess whether supplemental oxygen is still required.
- Once oxygen is stopped, recheck SpO_2 after 1hr, as late desaturation can sometimes occur
- Discharge only if baby has been stable with SpO_2 greater than or equal to 90% and no increased work of breathing on room air for at least 24hrs
- Document all assessments and interventions in the baby's file, nurses cardex and comprehensive newborn monitoring chart as appropriate
- Observe all IPC measure;
  - ✔ If humidification is required, change the distilled water in the humidifier daily (every 24 hours)
  - ✔ Discard the nasal prongs, catheter and non-breather mask after use
  - ✔ If no distilled water use water that is boiled for 10minutes and cooled.

3.3.6 Likely Complications and Prevention Measures

Complications	Prevention Measures
Hypoxia	Monitor SpO_2
Hyperoxia	Monitor SpO_2
Nasal blockage	Saline drops at every 3 hours
Nasal septum necrosis	Correct size of nasal prongs
Pressure sore	Properly secure tubings/probes

3.4 Providing guidance to the mother on the correct breastfeeding technique

3.4.1 Indications for providing guidance on breastfeeding

- Health workers must provide all mothers with guidance on how to correctly breastfeed their newborn baby. This is to include correct positioning and attachment.
- The guidance should be given before delivery, immediately after delivery and during the early postnatal period.
- Health talks, demonstrations and visual aids e.g. videos and pictures may be used

3.4.2 Items required

• Hand washing sink with running water, soap and disposable hand towels or alcohol-based hand rub
• Comfortable sit for the mother
• A pillow
• Manikin - Baby Ann
• Breast models

3.4.3 Steps to teaching on breast feeding

Step 1 **Introduction to the session by engaging the mothers/participants to;**

- Describe hunger cues (see figure 3.6.3a below). Emphasize to feed as soon as baby is ready to feed and so not to wait for crying
- Name the parts of the breast using the breast models – the nipple, areolar and temporary milk containers at the margin of the areolar. This will build a rationale as to why it is important to have the baby open the mouth wide to compress on these milk containers. Same region compressed during breast milk expression
- Describe why mothers should drain one breast completely before switching to the next one - to ensure baby gets the hind milk that is rich in fat
- Emphasize the need for hand hygiene to optimize benefits of breastmilk and prevent infections

- Describe the most appropriate positions for breastfeeding small and sick neonates - Cross-cradle and football positions. Only these two positions will be demonstrated in the session.
- Identify the features that describe the correct positioning, attachment and effective suckling. See table 3.4.1 below

Table 3.4.1 Correct Positioning, Attachment & Suckling	
Baby's Position	
Correct position (Yes to all)	**Incorrect position (No to any one)**
• Baby's head and body in line	• Baby's head and neck twisted to feed
• Baby's head close to the mother's body	• Baby not held close
• Baby's whole body supported	• Only baby's head and neck are supported
• Baby's nose at the level of the mother breast	• Baby's nose not at the level of the mother's breast
Baby's Attachment	
Correct attachment (Yes to all)	**Ineffective suckling (No to any one)**
• More areola seen above baby's upper lip	• More areola seen below baby's lower lip
• Baby's mouth wide open (more than 120^{o})	• Baby's mouth not wide open (less than 120^{o})
• Baby's lower lip turned outwards	• Baby's lips pointing forward or turned inwards
• Baby's chin touches breast	• Baby's chin not touching breast
Suckling	
Effective Breastfeeding (Yes to all)	**Effective Breastfeeding (Yes to all)**
• Slow deep sucks	• Rapid shallow sucks
• Cheeks round when suckling	• Cheeks pulled in when suckling (dimpling)
• Baby releases breast when finished	• Mother takes baby off the breast
• Mother notices signs of oxytocin release	• No signs of oxytocin reflex noticed

Step 2 **Demonstrate placing baby in the correct position**

- Have a participant wear the breast models and sit on a comfortable chair with a back rest or if on a hospital bed sit up straight with a pillow behind.
- Observe hand hygiene protocol
- For the Cross-Cradle hold (mother breastfeeding from the right breast) See fig 3.4.3a
  - ✔ Have a pillow on the laps to allow the baby to be at the same level as the breasts
  - ✔ Lay the baby on his side on the mother's laps, with the chest and abdomen against the mother's abdomen
  - ✔ When feeding on the right breast, hold the baby's head and neck using the left hand so that the left thumb is behind and below the right ear and the other fingers are behind and below the left ear of the baby
  - ✔ Let the baby's whole body lie on the left arm so it's easy to maintain the abdomen to abdomen position between mother and baby
  - ✔ Ask the participants to name the features of correct positioning

- For the Football hold (mother breastfeeding from the right breast) See fig 3.4.3b
  - ✔ Have a pillow on the side to support the mother's arm and allow the baby to be at the level of your breast
  - ✔ Support the baby in a **semi sitting position facing the mother**, with the bottom against the back of the chair.
  - ✔ Support the baby's back with the mother's arm closest to the baby.
  - ✔ When feeding on the right breast, hold the baby's head and neck using the right hand so that the right thumb is behind and below the left ear and the other fingers are behind and below the right ear of the baby
  - ✔ Let the baby's whole body lie on the right arm so it's easy to maintain the abdomen to abdomen position between mother and baby
  - ✔ Ask the participants to name the features of correct positioning

Fig 3.4.3a Cross cradle hold position

Fig 3.4.3b Football hold position

Step 3 **Demonstrate the correct attachment of the breast into the baby's mouth (applicable for any baby's position) (see fig 3.4.3c & fig 3.4.3d)**

- Hold the breast with the left hand using a C-grip, with the thumb positioned at the margin of the areolar on the upper side and the index finger same position but on the lower side of the breast
- Gently compress and shape the areolar to conform to the shape of baby's open mouth.
- Touch the baby's upper lip with the nipple to get the baby to open his or her mouth wide
- Quickly bring the baby's shoulders and head to the breast as you quickly pull the baby towards you and introduce the breast into the baby's mouth. See fig 3.4.3e
- Extend baby's neck slightly so that when you pull him on the breast, the chin will reach the breast. Aim the nipple at the baby's upper lip
- Keep the breast compressed until baby begin to suckle
- DO NOT LEAN FORWARD TO TAKE THE BREAST TO THE BABY. Bring the baby to the breast
- Ask the participants to name the features of correct attachment

Fig 3.4.3c Cross cradle hold attachment

Fig 3.4.3d Football hold position

Fig 3.4.3e Introducing the breast

Step 4 **Ending a feed**

- Ask the participants to describe how the mother should end a breastfeed - Wait until baby lets go of the nipple
- However, if a baby has not attached correctly or if the baby does not come off the breast by himself after 20 to 25 minutes on a side, and the mother would like to switch breasts or rest awhile, the baby can be taken off the breast by first breaking the suction.
- To release the suction, insert the mother's little finger into the corner of baby's mouth, pushing the finger between his gums until a release is felt or heard. The mother can also try placing her finger on the corner of the baby's mouth and pulling the skin gently toward his ear.
- After taking the baby off the breast, the mother's bra flaps should be left down so that the air can dry her nipples. Air drying helps to maintain healthy nipples.

3.5 Expressing Breast Milk

3.5.1 Indications for Expressing Breast Milk (EBM)

- Baby cannot breast feed due to critical condition – can be fed EBM via nasal gastric tube or cup
- Premature baby who is unable to suck - mostly below birth-weight 1500grams
- Storage of breast milk
- To ensure continuous supply of breast milk when baby is not breastfeeding
- To relieve engorged breasts
- To boost the breastmilk supply
- To be taught to all mothers during the antenatal period.

3.5.2 Items required

• Hand washing sink with running water, soap and disposable hand towels
• Wide open bisphenol A (BPA) free plastic bowl to collect the milk
• BPA free storage containers for storing the milk
• Comfortable chair for the mother with a foot stool if necessary

3.5.3 Steps to express breast milk

Step 1 Observe hand hygiene protocol

Step 2 Obtain clean safe containers to express and store the milk. Expression container should have a wide opening

Step 3 Relax and massage the breast all round to stimulate let down

Step 4 Hold the breast in a 'C' grip with your index finger and thumb near but not touching the areolar. (fig 3.5.3a)

Step 5 Push the breast back towards the chest wall

Step 6 Compress the breast between the thumb and the finger without lifting them from your breast. Release without moving your hand from the breast.

Step 7 Repeat this step until the breast is 'empty'. Begin the next breast until completely drained.

Step 8 Use the expressed breast milk immediately or store safely for later use;

Fig 3.5.3a Hold breast using 'C' grip

Fig 3.5.3b Push breast to chest wall, press and release

3.6 Cup Feeding

3.6.1 Indications for cup feeding

- Baby is stable, equal to or above 1500grams but cannot breast feed

3.6.2 Items required

• Hand washing sink with running water, soap and disposable hand towels
• Calibrated safe cup – BPA free if plastic
• Soft piece of cloth/disposable towel
• Comfortable chair

3.6.3 Steps to cup feed – to be demonstrated to the mother until she is able to do it herself

Step 1 Observe for hunger cues. Do not wait for crying to feed. See fig 3.6.3a below

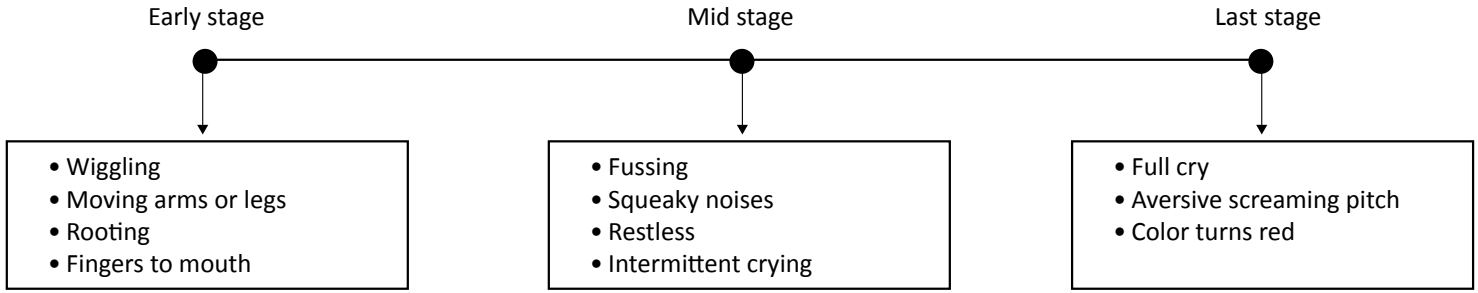


Fig 3.6.3a Stages of readiness to feed and hunger cues

Step 2 Observe hand hygiene protocol

Step 3 Prepare and put appropriate volume of milk in a cup. See section 1.5 for details

Step 4 Sit the baby at almost 90° supporting the baby's head, neck and back as shown on fig 3.6.3b below.

Fig 3.6.3b Sit the baby upright at almost 900 and place cup on lower lip

Fig 3.6.3c Tilt the cup so the baby can lick the milk

Do not feed a baby who is lying down

Step 5 Place the cup on the lower lip and tilt the cup so the milk reaches the baby lips. Let the baby lick the milk using the tongue (fig 3.6.3c). Do not pour milk into the baby's mouth

Step 6 Continue tilting the cup as the baby continues to lick the milk.

Step 7 When baby has taken enough, he will start closing his mouth and even fall asleep. Do not feed a sleeping baby

3.7 Inserting and Using the Nasal/Oral Gastric Tube (NGT/OGT)

3.7.1 Indications for NGT/OGT insertion

- Premature babies (usually those with birth-weight below 1500gram) requiring NGT feeding.
- Baby is on oxygen therapy via nasal catheter – insert in same nostril as nasal catheter
- Baby requires CPAP – insert OGT only
- Baby requires intensive phototherapy

3.7.2 Items required

• Hand washing sink with running water, soap and disposable hand towels or alcohol-based hand rub	• Blue litmus paper
• Clean gloves	• Transpore medical adhesive
• Gastric tube size 4, 6 or 8	• Kidney dish or procedure tray
• Marker pen or tape	• Stethoscope
• 2cc syringe	• 20cc syringe

3.7.3 Inserting and using a NGT/OGT

Step 1 Select the appropriate size of the nasal/oral gastric tube to use. Should be the minimum sized tube which is most effective for the purpose. Less than 1500gm – size 5 - 6 and equal to and above 1500gm size 6 – 8. See fig 3.7.3a

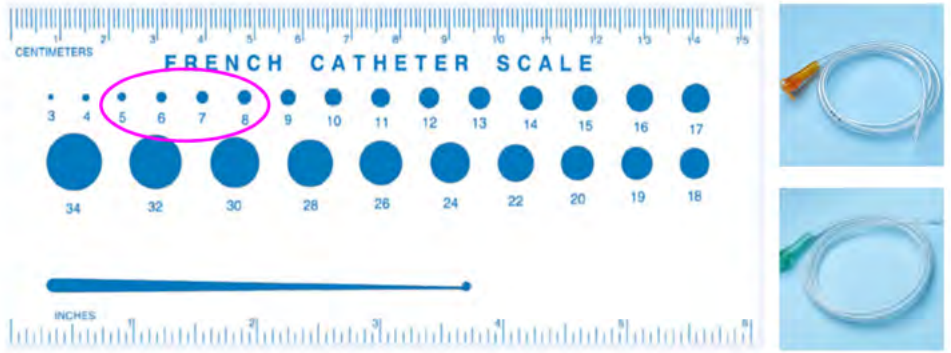


Fig 3.7.3.a Choose the correct size of nasal/oral gastric tube to use

Step 2 Size the nasal/oral gastric tube. Measure the distance from the nose to the tragus of the ear, then to the midpoint between xiphisternum (epigastrium) and umbilicus (OGT measure from the corner of the mouth). Mark the tube at this point.

Step 3 Insert the nasal/oral gastric tube (Fig 3.7.3c)

1. Lubricate the tip of the NGT with breast milk/water
2. Slightly flex the baby's head
3. Insert the tube through the nose (NGT) or mouth (OGT) until the measured distance is reached
4. Secure the gastric tube on the cheek if it is inserted in the nose and on the chin if it is inserted in the mouth using a transparent medical adhesive (fig 3.7.3d and fig 3.7.3e)

Fig 3.7.3.b Correct Sizing of Nasal/Oral gastric tube

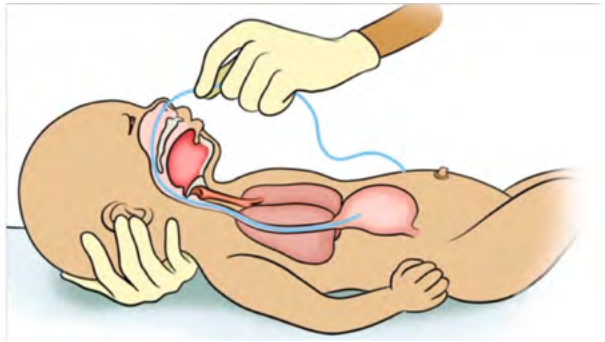


Fig 3.7.3.c Correct Insertion of the Nasal/Oral Gastric Tube

Fig 3.7.3.d Confirm correct placement before use

Fig 3.7.3.e Safely secured oral gastric tube

Step 4 Confirm the position of the nasal/oral gastric tube

1. Aspirate 2mls of the presumed gastric aspirate using a 2mls syringe
2. Check that aspirate turns blue litmus paper pink.
3. If no aspirate is obtained, inject 2mls of air down the tube using a 2mls syringe and listen over the abdomen with a stethoscope
4. Before feeding always confirm the tube is in the correct position by making sure the mark of the measured distance is visible Fig 3.7.3d

Step 5 Using the Gastric tube. To be demonstrated to the mother until she is able to do it herself

- Keep the gastric tube well secured so as to maintain the correct position.
- Use the tube for the purpose it was inserted.
  - For feeding purposes
  - To prevent gastric distension during oxygen therapy via nasal catheter and CPAP – When used to feed, close it for 30minutes after the feed then open it again.

1. Confirm the correct volume to feed
2. Observe hand hygiene protocol
3. Check correct tube placement
4. Pour correct volume of EBM needed in a cup
5. Remove the burrel from a 10 – 20cc syringe

6. Pinch the end of the NG/OG tube, open it and attach the empty syringe
7. Pour milk into the empty syringe, remove the pinch & hold the tube above the baby. See fig 3.7.3f
8. Let the milk flow slowly by gravity

Fig 3.7.3f Feeding using a gastric tube. Hold the syringe with milk above the baby and let the milk flow by gravity for 10 – 15 min

3.8 Administering buccal glucose

3.8.1 Items required

• Hand washing sink with running water, soap and disposable hand towels or alcohol-based hand rub
• Gloves
• 50% dextrose gel
• 5cc syringe
• Kidney dish or procedure tray

3.8.2 Administering oral glucose

Step 1 Observe hand hygiene protocols and wear gloves

Step 2 Prepare the 0.4mls/kg of 50% dextrose in a syringe (table 3.8.3)

Table 3.8.3 Dosage of 50% buccal glucose based on weight

Weight in Kg	0.6 – 0.7kg	0.8 – 0.9kg	1.0 – 1.1kg	1.2 -1.3kg	1.4 – 1.5kg
50% Dextrose in mls	0.3mls	0.3mls	0.4mls	0.5mls	0.6mls
Weight in Kg	1.6 – 1.7kg	1.8 – 1.9kg	2.0 – 2.1kg	2.2 -2.3kg	2.4 – 2.5kg
50% Dextrose in mls	0.7mls	0.7mls	0.8mls	0.9mls	1.0ml
Weight in Kg	2.6 – 2.7kg	2.8 – 2.9kg	3.0 – 3.1kg	3.2 -3.3kg	3.4 – 3.5kg
50% Dextrose in mls	1.1mls	1.1mls	1.2mls	1.2mls	1.4mls

Step 3 Dry the baby's mouth using a sterile gauze

Step 4 Apply a small amount of the prepared 50% glucose on one of your gloved finger and gently apply and massage the 50% glucose into the baby's left gum and buccal mucosa. Do not pour the glucose solution into the mouth. Repeat the same procedure on the right gum and buccal mucosa and vice versa until all the glucose in the syringe is over.

Step 5 Continue exploring other available means of correcting hypoglycemia. (see 1.4)

Fig 3.8.3 Gently apply and massage the gel into the baby's gum and buccal mucosa

3.9 Performing a heel prick

3.9.1 Indications for a heel prick

- To collect a small amount of blood sample for point of care diagnostics

3.9.2 Items required

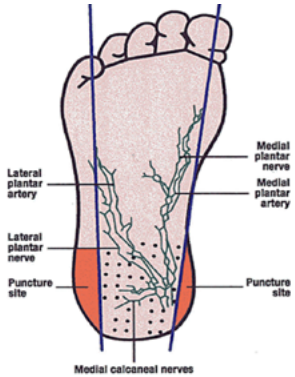
• Hand washing sink with running water, soap and disposable hand towels or alcohol-based hand rub	• Expressed Breast milk
• Gloves	• 50% dextrose if Expressed Breast Milk is not available
• Lancet (neonatal size)	• 5cc syringe
• Cotton wool soaked in 70% alcohol or alcohol swabs	
• Point of care diagnostic device	

3.9.3 Performing a heel prick

Step 1 Observe hand hygiene protocols and wear gloves

Step 2 Ensure baby is warm and manage pain by breastfeeding 2min before, during and after the procedure

Step 3 Select the appropriate site as shown on fig 3.9.3 below. Also described in Section 2.8.6



Preferred site for heel prick

- The lateral or medial side of the heel.
- At these point the bone is further away from the outer surface compared to the toe or posterior heel.
- Do not use toes or fingers

Fig 3.9.3 Choose the appropriate site

Step 4 Clean site with 70% alcohol; allow to dry for 30sec. Too much compression of the cleaned selected site before pricking should be avoided as this may cause a deeper puncture than is needed to get good flow

Step 5 Use a disposable lancet to puncture the site to a depth of not more than 2.4mm. For preterms use a 0.85mm lancet. Puncture the skin with one quick, continuous and deliberate stroke, to achieve a good flow of blood and to prevent the need to repeat the puncture.

Step 6 Wipe away the first drop of blood because it may be contaminated with tissue fluid or debris (sloughing skin). Avoid squeezing the heel too tightly when collecting second drop because this dilutes the specimen with tissue fluid (plasma) and increases the probability of hemolysis

Step 7 When the blood collection procedure is complete, apply firm pressure to the site to stop the bleeding. Dispose waste appropriately. If more than two specimens are needed, a venipuncture may provide more accurate laboratory results.

3.10 Inserting an Intravenous (IV) Access

Newborn Care Series: Inserting an IV

3.10.1 Indications for IV access

- To administer IV fluids
- To administer IV medication

3.10.2 Items required

• Hand washing sink with running water, soap and disposable hand towels or alcohol-based hand rub	• Water for injection
• Gloves	• Tunicate
• Cotton wool soaked in 70% alcohol or alcohol swabs	• Dry Gauze
• IV cannula gauge 26 (purple) or gauge 24 (yellow)	• Kidney dish or procedure tray
• Transpore medical adhesive	• Sharps container & clinical waste bin
• 2cc syringe	• Good lighting

3.10.3 Performing a heel prick

Step 1 Observe hand hygiene protocols and wear gloves

Step 2 Ensure baby is warm and manage pain by breastfeeding 2min before, during and after the procedure

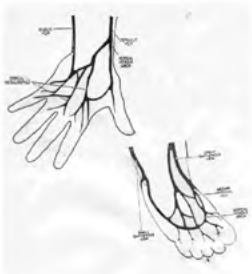


Fig 3.10.3a Select an appropriate site – upper and lower extremities

Fig 3.10.3b Select an appropriate site – the scalp

Step 3 Select the appropriate site as shown on fig 3.10.3a and 3.10.3b.

Step 4 Ensure good lighting and apply a tourniquet above the site selected

Step 5 Using gloved hands, clean site with cotton swabs with 70% alcohol for 30seconds. Let it dry for a minimum of 30 seconds (fig 3.10.3c).

Step 6 Stretch the skin over the selected cleaned site to stabilize the vein to be punctured. Can use a tourniquet to obstruct the venous flow and make the veins more visible..

Step 7 Open the cannula and keep the opening of the needle facing up and puncture the vein at a10¬0 angle. A slight flash back of blood into the needle will indicate you are in the vein. Pull the needle gently out as you gently push the cannula slowly forward into the vein.

Fig 3.10.3c Clean and let it dry

Fig 3.10.3d Stretch and puncture vein at a 10^0 angle

Step 8 Press the distal end of the cannula to occlude blood flow. Discard needle in sharps container. Remove tourniquet and take samples then flash with sterile water slowly

Step 9 - Secure firmly with a clear medical adhesive. If using a limb, immobilize using a splint. Fingers/toes must be visible and the area around the tip of the catheter must be visible too. See figure 3.9.3e below. Assess the baby for pain and the site for swelling, redness or discharge. If any of these are present, remove the IV access and insert on another site.

Fig 3.10.3e Safely secure the IV Access

Step 10 - Remove the IV access as soon it is not needed e.g. the baby can feed orally and IV medications are over. Apply pressure to stop bleeding, clean the site and cover with a dry gauze to prevent bleeding & infection

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