HEALTH HOLDING

HAFER ALBATIN HEALTH CLUSTER
MATERNITY AND CHILDREN HOSPITAL

Department:	Neonatal Intensive Care Unit (NICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	Monitoring Vital Signs of Neonates		
Applies To:	All NICU Staff, Respiratory Therapist and Biomedical engineers		
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1. PURPOSE:

1.1 To provide guidelines for appropriate patient monitoring and documentation of vital signs in the neonatology department monitoring of patient circulation, respiration & oxygenation.

1.2 Aid in early detection of changing physiology in order to initiate appropriate responses before the patient deteriorates.

2. DEFINITIONS:

2.1 Monitoring: A planned, systemic, on-going process to gather, organize, and review data information on a regular basis with the purpose of identifying changes in a situation.

2.2 Vital signs monitoring is the regular assessment of temperature, pulse, respirations, blood pressure and pain and neurologic status.

2.3 Patient Observation: Includes the components of care whereby the health care professionals including Physicians and Nurses, assess the patient's condition, identifying, evaluating and intervening appropriately. When the patient's condition triggers concern, a systematic assessment should ensure beginning with assessment of airway, breathing and circulation followed by assessment of other body systems.

2.4 Continuous electronic monitoring: Are adjuncts to patient care when periodic vital sign monitoring does not provide frequent enough assessment or when it is necessary to monitor the potential for changes in vital signs outside an acceptable range.

3. POLICY:

3.1 Electronic monitoring is only a support to appropriate assessment and clinical judgement by all health care providers.

3.2 The fundamental principle of electronic monitoring is to complement accurate observation by monitoring appropriate physiological parameters that will alert health care professionals to changing physiology prior to the occurrence of irreversible untoward events.

3.3 All patients require appropriate assessment and determination of requirements for observation, vital sign monitoring and electronic monitoring according to their condition.

3.4 In all neonatology department units, at least one nurse will be present in the patient's room at all times.

3.5 Electronic monitors will be maintained through the regular preventive maintenance program performed by biomedical engineering.

4. PROCEDURE:

4.1 Regardless of modality, electronic monitoring is only a support to appropriate assessment and clinical judgment by all health care providers.

4.2 Charge nurse in consultation with the attending medical staff will distribute nurse's patient observation assignments and ratio according to the needs and acuity of each patient and the skills of each nurse.

4.2.1 Intensive care and observation room: every 2 hours.

4.2.2 Intermediate care, postnatal wards every 4 hours.

4.3 More frequent monitoring is done as required according to patients condition with or without medical order e.g. every 15 minutes, 30 or 60 minutes.

4.4 If the vital signs are not expected to be within the normal range, a medical order is required for the acceptable vital sign range e.g. some cardiac patients need Physician order for acceptable oxygen saturation.

4.5 Physician should indicate in the order sheet the range of acceptable SpO_2 values for patients receiving oxygen therapy.

4.6 If there are circumstances when the Physician is to be notified, a medical order is required indicating the vital signs levels at which to notify the Physician.

4.7 The assigned nurse will:

4.7.1 Assure that the monitor is functioning at the beginning of each shift, each time the monitor has been turned off and on again, resumed from standby mode or if there has been a temporary power disruption.

4.7.2 At the initiation of patient monitoring, set the alarm limits appropriately for each patient and document the settings on the Neonatal ICU Flow Sheet of the patient's medical record.

4.7.3 At change of shift, the incoming nurse will confirm appropriateness of settings and document it on the neonatal ICU flow sheet. She also, documents any changes to alarm settings during her shift.

4.8 Note that although abnormal vital signs frequently indicate physiological instability, vital signs that fall within normal ranges do not necessarily indicate a stable physiological status, and on-going assessments are essential. Often it is a percentage of change over time that is a key alert.

4.9 Vital signs include temperature, pulse, respirations, blood pressure and pain, and neurologic status.

4.9.1 Temperatures:

4.9.1.1 Will be taken using the incubators probe, vital signs monitor or manually using the electronic thermometers and recorded in degrees Celsius. Attach the incubator core temperature probe over the infant's liver, and may also connect the baby to the wall mounted vital signs monitor.

4.9.1.2 Set the incubator on air temperature mode. Place the neonate in the proper Neutral Thermal Environment (NTE) for his/her weight and age according to NTE tables.

4.9.1.3 Acceptable temperature:

Despite its low sensitivity and specificity in detecting fever, axillary temperature is recommended by the American Academy of Paediatrics as a screening test for fever in neonates because of the risk of rectal perforation with a rectal thermometer:

4.9.1.3.1 Acceptable axillary temperature is 36.5 °C to 37.4 °C.

4.9.1.3.2 Rectal (definitive) if required to confirm axillary 36.6 °C to 37.8 °C.

4.9.1.3.3 Inform assigned Physician if outside this range and check incubator temperature.

4.9.1.3.4 Document the reading as read; do not add or subtract.

4.9.1.3.5 Fever should be interpreted and managed in the context of the patient's age, illness and clinical picture. Premature and small term infants may not be able to generate an elevated temperature in response to infection.

4.9.1.4 Frequency:

4.9.14.1 On admission check temperature axillary and if less than 36.5 °C check every 15 minutes until within the acceptable range.

4.9.14.2 All through admission, continuously monitor the baby's temperature and document it every 2 hours in NICU and every 4 hours in intermediate care and more frequently as required. Check axillary temperature manually as required and document it on the flow sheet.

4.9.1.5 Place the baby in the proper humidity as follows (humidity decreases the evaporative heat loss and thus aid in maintaining infant's temperature and fluid balance).

4.9.2 Pulse:

4.9.2.1 Continuous electronic monitoring for all babies admitted to the neonatology department.

4.9.2.2 Confirm by auscultation for one full minute at least twice per shift and if required.

4.9.2.3 If arrhythmia detected obtain electrocardiogram.

4.9.2.4 Acceptable pulse rate is 110-160 per minute. Inform assigned Physician if pulse is below 100 or above 160 bpm.

4.9.2.5 A low resting heart rate caused by sinus bradycardia (80 to100 beats/min) during sleep is common in healthy full-term infants (verify good acceleration with stimulation and normal blood pressure).

4.9.2.6 Set lower alarm limits at 80 bpm and upper alarm at 180 bpm.

4.9.2.7 Measure capillary refill time by pressing on the sternum for five seconds with a finger or thumb, and noting the time needed for the colour to return once the pressure is released. The upper acceptable limit for capillary refill is 3 seconds. If prolonged, may indicate poor tissue perfusion.

4.9.2.8 Be alert and report early alterations in vital signs e.g.

4.9.2.8.1 With smaller collections of pneumothorax compensatory increases may occur in heart rate and blood pressure. As the amount of air in the pleural space increases, central venous pressure rises, and severe hypotension, bradycardia apnea, hypoxia, and hypercapnia may occur.

4.9.2.8.2 Bradycardia and apnea may indicate apnea of prematurity or seizure activity.

4.9.2.8.3 Persistent tachycardia and poor tissue perfusion could be early signs of incipient decompensation of shock. Hypotension is a late finding in shock.

4.9.3 Respiratory Rate:

4.9.3.1 Respiratory rate; 40-60 per minute

4.9.3.2 Observe for cyanosis, stridor, nasal flaring, grunting, and suprasternal or intercostal retractions and report any.

4.9.3.3 Auscultate the lungs as required to assess air entry.

4.9.3.4 Observe for apnea. Report and document any event.

4.9.3.4.1 An apneic spell is a temporary cessation of breathing or airflow for 15 to 20 seconds or longer.

4.9.3.4.2 A shorter pause accompanied by bradycardia (< 100 beats per minute) desaturation or pallor.

4.9.3.4.3 Apnea that lasts for less than l0 seconds is considered significant if it is associated with decrease in oxygen saturation (SpO_2 < 80-85%).

4.9.4 Oxygen Saturation SpO_2:

4.9.4.1 Acceptable saturation for infants receiving oxygen:

4.9.4.1.1 For preterm infants less than 36 weeks post-conceptional age:

4.9.4.1.1.1 Keep SpO_2 between 91%-95%

4.9.4.1.1.2 Upper alarm limit of monitor; 95%

4.9.4.1.1.3 Lower alarm limit of monitor; 89%.

4.9.4.1.2 For infants 36 or more weeks post-conceptional age:

4.9.4.1.2.1 Keep SpO_2 between 92%-95%

4.9.4.1.2.2 Upper alarm limit of monitor 97%

4.9.4.1.2.3 Lower alarm limit of monitor 90%.

4.9.4.1.3 Note that at SpO_2 98% or more, in oxygen treated infants, the PaO2 can be well above 100 mmHg (toxic range).

4.9.4.2 For infants in room air SpO_2 may reach 100%;

4.9.4.2.1 For preterm infants less than 36 weeks post-conceptional age:

4.9.4.1.2.1 Keep SpO_2 between 92%-95%

4.9.4.1.2.2 Upper alarm limit of monitor 97%

4.9.4.1.2.3 Lower alarm limit of monitor 90%.

4.9.4.2.2 For infants 36 or more weeks post-conceptional age:

4.9.4.2.2.1 Acceptable SpO_2 92 - 100%
4.9.4.2.2.2 Upper limit of monitor 100%
4.9.4.2.2.3 Lower limit of monitor 92%

4.9.4.2.3 Follow neonatology guidelines "Use of pulse Oximetry in neonates"

4.9.5 Blood pressure (BP):

4.9.5.1 Varies with gestational age and postnatal age. Use appropriate graphs

4.9.5.2 Use correct with BP cuff.

4.9.5.3 Leave the infant undisturbed for 15 minutes, obtain 2-3 measurements over 5 minutes, when the infant is sleeping or settled, as far between feeds as possible.

4.9.5.4 Hypertension is defined as persistent systolic blood pressure and/or diastolic blood pressure more than 95th percentile for age on 3 separate measurements.

4.9.5.5 Hypotension: The two most common parameters used to define hypotension during first 3 days of life are:

4.9.5.5.1 Mean BP (MBP) below 30 mmHg, or Mean BP lower than the gestational age in weeks, which roughly correlates with the 10th percentile for age.

4.9.5.5.2 Studies suggest that MBP below gestational age in very low birth weight neonates during first day of life are below the auto-regulatory BP range for cerebral blood flow.

4.9.5.5.3 This led to the recommendation to maintain MBP above the infant gestational age.

4.9.5.5.4 After 3 days of life, more than 90% of neonates with gestation of 23-26 weeks will have a MBP > 30 mmHg.

4.9.5.6 BP increases with postnatal age, roughly, 1 to 2 mmHg/day during the first week and one mmHg /week during the next 6 weeks in both preterm and full term infants.

4.9.6 Pain assessment:

4.9.6.1 All admitted neonates are screened for presence of pain in the following situations (but not limited to):

4.9.6.1.1 On admission,

4.9.6.1.2 Regularly for all admitted infants to intensive care every 2 hours with vital signs,

4.9.6.1.3 Regularly for all admitted infants to intermediate care every 4 hours,

4.9.6.1.4 On performing any potentially painful procedures

4.9.6.1.5 Postoperative patients: every 1 hour for first 6 hours, then every 2 hours or more frequently if pain not improved.

4.9.6.1.6 To detect pain in infants with known medical conditions or interventions that may cause pain (e.g. NEC, chest tubes etc.)

4.9.6.1.7 Any time pain is suspected.

4.9.6.1.8 To evaluate weaning of opioid or benzodiazepine treatment. Weaning is advanced provided that PIPP-R is decreasing.

4.9.6.2 Follow neonatology policy; "Pain assessment for admitted neonate"

4.9.7 Abnormalities in alertness level:

4.9.7.1 Abnormalities are based on three criteria :

4.9.7.1.1 The appearance of the infant in a resting state.

4.9.7.1.2 The response to arousal manoeuvres i.e. persistent, gentle shaking, pinch, shining of a light.

4.9.7.1.3 Motor responses: the quantity and, the quality of motility, both spontaneous and that elicited by pinprick of the medial extremities.

4.9.7.2 Infants are considered stuporous when they have a diminished or absent arousal response and when motor responses are diminished:

4.9.7.2.1 Slight stupor, the infant is awake but "sleepy," or "lethargic,"

4.9.7.2.2 Moderate stupor, the infant appears to be asleep;

4.9.7.2.3 In both states, an arousal response, although diminished, is present.

4.9.7.2.4 In deep stupor, the infant not only appears to be asleep but also cannot be aroused.

4.9.7.2.5 The distinction between deep stupor and coma is based primarily on the quality of the motor responses:

4.9.7.2.5.1 In deep stupor, motor responses are high level (non-stereotyped, definite latency, and habituating),

4.9.7.2.5.2 In coma motor responses are low level (stereotyped, rapid onset Non habituating) or totally absent.

4.9.7.3 Observe and document any seizure activity.

4.9.7.4 Follow neonatology work instructions; Assessment of neonates: Neurologic examination

Levels of alertness in the neonatal period:

			Motor responses	
Level of alertness	**Appearance of infant**	**Arousal response**	**Quantity**	**Quality**
Normal	Awake	Normal	Normal	High level
Stupor-slight	Sleepy-lethargic	Diminished-slight	Diminished-slight	High level
Stupor-moderate	Asleep	Diminished-moderate	Diminished-moderate	High level
Stupor-deep	Asleep	Absent	Diminished-marked	High level
Coma	Asleep	Absent	Diminished or absent	Low level

4.10 If a Monitor Alarm Sounds:

4.10.1 Respond immediately.

4.10.2 Assess the patient and determine if the patient requires any intervention; take manual vital signs as necessary.

4.10.3 If alarms are outside the acceptable range, the assigned nurse will inform the assigned Physician.

4.10.4 High SpO2 alarm limit: If the baby's SpO2 exceeds the target saturation for 2-3 minutes, FiO2 may be decreased in increments of 2-3% every 5 minutes. Continue reducing inspired oxygen by 2-3% every 3-5 minutes until saturation is stable in targeted range.

4.10.5 Low SpO2 alarm limit:

4.10.5.1 If the baby's SpO_2, drops below 89% for preterm or 90% for term infants, or if associated with bradycardia check if the baby has apnea. Stimulate, ambu bag, if not responding, FiO2 may be increased in increments of 5% every 1-2 minute, not to exceed the acceptable range of SpO_2 or may need Physician to change ventilation settings.

4.10.5.2 Sick babies must be immediately assessed by the assigned Physician.

4.10.5.3 Check the following:

4.10.5.3.1 Ventilator function and settings; to determine if it is the infant or a mechanical problem, manually ventilate the bag.

4.10.5.3.2 Position and patency of endotracheal tube or other oxygen delivery device e.g. Nasal prongs or mask, and consider suctioning or repositioning.

4.10.5.3.3 Lung problem; pneumonia, collapse, pneumothorax, hyperinflation.

4.10.5.3.4 Apnoea; obstructive or central.

4.10.5.3.5 Seizures.

4.10.5.3.6 Assess for sepsis.

4.10.5.3.7 Metabolic or electrolyte abnormalities e.g. hypoglycemia, hypokalaemia, hyponatremia, hypo- or hypercalcemia hypo- or hypermagnesemia and acid base disturbances.

4.10.5.3.8 Infant's temperature; hypothermia or hyperthermia.

4.10.6 The assigned nurse should inform Physician if it is necessary to increase and maintain the FiO2 ≥ 10% above the previous stable FiO2 to maintain the saturation target.

4.10.7 Document relevant information, assessment, action taken and outcome in the patient's medical record.

4.10.8 If the alarm was not triggered by a patient incident, the assigned nurse will check monitoring equipment and all connections, replacing electrodes (reposition as necessary), lead, or cable as required. Contact Medical engineering if the equipment is defective. If engineers are not available, inform charge nurse to contact them.

5. MATERIAL AND EQUIPMENT:

5.1 Thermometer
5.2 Blood pressure monitoring apparatus
5.3 Pulse oximeter
5.4 Cardiac monitor

6. RESPONSIBILITIES:

6.1 Physician
6.2 Nurse
6.3 Respiratory Therapist
6.4 Biomedical engineers to ensure monitors maintenance

7. APPENDICES

N/A

8. REFERENCES:

8.1 American Academy of paediatrics. Clinical Report. Oxygen Targeting in Extremely Low Birth Weight infants. Paediatrics. Vol.1 38, No. 2, August 2016.

8.2 Canadian Pediatric Society. Position statement. Temperature measurement in paediatrics. October 2015.

8.3 Fanaroff A, Klaus M. The Physical Environment. Care of the high-risk neonate. Six editions 2013. 132-150.

9. APPROVALS:

	Name	Title	Signature	Date
Prepared by:	Ms. Afrah Saud Al Shammari	NICU Head Nurse		January 05, 2025
Prepared by:	Dr. Falah Nabhan Al Shammari	NICU Quality Coordinator		January 05, 2025
Reviewed by:	Mr. Sabah Turayhib Al - Harbi	Director of Nursing		January 07, 2025
Reviewed by:	Mr. Hassan Aldakhil	Head of Respiratory Therapist Department		January 07, 2025
Reviewed by:	Dr. Sarhan Hamdan Al Shammari	NICU Head of the Department		January 08, 2025
Reviewed by:	Engr. Wafi Abdoo Elgaleel	Head of Biomedical Department		January 08, 2025
Reviewed by:	Mr. Abdulellah Ayed Al Mutairi	QM&PS Director		January 09, 2025
Reviewed by:	Dr. Tamer Mohamed Naguib	Medical Director		January 12, 2025
Approved by:	Mr. Fahad Hazam Al - Shammari	Hospital Director		January 19, 2025