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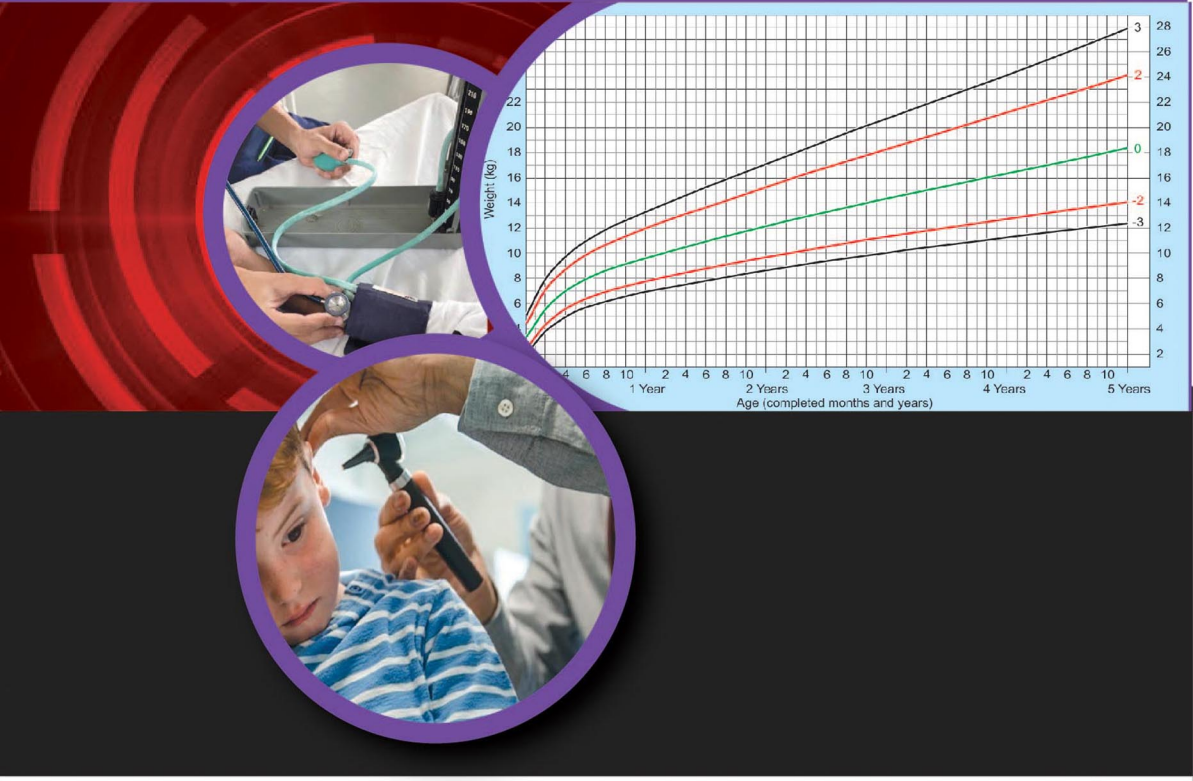

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11 CHAPTER

Examination of the Newborn

Rhishikesh Thakre

INTRODUCTION

The infant in the first 28 days of life is called a neonate. A neonate is vulnerable due to the structural and functional immaturity of various organs and systems and is therefore at increased risk of morbidity and mortality. Approach to a newborn is a unique challenge as to obtain proper history is difficult, symptoms and signs are nonspecific and examination also poses a great challenge. It is essential for us to know important definitions for neonates as given in **Box 1**.

NORMAL NEWBORN

It is defined as one who fulfills following criteria:

- Birth weight more than 2.5 kg and gestation of 37 weeks or more.
- Birth weight between 10th and 90th percentiles for the corresponding gestation age, as per intrauterine growth charts.
- Absence of maternal illness or intrapartum event that may put a newborn at risk of illness such as gestational diabetes and antepartum hemorrhage.
- Normal Apgar scores and no need of resuscitation at birth.
- No postnatal illness like sepsis, respiratory distress, hypoglycemia, polycythemia or dyselectrolytemia.

HISTORY TAKING IN NEWBORN

Maternal health and illness during the antenatal period, intrapartum events and immediate care at birth have significant effects on the health and wellbeing of the baby. The maternal history includes the following points:

- The basic information regarding the baby including age in hours/days after birth, gestational age, sex, birth weight, any perinatal insult, etc. should be noted.

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Box 1: Definitions in neonatology.

- *Low birth weight (LBW):* A neonate weighing less than 2500 g at birth is termed LBW
- *Very low birth weight (VLBW):* A neonate weighing less than 1500 g at birth is termed VLBW
- *Extremely low birth weight (ELBW):* A baby weighing less than 1000 g at birth is termed ELBW
- *Adequate for gestational age (AGA):* If the birth weight of a baby is between 10th and 90th percentiles for that gestational age, it is termed as AGA
- *Small for gestational age (SGA):* If the birth weight of a baby is below 10th percentile for that gestational age, it is termed as SGA
- *Large for gestational age (LGA):* If the birth weight of a baby is above the 90th percentile for its gestational age, it is termed as LGA
- *Perinatal mortality rate:* It refers to number of deaths of babies after 28 weeks of gestation (or weight >1000 g at birth) and up to 7th day of life per 1000 live births (late fetal deaths + early neonatal deaths)
- *Prematurity:* A baby born before completion of 37 weeks, is termed as preterm
- *Postmaturity:* A baby born after 42 weeks of gestation is termed postmature (post-term)
- *Birth asphyxia:* Gasping or ineffective breathing or lack of breathing at 1 minute of life
- *Neonatal death:* It refers to death occurring in first 28 days of life
- *Early neonatal death:* It refers to death occurring in first 7 days of life
- *Late neonatal death:* It refers to death occurring after 7th day and in the first 28 days of life
- *Perinatal period:* It extends from 28 weeks of gestation to 7th day of life

- The details of parents including their education, occupation, economic and social status should be collected and recorded. Mothers belonging to lower socioeconomical class are likely to give birth to small for date and preterm babies due to their poor nutritional status and iron deficiency anemia.
- It is important to note maternal age, as advanced maternal age (>35 years) is associated with increased risk of chromosomal anomalies especially Trisomy 21 (Down syndrome) and young mothers (<18 years) are likely to give birth to low birth weight and preterm babies.

Past Obstetric History

- Gravidity, parity, abortions, stillbirths and neonatal deaths, if any, should be recorded. Gravidity is defined as the number of all conceptions including abortions and stillbirths,

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while parity means total number of pregnancies reaching to viable gestational age (live births and stillbirths).

- The interval between successive pregnancies and their outcome should be enquired.
- History of recurrent abortions and stillbirth is suggestive of incompetent cervical os, diabetes mellitus, syphilis, Rh isoimmunization, etc.
- Gestational maturity, birth weight, congenital malformations and mode of delivery of previous babies should be noted.
- The neonatal course, unusual manifestations and outcome of previous babies should be ascertained.

Prepregnancy Health Status

- Maternal nutrition before pregnancy should be known as malnutrition is one of the important causes of intrauterine growth retardation (IUGR). Criteria for maternal malnutrition are height less than 145 cm, weight less than 40 kg and mid arm circumference less than 20.9 cm.
- Chronic systemic illness in mother like anemia, heart diseases, chronic renal failure, urinary tract infections are associated with IUGR.
- History of maternal endocrinal disorders such as diabetes mellitus, hypothyroidism, hyperthyroidism should be asked. Systemic lupus erythematosus may be associated with congenital complete heart block in the baby.
- Blood group of mother should be confirmed to predict status of Rh and ABO incompatibility between mother and baby.
- Tetanus—toxoid vaccination status of the mother should be assessed.

Antenatal History

Enquire about details of antenatal care for community purpose, 'minimum antenatal care' is defined as atleast four antenatal visits and two doses of injection tetanus toxoid received during pregnancy.

- First trimester of pregnancy is the time of embryogenesis and therefore diseases and drugs taken during this phase of

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pregnancy are potentially teratogenic. History of fever with rash during this phase should be asked in detail as its presence may be suggestive of TORCH infection. Detailed history of medications during pregnancy is important. Inadvertently exposure of the fetus to the drugs may cause malformations or abnormal clinical manifestations **(Table 1)**.

- The diagnostic and therapeutic procedures performed during pregnancy should be noted.
- Blood group of the mother should be known as Rh and ABO incompatibility may lead to neonatal jaundice.
- Dietary intake especially during second half of pregnancy is very crucial to ensure optimal growth of the fetus. During an uncomplicated pregnancy, most Indian mothers gain the weight between 6 and 11 kg. Less weight gain may be

Table 1: Common neonatal disorders due to maternal medications during pregnancy.

Neonatal disorder	*Drugs*
Vitamin K-dependent bleeding manifestations	Phenobarbitone, phenytoin, salicylates, INH, rifampicin, etc.
Thrombocytopenia	Quinine, salicylates
Seizures	Narcotic withdrawal syndrome, accidental injection of local anesthetic agent into fetal scalp, propranolol
Jaundice	Vitamin K, nitrofurantoin, primaquine, oxytocin
Deafness	Quinine, chloroquine, aminoglycosides like streptomycin
Cerebral depression and hypotonia	Pethidine, morphine, diazepam, magnesium sulfate, phenobarbitone, etc.
Drug withdrawal syndrome	Alcohol, morphine, addictive drugs, etc.
Intrauterine growth retardation	Smoking, alcohol, addictive drugs, etc.
Cretinism	Antithyroid drugs
Congenital malformations	Thalidomide, haloperidol, hormonal therapy, clomiphene, valproic acid, streptomycin, corticosteroids, etc.

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Box 2: Common symptoms of sick neonates.

- Refusal of feeds
- Vomiting
- Lethargy
- Excessive crying
- Convulsions (abnormal movements)
- Remains cold
- Fast breathing
- Chest indrawing
- Jaundice
- Bleeding from any site
- Blue lips and nails
- Weight loss or not gaining weight

- The common neonatal problems are birth asphyxia, respiratory distress syndrome, jaundice, septicemia, bleeding manifestations, convulsions, congenital malformations, etc.
- Preterm babies are vulnerable to develop hyaline membrane disease, hypothermia, septicemia, necrotizing enterocolitis, intraventricular hemorrhage, patent ductus arteriosus, retinopathy of prematurity, etc.
- Neonates are known to manifest a large number of minor developmental peculiarities, physiological problems and minor illnesses which need to be identified and managed properly along with reassurance to mother.

Family History

Ask for family history of developmental and metabolic disorders. History of bleeding disorders and neonatal deaths in family should be asked. History of similar disorder in a previous sibling should be enquired.

Immunization History

Maternal status of tetanus toxoid vaccination should be enquired. Her status for hepatitis B, tuberculosis and other infections should be confirmed. Check whether BCG, OPV and hepatitis B vaccines are given to the baby.

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NEWBORN EXAMINATION

The purpose of newborn examination is to identify normal from abnormal. It is a vital diagnostic tool and therefore the examination must be systematic, objective, and thorough. It needs to be flexible taking into account the newborn status and response. A well-baby evaluation usually takes 5–10 minutes with practice. The purpose of examination differs based on timing and place of examination **(Table 2)**. Common errors in diagnosis are more frequent due to lack of proper diagnostic process, i.e., history and/or clinical examination. The art and science of newborn examination involves inspection (look), palpation (feel), auscultation (listen), and percussion (tap, if necessary). By far, majority of information is derived by good observations.

Essential tools for examination:

- Stethoscope
- Measuring tape
- Infantometer
- Digital scale

Table 2: Purpose of newborn examination.

Age	*Place*	*Purpose*
Birth	Delivery room	• Identify need for resuscitation • Identify major congenital anomalies • Identify high risk newborn • Support physiologic transition
24–48 hours	Hospital discharge	• Identify high risk newborn • Assess gestation/growth • Identify major-minor-occult congenital anomalies • Respond to parental concerns
Day 3–7	OPD clinic	• Identify high risk newborn • Assess gestation/growth pattern • Identify physiologic variations • Perform clinical and metabolic screening • To assess growth, health, and behavior
Any	Emergency room	• Identify life-threatening event • Identify sick newborn • Identify physiologic derangements • Identify severity of illness

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- Spatula
- Ophthalmoscope
- Appropriate growth charts.

Getting ready for examination:

- Wash and warm hands
- Draft free area with adequate light
- Neutral thermal environment
- Gather equipment
- Introduce and greet the parents/caretaker
- Ask the baby's name and confirm gender
- Ask about any concerns
- Inform the purpose of examination.

SEQUENCE OF EXAMINATION

Clinical evaluations that cause the least disturbance should be done first. The examiner may then proceed to the more disturbing maneuvers that are not so dependent on a quiet state for accurate interpretation.

The sequence of examination is not important but it should cover general assessment of wellbeing and body measurements, vital parameters, gestational assessment and growth status, moving from top to bottom examining the head, face, mouth, palate, nose, ear, eyes, chest, abdomen, arms, hands, legs and feet, and the skin. It is vital not to miss the genitals, anus, and spine.

PHYSICAL EXAMINATION

The examiner's hands should be warm and cleaned before examination.

Apgar Scoring System

Despite its limitations, Apgar scoring system is used to assess the condition of the baby at birth **(Table 3)**. Time taken by the baby to produce first cry after birth should be noted.

Anthropometry

The weight taken in first 24 hours is considered as birth weight and it is 2.5–3 kg. Average birth weight of an Indian baby is reported

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Table 3: Apgar scoring system.

	Score		
Criteria	*0*	*1*	*2*
Breathing	Nil	Slow, gasping	Crying
Heart rate/min	Nil	Up to 100	>100
Muscle tone	Flaccid	In between	Flexed
Reflex response	Nil	Grimace	Cry
Color	Pale or blue	Peripheral cyanosis	Pink

to be 2.9 kg. Occipitofrontal head circumference, chest circumference at nipples and crown—heel length on an infantometer are recorded. The head circumference should be preferably measured after 24 hours of birth when caput succedaneum and over riding of sutures would have been disappeared. In a term baby, head circumference is around 34–35 cm with length of 48–50 cm.

Temperature

The normal body temperature of newborn is 36.5–37.5°C. Hypothermia is a more common response rather than fever in sick neonates. The low reading thermometer (30–40°C) is used to measure rectal temperature in neonates.

Heart Rate and Pulsations

In newborns, the normal heart rate is 120–160/min. One must look for femoral pulsations. Diminished or absent femoral pulsations suggest the possibility of coarctation of aorta.

Respiration

The normal respiratory rate of the neonatal is 40–60/min. Tachypnea in a newborn is defined as respiratory rate >60/min. Respiration should be assessed in a quiet baby and 30 minutes after the feed. Periodic breathing should not be mistaken for irregular respiration. Signs of increased work of breathing like tachypnea, chest retractions and abnormal sounds should be checked.

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Box 3: Danger signs.

- Hypothermia
- Hyperthermia
- Cyanosis
- Chest indrawing
- Grunt
- Seizures
- Decreased feeding
- Decreased activity

If the mother happens to breastfeed during examination, note the position and attachment of the baby.

FOCUSED SYSTEMIC EXAMINATION

Cardiovascular System

- *Inspection:*
  - Look for growth pattern, dusky hue or cyanosis, and work of breathing
  - Note the precordial bulge, precordial pulsations, symmetry of chest, and apical impulse.
- *Palpation:* Note the heart rate, pulse volume, femoral pulses, rhythm, and symmetry of pulses.
- *Auscultation:* Note the first and second heart sound (split), abnormal heart sounds, and murmur.
- Assess for signs of cardiac failure (tachypnea, tachycardia, gallop rhythm, hepatomegaly).
- Ask for pulse oximetry check.

Respiratory System

- *Inspection:*
  - Note the chest symmetry, movement, rate, depth, and work of breathing.
  - Note the color, cry, and activity pattern.
  - Note audible sounds if any—grunt, stridor, etc.
- *Auscultation:*
  - Listen to the air entry and note the quality of breath sounds
  - Note if any abnormal sounds, crackles, grunt, etc.

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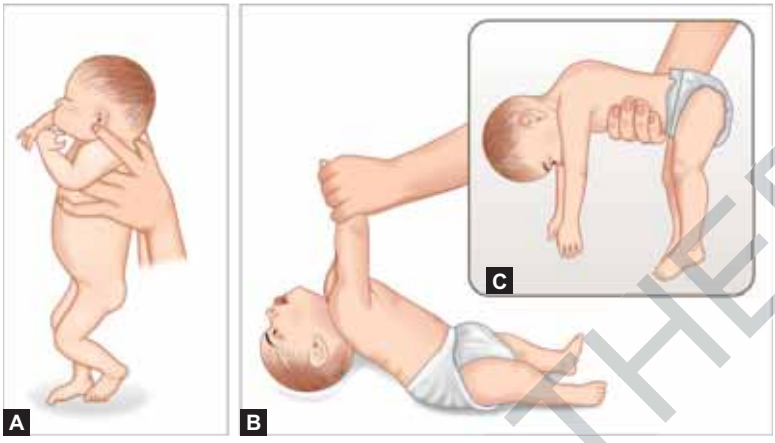

Figs. 1A to C: Assessment of hypotonia. (A) Axillary suspension; (B) Traction response; and (C) Ventral suspension.

- *Power:* Note the movement against gravity.
- *Neonatal reflexes* ***(Table 4)****:* There are several primitive reflexes (>73) in neonates. It is practically difficult and not necessary to elicit all these reflexes. The following reflexes are important and useful for clinical purposes and one should know how to elicit them and their clinical applications.
  - *Moro reflex:* Moro reflex or startle response is the most important reflex in newborn examination. The baby should be held supine over the right hand and arm. The head is flexed to 30° and allowed to drop suddenly. The normal response consists of rapid abduction and extension of upper limbs along with opening of hands followed by slower adduction and flexion or embrace equivalent **(Fig. 2A)**. The infant may cry. It can also be elicited by pulling a supine infant by both hands. When angulation occurs between the head and trunk, the hands are sharply released to cause sudden extension of neck.

    The response may be depressed or absent in babies with cerebral depression. It is exaggerated in babies with cerebral irritability.
    - *Incomplete Moro reflex:* The Moro reflex is incomplete in preterm babies, where the arms tend to fall backwards

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Figs. 2A to E: Neonatal reflexes. (A) Moro's reflex; (B) Suck reflex; (C) Palmar/plantar grasp; (D) Tonic neck reflex; and (E) Stepping reflex.

When the examiner allows the plantar surface of the other foot to a table top, the infant makes crude sequential walking movements (stepping reflex) **(Fig. 2E)**.

- *Landau reflex (position reflex):* Passive extension of neck in ventral suspension leads to extension of spine, lower and upper limbs. Passive flexion of neck leads to flexion of

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spine, lower and upper limbs. It appears at 6 months of age and disappears at 9 months of age. It is absent in cerebral palsy.

- *Parachute reflex:* The parachute reflex can be evoked by holding the infant's trunk and then suddenly lowering the infant as if he or she were falling. The arms will spontaneously extend to break the infant's fall. This reflex is a prerequisite to walking. It appears at age of 9 months and persists for lifetime.

Musculoskeletal System

- *Arms and legs:*
  - Note the shape, posture, and symmetry of extremities. Look for asymmetry of knees (Galeazzi's sign) **(Fig. 3)**. With the infant supine, place the sole surface on bed surface with hip and knee flexed at 90°. Normally, both knees should be at same height. If one hip has developmental dysplasia of hip (DDH) that knee will be at shorter height.
  - Note for spontaneous and induced movements and if any, limitations of movements



Fig. 3: Asymmetry of knees (Galeazzi's sign).

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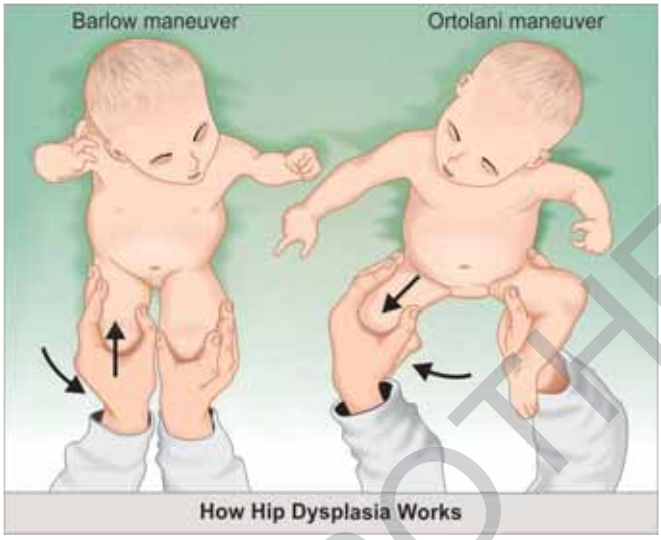

Fig. 5: Clinical tests for congenital dislocation of hips.



Fig. 6: Lumbosacral meningomyelocele.

Light is shined tangentially into the eyes to rule out corneal lesions and visible cataracts, and the examiner should ensure that a red reflex is seen bilaterally **(Table 5 and Figs. 7A to C)**.

COMMUNICATION AND DOCUMENTATION

- Listen to the mother. Do not interrupt or ignore her concerns.
- Use simple words while providing information and counseling.

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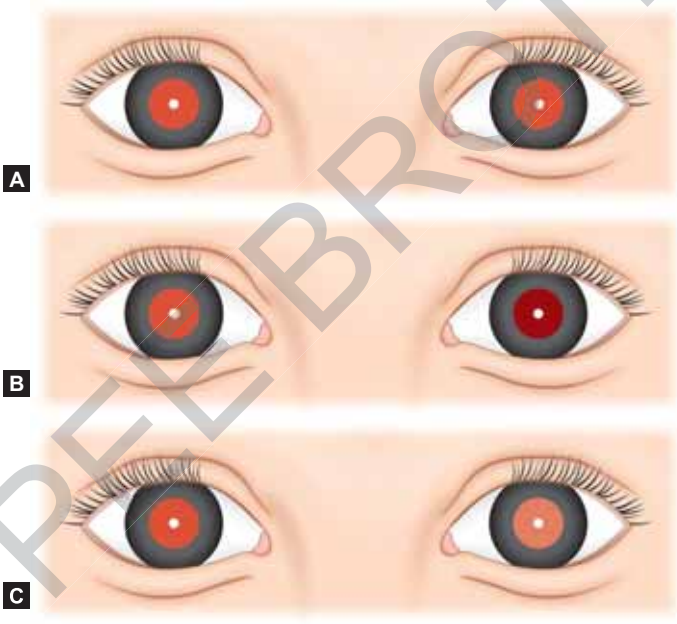
Table 5: Red reflex test.

Use an ophthalmoscope, with the lens power set at 0. Project light on eyes simultaneously with 15–20 cm away from the patient. The test is done in OPD during routine visit and needs no eye drops. Ensure that the eyes are open.

Note	*Interpret*
Symmetric red reflex	Normal
Normal red reflex in one eye but diminished in another eye	Refractory error, retinoblastoma
Normal red reflex in one eye but absent in another eye	Cataract



Figs. 7A to C: Red reflex and asymmetry of color.

- Use of nonverbal means of communication (gestures, facial expressions, tone, and body language).
- Discuss the findings with the parents and answer any queries.
- Ensure that the findings of the examination are appropriately and accurately recorded.

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LIMITATIONS OF PHYSICAL EXAMINATION

- Metabolic disorders, hearing deficits are missed as there is a window period when the newborn is likely to be asymptomatic. Hence, screening for congenital hypothyroidism, phenylketonuria, cystic fibrosis, etc., and the hearing screening, is offered in the neonatal period.
- One-time assessment may not be enough. A trend is far more informative.
- Newborn evaluation in a nutshell can be described as shown in **Table 6**.
- Checklist for newborn examination **(Table 7)**. It should be routine to follow this checklist for newborn examination so that baby is examined methodically and thoroughly and there are least chances of missing any important condition. The baby is examined and least chances of missing any important condition.

ADVICE TO MOTHER ON DISCHARGE

- Covering the baby well for prevention of hypothermia.
- Exclusive breastfeeding for 6 months of age and to be continued till 2 years of age with other foods.
- Explain for good hygiene to prevent sepsis.

Table 6: Newborn evaluation in a nutshell.

Ask • Parental concerns • Maternal, antenatal, perinatal, family history • Feeding activity • Urine and stool pattern • Vaccination	*Look* • Appearance (posture, activity) • Breathing • Color (Cry)
Examine • Vitals • Head-to-toe: Normal variations, physiologic variants, pathologic signs, anomalies, spine, genitals • Gestational age • Anthropometry • Neonatal reflexes • Systemic examination	*Document* • Age in hours (For first week) • Risk factors • Anthropometry on growth chart • Abnormal findings • Specific instructions/tests

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- Presents the art and science of clinical examination in children
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- Detailed history taking and thorough clinical examination is the foundation for clinical diagnosis, both the chapters include important aspects of science, art and its application in daily practice
- Infant and young child feeding, Anthropometry and assessment of growth, Developmental assessment have a unique place in clinical examination of children. These chapters are dealt with important practical aspects. Besides all the systems, it also includes newborn, eye, ENT, skin and musculoskeletal system examination. In this era, ethical and legal issues are also important in our daily practice, a separate chapter is devoted for the same. With the availability of advanced life support systems for management of critical patient, it is essential for all of us to diagnose death with reference to current science and law, which is also included. A chapter on Common procedures in pediatrics is very useful in our daily practice
- Included a large number of original clinical photographs for good visual impression
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