Guide To Paediatric Clinical Examination
Guide to Paediatric Clinical Examination
Guide to
Paediatric
Clinical
Examination

S. S. Chin
Josephine S. L. Ng
Mohamed Ameenudeen B. A. Sultan Abdul Kader

Universiti Malaysia Sarawak
2012
## Contents

**Foreword**

**Preface**

**Acknowledgement**

**Part One : History taking**

1. **Hand hygiene & overall approach to children**

2. Cardiovascular system

3. Respiratory system

4. Abdominal system

5. **Neurological examination in an older children**

6. Developmental assessment in children

7. **Musculoskeletal system (pGALS) in children**

8. Skin examination

9. Newborn examination

**Index**
To our teachers who have been our role models.
To all the children whom we have worked with, for you have been our greatest teachers.
Foreword

Malaysia is a relatively young country with thirty percent population under 18 years of age. The Malaysian Ministry of Health has always given priority to Child Health Services. While acknowledging this emphasis, the Faculty of Medicine and Health Sciences, Universiti Malaysia Sarawak (UNIMAS) introduces Paediatric and Child Health in the curriculum during the first clinical year. Students will also have another Paediatric posting in their final year of study.

As Malaysia is gearing to become a developed country by the year 2020, advanced technologies are being introduced into our regional centres - CT scanning, magnetic resonance imaging, organ transplantations and minimally invasive surgery. But some of the best qualities of being a good doctor do not need technological genius. Greater emphasis should be given towards basic bedside skills: attentive listening, keen observation and an open mind. This is equally true for our young doctors posted in rural areas in Sarawak, where good history taking and careful clinical examination will make the difference to the patients there.

This book is divided into two parts: history taking and physical examination. The authors take the students through the important elements of obtaining a comprehensive history leading to differential diagnosis. Caring and skilful physical examination calls for application of fundamental skills in observation, inspection, palpation, percussion and auscultation. A systematic approach in physical examination will introduce the students to the correct methods of examining children of all ages, from newborn to young adolescents. Practical tips from authors’ experiences are also described in the book. It is not meant to be an exhaustive detailed textbook, but rather as a guide for medical students new to the Paediatric posting. References are given at the end of each chapter to enable readers to search for further information and explanation.

I hope students will read, learn and understand the information described in this book. It is written with students’ interests in mind, and they will find this handbook useful during their Paediatric posting. It will also serve as a quick revision of the subject when preparing for the Paediatric clinical examinations.

Prof. Tan Sri Datu Dr. Mohamad Taha Arif
Dean
Faculty of Medicine and Health Sciences
Universiti Malaysia Sarawak.
Preface

Mastering the art of clinical examination is the aim of every medical student in their clinical years. It is a big hurdle to cross, and it is even more challenging in the Paediatric posting. Most textbooks of clinical methods are written with an approach to examination of the adult patient. We have written this booklet for our medical students to serve as their pocket guidebook on clinical examination of the paediatric patient. We have chosen a step-by-step approach and elaborated on some important clinical implications. It is meant to complement regular textbooks of clinical methods, and not as a replacement. We hope students will find this guidebook handy and helpful during their Paediatric posting, and will use the examination skills mastered to make clinical examination a pleasant experience for every child.

S. S. Chin
Josephine S. L. Ng
Mohamed Aminudeen B. A. Sultan Abdul Kader
Acknowledgement

We would like to thank our colleagues in the department of Paediatrics at UNIMAS and Ministry of Health for their contributions to the writing of this guidebook. We are also grateful to our Dean, Prof. Tan Sri Datu Dr. Mohamad Taha Arif for his encouragement and support:

A/P Dr. Khin Hnin Hnin Hlaing, Dept. of Paediatrics, UNIMAS
A/P Dr. Hla Hla Myint, Dept. of Paediatrics, UNIMAS
Dr. Andy Rahardja, Dept. of Paediatrics, UNIMAS
Dr. Htwe Htwe Sein, Dept. of Paediatrics, UNIMAS
Dr. Sabai Soe Maung, Dept. of Paediatrics, UNIMAS
Dr. Wai Wai Shein, Dept. of Paediatrics, UNIMAS
Dr. Chan Lee Gaiik, Consultant Neonatologist & Head, Dept. of Paediatrics, Hospital Umum Sarawak, Kuching
Dr. Kok Juan Loong, Consultant General Paediatrician, Hospital Umum Sarawak, Kuching
Dr. Ng Hoong Phak, Consultant General Paediatrician, Hospital Umum Sarawak, Kuching
Dr. Martin Wong, Consultant Paediatric cardiologist, Hospital Umum Sarawak, Kuching
Dr. Pudalan Muniandy, Consultant Dermatologist & Physician, Hospital Umum Sarawak, Kuching
Dr. Tan Swee Ping, Consultant Paediatric Rheumatologist, Hospital Selayang
Data’ Dr. Amar-Singh HSS, Consultant Community Paediatrician & Head, Dept. of Paediatric, Hospital RPB Ipoh

Our sincere thanks to a very special lady, Ms Tay Eichi, for the illustrations in this guidebook.

Contributing authors
Dr. Andy Rahardja, Dept. of Paediatrics, UNIMAS
A/P Dr. Chin Saw Sian, Dept. of Paediatrics, UNIMAS
Dr. Htwe Htwe Sein, Dept. of Paediatrics, UNIMAS
A/P Dr. Josephine S. L. Ng, Dept. of Paediatrics, UNIMAS
A/P Dr. Khin Hnin Hnin Hlaing, Dept. of Paediatrics, UNIMAS
Dr. Mohd Ameenudeen S. A. Kader, Dept. of Paediatrics, UNIMAS
Dr. Sabai Soe Maung, Dept. of Paediatrics, UNIMAS

Erratum: Acknowledgement for contributions to the writing of this book.
Dr. Wong See Chang, Consultant Paediatrician & Head, Dept. of Paediatrics, Hospital Sibu.
PART ONE

History Taking
# History taking in Paediatrics

In paediatric practice, the primary person providing the history is usually a third party, either the parents or another caregiver. Attempts should be made to obtain history from the child, especially the older children. While taking the history, listen attentively and observe the parent-child relationship.

1. **Patient profile**
   - Patient's Name.
   - Date of birth & age (chronologic and corrected age for prematurity).
   - Gender.
   - Race/Ethnicity.
   - Date of examination/admission.

2. **Chief complaints:** The reason the child is brought for medical attention:
   - There may be more than one symptom.
   - Note duration of symptoms (rather than the dates when symptoms arise).
   - Note the temporal and chronological sequence of symptoms.

3. **History of present illness:** The story of the development of the child's illness in chronological order, include any relevant information to the child's current illness:
   - Start with allowing parents to give history freely by asking open-ended questions.
   - Move to more directed questioning on each symptom/event.
   - Elicit pertinent positives and pertinent negatives with more focused questioning.

4. **Focused history on each symptom should generally follow line of questioning as listed in the table:**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>History to be elicited</th>
<th>Question to ask (substitute &quot;it&quot; with the symptom)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>Onset</td>
<td>How did it start?</td>
</tr>
<tr>
<td></td>
<td>Precipitating cause</td>
<td>What brought it on?</td>
</tr>
<tr>
<td></td>
<td>Character/quality/nature</td>
<td>What is the symptom like?</td>
</tr>
<tr>
<td></td>
<td>Duration</td>
<td>How long has it been?</td>
</tr>
<tr>
<td></td>
<td>Temporal relationship/circadian pattern</td>
<td>Time relationship between symptoms.</td>
</tr>
<tr>
<td></td>
<td>Severity</td>
<td>Any change in symptom with time of day or night?</td>
</tr>
<tr>
<td></td>
<td>Aggravating and relieving factors</td>
<td>How bad is it?</td>
</tr>
<tr>
<td></td>
<td>Progress</td>
<td>How is it now?</td>
</tr>
<tr>
<td></td>
<td>Effect on child's daily life</td>
<td>e.g. feeding, sleeping, playing, school, family</td>
</tr>
<tr>
<td></td>
<td>Medications and treatments received</td>
<td>What medications (prescribed or otherwise)?</td>
</tr>
<tr>
<td></td>
<td>Previous episode, other associated</td>
<td>Has child had this before? Any related symptoms?</td>
</tr>
<tr>
<td></td>
<td>symptoms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others similarly affected in family or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>school</td>
<td>Anyone else with similar symptom?</td>
</tr>
</tbody>
</table>

5. **Medication and treatment history**
   - Current and relevant past medications (drug name, dose, frequency, duration, compliance).
   - Prescription drugs.
   - Over-the-counter drugs.
   - Traditional medications and other modalities of treatment.

6. **History of allergies**
   - Established allergies and adverse reactions: inquire into allergic reaction/adverse reaction to the drug.
   - Food allergies: describe the reaction to the food.
   - Any other allergies: environmental toxins, bee stings.

7. **Prenatal/Birth/Neonatal history:** How detailed this should be depends on child's age and illness.
   - Prenatal history: any maternal illnesses, maternal medications.
   - Birth history: type of delivery, gestation, birth weight, status in the immediate neonatal period, Apgar scores if known.
   - Neonatal history: illnesses and treatment received.
   - Neonatal screening result: G6PD status and TSH result, hearing (if performed).

8. **Feeding history**
   - Type of infant feeding: Breastfeeding/Formula feeding/Mixed feeding/Solid diet.
   - Breastfeeding history:
     - Supplementary and complementary feeding.
     - Frequency (demand or timed).
     - Quantity (time spent while suckling at each breast).
     - Quality of latch and suck.
     - Satiation after feed.
     - Amount of stools and urine passed.
     - Problems associated with breastfeeding.
   - Formula feeding history:
     - Type of formula (infant, special, soy formula).
     - Frequency and number of feeds per day & its volume (1oz=30mls).
     - Preparation of feeds (powder: water) and hygiene (bottle sterilisation, water source).
   - Solid diet:
     - Weaning diet in infants & consider its nutritional content.
   - Dietary history: detailed history may be required in certain conditions.
     - Representative day or week.
9. Immunization history: Sarawak Extended Program for Immunisation (EPI) Schedule

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth</td>
<td>BCG</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>DTap/IPV/HIB</td>
</tr>
<tr>
<td>3</td>
<td>DTap/IPV/HIB</td>
</tr>
<tr>
<td>4</td>
<td>DTap/IPV/HIB</td>
</tr>
<tr>
<td>6</td>
<td>Hepatitis B</td>
</tr>
<tr>
<td>9</td>
<td>Japanese Encephalitis</td>
</tr>
<tr>
<td>10</td>
<td>Japanese Encephalitis</td>
</tr>
<tr>
<td>12</td>
<td>MMR</td>
</tr>
<tr>
<td>18</td>
<td>DTap/IPV/HIB</td>
</tr>
<tr>
<td>4 years</td>
<td>Japanese Encephalitis</td>
</tr>
<tr>
<td>6 years</td>
<td>DT / OPV</td>
</tr>
<tr>
<td>12 years</td>
<td>T</td>
</tr>
</tbody>
</table>

(DTap = Diphtheria, Tetanus, acellular Pertussis, IPV = Inactivated Polio Vaccine, OPV= Oral Polio Vaccine HIB = Haemophilus Influenza type B, MMR = measles, mumps, rubella).

10. Developmental history
- Physical growth including Weight, Height/Length, Head circumference.
- Trend of growth is more informative than a single entry on the growth chart.
- Psychomotor development (see development assessment chapter).
- Toilet Training.
- School Performance, attention and activity level.
- Relationship with peers, family and adults.

11. Family history
- Consanguinity in parents.
- Relevant medical and surgical illnesses in family, especially those with childhood onset.
- Inherited genetic disorders e.g. G6PD deficiency, Thalassemia.
- Contact of infectious diseases e.g. TB.
- Draw genetic pedigree where appropriate.

12. Social history
- Family's composition, including extended family, sibling relationship.
- Child care arrangements.
- Parents' occupations, family income and their smoking/alcohol/drug consumption.
- Child's interests/activities.
- Home structure/amenities/living environment/pets at home.
- Major life events e.g. divorce of parents, death in the family.
- In the older adolescent child: HEADSSS (expanded HEEADSSS) interview.
- Family dynamics: an understanding is the key to successful management especially in children with severe/chronic illness.

13. Review of systems
- Serves as a general enquiry into the functioning of body systems.
- Addresses symptoms that may have been overlooked.

Tips to taking a good history in Paediatrics
- Listen attentively to the historian and the child.
- Do not merely ask a list of questions.
- Respect both carer/caregiver and the child.
- Develop good rapport and gain trust.
- Accord privacy, dignity, and confidentiality.
- Be not judgmental.
- Be professional in conduct.
- Be aware of personal non-verbal facial expression, body language, and intonation of voice.

Confidentiality
- All patient information is CONFIDENTIAL.
- Do not share Child/Parent/Family information unless consent is obtained.
- Do not discuss Child/Parent/Family information in public places where it can be overheard.
- Information provided in confidence by the older child & adolescent should not be shared with others (including parents) without the child's consent. Exception is made only for medico-legal issues.
PART TWO

Physical Examination
Hand hygiene

- The single most important factor to prevent spread of communicable disease and infection.
- Observe hand hygiene at all times.
- Required before and after each examination.
- May be performed either by using soap and running water, or with alcohol-based hand rubs.
- Adhere to the six steps in the Ayliffe method of hand hygiene.

## Overall approach to children

- Introduce yourself to the child and parent/s.
- Ensure the child is comfortable.
- Engage the child in conversation or play (within limits).
- Allow time for shy youngsters to "warm up".
- Explain the steps of the examination clearly to the child.
- Once child is cooperative, undress child appropriately for the examination. Parents may be asked to undress young children rather than asking or forcing the child to do it himself.
- Remember: Proper exposure is the key to a successful thorough physical examination.
- In general, examination should follow the basic order of:
  - Inspection.
  - Palpation.
  - Percussion.
  - Auscultation.
  - Special manoeuvres.
- It may be necessary to modify the examination sequence order e.g. auscultate the heart when the child is quiet, before palpating for peripheral pulses.
- Perform the less distressing parts of the examination first.
- Every examination should be a pleasant experience for the child.

### United Nation Convention of the Rights of the Child (UNCRC)

- The UNCRC is an international treaty that addresses the rights of all children under the age of 18 years. Its 54 articles recognise basic human rights of children and provide them additional protection from harm.
- The Convention is based on four foundation principles:
  1. Non-discrimination.
  2. Best interests of the child.
  3. The child's right to life, survival and development.
  4. Respect for the views of the child.
- It is our duty to ensure these rights are practiced in our clinical setting.
- Always share information with children and listen to their needs.

### 2. Cardiovascular examination

You may examine the child lying horizontally, or in a position of 45° (as in adults). Young children, who are reluctant to lie down, may be examined while sitting on mother's laps.

#### Inspection and palpation

1. **General appearance**: stand back and observe the child.
   - **General growth parameters**: failure to thrive or short stature. Plot the growth charts.
   - Dysmorphic features: Down's, Tumer or Marfan syndrome, etc.
   - Is the child in respiratory distress? What is the breathing pattern? Are accessory muscles being used?
   - Look for the presence of cyanosis, pallor or jaundice.
   - Is the child sweating? (most obvious over the head and forehead).

2. **Hands and fingers**:
   - **Splinter haemorrhages**: multiple linear reddish-brown marks along the axis of fingernails and toenails. Up to two isolated haemorrhages is a common finding in healthy individuals.
   - **Clubbing (figure 1)**: widening and thickening of the ends of fingers and toes, with convex fingernails and loss of angle between nail and nail bed. Results from long standing arterial desaturation (usually > 6 months).
   - **Perfusion** - cold or warm hands, check capillary refill time at nail bed.

3. **Jugular venous pressure**; this is usually omitted in very young children, but it should be performed in older children as in adult examination.

4. **Pulses**:
   - Feel the radial pulse to count the rate: In infants the brachial pulse may be more readily felt.
   - **Pulse rate** = pulse counted in 15 seconds x 4
   - Feel all the peripheral pulses with tips of the index and middle fingers. (Do not feel peripheral pulses with your thumb).
   - **Note the rate, rhythm, character and volume of the pulses**.
   - To detect collapsing/bounding pulse, raise the patient's arm and feel across the pulse. Bounding pulse is found in patent ductus arteriosus, aortic regurgitation, large systemic arteriovenous fistula or truncus arteriosus (rarely).
   - To detect radial femoral delay, simultaneously feel the radial and femoral pulses to appreciate the time lag between the two.
   - Absent femoral pulses with normal or increased brachial pulses suggest coarctation of aorta.

5. **Eyes**:
   - **Conjunctival pallor**
   - **Polycythaemia**
   - **Sclera for icterus**

<table>
<thead>
<tr>
<th>Age</th>
<th>Normal range of heart rate at rest (beats/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;3 mth</td>
<td>80–160</td>
</tr>
<tr>
<td>3 mth-2 yr</td>
<td>75–160</td>
</tr>
<tr>
<td>2-10 yr</td>
<td>60–80</td>
</tr>
<tr>
<td>&gt;10 yr</td>
<td>50–90</td>
</tr>
</tbody>
</table>
6. **Tongue and mucosal membrane:** Cyanosis, polycythaemia.

<table>
<thead>
<tr>
<th>Cyanosis</th>
<th>Pathophysiology</th>
<th>Central Distribution (lips, mouth mucosa, tongue, conjunctiva)</th>
<th>Peripheral Distribution (extremities, nail beds)</th>
<th>Present in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Reduced arterial oxygen saturation</td>
<td>Cyanosed</td>
<td>Cyanosed</td>
<td>Cardiac and Pulmonary disease</td>
</tr>
<tr>
<td>Peripheral</td>
<td>Cutaneous vasoconstriction</td>
<td>Not cyanosed</td>
<td>Cyanosed</td>
<td>Physiological response to cold</td>
</tr>
</tbody>
</table>

7. **Teeth:** Dental caries.

8. **Inspection of the chest wall:**
   - Symmetry.
   - Precordial bulging.
   - **Visible cardiac impulse**, which may suggest cardiomegaly.
   - Surgical scar, e.g. median sternotomy, lateral thoracotomy, subcostal pacemaker incision, etc.

9. **Palpation of the chest wall:**
   9.1 **Apex beat.**
      - Point of maximal impulse (PMI): the lowest and most lateral point at which the cardiac impulse can be palpated.
      - Locate PMI by placing examining hand on the left chest wall, with fingers parallel to the rib spaces.
      - Describe the PMI location (count the intercostal space from 2nd rib) and the diffuseness of impulse.
      - Surface marking: sternal angle of Louis corresponds to 2nd rib.

<table>
<thead>
<tr>
<th>Age of child</th>
<th>Normal Location of Apex Beat (PMI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7 years</td>
<td>4th intercostal space, left mid-clavicular line.</td>
</tr>
<tr>
<td>&gt; 7 years</td>
<td>5th intercostal space, left mid-clavicular line</td>
</tr>
</tbody>
</table>

   - Special manoeuvre: If PMI is difficult to locate, ask child to turn slightly onto the left lateral position to accentuate apex beat.
   - Apex beat that is displaced laterally or downward suggest cardiac enlargement.

9.2 **Right ventricular heave:**
   - **Place the heel** of examining hand firmly on the left parasternal position.
   - A heave can be felt as sustained, lifting movement of the precordium.
   - Usually associated with right ventricular hypertrophy.

9.3 **Thrills:**
   - Feel for thrill with the palm of the hand over the precordium, especially over the apex, both sides of the sternum, suprasternal and supraventricular regions.
   - A thrill is felt as a vibratory sensation.
   - It is a palpable manifestation of a loud murmur.

**Auscultation**

- Start auscultation at the apex using the diaphragm of stethoscope.
- Diaphragm of the stethoscope is used to auscultate high pitched sounds. Use the bell only for low pitched murmurs.

**Systematic attention should be given to the following aspects:**

   - **Heart rate and regularity.**
   - **Heart sound: intensity and quality of the heart sounds, especially the 2nd heart sound (S2) should be evaluated.**
   - **Systolic and diastolic sounds, e.g. ejection click and midystolic click.**
   - **Heart murmurs:** Evaluate its intensity, timing (systolic or diastolic), location, transmission and quality.

1. **Heart sounds:**
   - Auscultate at the apex to evaluate the two heart sounds.
   - Identify S1 and S2 by timing them to the peripheral pulses (carotid or brachial). S1 precedes the pulsation and S2 follows it.
   - Next, listen at the parasternal borders, and subsequently over pulmonary and aortic areas.
   - Note the intensities of S1 and S2, any added sounds and heart murmurs.

<table>
<thead>
<tr>
<th>Event causing Heart Sound</th>
<th>Best Heard Location</th>
<th>Normal Splitting</th>
<th>Abnormal Splitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 closure of mitral and tricuspid valves</td>
<td>apex or lower left sternal border</td>
<td>Split S1 may be found in normal children</td>
<td>Abnormal splitting of S2 in</td>
</tr>
<tr>
<td>S2 closure of aortic and pulmonary valves</td>
<td>upper left sternal border</td>
<td>Physiological splitting of S2 during inspiration</td>
<td>Atrial septal defect: wide and fixed splitting</td>
</tr>
</tbody>
</table>

7. **Gallop rhythm**
   - A rapid triple rhythm, combining a loud S3, with or without a S4, and tachycardia.
   - A sound generated by rapid ventricular filling.
   - S3 occurs in early diastole, S4 in late diastole.
   - Usually present in cardiac failure, but S3 can occur in healthy children.
3. Murmurs

3.1 Timing of the murmur:

<table>
<thead>
<tr>
<th>Murmur</th>
<th>Characteristic features</th>
<th>Possible underlying lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic murmur: between S1 and S2</td>
<td>- begins with S1, no gap exists between S1 and the onset of murmur</td>
<td>• ventricular septal defect</td>
</tr>
<tr>
<td>Pansystolic murmur</td>
<td>- murmur lasts throughout systole.</td>
<td>• mitral or tricuspid regurgitation</td>
</tr>
<tr>
<td>Ejection systolic murmur</td>
<td>- begins after S1, with an interval between S1 and the onset of murmur</td>
<td>• pulmonary or aortic stenosis</td>
</tr>
<tr>
<td>- maximal intensity in mid-systole, then fades, stopping before S2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2 Location of the murmur:
- Location where murmur is heard the loudest indicates the possible underlying cardiac pathology (refer to diagram below).

3.3 Radiation of murmur: either radiates to axillae or carotids.

3.4 Intensity of murmur
- Grade the intensity of the murmur as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Intensity of murmur</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>barely audible</td>
</tr>
<tr>
<td>2</td>
<td>soft but easily audible</td>
</tr>
<tr>
<td>3</td>
<td>moderately loud, but not accompanied by a thrill</td>
</tr>
<tr>
<td>4</td>
<td>loud and associated with a thrill</td>
</tr>
<tr>
<td>5</td>
<td>audible with the stethoscope barely on the chest</td>
</tr>
<tr>
<td>6</td>
<td>audible with the stethoscope off the chest</td>
</tr>
</tbody>
</table>

Note: Diastolic murmur grading only grade 1 to 4.

- To conclude the cardiovascular examination:
  - Sit the child up.
  - Listen to change in the murmur's intensity with change in position.
  - Listen to the back for radiation of murmurs previously heard.
  - Auscultate the lungs for pulmonary adventitious sounds (crepitations with left ventricular failure, other findings of coexistent chest infection).
  - Examine the abdomen for hepatomegaly (congestive heart failure), pulsatile liver (tricuspid regurgitation) and splenomegaly (infective endocarditis).
  - Check for ankle oedema.
  - Measure blood pressure with an appropriately sized sphygmomanometer cuff (to cover 1/3 of the arm).

- Normal systolic blood pressure (50th centile) = 80+ (age in years x 2) mmHg
- Minimal systolic blood pressure (3rd centile) = 70+ (age in years x 2) mmHg

References:
3. Respiratory examination

Begin the respiratory examination with the child in the supine position or the position a young child is comfortable in. Complete the examination of the anterior chest before proceeding to examine the back.

Inspection

1. General appearance:
   - General activity and mental status of child.
   - Is the child in respiratory distress?
     - Nasal flaring.
     - Use of accessory muscles, e.g. sternocleidomastoids.
     - Tachypnoea (obtain resting respiratory rate).
     - Grunting (breathing against closed glottis).
     - Abnormal breathing pattern e.g. shallow, deep, sighing, etc.
     - Cyanosis.
   - Listen to the character of cough and added sounds, e.g. stridor, wheeze.
   - Listen to the cry and speech of the child.
   - Bedside equipment/apparatus: nebuliser, oxygen, SpO₂ monitor, sputum pot & peak flow meter.
   - General growth parameters
     - Failure to thrive.
     - Short stature.
     - Plot the growth charts if indicated.
   - Dysmorphic features.

2. Hands and fingers:
   - Finger clubbing (refer to CVS examination).
   - Cyanosis: distinguish between peripheral and central cyanosis (refer to CVS examination).
   - Pulses: bounding pulse may be present in CO₂ retention.
   - Skin changes (include lower limbs); eczema may be present in a child with asthma.
   - Look at BCG scar.

3. Face:
   - Cheek lip and palate.

4. Neck:
   - Cervical lymph nodes are best palpated from behind, with the child sitting up (usually at the end of the respiratory system examination).
   - Look for tracheal tug and deviation.
   - Other neck swellings, e.g. cystic hygroma, thyroid.

5. Inspection of chest:
   - Respiratory rate: count for 1 minute (resting rate is taken while the child is quiet).
   - Shape of chest-deformity and asymmetry
     - Tachypnoea (breaths/min)
     - Paradoxical movement
     - Hyperinflation: barrel chest.
     - Harrison's sulcus.
     - Rachitic rosary.
     - Scars: look at all sides of the chest (front & back).
     - Recession: intercostal/subcostal/suprasternal.

Palpation

Start with palpation, percussion and auscultation on the anterior chest. Then sit the child forward to perform the same on the back.

1. Mediastinum position
   - Feel the trachea in the suprasternal notch. (This is only performed in children >3 years old).
   - Use two fingers when examining the older child and one finger for the younger child.
   - Locate the apex beat.

2. Chest expansion
   - Usually performed in children >5 years old.
   - First, observe the general chest expansion by asking the child to take deep breaths in and out.
   - Examiner then places both hands with fingers holding on to the child's lateral chest wall and abducted thumbs meeting in the midline.
   - The examining thumbs should be held slightly lifted off the child's chest to allow free movement in expansion of the chest.
   - Landmark for examination of chest expansion:
     - Anterior: the thumbs are placed at the level of the nipples.
     - Posterior: the thumbs are placed at T1 level.
   - With the child breathing in and out deeply, note the excursion and symmetry of movement of the examining thumbs. The excursion of movement is the measure of the chest expansion.

3. Tactile vocal fremitus
   - Information obtained is the same as that from vocal resonance (not necessary to do both).
   - Appropriate in children >5 years old.
   - Place the palm of the hand (the ulnar side of the hand) on either side of the upper chest.
   - Ask the child to say "nin" or "nenek".
   - Compare right and left, anteriorly and then posteriorly.

Vibrations of tactile vocal fremitus | Pathology on that side
--- | ---
Increased | Consolidation
Decreased | Collapse, pneumothorax, pleural thickening
Absent | Pleural effusion
Practical points:

- Palpation and percussion are not part of routine respiratory examination in an infant, except:
  - to assess the degree of hyperinflation
  - to detect upper border of the liver
  - to confirm signs of consolidation, collapse or effusion.
- Respiratory distress is indicated by tachypnea, increased respiratory effort & chest recession.
- Over-inflation is more obvious in the upper half of the chest (e.g. in bronchiolitis or chronic lung disease)
- You may need to palpate for apex beat if mediastinal shift is suspected.

Percussion and auscultation

1. Percussion of the chest
   - Not routinely performed in infants.
   - Explain procedure to the child, e.g. "I am going to make your chest sound like a drum".
   - Normal percussion technique: Percussing right middle finger strikes the middle phalanx of the left middle finger placed along the respective intercostal space. Tap twice at each site.
   - Be aware of the surface anatomy in relation to lung lobes. (Figure 1)
   - Percuss the clavicles and the axilla on both sides (not always necessary).
   - Always compare both sides. (See Figure 2)
   - Percussion for the upper border of the liver (normally at the 6th intercostal space anteriorly), gives an idea of the degree of hyperinflation of the right lung.
   - Auscultate the anterior chest before proceeding to examining the back of the chest.

<table>
<thead>
<tr>
<th>Percussion note</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resonant</td>
<td>Normal</td>
</tr>
<tr>
<td>Hyper-resonant</td>
<td>Pneumothorax</td>
</tr>
<tr>
<td>Dull</td>
<td>Consolidation</td>
</tr>
<tr>
<td>Stony dull</td>
<td>Pleural fluid</td>
</tr>
</tbody>
</table>

2. Auscultation of the chest
   - Use the diaphragm of the stethoscope.
   - Listen over the areas shown in Figure 2 for at least two breath cycles.
   - Normal vesicular breath sound: low pitched rustling sound with an inspiratory phase, followed by a continuous quieter and shorter expiratory phase.

<table>
<thead>
<tr>
<th>Breath Sounds</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vesicular</td>
<td>Normal breath sound</td>
</tr>
<tr>
<td>Absent breath sounds</td>
<td>Pleural effusion</td>
</tr>
<tr>
<td>Decreased vesicular</td>
<td>Collapse</td>
</tr>
<tr>
<td>Bronchial breath sounds</td>
<td>Consolidation</td>
</tr>
<tr>
<td>Rhonchi, crackles, pleural rub</td>
<td>Added sounds (see explanations below)</td>
</tr>
</tbody>
</table>

Added sounds that you may hear:

<table>
<thead>
<tr>
<th>Transmitted upper airway sounds</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sounds produced by turbulent air flow in the upper airways. Can be heard without stethoscope. Remain as background noise on chest auscultation.</td>
<td></td>
</tr>
<tr>
<td>Tip: To determine if the coarse crackles heard on chest auscultation are transmitted upper airway sounds, place stethoscope on the side of the neck after listening to the chest. If the coarse crackles are transmitted upper airway sounds, they will now be heard louder in the neck.</td>
<td></td>
</tr>
</tbody>
</table>

Wheezes/Rhonchi
- High-pitched musical sounds heard when there is partial obstruction or narrowing of bronchi & bronchioles. Maximal intensity during expiratory phase, which is prolonged.
- Can also occur in inspiration if obstruction is severe.

Crackles/Crepitations
- Non-musical sounds, generally heard during inspiration:
  - Fine, high-pitched sounds, best heard at the bases, alveolar level
  - Fibrosing alveolitis (especially at the end of inspiration).
  - Coarse, variable pitch, bubbly secretion in bronchioles
  - Pneumonia
  - Bronchiectasis.
4. Abdominal system examination

- Ideally, examine the child in supine relaxed position, with arms held loosely by the side, head and neck supported by a pillow.
- Child should be adequately undressed from above the xiphisternum to the level of symphysis pubis.
- External genitalia can be exposed for examination last.

1. General inspection:
   - General appearance
   - Does the child look unwell?
   - Is the child in pain?
   - Growth and nutritional status
   - Plot height and weight on the growth chart as indicated.
   - Dysmorphic features.
   - Skin pigmentation, bruising, rashes.
   - Is there jaundice?
   - Hydration status.
   - Presence of nasogastric tube or central line for Total Parenteral Nutrition.

2. Hands and facies:
   - Finger clubbing, koilonychia, leuonychia, palmar erythema & palmar pallor.
   - Conjunctiva pallor; jaundice.
   - Oral cavity for ulcers, smooth/coated tongue, angular stomatitis.
   - Any foetor?

3. Neck:
   - Look for lymphadenopathy.

4. Inspect the abdomen for:
   - Anterior-posterior dimension (best observed from the side).
   - Abdominal contour and symmetry: Protruberant/distended/flat/scaphoid (Young children may have slightly protruberant abdomen).
   - Skin texture, colour and integrity.
   - Scars: look in the front and back (remember: renal biopsy scar is at the back).
   - Skin lesions, rashes, pigmentation, scratch marks.
   - Spider naevi or dilated veins.
   - Umbilicus:
     - normal umbilicus is slightly retracted and inverted;
     - exclude umbilical hernia if umbilicus is everted.
   - If abdomen is distended, determine:
     - site of distension.
     - symmetrical/ asymmetrical.
     - generalized/localized.
   - Remember SFs (Fat, Faeces, Flatus, Fluid, Foetus for adolescent after puberty).

**Tips: If child is upset during respiratory examination:**
- You may demonstrate examination on teddy or carer.
- Do not give up if the child is upset; listen to inspiratory breaths, between cries if necessary.

**Other specific examinations**

1. **ENT examination:**
   - This should be examined last.
   - Complete the respiratory examination by examining the ear, nose and throat.

2. **PEFR**
   - May be assessed in school-aged children.
   - Predicted PEFR (litres/min) = 5 x height in cm – 450.
   - 3rd centile=Average PEFR >50.

3. **PULSUS PARADOXUS**
   - Is present when the pulse volume increases on expiration and decreases during inspiration, this is best measured with blood pressure.
   - It is physiologically normal if the systolic BP difference is >15mmHg.
   - In acute exacerbation of asthma, this difference may be >45mmHg.

**References:**
Palpation and percussion

- Comfortable position for examiner is important.
- Sit on a chair or kneel beside the bed on the RIGHT side of the child to ensure examiner's hand is at the level of child's abdomen.
- Make sure examining hands are warm.
- Palpate the abdomen with a relaxed hand.
- Movement of the palpating hand should be gentle yet with firm pressure.
- Fingers should be held straight with slight flexion at the meta-carpo-phalangeal joint.

Practical points:
- **DO** look at the child's face throughout the examination to assess for abdominal tenderness.
- **DO NOT** cause pain or undue discomfort during the abdominal examination.
- **DO NOT** poke or dig into the abdomen with fingertips.

1. **Light palpation**
   - Purpose of light palpation is to check for:
     - tenderness.
     - guarding.
     - rebound tenderness.
     - rigidity.
   - Before palpation, ask child to indicate if there is any pain or discomfort in the abdomen.
   - Begin gentle palpation away from tender areas. Palpate tender area last.
   - Watch the child's face for any sign of discomfort during palpation.
   - Begin away from you and examine each section in turn, as shown in figure 1 below.

2. **Deep palpation**
   - Repeat the above sequence but with deeper palpation.

   ![Figure 1](image)

   - Purpose of deep palpation is to:
     - detect any abdominal mass.
     - define the characteristics of any abdominal mass felt
       - site, size and shape
       - consistency (e.g. faeces are indentible)
       - mobility: does it move with inspiration?

3. **Organ palpation and percussion**
   - The liver, spleen, kidneys, and gallbladder move downward with inspiration.
   - Ask the child to take deep breaths during organ palpation.
   - Technique: When the child breathes in, the organ being palpated moves downward. The examining hand is held still in position or gently moves upwards, to make contact with the lower edge of the organ being palpated.
   - Palpation of the abdomen may be aided if the child is asked to flex the hips as this helps to relax the anterior abdominal wall.

3.1 **Liver**

3.1.1 **Palpating for the liver**
   - The liver may be palpable (to 2cm below the right costal margin) in normal infants or toddlers.
   - Technique:
     - Start palpation in the right iliac fossa and work your way upwards.
     - Feel for the liver edge with the radial aspect of the index finger (or fingertips).
     - Position examining hand with fingers parallel to the right costal margin.
     - As the child breathes in and out, palpate slowly towards the right costal margin feeling for the liver edge.
   - If the liver is palpable, take note of:
     - Position: measure the liver edge below the right costal margin, along the midclavicular line (figure 2). Use a measuring tape or a plastic ruler (not fingerbreadth).
     - Texture: smooth or nodular, tender or not?
     - Liver edge: hard or firm?

   *(Note: It is useful to follow the liver edge laterally and medially to demarcate the extent of liver enlargement.)*

3.1.2 **Percussion for the liver**
   - Purpose of percussion: to define the upper border of the liver and to exclude lung hyperinflation as the cause of the palpable liver edge.
   - Technique:
     - Percuss each intercostal space, moving downwards from the 3rd intercostal space.
     - When the percussion note turns dull, this corresponds with the upper border of the liver.
     - Count the intercostal spaces, using the angle of Louis as a landmark.
     - Upper liver border: normally at the 6th intercostal space, along the right mid-clavicular line.

   *(Note: liver span is not usually measured in children as it varies with age)*

3.2 **Spleen**
   - The spleen is not normally palpable.
   - Initial splenic enlargement is in a superior and posterior direction. Thus a mildly enlarged spleen may not be palpable below the left costal margin.
   - The spleen needs to be 2 to 3 times its normal size to be consistently palpable beneath the left costal margin.
   - With further enlargement, the spleen will enlarge downwards and medially, towards the right iliac fossa.
3.2.1 Palpating for the spleen:
- Technique:
  - Examiner's left hand supports child's left lower rib cage to push the spleen forwards.
  - Start palpation for the spleen from the child's right iliac fossa.
  - Place radial aspect of right index finger over the child's right iliac fossa.
  - As the child breathes in and out, palpate and move towards the left costal margin.
  - Measure the lowest point of spleen edge to left costal margin on left mid-clavicular point.
- If the spleen is not palpable, turn the child onto the right lateral decubitus position:
  - With child taking deep breaths, begin palpation again, working towards the left costal margin.
  - Move position of examining hand upwards during expiration.
  - Hold position of examining hand during inspiration to appreciate the tip of the spleen moving downwards and medially, to meet the examining fingertips.

*Note: In young infants, the direction of enlargement may be less medially, therefore you may need to palpate from left iliac fossa towards left costal margin.

3.2.2 Percussion for the spleen:
- Traube's space surface marking: left 6th rib superiorly, left mid-axillary line laterally, and left costal margin inferiorly
  - Normal percussion is resonant due to gas-filled stomach.
  - Dull percussion over Traube's space may indicate splenomegaly or pleural effusion.

The following features are characteristic of an enlarged spleen:
- A firm mass palpable beneath the left costal margin
- Moves inferior-medially on early inspiration
- Is not bimanually ballotable
- Upper border cannot be felt ("cannot get above it")
- A notch often (though not invariably) can be felt in the lower medial border
- Dull to percussion

3.3 Kidneys:
- The kidneys can be felt by bimanual palpation (ballottement).
- Technique of ballottement:
  - With the child lying supine.
  - Place ballotting hand behind the child's loin (in the costo-vertebral angle).
  - Place other palpating hand on the lumbar region anteriorly.
  - Firmly depress the abdominal wall with the palpating hand, while the ballotting hand lifts and pushes the kidney forward.
  - An enlarged kidney can be felt between the two hands.

4. Percussion:
- Percussion of the abdomen can be useful to:
  - detect any organomegaly (as above).
  - distinguish the cause of abdominal distension (is it mass, gas or fluid?).

Percussion for ascites:
- Ascites is the presence of fluid in the peritoneal cavity.
- To confirm the presence of ascites, techniques to elicit shifting dullness and a fluid thrill are used:

(i) Shifting dullness:
- With the child lying supine, start percussion of the abdomen at the level of umbilicus from midline.
- The fingers to be percussed are placed along the longitudinal axis of the child's abdomen.
- Continue percussion from midline towards the left flank and take note where the percussion note becomes dull.
- Keep examining finger in the position where the dullness is detected.
- Roll child onto the right (towards examiner) and wait for 20-30 seconds for the fluid to redistribute.
- Percuss again (finger has not been moved).
- If the percussion note becomes resonant, there is presence of ascites.
- With the child still in the right lateral decubitus position, percuss back towards the midline.
- Percussion note in the midline now becomes dull, i.e. the dullness has shifted. This is a positive test for ascites.

(ii) Fluid thrill:
- Flicked only when there is a massive ascites under tension.
- Not a very reliable sign.
- Child (or assistant) places hand firmly in the midline longitudinal position of abdomen.
- This serves to dampen any thrill transmitted through the abdominal fat.
- Examiner places one hand across, flat on the child's left lumbar region.
- Flick or tap abdominal wall on the child's right side.
- A fluid thrill will be felt by the hand placed on the left lumbar region, if ascites is present.
Auscultation

- To detect bowel sounds and vascular bruits.
- Place stethoscope on the same site of the abdomen for some time until bowel sounds are heard.
- Normal bowel sounds are heard every 10 to 20 seconds.
- If bowel sounds are not heard for 2 minutes, they are described as absent.
- Absent bowel sounds may indicate paralytic ileus or peritonitis.

Other examinations:
- Examine the genitalia for undescended testes, scrotal swelling, hernia etc.
- Examine the urine or stool as indicated.
- Examine the back for spinal bifida if chronic constipation is suspected.
- Rectal examination is not routinely performed in children.

5. Neurological examination in older children

Paediatric neurological examination at a glance

- A successful neurological examination requires the child to understand and cooperate during the examination.
- Instructions to the child must take into consideration the child’s age, mental and emotional status.
- Observation plays an important role in the examination process.
- Always approach the child in his position of comfort.

Recommended sequence of the neurological examination* (* need not be strictly adhered to)
1. General inspection.
2. Cranial nerves i-XII.
3. Motor:
   - Inspection
   - Tone
   - Reflexes
   - Power
   - Coordination
4. Sensory.
5. Posture and gait.
7. Specific examinations.

General inspection for neurological examination

- Overall body size and proportions.
- Size and shape of head, always measure OFC (occipito-frontal circumference) in children under 2 years of age.
- Dysmorphic features.
- Posture: Supine, prone, sitting and standing posture. Take note of asymmetry or dystonic posture.
- Movement: Gross and fine motor. Abnormal movements include convulsion, tic, tremors (at rest and intention), chorea, athetosis.
- Mental Status:
  - patient’s activity.
  - orientation.
  - level of consciousness: use Paediatric Glasgow Coma Scale, especially in patients with traumatic brain injury.
- Language and behaviour.

(Tip: Observe the gait as the child first walks into the consultation room. As the child settles in for the consultation, note his posture as he sits, listen for his speech and observe his behaviour.).

References:
### Cranial nerves examination

1. **Cranial nerve I: Olfactory**
   - Not routinely examined.
   - Assess if the child
     - complains of loss of taste or smell.
     - has evidence of visual field defect.
     - has frontal tumour or surgery.
   - Use non-irritating and non-noxious agents e.g. lemon, coffee

2. **Cranial nerve II: Optic nerve**
   - Visual Acuity.
   - Visual Field.
   - Pupillary Reactions.
   - Fundoscopy.
   - Colour blindness - Ishihara plates are used to assess children suspected to have colour blindness.

#### 2.1 Cranial nerve II: Visual acuity

**Formal technique:** Use a Snellen chart
- Child sits or stands SIX meters from the chart.
- Corrective glasses can be worn if necessary.
- Each eye is tested separately.
- Child reads each line from the top of the chart.
- If unable to read the largest letter, reduce the standing distance gradually down to ONE meter.

**Other techniques:**
- If Snellen chart testing has failed, proceed to test with counting fingers, hand movements and light perception.

#### 2.2 Cranial nerve II: Visual field

**Technique:** Confrontation perimetry
- Sit or stand ONE meter in front of the child.
- The child covers one eye and fixes his gaze on the examiner’s eyes.
- Examiner closes corresponding eye.
- Examiner brings a moving finger, a red or white headed pin into the peripheral visual field, in a plane equidistant between the examiner and the child.
- Test all four quadrants.
- **Document when child first sees the object moving in.**

The use of the red pin in confrontation perimetry allows for easy detection of **paracentral scotomas** and comparison of the size of the patient’s **blind spot** with that of the examiner’s.

*Tip: In a younger child, you may test visual field by bringing a dangling object from behind, into the child’s peripheral visual field.*

---

### Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Eye opening</th>
<th>Glasgow Coma Scale (4-15 years)</th>
<th>Children’s Glasgow Coma Scale (&lt; 4 years)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous with blinking</td>
<td>Open spontaneously</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Response to verbal stimuli, command, speech</td>
<td>Open in response to speech</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Response to pain only</td>
<td>Open in response to pain only</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best verbal response</th>
<th>Glasgow Coma Scale (4-15 years)</th>
<th>Children’s Glasgow Coma Scale (&lt; 4 years)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oriented</td>
<td>Smiles, follows objects, interacts, coos, babbles (normal activity)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Disorientated, confused conversation, but able to answer questions</td>
<td>Fewer than usual words, irritable cry</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Inappropriate words</td>
<td>Cries only to pain</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Incomprehensible speech</td>
<td>Moans to pain</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Best motor response</th>
<th>Glasgow Coma Scale (4-15 years)</th>
<th>Children’s Glasgow Coma Scale (&lt; 4 years)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obey commands for movement</td>
<td>Moves spontaneously and purposefully</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Localises painful stimulus</td>
<td>Withdraws in response to touch</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Withdraws in response to pain</td>
<td>Withdraws in response to pain</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Abnormal flexion (decorticate posturing) in response to pain</td>
<td>Abnormal flexion (decorticate posturing) in response to pain</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Abnormal extension (decerebrate posturing) in response to pain</td>
<td>Abnormal extension (decerebrate posturing) in response to pain</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>No response</td>
<td>No response</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

- Total Score range = 3 – 15.
- Scores of 3 – 8 indicate that the child may be in a coma.
2.3 Cranial nerve II: Pupillary reactions


Technique: (figure 1)
- Examine the pupils for shape, size, symmetry and response to light.
- With the child fixing his gaze on a distant point straight ahead, bring a bright light source from the side, shining onto the pupil (Pupil A).
- Observe for constriction of pupil A (direct light reflex) and for constriction of the other pupil B (consensual light reflex).
  i. Direct Response tests ipsilateral CN II, pretectal area and ipsilateral parasympathetics along CN III.
  ii. Consensual Response tests ipsilateral CN II, pretectal area and contralateral parasympathetics along CN III.

Figure 1

Swinging flashlight test (not routinely performed in children): indicated when assessing for a relative afferent pupillary defect or a Marcus Gunn pupil.

2.4 Cranial nerve II: Fundoscopy (as demonstrated during ophthalmology posting)
- Examine for the red reflexes from a distance of 20cm.
- Examine optic disc for papilloedema & optic atrophy.
- Examine the retina for haemorrhage.

Swinging flashlight test (not routinely performed in children): indicated when assessing for a relative afferent pupillary defect or a Marcus Gunn pupil.

3.1 Eye movements examination:
- Sit ONE meter in front of the child.
- Ask the child to follow examiner’s finger with their eyes only, without moving the head.
- Check gaze of both eyes, in the six cardinal directions using a "+" or "H" pattern (figure 2 & 3).
- Observe for smooth movement and pursuit of both eyes.
- Hold the examining target finger at the end of upward and lateral gaze to check for nystagmus.
- Check for convergence by moving the examining target finger toward the bridge of the child’s nose.
- Check for diplopia by asking the child to indicate if he sees two fingers at any point of the examination.
3.2 Screening tests for squint/strabismus:

i. Corneal light reflex test: A quick screening test
- Hold penlight at about ONE meter away in front of child.
- Gain child's attention to fixate at the light, which is shone at the level of the eyes.
- Note the position of light reflection on both cornea:
  - NORMAL: Light reflex falls on nasal portion of both cornea.
  - ESOTROPIA: Light reflex is displaced temporally.
  - EXOTROPIA: Light reflex is displaced nasally.

ii. Cover test -
- Direct (manifest squint): Figure 4 shows a left manifest convergent squint.

Corneal light reflex test: esotropia is noted in left eye.

Right eye in normal position, left affected eye is turned inward.

Right normal eye is covered, left affected eye moves outward to take up position of fixation.

Right normal eye is uncovered, left affected eye moves back to squinting position.

- Latent squint: figure 5 shows left convergent latent squint.

In latent squint, corneal light reflex shows symmetrical position: Both right (normal) and left (affected) eye are in normal position.

When left affected eye is covered,
Right normal eye has no movement, left affected eye may converge or diverge underneath the cover.

When left affected eye is uncovered,
Right normal eye has no movement, left affected eye moves back to normal position.

4. Cranial nerve V: Trigeminal nerve

4.1. Trigeminal nerve: sensory
- Test light touch and superficial pain (usually not performed) in the territories of V1 (ophthalmic), V2 (maxillary) and V3 (mandibular).
- You may use an orange stick to test touch sensation on the anterior two-thirds of the tongue.

4.2. Trigeminal nerve: motor
- Inspect for wasting of the muscles of mastication.
- With the child clenching his jaw, assess the strength of the temporalis and masseter muscles.
- Pterygoid muscles can be assessed by asking the child to open the mouth and slide the jaw from side to side.

4.3. Trigeminal nerve: reflexes
- Jaw jerk & corneal reflex are rarely performed in children.