## Developmental Milestones

<table>
<thead>
<tr>
<th>AGE</th>
<th>Gross Motor</th>
<th>Fine Motor</th>
<th>Language</th>
<th>Social/ Cognitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 months</td>
<td>Holds head up</td>
<td>Swipes at objects</td>
<td>Coos</td>
<td>Social smile</td>
</tr>
<tr>
<td>4 months</td>
<td>Rolls front to back</td>
<td>Grasps objects</td>
<td>Orients to voice</td>
<td>Laughs</td>
</tr>
<tr>
<td>6 months</td>
<td>Rolls back to front, Sits upright</td>
<td>Transfer objects</td>
<td>Babbles</td>
<td>Stranger Anxiety Sleeps thru the night</td>
</tr>
<tr>
<td>9 months</td>
<td>Crawl</td>
<td>Pincer grasp, eats with finger</td>
<td>Non specific Mama Dada</td>
<td>Waves bye bye, responds to name, uncover hidden toys</td>
</tr>
<tr>
<td>12 months</td>
<td>Stands</td>
<td>Mature pincer</td>
<td>Specific Mama Dada</td>
<td></td>
</tr>
<tr>
<td>15 months</td>
<td>Walks</td>
<td>Uses cup</td>
<td>4-6 words</td>
<td>Temper Tantrum</td>
</tr>
<tr>
<td>18 months</td>
<td>Throws ball, walks upstairs</td>
<td>Uses spoon for solid</td>
<td>Names common object</td>
<td>Toilet training may begin</td>
</tr>
<tr>
<td>24 months</td>
<td>Runs, up and down the stairs</td>
<td>Uses spoon for semi solid, Builds tower of six cubes</td>
<td>2 word sentence</td>
<td>Follows 2 step command, Asks questions what this is and what that is, Parallel play</td>
</tr>
<tr>
<td>36 months</td>
<td>Rides a Tricycle</td>
<td>Eats neatly with utensils</td>
<td>3 word sentence</td>
<td>Knows first and last name, peer interaction, sibling rivalry</td>
</tr>
</tbody>
</table>

*Weight-for-age percentiles, boys, 2 to 20 years, CDC growth charts: United States From National Health Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).*
### Separation / Stranger anxiety

<table>
<thead>
<tr>
<th>Number</th>
<th>Stranger Anxiety</th>
<th>Separation Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Starts around 6 months</td>
<td>Starts around a year, mostly in preschoolers</td>
</tr>
<tr>
<td>2</td>
<td>Child starts crying when stranger comes to the house or child is left in the day care center</td>
<td>Child starts crying when mother leaves.</td>
</tr>
<tr>
<td>3</td>
<td>Disappears before the end of first year.</td>
<td>May need behavioral modification.</td>
</tr>
</tbody>
</table>

### Cognitive Development

<table>
<thead>
<tr>
<th>0-2 years</th>
<th>Object Permanence: Children are aware of objects around without their involvement with the object</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-7 years</td>
<td>Egocentric: Children see themselves as center of attention, unable to understand another’s point of view.</td>
</tr>
<tr>
<td>7-11 years</td>
<td>Law of conservation: If 10 cc of water is placed in a thin tube then the same water is transferred to a thick tube, child can say the amount of water is the same. Children can understand that ice can be melted to water and water can be frozen to make ice.</td>
</tr>
<tr>
<td>11 to Adolescent</td>
<td>Children can think abstract, can have deductive reasoning.</td>
</tr>
</tbody>
</table>

### Rett syndrome
- Rett syndrome (symbolized RTT) is caused by sporadic mutations in the gene MECP2 located on the X chromosome, mainly in females.
- Affected patients initially develop normally, then around 6-18 months of age, gradually lose speech and purposeful hand use. Deceleration of head growth, seizures, autistic features, ataxia, stereotypic hand movements, and intermittent breathing abnormalities develop subsequently.

### Autism
- Autism is a neurodevelopmental disorders characterized by impairments in three major domains:
  - 1: Socialization: Autistic infants show less attention to social stimuli, smile and look at others less often, and respond less to their own name. Autistic toddlers have more striking social deviance; for example, they have less eye contact and anticipatory postures and are more likely to communicate by manipulating another person’s hand.
  - 2: Communication: delayed onset of babbling, unusual gestures, diminished responsiveness, and the desynchronization of vocal patterns with the caregiver.
  - 3: Behavior: purposeless movement, such as hand flapping, head rolling, or body rocking, ritualistic and compulsive behavior
- Starts usually around 2 years.
- Incidence: 1:100
- There is no relationship between vaccination and autism
- Head growth is normal or accelerated in contrast to Rett’s syndrome.
- The American Academy of Pediatrics recommends that all children be screened for Autistic Spectrum Disorder at the 18- and 24-month well-child doctor visits
Adolescent Medicine

Puberty

- Normal Puberty: Girls= 10-12, Boys= 12-14
- Menarche: 2.5 years after the onset of puberty
- Hormones: GnRH (Gonadotropin releasing hormone) → Hypothalamus
  - Gonadotropins: (Anterior Pituitary) → FSH and LH
  - Sex steroid: Ovarian Follicle, Testes and Peripheral source
- Early onset of puberty has been attributed to Obesity.

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<thead>
<tr>
<th>Tanner stage</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Prepubertal</td>
<td>Prepubertal</td>
<td></td>
</tr>
<tr>
<td>2 Breast bud with elevation of breast and papilla and enlargement of areola</td>
<td>Enlargement of testis and scrotum. Change in color of the scrotum</td>
<td></td>
</tr>
<tr>
<td>3 Further enlargement</td>
<td>Enlargement of the length of the penis and growth of testes.</td>
<td></td>
</tr>
<tr>
<td>4 Areola and Papilla form mound above the level of breast</td>
<td>Increase the girth of the penis and development of glans.</td>
<td></td>
</tr>
<tr>
<td>5 Adult genitalia</td>
<td>Adult genitalia.</td>
<td></td>
</tr>
</tbody>
</table>

Peak height velocity

- The limbs accelerate before the trunk.
- The distal portions of the limbs accelerating before the proximal portions;
- Adolescent in early puberty is "all hands and feet."
- In later puberty- growth spurt is primarily truncal
- Peak height velocity → two years earlier during puberty in girls than in boys

Bone growth

- By the end of puberty, males have nearly 50 percent more total body calcium than do females.
- Peak bone mineral content velocity takes place at the age of menarche that means 9 to 12 months after peak height velocity
- These disparities in the timing of bone growth and mineralization may place the growing adolescent at increased risk for fracture

Weight change

- Adolescent girls have a greater proportion of body fat along the upper arms, thighs, and upper back.

Anemia

- Hemoglobin and serum ferritin- Both increase with advancing pubertal stage in males, but not in females

Gynecomastia

- Pubertal gynecomastia occurs in approximately one-half of teen-age boys, at an average age of 13 years, and it persists for 6 to 18 months

Acne

- A greater number of acne lesions are normal in early puberty
Psychosocial factors

- The prevalence of depression is twice as great in girls compared to boys. Depression in adolescent period may present with irritability (Adult depression presents with depressed mood)
- As puberty progresses, boys develop a more positive self-image and mood, but girls experience a diminished perceived physical appearance.
- Caucasian girls also exhibit diminished self-worth as they pass from early to mid-adolescence.
- The early maturing girl may experience a greater decrease in self-esteem and body satisfaction
- Girls who matured early were more likely to have a lifetime history of disruptive behavior disorder and suicide attempts
- Late maturing boys more likely to have internalizing behaviors and emotional reliance on others.

Sports related injury

- Epiphyseal growth plates injuries occurs during periods of peak height velocity

Myopia (near sightedness)

- The greatest incidence of myopia occurs during puberty and is caused by growth in the axial diameter of the eye.

Kyphosis / Scoliosis

- Kyphosis: Spinal deformity with anteroposterior angulation
- Scoliosis: lateral displacement or curvature of the spine
- Scoliosis is usually associated with kyphosis, but kyphosis can occur in isolation
- The severity of these two conditions is defined by measurement of the Cobb angle of curvature
- The U.S. Preventive Services Task Force (USPSTF) recommends against the routine screening of asymptomatic adolescents for idiopathic scoliosis.
- If an adolescent comes with Scoliosis or Kyphosis and reports the deformity before the age 10 a thorough evaluation is recommended.
- If an adolescent with Kyphosis or Scoliosis with pain comes, no intensive investigation is required. An X-ray spine is sufficient
- If spinal curve is less than 30degree, manage conservatively with regular follow up and X-ray of spine.
- If the curve is between 30 and 45 degree, use of bracing is advised.
- Surgery (spinal fusion) is recommended if the spinal curve is more than 45 degree or if the curve is progressive despite the use of braces.

Dysfunctional uterine bleeding

- In adolescents, anovulation accounts for approximately 80 percent of cases of DUB
- Sexually transmitted disease: Sexually active adolescents represent the highest-risk age group for all sexually transmitted diseases

Precocious puberty

- Abnormal or precocious pubertal development is defined as children entering puberty more than 2.5 to 3 standard deviations (SD) earlier than the median or mean age (8 for girls, 9 for boys)
- Secondary sexual character in girls before age 8 and secondary sexual character in boys before 9
- History, Physical exam and pubertal staging.
- Signs of precocious puberty + normal bone age→ close follow up.
• Signs of Precocious puberty + accelerated bone age → work up

**Work up**
• LH serum estimation: 1: Normal or high 2: Low

**Pituitary Hormone**

GnRH → Anterior Pituitary → LH & FSH → Estrogen, Progesterone and Testosterone

- Normal or High LH
- GnRH Stimulation
  - Increased LH Level
    - Central
      - Ideopathic → CT and Treatment
      - CNS Tumor → CT and Treatment
  - No Change in LH Level
    - Peripheral
      - Investigation to find the cause
        - Most likely ovarian tumor in girls
        - And leydig cell tumor in boys

**Treatment of Precocious Puberty**
• Precocious Puberty- Central (Idiopathic)
• LHRH analog in the form of depot injection or subcutaneous implant.
• GnRH analog- Histerline
• Precocious Puberty- Peripheral
• Tamoxifen (antiestrogen), Biphosphonate (bone mineralization) in girls
• Ketoconazole, Spironolactone and Testolactone in boys.
McCune-Albright syndrome (MAS)
- Familial gonadotropin-independent precocity triad of peripheral precocious puberty, café au lait skin pigmentation, and fibrous dysplasia of bone

Delayed Puberty
- If a girl at age 12 and boy at 14 do not develop secondary sexual character may need evaluation.
- 1: Primary GnRH deficiency: Mostly congenital → Kallmann’s syndrome
- 2: Secondary hypogonadism: Low LH and FSH → Hyperprolactemia, Hypothyroidism and Anorexia Nervosa / Malnutrition
- 3: Primary hypogonadism: High LH and FSH no sex hormones → Turner syndrome or Klinefelter syndrome
Evaluation of Delayed Puberty:
1: History and Physical exam → may indicate familial or constitutional
2: X-ray of left hand to determine bone age.
3: Random LH and FSH, estrogen in female and testosterone in males.
4: Serum TSH, Prolactin

Treatment:
1: Treatment of Primary GnRH deficiency:
   A: For the development of secondary sexual character → Estrogen in girls (add progesterone when breast development completes) and testosterone in boys.
   B: Gonadotropins or pulsatile GnRH
      • Women: Clomiphene Citrate → It stimulates pituitary gonadotrophins
      • Men: To induce spermatogenesis in men recombinant FSH and human chorionic gonadotropin (hCG) to induce full steroidogenesis from Leydig cells.
2: Secondary hypogonadism: Treat the cause
3: Primary Hypogonadism: Turner’s syndrome and Klinefelter syndrome will be discussed in Genetics

Kallmann syndrome
• Characterized by hypogonadotropic hypogonadism including anosmia, red-green color blindness, midline facial abnormalities such as cleft palate, urogenital tract abnormalities, and neurosensory hearing loss. Hypogonadism in this syndrome is a result of deficient hypothalamic secretion of GnRH

Things physicians should know about adolescents:
• Interviewing adolescents: Home, Education, Activities, Drugs, Safety, Sexuality, Suicide (Depression)
• Leading cause of death in American teenage: Accidents 50%, homicide-15%, Suicide- 12% (if questions about suicidal ideas are asked, the incidence of suicidal thought or suicide does not increase)
• Leading cause of death in African Americans- Homicide
• Age of private interview with the child can start at 11 or 12. Questions related to sexual activity can be asked at around 12.
• Physician should emphasize on confidentiality when discuss, sexually transmitted disease, prenatal care, contraceptive services, evaluation and treatment of substance abuse and mental illness and emergency care.
• If a physician keeps the information confidential from the parents, 65% of adolescents will seek treatment if it is not kept confidential, then only 15% will seek help.
• Physicians can’t keep the information confidential if the child is suicidal, homicidal or have been abused sexually.

Screening in Adolescents
• Hypertension
• Obesity
• Eating disorders
- Hyperlipidemia
- Tuberculosis, if at risk
- Physical, sexual, and emotional abuse
- Learning or school problems
- Substance use (both tobacco and alcohol)
- Behaviors or emotions that indicate recurrent or severe depression or risk of suicide Sexual behavior that may result in unintended pregnancy and sexually transmitted diseases, including
- Cervical cancer, if sexually active and at risk.

**Eating Disorder**

- **Anorexia Nervosa: Restrainers**
  1: Female: Male = 10:1
  2: Most onsets around menarche
  3: Criteria to diagnose Anorexia Nervosa
     - A-BMI (kg/m2) < 17 (Normal BMI = 20) or body weight is ≤ 85% expected body weight.
     - B- Intense fear of gaining weight.
     - C- Body image distortion
     - D- Amenorrhea in post menarche females
- Two subtypes of anorexia nervosa: Restrictive and Binge/purging type
- Medical Problems: Bradycardia, hypotension, ↑ QTc., Mitral valve prolapse (very high incidence) Dehydration, Hypokalemic metabolic alkalosis, ↓Mg, ↓Ca, Brittle hair, Cold extremity, Osteopenia (Increased risk of developing Osteoporosis in later life).
- Treatment: mainly behavioral. If superimposed depression Fluoxetine may be given. Limited role of appetite stimulant.
- High suicide rate.
- If the weight loss is >20% of expected body weight or body weight is < 60% of expected body weight→ Hospitalization and possible forced feeding.

- **Bulimia Nervosa: Failed Restrainers**
  - Early 20s onset, More prevalent than Anorexia.
  - They usually have normal or overweight. Menstruation is usually preserved.

**Diagnostic criteria**

- 1: Recurrent episode of binge eating
- 2: recurrent inappropriate compensatory behavior to prevent weight gain.
- 3: 1 & 2 occurs for ≥ twice a week.
- Dental Caries and loss of enamel
- Better prognosis than Anorexia.
- High dose SSRI may help.
- Behavioral Treatment.

**Adolescent Contraception and Pregnancy**

- Teen pregnancies are a huge problem in USA.
- Most of the adolescent have now access to confidential testing for pregnancy and Sexually transmitted diseases. If the adolescent needs absolute confidentiality, then tell the adolescent about Title X-Family planning program. This is federally funded program where all parents have no access to the record of the adolescents.
If a teenager asking for contraception, you are required to provide prescription of OCP without informing the parents.

You are not required to perform a pelvic exam before prescribing oral contraception.

You must do a pregnancy test before prescribing.

Best method of contraception for adolescent is Condom, because it prevents pregnancy and STD.

Best hormonal contraception for adolescent is injectable Medroxyprogesterone (Depot Provera) or combination of estrogen and medroxyprogesterone (lunella)