Adolescent Medicine I
Growth and Development

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Learning Objectives

• Growth and Development
  – Understand normal pubertal development
  – Recognize when puberty is early or delayed and warrants additional evaluation
  – Identify stages of adolescent cognitive and social-emotional development

• Contraception and STI Screening

• Reproductive Health Cases
Goals of Adolescence

• Physical Development
  – Sexual
  – Body Growth

• Psychosocial Development
  – Cognition
  – Psychosocial
Factors Influencing Pubertal Timing**

- Y-aminobutyric acid (GABA), neuropeptide Y, kisspeptin, glutamate
- Leptin, nutrition, genetics, chronic illness, environment

- Pulsatile secretion of gonadotropin releasing hormone from the hypothalamus

- Secretion of luteinizing hormone and follicle-stimulating hormone from the anterior pituitary

- Growth of testes/ovaries and production of sex steroids
<table>
<thead>
<tr>
<th>SMR</th>
<th>Pubic Hair</th>
<th>Testicular Volume (mL)</th>
<th>Penile Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>&lt;4</td>
<td>Pre-pubertal</td>
</tr>
<tr>
<td>2</td>
<td>Sparse, vellus</td>
<td>&gt;4</td>
<td>Slight increase in size</td>
</tr>
<tr>
<td>3</td>
<td>Dark, curly, lateral spread</td>
<td>&gt;8</td>
<td>Increase in length</td>
</tr>
<tr>
<td>4</td>
<td>Adult, no thigh extension</td>
<td>&gt;12</td>
<td>Increase in width</td>
</tr>
<tr>
<td>5</td>
<td>Adult, extends to thighs</td>
<td>&gt;16-20</td>
<td>Adult Size</td>
</tr>
</tbody>
</table>
Sexual Development: Boys


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Abnormal Puberty – Males**

- Precocious Puberty
  - SMR 2 prior to age 9 years

- Delayed Puberty
  - No testicular growth by age 14 years
  - No pubic hair by age 15 years
### Sexual Maturity Rating (SMR) - Females**

<table>
<thead>
<tr>
<th>SMR</th>
<th>Pubic Hair</th>
<th>Breast</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>Pre-pubertal</td>
</tr>
<tr>
<td>2</td>
<td>Sparse, vellus</td>
<td>Bud under areola</td>
</tr>
<tr>
<td>3</td>
<td>Dark, curly, lateral spread</td>
<td>Mound beyond areola, single contour</td>
</tr>
<tr>
<td>4</td>
<td>Adult, no thigh extension</td>
<td>Secondary areolar mound</td>
</tr>
<tr>
<td>5</td>
<td>Adult, extends to thighs</td>
<td>Adult size, single contour</td>
</tr>
</tbody>
</table>
Sexual Development: Girls

- Height Velocity
- Menarche
- Pubic Hair
- Breast


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Abnormal Puberty – Females**

• Precocious Puberty
  – SMR 2 prior to age 8 years

• Delayed Puberty
  – No thelarche by age 13 years
  – No pubic hair by age 14 years
  – No menarche by age 16 years
  – More than 3 years from thelarche to menarche
Bone Growth

• Affects both axial and appendicular skeleton

• Early to Middle Adolescence
  – limbs accelerate before the trunk with distal limbs accelerating before proximal
  – “all hands and feet”

• Middle to Late Adolescence
  – primarily truncal growth
Adolescent Growth Spurt
- Lasts 24-36 months (M>F)
- 20-25% of adult height attained
- 95% complete by SMR 4 (18yr M, 16yr F)

Males
- Peak height velocity 10.3 cm/yr (total ~28cm)

Females:
- Peak height velocity 9cm/yr (total ~25cm)
- 6-8cm after menarche
Evaluation of Premature Growth Arrest**

- **HISTORY AND PHYSICAL**
- Nutritional
  - Diet and exercise history
- Endocrine
  - TSH, GH
  - Gonadal insufficiency
- Inflammatory
  - CBC, ESR, CRP
- Oncology
  - CBC, imaging
Laboratory Changes**

• Alkaline phosphatase – transient increase during bone growth

• Hemoglobin and Ferritin
  – Males: increased, establishing a higher norm than females
    • Androgen mediated
  – Females: may decrease (menstrual blood loss, low iron diet)

• Cholesterol
  – Males: HDL decreases, LDL increases
  – Females: HDL increases, LDL decreases

• Serum Creatinine – increases to adult level
Growth and Development**

• May appear physically mature before cognitively or socially mature
• Exact timing and sequence is variable
Cognition and Psychosocial Development

• Age Related, not SMR

• Divided into 3-4 categories
  – Early (10-13 yrs)
  – Middle (14-17 yrs)
  – Late (18-21 yrs)
  – Emerging Adulthood (to 24 or 26yo)
Early Adolescence (10-13yrs)**
Quest for autonomy

• Parents/family
  – Less interest in activities with family
  – Able to recognize parental flaws
  – Less tolerant of parent criticism
  – May be reluctant to accept parental advice
  – Question rules, authority figures

• Peers
  – Same sex friendships, often with emphasis on conformity
  – Self-awareness and self-consciousness; socially awkward
  – Feelings of sexual attraction, with interest >> action
  – Curious about risk behaviors, with interest >> action
Early Adolescence (10-13yrs)**
Quest for autonomy

• Cognition
  – Concrete thinking (right vs. wrong)
  – Early moral concepts
  – Real and unreal vocational goals
  – Can’t perceive long range implications of actions and decisions
  – Lack of impulse control with immediate gratification

• Emerging Capacity to Consent
  – Understand risk/benefits
  – Difficulty considering multiple conflicting points
  – Decisions similar to adults
Middle Adolescence (14-17yrs)**
Exploring Identity

- **Parents/Family**
  - Amplification of Early Adolescent separation from family
  - Time of greatest parent/teen conflict

- **Peers**
  - Friend group includes both sexes
  - Conformity with peer values and codes
    - Attractiveness, clothes, make-up, eating habits, experimentation
    - Clubs, sports, gangs
  - Begin to explore role of self as a unique individual in the group
  - Dating and questions of sexual orientation, interest >= action
  - Increase in risk behaviors, interest >= action
Middle Adolescence (14-17yrs)**
Exploring Identity

• Cognition
  – Formal operational thinking, begin to abstract, concrete under stress
  – Fervent ideology, fantasy, idealism → daydreaming
  – Identification of law with morality
  – Fewer unrealistic vocational goals
  – Increased verbal abilities, creativity, and intellect
  – Perceives long term consequences, but still invincible/omnipotent

• Capacity to Consent
  – Understand and process information in a manner similar to adults
  – Excellent “cold” decision-making, may be impaired in “hot” situations
Late Adolescence (18-21yrs)**
Realization of Self

• Parents/Family
  – Renegotiate relationship from child-parent to adult-adult
  – More positive interactions
  – Emancipation complete

• Peers
  – Individual values/identity > peer group values
  – Individual friend relationships > large group relationships
  – Longer romantic involvement with plans for future family development
Late Adolescence (18-21yrs)**
Realization of Self

• Cognition
  – Complex, abstract thinking
  – Future orientation with goals, focus
  – Increased impulse control, ability to delay gratification
  – Stable interests
  – Refining values and beliefs (moral, sexual, religious, political)

• Capacity to Consent
  – Adult legal capacity
Potential pitfalls - Adolescent**

• Unsuccessful transition from parents to peers can leave emotional void
  – Behavioral problems, poor social functioning
  – Higher risk taking
  – Unstable foundation for identity/morality development

• Rapid body changes
  – Challenge to sense of self
  – Self-esteem
  – Eating disorders
  – Higher risk taking
Potential pitfalls – Parent/Family**

- Search for identity
  - Frustrating for parents
  - Body modification (hair color, piercings, clothing styles)
  - High risk behavior
  - Shifting interests
- Successful transition requires
  - parent-child role adjustment
  - Validation of peer group importance
  - Acceptance of “new” identity
  - Modeling appropriate behaviors, coping mechanisms
Potential pitfalls – Health Care Provider**

- Evaluate the family/context
  - Family dynamics
  - Stressors
  - Coping mechanisms

- Recognize that things can change quickly
  - School functioning, extracurricular activities
  - Diet, exercise
  - Substance use, mood disorders, stress
  - Relationship health, sexual behaviors
  - Personal safety, driving, sleep
Potential pitfalls – Health Care Provider**

• Adherence issues
  – Need to include adolescent in treatment decisions
  – Need immediate (adolescent) and long term (parent/provider) goals and consequences
  – Understand adolescent life context of illness and treatment

• Motivational Interviewing
  – Works!
  – May initially feel time-consuming
  – Ultimately saves time, engages patient, improves health
Suggested Practice Changes

• Help patients and families successfully navigate adolescence
  – Confidential conversations about how they are handling their physical, social, and cognitive development
  – Frequent and routine assessment of functioning, behaviors, and context
  – Shared decision-making about health care and treatment plans

• Be formally trained in and routine use motivational interviewing
References

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• Emans SJ et al. Emans, Laufer, Goldstein's Pediatric and Adolescent Gynecology. Lippincott Williams & Wilkins, 2012


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