

Module B1: Growth and puberty

Entry Scenario: The entry scenario addresses a variety of issues and problems associated with the module topic. It may be used at the beginning of the course to stimulate the students to identify their own needs and interests (see appendix 1). The results may be utilized by the individual to assess own learning process, or be integrated with class objectives.

The 14.5 year-old boy David comes to clinic with his parents because the of stomach ache and headache since about 4 months. He does not like school. There is nothing unusual in the medical history. The growth curve drawn from school health service visits indicates growth in height along the 25th percentile until age 12, at which time a failure in growth began. The boy's height is now at the 3rd percentile. A physical exam shows Tanner stages P1, A1, G2 with bilateral testicular volume of 5 ml. Weight is appropriate for height. The boy is concern about his delayed pubic hair and penile development because his teammates tease him in the showers after practice. The father 's height is 179 cm, the height of the mother 155 cm. Her menses began at age 15.

General Goals for Learners *By completing the module the participant will be able to:*

- I. Evaluate an adolescent's growth status and pubertal development in context of their bio-psychosocial development, and communicate the findings and their significance to the adolescent and the parents
- II. Identify disorders of growth and/or puberty and causal conditions; initiate specific diagnostic assessments and therapeutic management

	lower limits of normal			<ul style="list-style-type: none"> - A girl with primary amenorrhea at 15.5 yrs/ a tall 14year old boy G3/ PH 3 with testicles of 5mls both sides. - A 13.5 year old girl with prepubertal breast development (B1)/ A boy with prepubertal penis at 14 yrs <p>Example: Bonthuis et al. (2012) Use of National and International Growth Charts for Studying Height in European Children: Development of Up-To-Date European Height-For-Age Charts http://journals.plos.org/plosone/article/asset?id=10.1371%2Fjournal.pone.0042506.PDF</p>
Attit.	<p>B. Describe the typical complaints and questions a boy or girl may mention or ask that show concern about growth and puberty, and compare the two sexes.</p> <p>C. Identify factors which impact on adolescent's perception of the normality/abnormality of his or her own growth and pubertal development</p>		<p>Focus group</p> <p>Introductory short lecture</p> <p>Group discussion</p>	<p>List and rank by order of frequency the questions or problems brought up by female and male adolescents about growth, breast development (in both sexes) and general puberty. Compare the two sexes.</p> <p>Lecture highlights the biological, social and mental development in early, middle and late stages of adolescence (AAP categories http://eclkc.ohs.acf.hhs.gov/hslc/tta-system/ehsnrc/docs/_34_Stages_of_adolescence1.pdf) using App. 1 of module A1 and comprehensive growth graphic (App. 1 und 2)</p> <p>Participants formulate and discuss examples in which a particular context may affect an adolescent's perception of height and pubertal development (e.g. being shorter or taller than a twin brother/sister; being similar to a short parent who did or did not accept his/her stature; being normal but "short" relative to peers;</p>

	D. Identify the impact of early versus late puberty on cognitive affective and behavioral development		Small group discussion	Using national growth charts/ guidelines of pubertal timing. Discuss the potential impact of early-middle and late puberty in both sexes. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4251487/
Skill	E. Indicate how to obtain relevant information on growth and puberty during history taking and physical examination F. Demonstrate how to explain the findings on growth and puberty to the adolescent patient, and how to describe what is normal and what needs further clarification		Focus group Case study and role play	Groups develop recommendations on interviewing adolescents for school doctors responsible for routine health visits. Answers are compared and evaluated during plenary with discussion about the issues of communication, confidentiality/consent and contexts (cultural, religious, etc.) 1. Should pubertal development be assessed and why? What are suitable conditions to do so? 2. What are the key questions to be used when taking a history from an adolescent boy or girl to evaluate pubertal development and the adolescent's perception of it? 3. What are ways of respectfully assessing pubertal development through a physical examination? <u>Case study:</u> A boy of 15 complains about his short stature (3 rd centile) citing negative remarks from the coach of his football team. Your findings: target height (sex-corrected mid-parental height) at 10 th percentile; born full term small at 2.4 kg; puberty stage P4 G4; previous growth regular between the 3 rd and 10 th centiles. When and how do you comment on these findings? <i>Some considerations for use with case study (with attention paid in role play to the use of proper timing during interview, and proper wording to address these issues):</i> <ul style="list-style-type: none"> • Height has a familial/genetic component that does not result from a choice by the parents nor by their children. • Small size at birth may also account for relatively short height later in life. • Normal growth along a normal centile indicates that growth and sex hormone are in order. • Being short does not prevent one from being a good athlete. • Treatment manipulation of growth is not efficient and not necessarily safe in such a case.

Case study:

A 13.5 year-old boy consults for mild obesity (BMI +2.3 SD). Your findings: breasts (B3 appearance) with prominent fat and little true gynecomastia; testes are 5 ml but penis is still early-pubertal (G2) and partly hidden in pubic fat. How do you comment on these findings?

Some considerations for case study:

- Fat tissue in excess may result in a breast-like appearance.
- True glandular breast tissue does develop slightly but transiently during puberty in a majority of normal boys.
- Breast tissue does not indicate wrong sex orientation or wrong (female) hormones in blood. The tissue may result from local transformation into estrogens of the increased male hormones produced by the testes.
- A hidden penis appears smaller than it is.
- Increased testicular volume indicates that puberty just started and the signs of hormonal effects (pubic hair, penile growth) are to be expected soon.
- Being age 13.5 at such a stage corresponds to the lower limit of a normal range of 4 years between the fastest and slowest maturers.

Case Study:

A 16 year old girl presents with B4, PH 4, no menarche, height at the 25th percentile, weight at the 3rd percentile,. She is very active in gymnastics.

Some considerations for case study:

- Assess the amount of training intensity/hours and eating pattern.
- Examine growth curves for drops in weight and height.
- Consider laboratory tests of hormonal state (incl. Thyroidea)
- Consider female inner genital sonography
- Consider assessing bone age
- Consider smelling ability (Kallmann's syndrome)
- Consider a chromosomal analysis

				<p>Case Study:</p> <p>A 9.5 year old girl of African ethnicity is brought by her parents due to vaginal blood discharge. She is between B3-B4, PH3-4. She had a growth spurt in the last half year, breast budding started at age 8. The mother's menarche was at age 10 Her height is at the 95th percentile, weight above 95th percentile.</p> <p>Some considerations for this case study:</p> <ul style="list-style-type: none"> • Know that this girl is within the normal range of puberty. • Consider ethnic influences on pubertal development (WHO charts: http://www.who.int/growthref/en/) • Examine growth charts and target height • Discuss the influence of overweight on puberty • Discuss the role of laboratory and radiographic work up.

GOAL II. Identify disorders of growth and/or puberty and causal conditions; initiate specific diagnostic assessments and therapeutic management

	Training Objectives Topics to be covered		Educational methodology	Activities, Issues, and Questions
Know	A. List common conditions with growth and/or pubertal problems, and recognize their associated growth patterns and etiologies. <ul style="list-style-type: none"> - Familial short stature - Precocious puberty - Intrauterine growth retardation - Constitutional delay of puberty - Panhypopituitarism (craniopharyngioma) - Turner syndrome (non-limiting list)		Interactive lecture Group discussion	<p>The lecturer lists the common etiologies of short stature or delayed puberty in adolescent boys and girls, noting the prominent features. Participants identify and juxtapose the constitutional versus non-constitutional etiologies (e.g. familial pubertal delay vs Kallmann syndrome, idiopathic central precocious puberty vs sexual precocity in children from international adoption, idiopathic GH deficiency vs craniopharyngioma, hypothyroidism).</p> <p>Participants interpret growth charts suggestive of the common conditions, and explain their conclusions.</p> <p><u>Case study:</u> A girl of 14 consults because of her short stature. She had recurrent otitis in childhood, and occasional school problems. The exam indicates P3 B1. She has a mild dysmorphic appearance (short neck).</p>
	B. List the essential assessment procedures required for an adolescent boy or girl with short stature and/or delayed puberty		Interactive lecture	<p>Define the appropriate examination procedures, including other medical opinions, that you would request for an adolescent in whom you suspect</p> <ul style="list-style-type: none"> - Turner syndrome - GH deficiency - Kallmann syndrome - Anorexia nervosa <p>Which specialists would possibly be involved?</p>

Attit.	C. Identify reasons for diagnostic and therapeutic intervention in non-specific disorders of growth or puberty		Focus group Individual reflection, small group discussion	<p><u>Case study:</u> An adolescent boy with borderline (3rd centile) short stature who just entered puberty at the age of 14 is referred by his general practitioner. Examination reveals no specific etiological condition. Discuss:</p> <ul style="list-style-type: none"> • What could be reasons for considering and proposing minimal diagnostic assessment? • What could be reasons for considering referral for therapeutic intervention? • How would you counsel this boy with his serious concerns about his height? <p>Discuss differences regarding the psycho-social impact on girls / boys with short/tall stature.</p>
Skill	<p>D. Demonstrate an ability to elicit from an adolescent with a growth/puberty problem information about the possible influence of situational factors</p> <p>E. Identify the possible causes of gynecomasty</p>		<p>Group work with role play</p> <p>Group work with role play</p>	<p>For Objectives D and E, group formulates questions (sample questions provided below) and uses them to role-play case study.</p> <p><u>Case study:</u> A 14 year old girl is seen at consultation, for inadequate breast development (B2-B3). The findings : pubic hair P4; girl is involved in gymnastics 10 hours/week ; mother's menarcheal age 15 years. You take her history, paying attention to uncovering situational factors that impact the patient's feelings and condition. What areas need to be considered in an assessment of situational factors? For what purpose? Using which questions?</p> <p><i>Sample questions :</i></p> <ul style="list-style-type: none"> • Does it bother you that your breasts have not developed yet? Are your parents worried about it? • How do you feel when compared to your schoolmates? Or to your classmates in gymnastic training? • Do you feel happy or pressured by your gymnastic training? • How about your height and your growth? Did it slow down recently? • How do you feel about the way your body looks right now? How do you feel when compared to your classmates? • What does your coach think about your size? • Have you done anything to try to gain or lose weight? Dieting? Restricting what you eat? Intentionally vomiting?...

and how to address it.

**F involve the adolescent
and the family in the
management of the
situation**

Focus group
Role play

Case study :

- A boy of 15 complains about breast development (B3) that occurred a year ago and did not change for the last 6 months. Take history incl. development of height and weight. Assess complete pubertal development (i.e. is testicle development correlating with the other Tanner stages? Consider work-up for Klinefelter syndrom (if necessary). Pay attention to identifying consequences of his problem.

What are helpful ways of assessing and responding to an adolescent's emotionally loaded complaint ? Using which questions/statements?

Sample questions for assessment:

- Your breast development started about a year ago. Were there changes in your life at that time, or during the past year?
- Does the breast development bother you? Worry you? When does it bother you the most?
- How do you feel about it in relation to your friends or classmates?
- What do you think about the way your body is developing and changing?
- How is life at home? Do you feel cool or nervous, aggressive?
- Taking any medicine on a regular basis?
- Smoking tobacco? Using any drug or substance?
- Are activ in sports?

Sample statements for response:

- I can understand your concern.
- This is a very common, almost normal problem that is bothering you, perhaps because it is a little more obvious than usual.
- It should resolve spontaneously, but it can take months or even years.
- If you are bothered in the gymnastic class, we can talk about whether you'd want a certificate of exemption.
- Consider referral to an endocrinologist depending on the adolescent distress.

Case study :

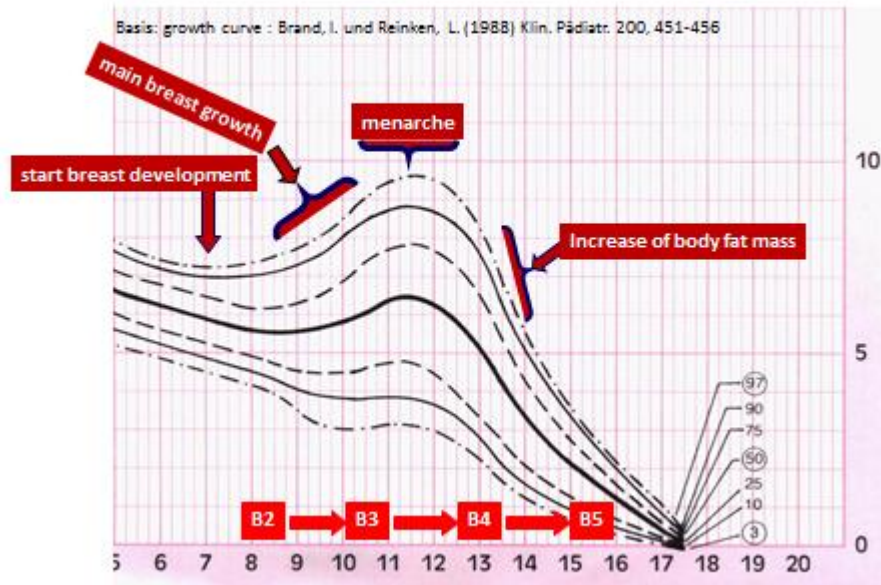
A boy aged 14.5 presents with delayed puberty (G2 P2, test. vol. 5 ml). He has school problems (repeated a grade) and exhibits social withdrawal. He wants treatment if possible, but his parents are reluctant. They were also late bloomers and could manage their lives without therapy.

Question: What kind of information should be provided to facilitate the adolescent and family's input in the decision-making process regarding therapy? Participants formulate responses and practice in role-play.

Guideline statements:

- DP is not a disease; it is an extreme variant of normal development and a self-limiting condition.
- DP does not harm physically and will ultimately result in normal adult development and function (height, sexuality, fertility).
- DP may harm psychologically.
- In such conditions, a treatment may be useful because there are still several months or years of delay before the growth spurt.
- Testosterone therapy is transient, lasting for 6-12 months with the aim of attaining a blood level of testosterone consistent with age.
- The treatment will accelerate growth and pubertal development (penile growth, pubic hair) but will not change the final height and development outcome.
- Both options (treatment or no therapy) are medically acceptable and safe.
- Give priority to the adolescent's opinion, while listening to and answering the parent's concerns and questions.
- Whatever the patient's decision is may change with time and development. The decision might be revised during follow up.

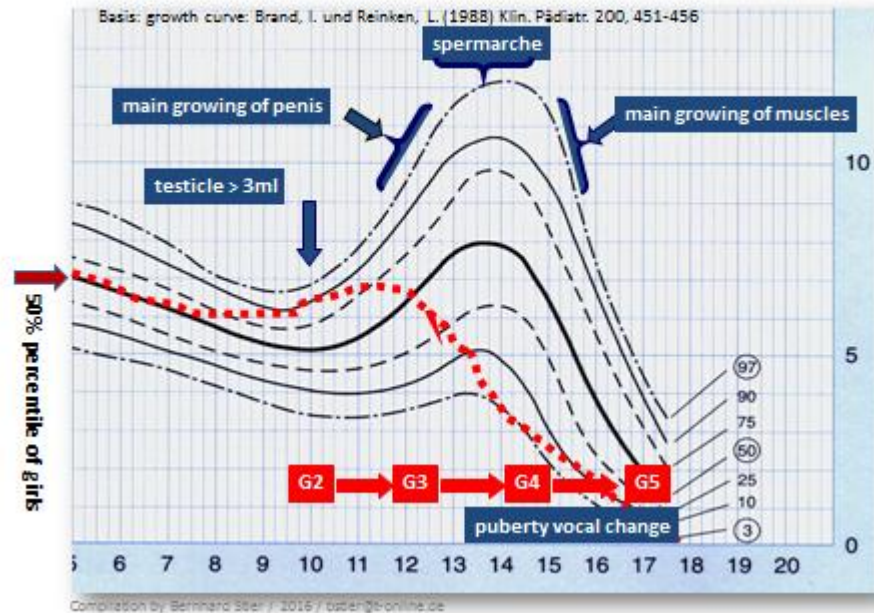
developmental stages in adolescent girls



Compilation by Bernhard Stier / 2016 / bstier@t-online.de

Appendix 2

developmental stages in adolescent boys



Further Resources

Adolescent Growth and Development - Virginia Cooperative Extension

<http://pubs.ext.vt.edu/350/350-850/350-850.html>

Ohio State University Medical Center

http://medicalcenter.osu.edu/patientcare/healthcare_services/mens_health/puberty_adolescent_male/Pages/index.aspx

Neinstein L. Puberty

<http://www.usc.edu/adolhealth>



Deborah Christie, Russell Viner Adolescent development. BMJ 2005; 330 doi: <http://dx.doi.org/10.1136/bmj.330.7486.301> (Published 03 February 2005)
<http://www.bmj.com/content/330/7486/301>