Growth and development: Introduction

Dr Vidushi

Why do we need to know?

- Monitor child's progress
- Identify delay or abnormalities in development
- Counsel parents to maximise each child's potential

Normal growth from conception to birth:

- Embryonic period: conception to 8 weeks
- Fetal period: 9 weeks to birth

Embryonic period

- 6 days: implantation begins (blastocyst)
- 2 weeks: implantation complete, uteroplacental circulation begins, embryo –ectoderm, endoderm
- 3 weeks: mesoderm, primitive neural tube, blood vessels, paired heart tubes begin to pump
- 5 weeks: 3 main divisions of brain evident
- 4-8 weeks: folding of embryological plate- humanlike shape, somites, branchial arches, lens placode appears
- Embryo- 9 gm, CRL- 5cm

Cleavage: From Zygote to Blastocyst

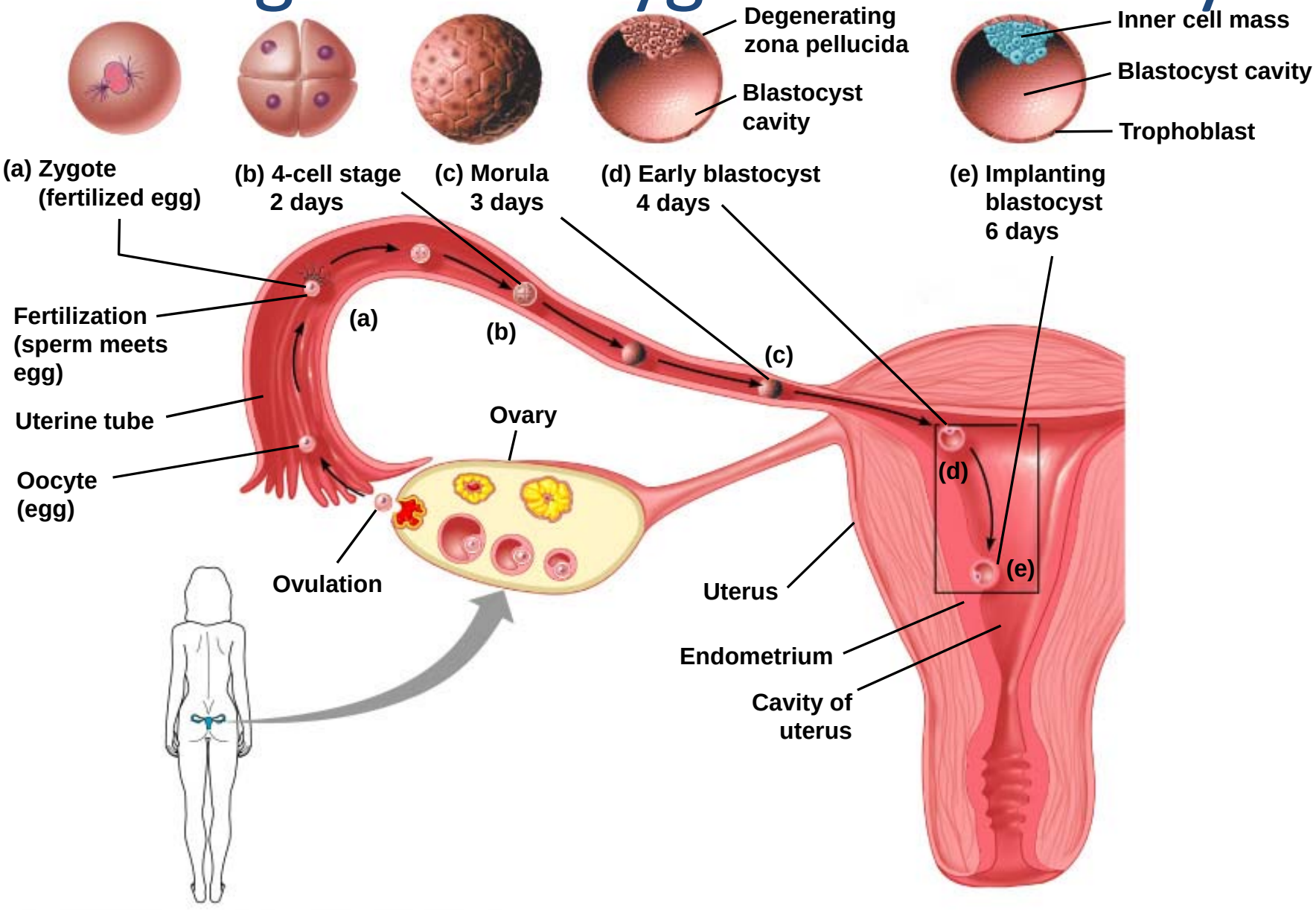
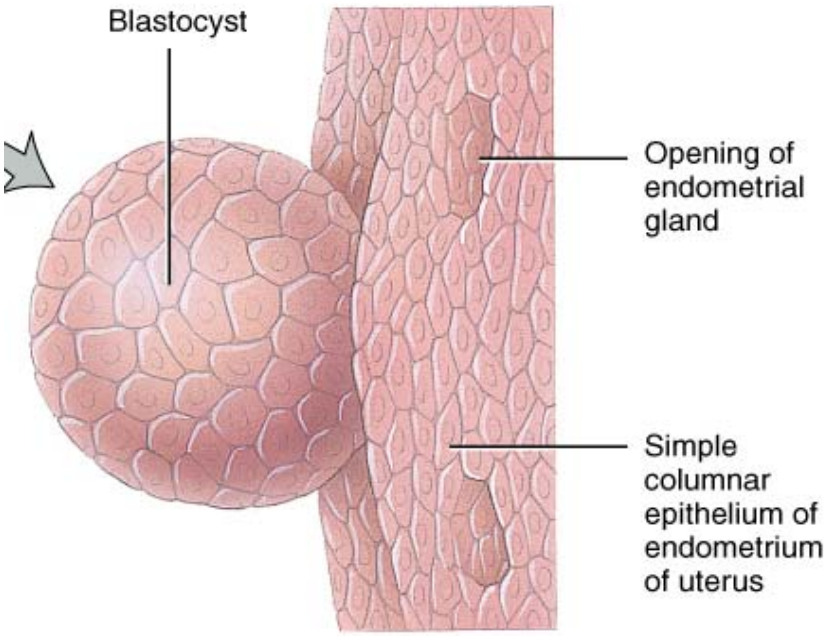
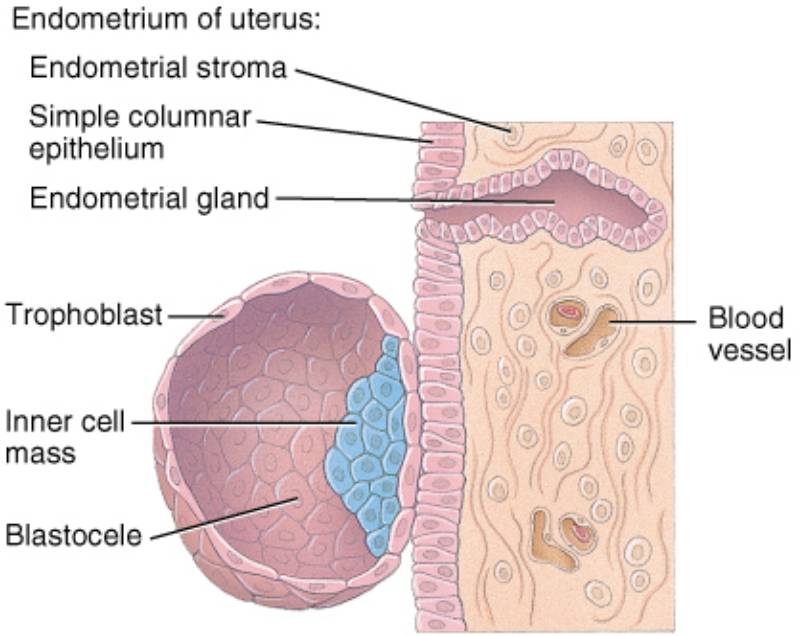
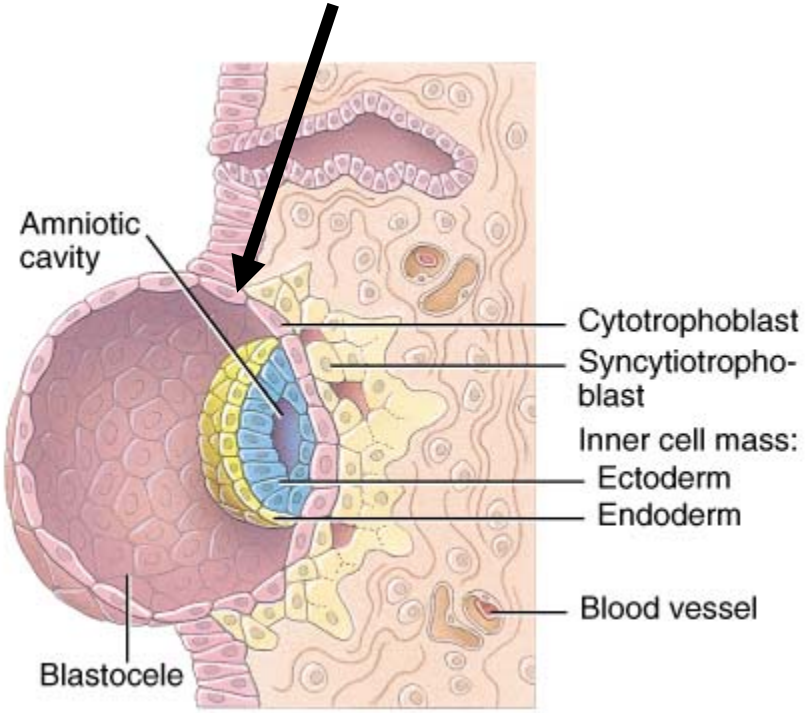


Figure 28.4

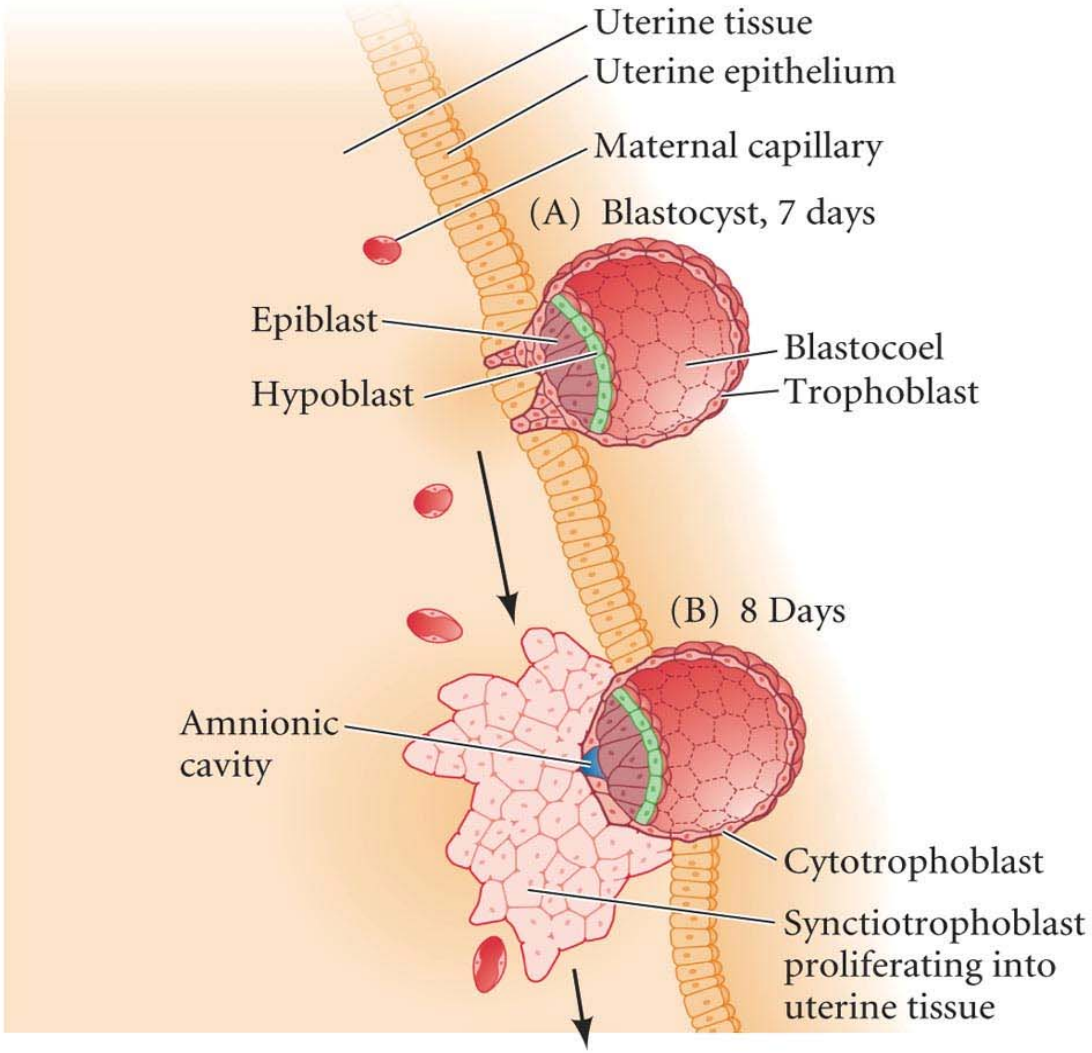
Implantation







Tissue Formation in the Human Embryo Between Days 7 and 11



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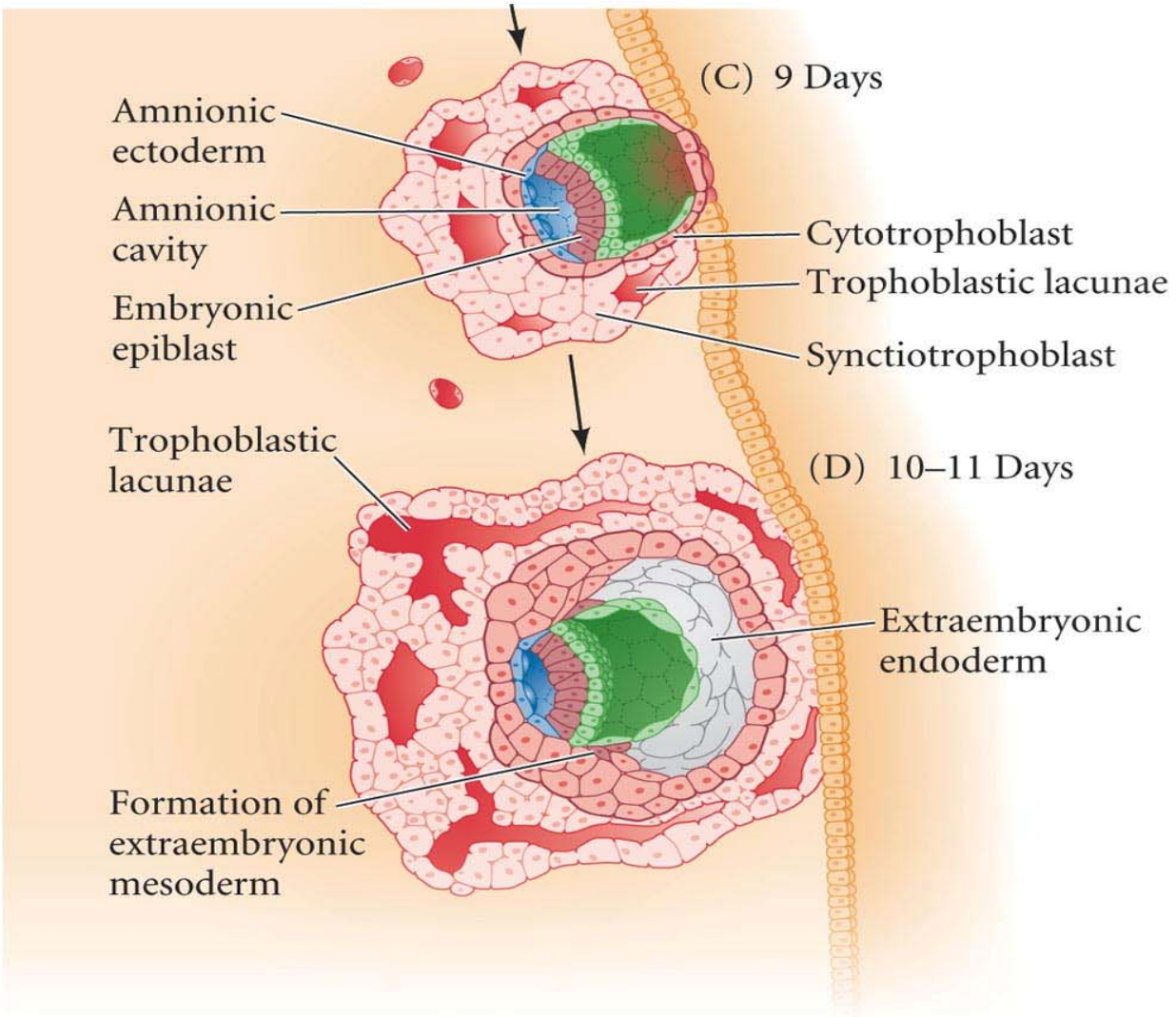
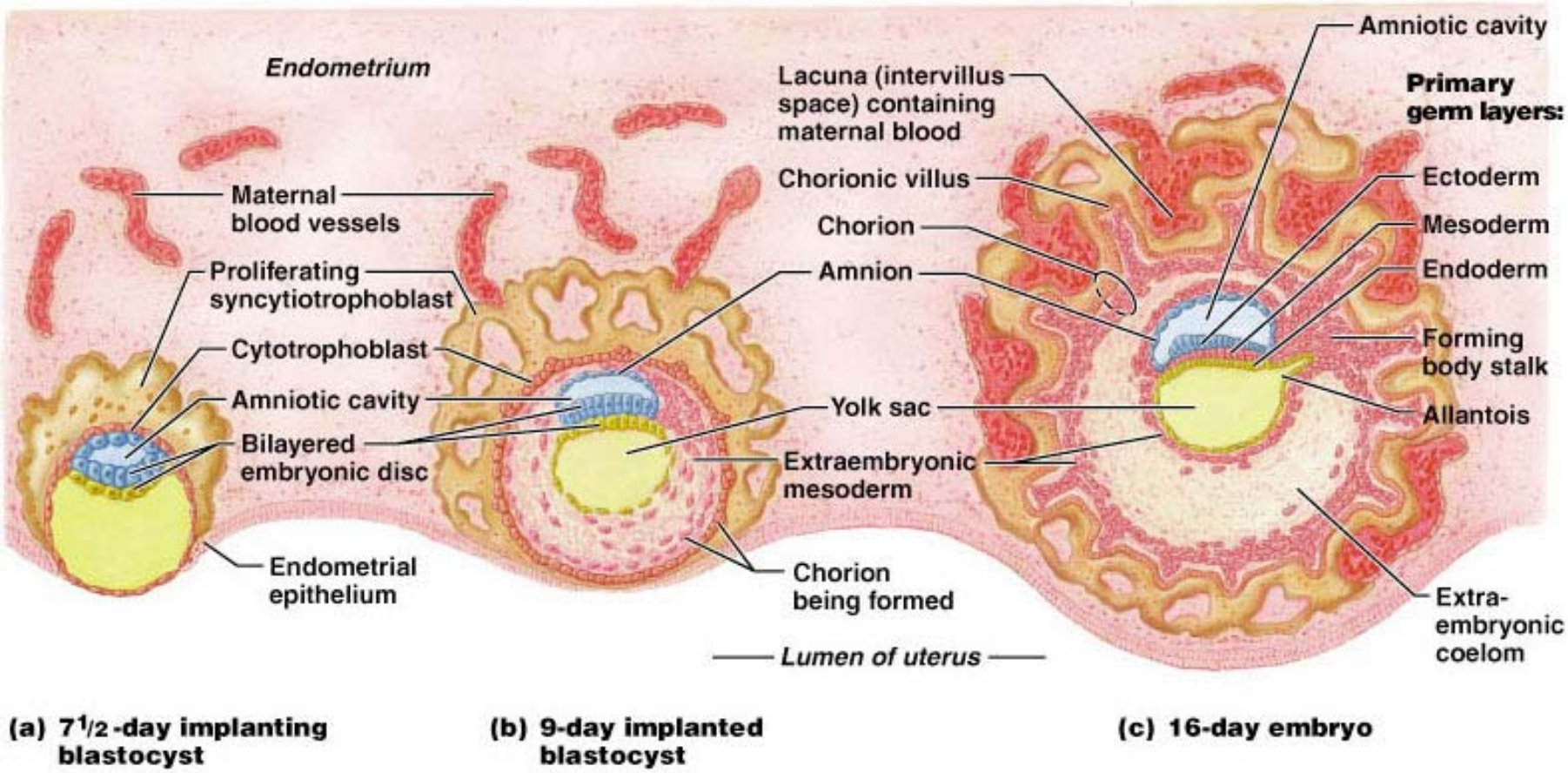


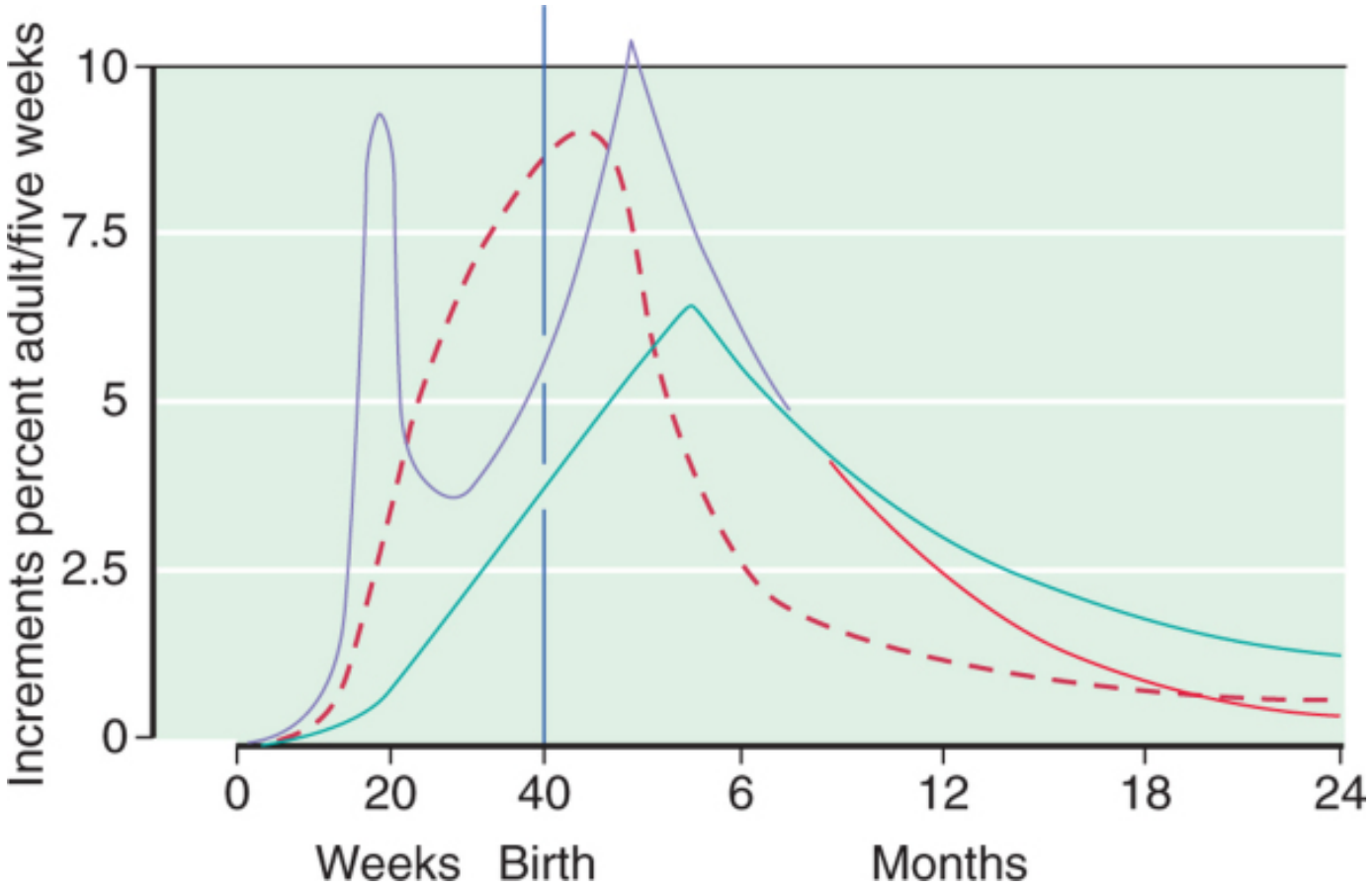
Placentation



Fetal period

- 12 weeks: external genitalia distinguishable
- 13-14 weeks: breathing & swallowing movt
- 17 - 27weeks: grasp reflex appears
- 20-24 weeks: surfactant production begins
- 20 weeks onwards: myelinisation begins
- 28 weeks: eye opening, 1000gm, early sucking
- 34 weeks: coordinated sucking & swallowing
- 40 weeks : Term gestation

Velocity curves - Human brain growth



***Solid line with two peaks*, DNA; *dashed line*, brain weight; *solid line with a single peak*, cholesterol**

Anthropometry-assessment of growth

- Weight: gm/kg
- Weighing machines: manual,electronic
- length/height: cm/m
- child supine on a measuring board (infantometer)
- Height- (for older children) stadiometer
- Head circumference: measuring tape-supraorbital ridge to external occipital protuberance
- BMI-wt(kg)/ht2(m2)
- Midarm circumference: midpt from acromion-olecranon

- Normal newborn-3 kg, 50 cm, 35cm
- 30gm/d-1st 3 mo, 400 gm/month every month for 1st 1 year
- BW doubles by 5mo, trebles by 1yr, quadruples by 2 yr
- 2kg / yr added till 6 yrs, 3kg/yr till puberty
- Midpoint of body in child-umbilicus (vs. pubic symphysis in adult)
- Upper segment-vertex to pubic symphysis
- Lower segment- pubic symphysis to heel
- US:LS=1.7:1

- Length- 75 cm-1 yr, 87 cm-2 yr, 100 cm-4 yr
- 6 cm/yr added till puberty
- HC-2 cm/mo-1st 3 mo, 1 cm/mo-4-6 mo, 0.5 cm/mo-6-12 mo
- Ant fontanelle-9-18 mo
- Post fontanelle-2-4 mo
- Failure: hypothyroidism, rickets, hydrocephalus
- Preterm catchup growth- 2yr

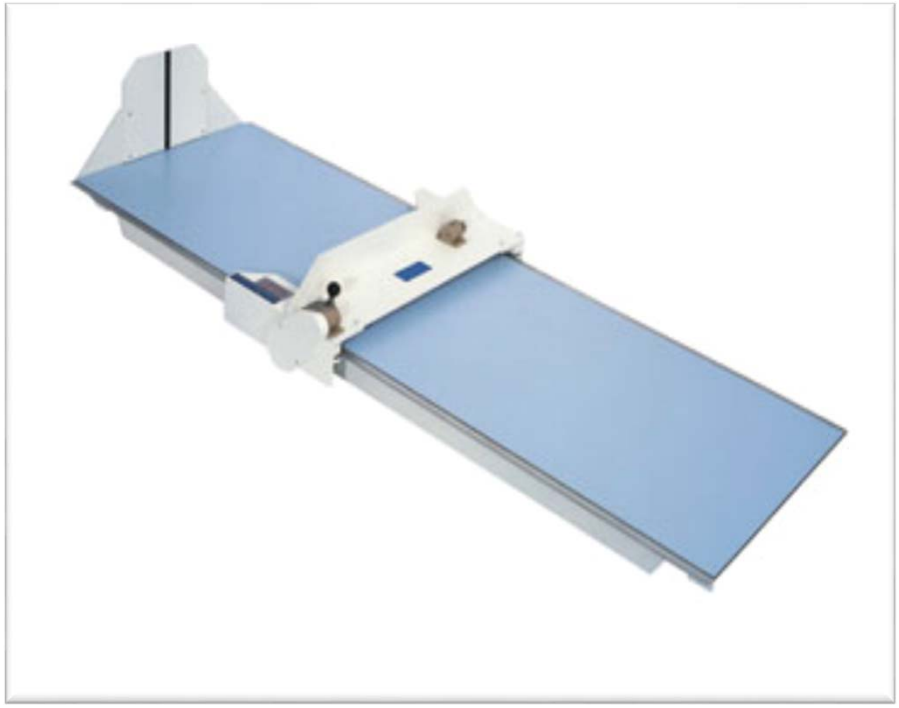
Formulas for approx wt & ht of normal children

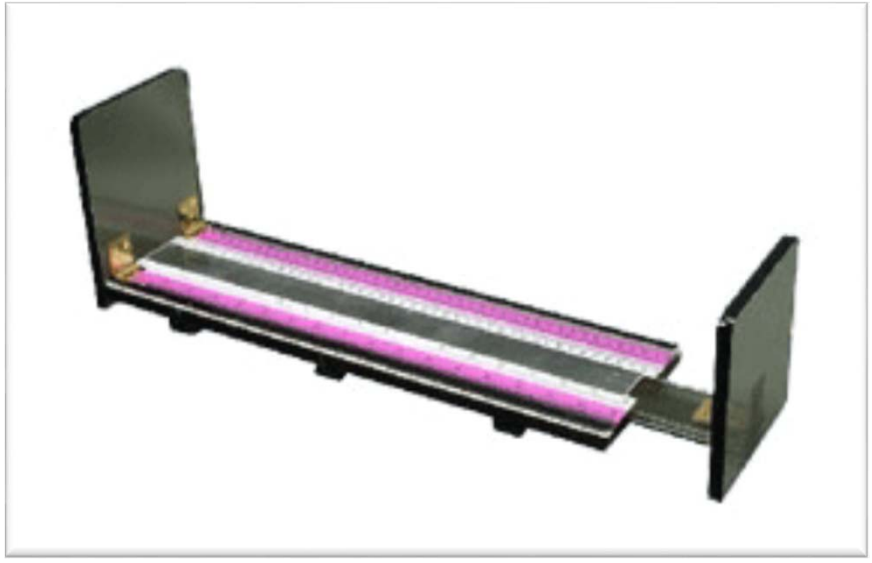
- At birth 3kg
- 3-12 months: $\frac{\text{age(mo)}+9}{2}$
- 1-6yr:age(yr)x2+8
- 7-12yr:$\frac{\text{age(yr)x7-5}}{2}$
- At birth=50 cm
- 1yr=75 cm
- 2-12yr: age(yr)x6+77
- BMI=$\frac{\text{wt(kg)}}{\text{ht(m)}^2}$

Manual Weighing Scale

Electronic Weighing Scale

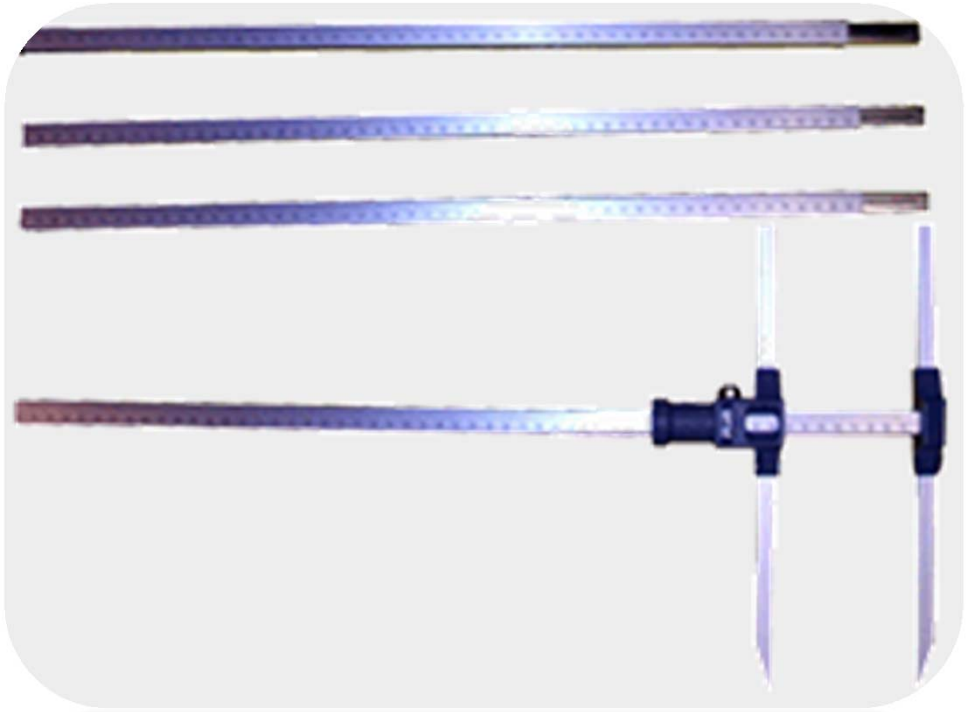
Infantometer





Stadiometer

Calipers



Growth monitoring

- Target -<5 yrs
- Basic activity of under 5 clinics
- Monthly-1st yr, 2mnthly-2nd yr,3mnthly till 5 yr

Aim

- Identify children with growth deviation
- Identify diseases & conditions that manifest through abnormal growth
- Promote health related to feeding, hygiene, immunisation
- Educate parents and allay their anxiety about their child’s growth
- Evaluating tool for various health programmes- school health, midday meal, IMNCI

Statistics

- Normal=healthy (routine)
- Normal=set of values generate a bell shaped or gaussian distribution
- Ideal bell shaped curve, mean, median, mode are same
- Mean=arithmetic average
- Mode=value having highest no. of observations
- Median=value above & below which 50% of observations lie
- Skewed distribution-mean, median, mode are not same
- Standard deviation (SD)-degree of dispersion of the observations away from the mean
- $2/3^{RD}$ of observations (68%) fall within 1 SD above or below the mean
- 95% of observations fall within 2SD above or below the mean
- 99.7% of observations fall within 3SD above or below the mean
- Values beyond 2SD are rare and beyond 3SD grossly abnormal

Statistics contd……

- Percentile-% of individuals who have achieved a certain measured quantity or a developmental milestone
- Used to represent the position of a particular measurement in the bell shaped curve
- 1 SD= 16^{th} and 84^{th} centile
- 2 SD=3^{rd} and 95^{th} centile
- Permissible normal range of variation =3-95^{th} centile or +/- 2 SD

Which charts to use?

- Regional/ethnic differences-national representative sample of population data ideal as growth standards
- NCHS, USA-international growth standards
- ICMR-1956/65 nationwide study , children of low SES
- Agrawal-1989-91, children of affluent urban families from all zones, birth-18 yrs
- WHO-birth-5 yrs

Representation of data

- 5 gender specific charts

1)Weight for age

2)Height for age

3)Head circumference for age

4)Weight for height

5) BMI

Growth chart

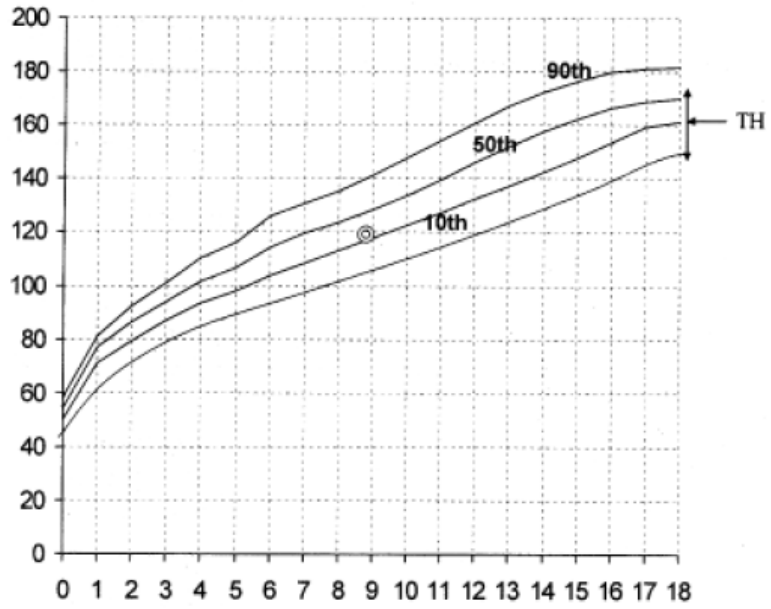
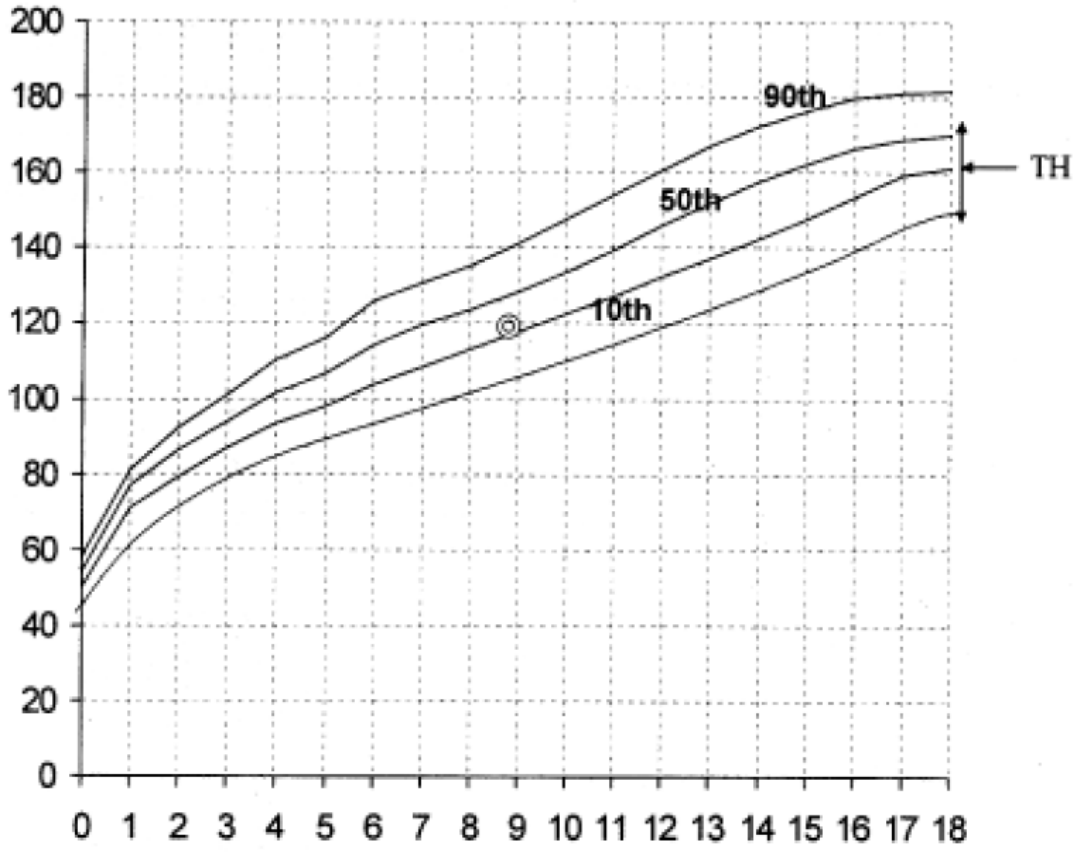


Fig. 1. Calculation of Target Height and Target Height Centile. Measure the parent's heights and make a note of their heights on the chart. Calculate the child's target height (TH) and plot it at 18 years and mark it with an arrow on the growth chart. This represents the child's projected height and the target range is produced by plotting two points 7.5 cms above and below for a boy and 6 cm above and below for a girl (representing the 10th and the 90th centile for that child). In the example shown above, the 50th percentile for the general population is the 90th centile for the child measured and the 10th centile for the child is below the 10th centile for the population.

Source: Cowell CT. Short Stature. In: Clinical Pediatric Endocrinology, 3rd edn. Ed. Brook CGD. London, Blackwell Science, 1995; pp 136-172.


200
180
160
140
120
100
80
60
40
20
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
90th
50th
10th
TH

How to use growth chart...

- child's name, DOB, other details entered on growth chart

  chart explained---keep properly----bring every visit------ in a plastic sleeve
- measure the parents & make a note of their ht on chart
- Calculate child's target ht& plot it at 18 yrs& mark it with an arrow on the growth chart

Target ht=0.54x(ht at age3)+0.54(miparental ht)+38/26
or 2(ht at age 1.5 /2yrs)

This is the child's projected ht

- Midparental ht=(maternal ht+paternal ht+13)/2

…How to use growth chart?

- Present ht centile is judged by tracing a line backward from target to current ht.
- Target range is by plotting 2 points(6 cm for females, 7.5 cm for males) above and below target ht-3rd and 97th centile for that child
- All points on growth chart should be marked as dots not circle
- Ht& wt to be recorded. join dots uptil previous dots
- Remind parents for next time of measurement

Recommended intervals for growth monitoring

- Birth-3 yr: immunisation contact at birth, then 6 monthly
- Normally growing babies shouldnot be weighed 1/2 wk till 6 months, 1/month thereafter
- BMI/SMR assessed yrly from 6 yrs

Criteria for referral

- <3rd or >97th centile
- Crossing of 2 centile line (upward or downward)
- Wt loss or lack of wt gain for 1 month in 1st 6 months, for 2-3 months in next 6 months
- Micropenis
- Ambiguous genitalia
- Ul or bl undescended testis

Abnormal growth pattern-failure to thrive

- Physical growth is < of peers. Assoc with poor developmental & cognitive functioning
- Growth < 3rd or 5th centile
- Change in growth that has crossed 2 major growth centiles
- Aetiology: failure of parent to offer adequate calories
  failure of child to take adequate calories
  failure of child to retain adequate calories

- Organic FTT----------Psychosocial FTT
- Underlying medical condition
- **Psychosocial**-1)parental neglect
  2) poor parent knowledge
  3) parent problem-mental health, interaction problem

Organic FTT

- Neurological- CP, neurodeg, neuromusc
- Renal-UTI, RTA, RF
- Endocrine-DM,DI,GH defcy
- Genetic-IEM, skeletal dysplasia
- GI-pyloric stenosis, GERD, Celiac disease
- Cardiac-CHD,CCF
- Pulm-CF,BPD
- Infection-TB,HIV,IU infection

Classification of FTT…

- Weight for age:
  - Mild-75-90%
  - Moderate-60-74%
  - Severe-<60%
- Height for age:
  - Mild-90-95%
  - Moderate-85-89%
  - Severe-<85%

…Classification of FTT

- Wt/ht:
  - Mild-81-90%
  - Moderate-70-80%
  - Severe-<70%
- In FTT 1st to decrease--------wt for age
  then ht for age
- Chronic FTT –wt/ht maybe normal

Diagnosis

- History
- Physical examination
- Lab investigation

Symptomatology…

- Failure to meet expected age norms for wt,ht
- Alopecia
- Loss of subcut fat
- Decreased muscle mass
- Dermatitis
- Recurrent infections- scabies, thrush
- Neglect of hygiene-uncut nails, diaper rash,impetigo
- Dev delay-absent eye contact, hypotonia, expressionless face, absence of cuddling response

Symptomatology

- Recurrent vomiting- GERD
- Rash around lips on eating food- food allergy
- Diarrhea, fatty stool- malabs, int parasites, CD, milk prot intolerance
- Snoring, mouth breathing, enlarged tonsils- adenoid hypertrophy, OSA
- Recurrent infection- immunodefcy

Lab investigation

- CBC
- Urine
- Bone age: familial short stature vs nutritional/endocrine
- Rest as indicated by clinical examination

Indication for hospitalisation

- Severe malnutrition
- Further diagnostic workup
- Evaluation of parent child interaction
- Diet plan-150 kcal/kg
- Catchup growth=30gm/d

Prognosis

- FTT in 1st yr- ominous
- 1/3 children with psychosocial FTT-dev delay& social/emotional problems

Abnormal growth pattern-short stature

- Height (ht) below 85% of expected or below 3rd centile
- Chronological age=actual age
- Height age=age at which 50th centile for the current ht is reached
- Bone age/skeletal maturation-study of epiphyseal maturation pattern of various bones, time of fusion of epiphyses with respective long bones

Bone age

- Skeletal maturation- lower end of femur
  upper end of tibia
- Carpal bones- 1 yr-2 , 3-4yr-3, +1/yr ,8^{th}-12 yr
- Bone age, ht age ,chronological age
- Familial short stature-bone age is normal(=chronological age)
- Constitutional delay, endocrinological short stature, undernutrition-bone age is low comparable to ht age

Propotionate short stature-

Normal variant

1)Constitutional delay

2) Familial

Antenatal causes

1) IUGR
2) IU infection
3) Genetic disorder(chromosomal &metabolic)

Postnatal causes

1) Nutritional dwarfism-PEM
2) Chronic visceral disease(renal, malabsorption, chronic infections, anemia, cardiopulmonary)
3) Endocrine- hypothyroidism, hypopituitarism
4) Psychosocial (emotional deprivation)

Constitutional delay

- h/o delay in puberty in one of the parent
- BW & ht are normal
- Rate of growth is less from early life
- Final adult ht is normal
- Bone age < chronological age
- No treatment; reassurance

Familial short stature

- h/o short stature in parent or 1st degree relative
- Ht maybe < 3rd centile
- Rate of growth less than normal but >/= 4cm/yr
- Puberty occurs at the expected age
- Bone age= chronological age

IUGR/Nutritional/Gentic

- Arrest of fetal growth in embryonic period----- diminished growth potential in postnatal life

- Nutritional-PEM, Zn defcy

- Genetic-downs, turner’s syndrome
- Metabolic-DM,DI,IEM

Chronic visceral disease

- Chronic infection-TB, empyema, CRF,CHD,CLD
- Malabs-CD,CF,Giardiasis
- Hemat-anemia, thal, SCD

Endocrine

- **GH defcy**-
- BW & ht normal
- Rate of growth regular but slow<4 cm/yr
- Bone age< chronological age
- Gonadal development infantile
- hGH assay >10 ng/ml excludes defcy
- Close D/D:Laron's syndrome- hGH inc, somatomedin levels decr

- **Hypothyroidism**-
- Short, stocky, dull, face puffy, skin & subcut tissue thickened, protuberant abdomen, umb hernia
- Bone age, puberty delayed
- T4 decr, TSH incr

- **Cushing's syndrome**-
- Obesity, moon shaped facies, abdominal striae, hypertension, diminished glucose tolerance
- Excess secretion of glucocorticoids by adrenal cortex

Dispropotionate short stature

Short limbs(*UL don't reach midpelvis in infancy, upper thigh after infancy****)***

1)chondrodysplasia- achondroplasia, hypochondroplasia

2) OI, deformity due to rickets

Short trunk (*short neck, small chest, protuberant abdomen****)***

1)Mucopolysaccharidosis

2) Spondylo-epiphyseal dysplasia

Screening investigation

- CBC
- BU, creat
- Ca,P,ALP
- LFT
- Anion gap
- RBS
- TFT
- Chronic anemia, chronic infection
- Chronic Renal Failure
- Rickets
- Chronic liver disease
- RTA
- DM
- Hypothyroidism

- Urine R/E
- Stool microscopy
- Radiology-xray skull
- xray wrist

- CRF,RTA
- Giardiasis
- Suprasellar calcification (craniopharyngioma)
- Bone age: Familial short stature-bone age is normal(=chronological age)
- Constitutional delay, endocrinological short stature, undernutrition-bone age is low comparable to ht age
- rickets

Approach to short stature

- History-parental ht, onset of puberty
- Physical examination
- Anthropometry (US:LS), growth charting, midparental ht
- Bone age
- Screening investigation
- Karyotyping(in females), test for GH defcy, RTA, malabs

Case

Vishal, 13 months

- Length - 63 cm
- Weight – 10 kg
- HC- 44 cm
- US:LS-1.56:1
- Arm span – 57 cm
- Mid parental Ht- 159 cm
- Father- 154 cm
- Mother – 138 cm
- ht age=4months
- Bone age - ?


6

On examination:

Frontal bossing, wrist widening, potbelly, Hepatosplenomegaly, lumbar lordosis, dysmorphism (?trident likehand)

Possibilities:1)s/o rickets

Odd- no bowing of legs

2) Familial short stature

3) achondroplasia

Further plan

- Radiology-Bone age, rickets
- Screening investigations
- Follow up- serial growth charting

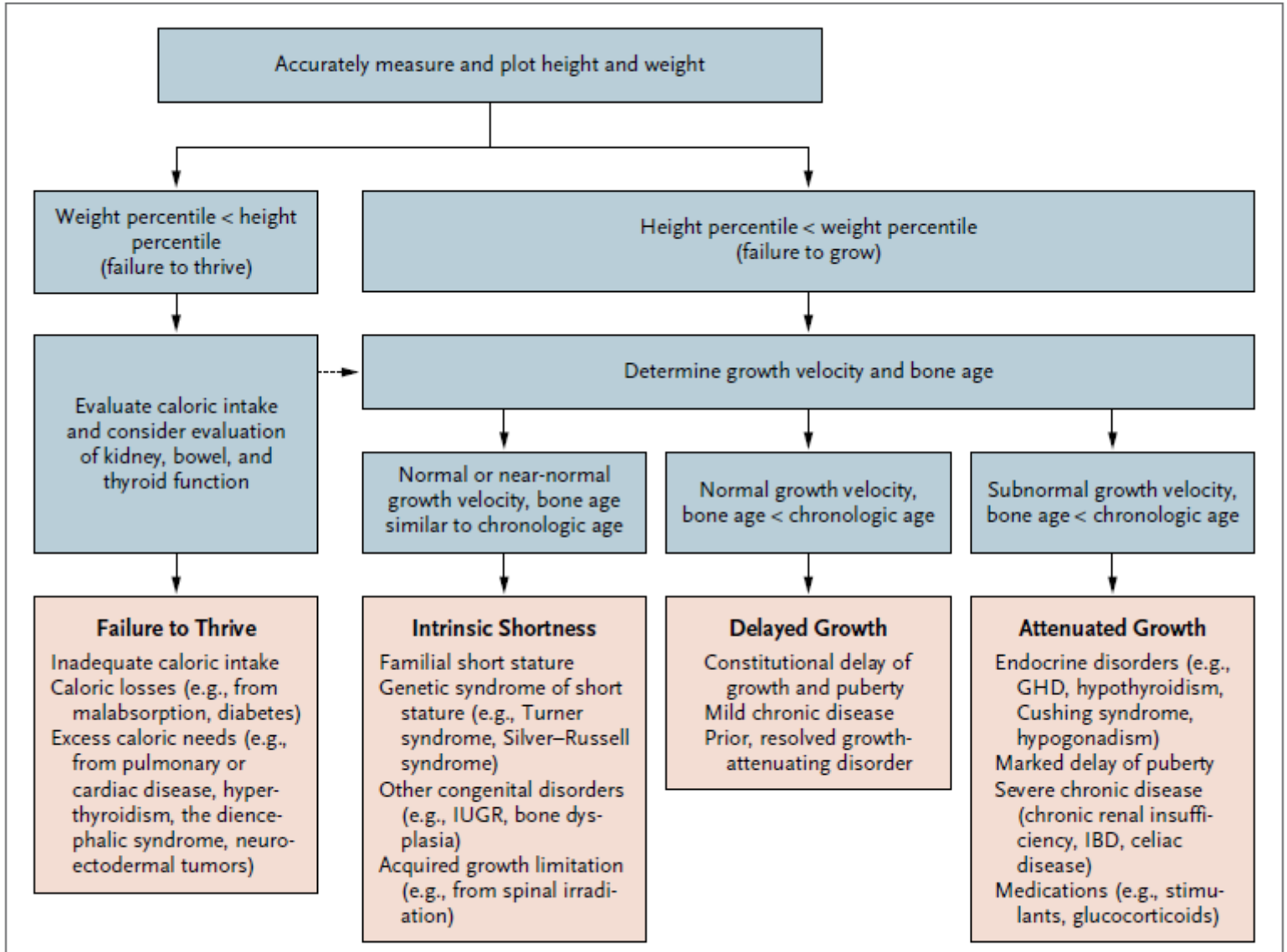


Figure 2. Conceptual Approach to the Evaluation and Differential Diagnosis of Slow Growth and Short Stature in Childhood.

Sexual maturity rating(SMR)

- ***Adoloscence***: a period of development
- Early-10-13yrs
- Middle-14-16 yrs
- Late-16-19yrs
- ***Puberty*** :biological process by which child becomes an adult
- Appearance of secondary sexual characters
- Increase to adult size
- Dev of reproductive capacity

- In girls 1st visible sign of puberty & hallmark of SMR2-thelarche(8-12 yrs)----pubearche-----menarche(2-2.5 yrs later)=SMR3&4=Around peak ht velocity
- In boys 1st visible sign of puberty & hallmark of SMR2-testicular enlargement-----penile growth(SMR3)--------peak ht(SMR4)

- Gain 25% of adult ht

  50% of adult wt during adoloscence
- Peak growth velocities for both sexes is reached in SMR3&4
- Boys typically peak 2-3 yrs later than girls& continue their linear growth for 2-3 yrs after girls have stopped
- Voice changes in boys occur in SMR4

AGE AT ERUPTION

	Maxillary	Mandibular
Central incisors	6–8 mo	5–7 mo
Lateral incisors	8–11 mo	7–10 mo
Cuspids (canines	16–20 mo	16–20 mo
First molars	10–16 mo	10–16 mo
Second molars	20–30 mo	20–30 mo
SECONDARY TEETH		
Central incisors	7–8 yr	6–7 yr
Lateral incisors	8–9 yr	7–8 yr
Cuspids (canines	11–12 yr	9–11 yr

….Chronology of Human Dentition

SECONDARY TEETH	Maxillary	Mandibular
First premolars	10–11 yr	10–12 yr
Second premolars	10–12 yr	11–13 yr
First molars	6–7 yr	6–7 yr
Second molars	12–13 yr	12–13 yr
Third molar	17–22 yr	17–22 yr

Emerging Patterns of Behavior During the 1st Year of Life

- **(1ST 4 WK)**
- **Prone: Lies in flexed attitude; turns head from side to side; head sags on ventral suspension**
- **Supine: Generally flexed and a little stiff**
- **Visual: May fixate face on light in line of vision;“doll's-eye” movement of eyes on turning of the body**
- **Reflex: Moro response active; stepping and placing reflexes; grasp reflex active**
- **Social: Visual preference for human face**

- **AT 1 MO**
- **Prone: Legs more extended; holds chin up; turns head; head lifted momentarily to plane of body on ventral suspension**
- **Supine: Tonic neck posture predominates; supple and relaxed; head lags when pulled to sitting position**
- **Visual: Watches person; follows moving object**
- **Social: Body movements in cadence with voice of other in social contact; beginning to smile**

- **AT 2 MO**
- **Prone: Raises head slightly farther; head sustained in plane of body on ventral suspension**
- **Supine: Tonic neck posture predominates; head lags when pulled to sitting position**
- **Visual: Follows moving object 180 degrees**
- **Social: Smiles on social contact; listens to voice and coos**

3 MO

- **Prone: Lifts head and chest with arms extended; head above plane of body on ventral suspension**
- **Supine: Tonic neck posture predominates; reaches toward and misses objects; waves at toy**
- **Sitting: Head lag partially compensated when pulled to sitting position; early head control with bobbing motion; back rounded**
- **Reflex: Typical Moro response has not persisted; makes defensive movements or selective withdrawal reactions**
- **Social: Sustained social contact; listens to music; says “aah, ngah”**

AT 4 MO

- **Prone: Lifts head and chest, with head in approximat axis; legs extended**
- **Supine: Symmetric posture predominates, hands in midline; reaches and grasps objects and brings them to mouth**
- **Sitting: No head lag when pulled to sitting position; head steady, tipped forward; enjoys sitting with full truncal support**
- **Standing: When held erect, pushes with feet**
- **Adaptive: Sees pellet, but makes no move to reach for it**
- **Social: Laughs out loud; may show displeasure if social contact is broken; excited at sight of food**

AT 7 MO

- Prone: Rolls over;crawls or creep-crawls (Knobloch)
- Supine: Lifts head; rolls over; squirms
- Sitting: Sits briefly, with support of pelvis; leans forward on hands; back rounded
- Standing: May support most of weight; bounces actively
- Adaptive: Reaches out for and grasps large object; transfers objects from hand to hand; grasp uses radial palm;
- Language: Forms polysyllabic vowel sounds
- Social: Prefers mother; babbles;enjoys mirror; responds to changes in emotional content of social contact

AT 10 MO

- **Sitting: Sits up alone without support, with back straight**
- **Standing: Pulls to standing position;“cruises” or walks holding on to furniture**
- **Motor: Creeps or crawls**
- **Adaptive: Grasps objects with thumb and forefinger; pokes at things with forefinger; picks up pellet with assisted pincer movement; uncovers hidden toy; attempts to retrieve dropped object; releases object grasped by other person**
- **Language: Repetitive consonant sounds (“mama,” “dada”)**
- **Social: Responds to sound of name; plays peek-a-boo or pat-a-cake; waves bye-bye**





AT 1 YR

- **Motor: Walks with one hand held (48 wk); rises independently, takes several steps (Knobloch)**
- **Adaptive: Picks up pellet with unassisted pincer movement of forefinger and thumb; releases object to other person on request or gesture**
- **Language: Says a few words besides “mama,” “dada”**
- **Social: Plays simple ball game; makes postural adjustment to dressing**

15 MO

- **Motor: Walks alone; crawls up stairs**
- **Adaptive: Makes tower of 3 cubes; makes a line with crayon; inserts raisin in bottle**
- **Language: Jargon;follows simple commands; may name a familiar object (e.g., ball)**
- **Social: Indicates some desires or needs by pointing; hugs parents**

1 8 MO

- **Motor: Runs stiffly; sits on small chair; walks up stairs with one hand held; explores drawers and wastebaskets**
- **Adaptive: Makes tower of 4 cubes; imitates scribbling; imitates vertical stroke; dumps raisin from bottle**
- **Language: 10 words (average); names pictures; identifies one or more parts of body**
- **Social: Feeds self; seeks help when in trouble; may complain when wet or soiled; kisses parent with pucker**

24 MO

- **Motor: Runs well, walks up and down stairs, one step at a time; opens doors; climbs on furniture; jumps**
- **Adaptive: Makes tower of 7 cubes (6 at 21 mo); scribbles in circular pattern; imitates horizontal stroke; folds paper once imitatively**
- **Puts 3 words together (subject, verb, object)**
- **Social: Handles spoon well; often tells about immediate experiences; helps to undress; listens to stories when shown pictures**

30 MO

- **Motor: Goes up stairs alternating feet**
- **Adaptive: Makes tower of 9 cubes; makes vertical and horizontal strokes, but generally will not join them to make cross; imitates circular stroke, forming closed figure**
- **Language: Refers to self by pronoun “I”; knows full name**
- **Social: Helps put things away; pretends in play**

36 MO

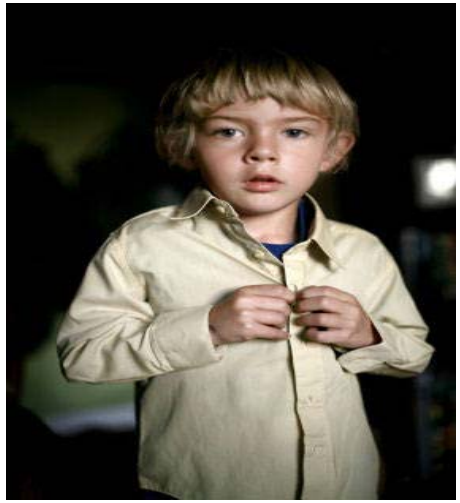
- **Motor: Rides tricycle; stands momentarily on one foot**
- **Adaptive: Makes tower of 10 cubes; imitates construction of "bridge" of 3 cubes; copies circle; imitates cross**
- **Language: Knows age and sex; counts 3 objects correctly**
- **Social: Plays simple games (in "parallel" with other children); helps in dressing (unbuttons clothing and puts on shoes); washes hands**

48 MO

- **Motor: Hops on one foot; throws ball overhand; uses scissors to cut out pictures; climbs well**
- **Adaptive: copies cross and square; draws man with 2 to 4 parts besides head; identifies longer of 2 lines**
- **Language: tells story**
- **Social: Plays with several children, with beginning of social interaction and role-playing; goes to toilet alone**

60 MO

- **Motor: Skips**
- **Adaptive: Draws triangle from copy; names heavier of 2 weights**
- **Language: Names 4 colors; repeats sentence of 10 syllables; counts 10 pennies correctly**
- **Social: Dresses and undresses; asks questions about meaning of words; engages in domestic role-playing**



Evaluation of a child with developmental delay

- History& physical examination

↓

Auditory & ophthalmological screening

↓

Are there features s/o specific diagnosis

1. Dysmorphism, neurocut markers-Down, fragile X, Turner, NF
2. Microcephaly, seizures, CP-asphyxia, CNS malformation
3. h/o parental consanguinity, unexplained child loss/ abortion

↓

Karyotyping neuroimaging metabolic screen other tests as
IQ testing genetic consultation indicated

Preventable causes of developmental delay

- Maternal abuse of drugs, alcohol
- Traumatic injury-fall, while driving, biking
- Poisoning-exploratory nature, easy access
- Vaccine preventable diseases-congenital infections
- Teen pregnancy
- Sexually transmitted diseases

Psychological & behavioural problems

- ***Colic***-starts 1-2 weeks of age

  peaks 4-6 weeks

  clears 3-4 months

Flexes legs, clenches feet, makes apparent sucking movements

Therapy: burping, nursing in prone position

Breath holding spells

- 6months-5yrs
- Cyanotic/pallid
- Pptating events: anger, frustation/fear, minor injury
- Cause of event: exhalation of air in the lungs → closure of vocal cords → breath held in expiration child turns blue → rigidity & opisthotonus → limpness
- 20% child suddenly become unconscious& apneic
- aborted following a stimulus like pinch

- Closest d/d:seizure-pptating event absent
  blue/pallid in late stages
- syncope

Vegetative disorders

- ***Pica***-repeated/ chronic ingestion of non nutritive substances like earth/ pencil/paint/ wool/ plaster
- Mouthing common in infants & toddlers
- >2 years –needs investigation
- Aetio-1) parental neglect
  2) mental retardation
  3) autism
- Increased risk of -1)lead poisoning
  2)parasitic infections
  3)Fe defcy anemia

Enuresis

Primary

- child has never been dry/continent
- 90%
- Aetio-delayed maturation of bladder function

Secondary

- Child has been dry for >6 months---then begins to wet
- 10%
- Aetio-stress/trauma

Classification

nocturnal

- delayed maturation of bladder function

diurnal

- Micturition deferral
- Uti
- Constipation
- Stress incontinence
- Diabetes mellitus

Management

- ***Basic investigations***-urine routine, urine c/s, urine osmolarity
- ***Treatment***-conservative-85%success rate

1. Enlist cooperation of the child
2. Parent can chart dry & wet nights. Positive reinforcement would help
3. Child should void before retiring
4. Wake the child after 3-4 hrs after she/he has slept, to void
5. Punishment/humiliation of the child by parents should be discouraged

Non conservative measures

- Bell and pad alarm-75%
- Drugs-2nd line -50%
- Imipramine, desmopressin
- S/E-imipramine: cardiac conduction disturbance
- DDAVP: hyponatremia, water intoxication, seizure

Habit disorders

- ***Bruxism/ teeth grinding:***
- Assoc with daytime anxiety
- Dental occlusion
- More enjoyable bedtime-reading, story telling

Thumb sucking-

- Self soothing behaviour
- >4-5 yrs
- Behaviour therapy
- Dental occlusion, callosities

Trichotillomania-

- Repetitive pulling of hair
- Onset-prepubertal