Growth in children

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PRINCIPLES

- What is normal?
- plot on a growth chart , need serial measurements
- crossing over percentiles
- Weight
- Index of nutrient
- Will improve if underlying issues are addressed
- Height

-should be measured at a six-month interval

- Measure height velocity
- mid parental height /puberty
- Head circumference

- Fontenelles & sutures

Weight - what is expected?

- First few days of life loose not more than 10% of birth weight

- Regain after 10 days

- The first few months expect 30 grams per day
- 3months to 12 months weight ***in pounds*** is equal to months plus 11
- Double birthweight at four months
- Triple birthweight at first year
- Quadruple end of 2nd year
- Between 2 to 9 years of age 5 pounds (2kg) per year
- At 7 years old - Seven times from birth weight

Height – Expected growth velocity

- Birth to one years -25 centimeters per year
- 1 to 2 years - 12.5 centimeters per year
- 2 to 3 years - 8 centimeters per year
- 3 years to puberty - 5 to 6 centimeters per year
- Adolescent puberty - up to 15 centimeters per year

Head growth – what is expected

- How many fontenelle do we have?
- Posteior fontenelle – closes up to 2 months
- Anterior Functional – closes at around 1 years

-Can be remained open until 18 months may close by three months

Look at head shape and sutures

Development

- Accusation of skills secondary to organ development
- IMPORTANT - Developmental regression vs delay
- Goes hand in hand with ggrowth
- Critical period may result in long term developmental deficits

Case 1

3 years 10 months girl

Concerns ：

- **Behavioural/Aggression**
- **Social difficulty**
- **Unhealthy weight**

Behaviour

- Screams when she's upset
- noise from television and loud noises
- Sometimes no obvious triggers
- Grandparents would give into her needs
- Aggressive towards parents
- Timeout not effective
- parents usually ignore

Social skill

- Playing with other children but prefers to play by herself.
- ? Pretend play
- The family has no concerns with her sleeps
- Eat by herself. She is not toilet trained
- Good eye contact, shares interest and emotions with her mother.
- Her diet is mainly restricted to yogurt, chips, bananas and crackers and she drink At least 750 mls of milk a day.

Language

- 2 to 3 word sentences but the speech may not be clear.
- Parrot what her parents or advertisement on the television.
- He can follow two the tree steps instruction.
- Count to 10
- Recognize more than 6 parts of her body.

Hearing, vision and motor skills

- Normal

History…

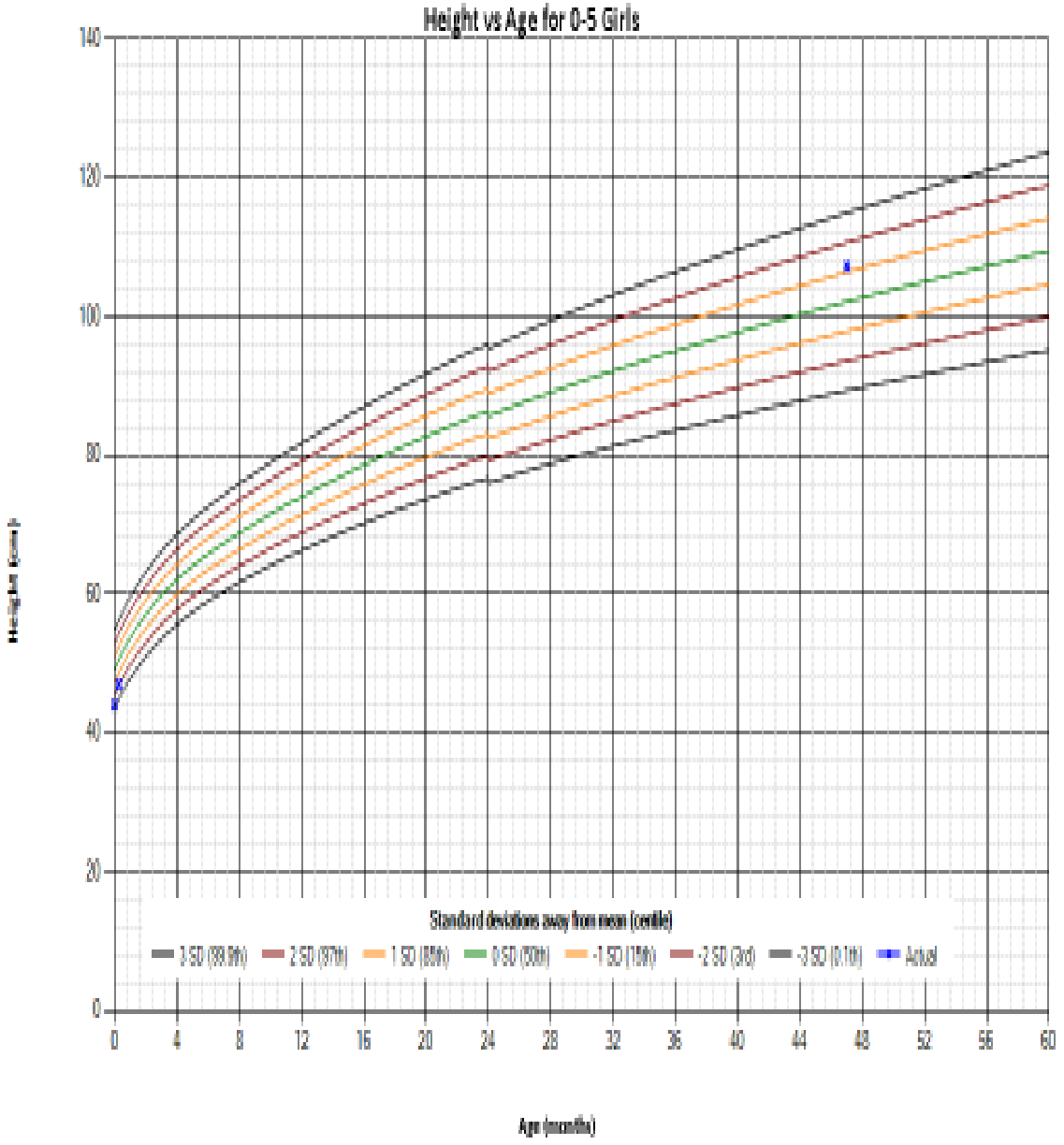
- Normal birth history
- No medication
- No allergies
- Immunization up to date
- Stays with parents and grandparents lives next door
- No Significant past medical history

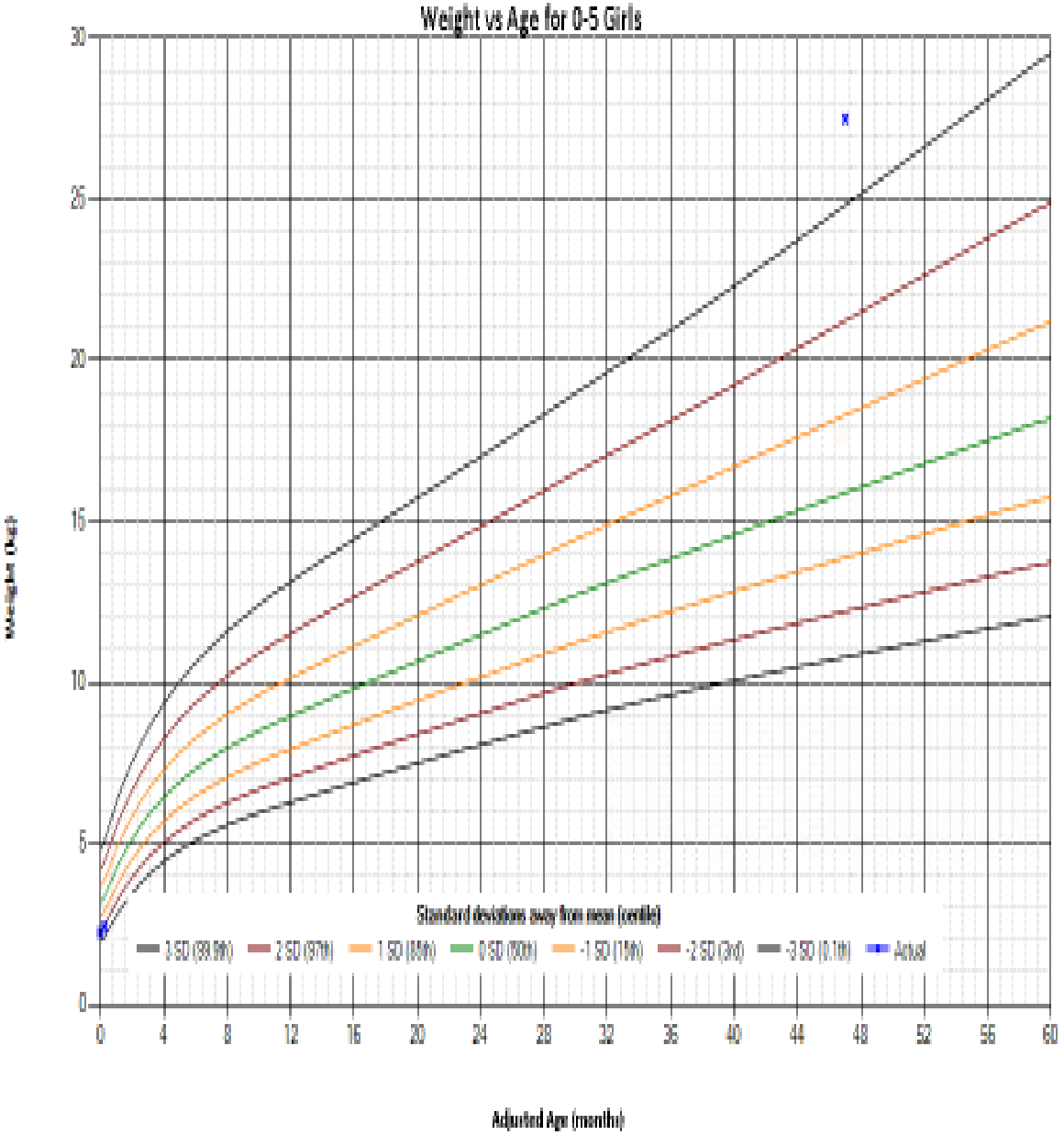
Examination

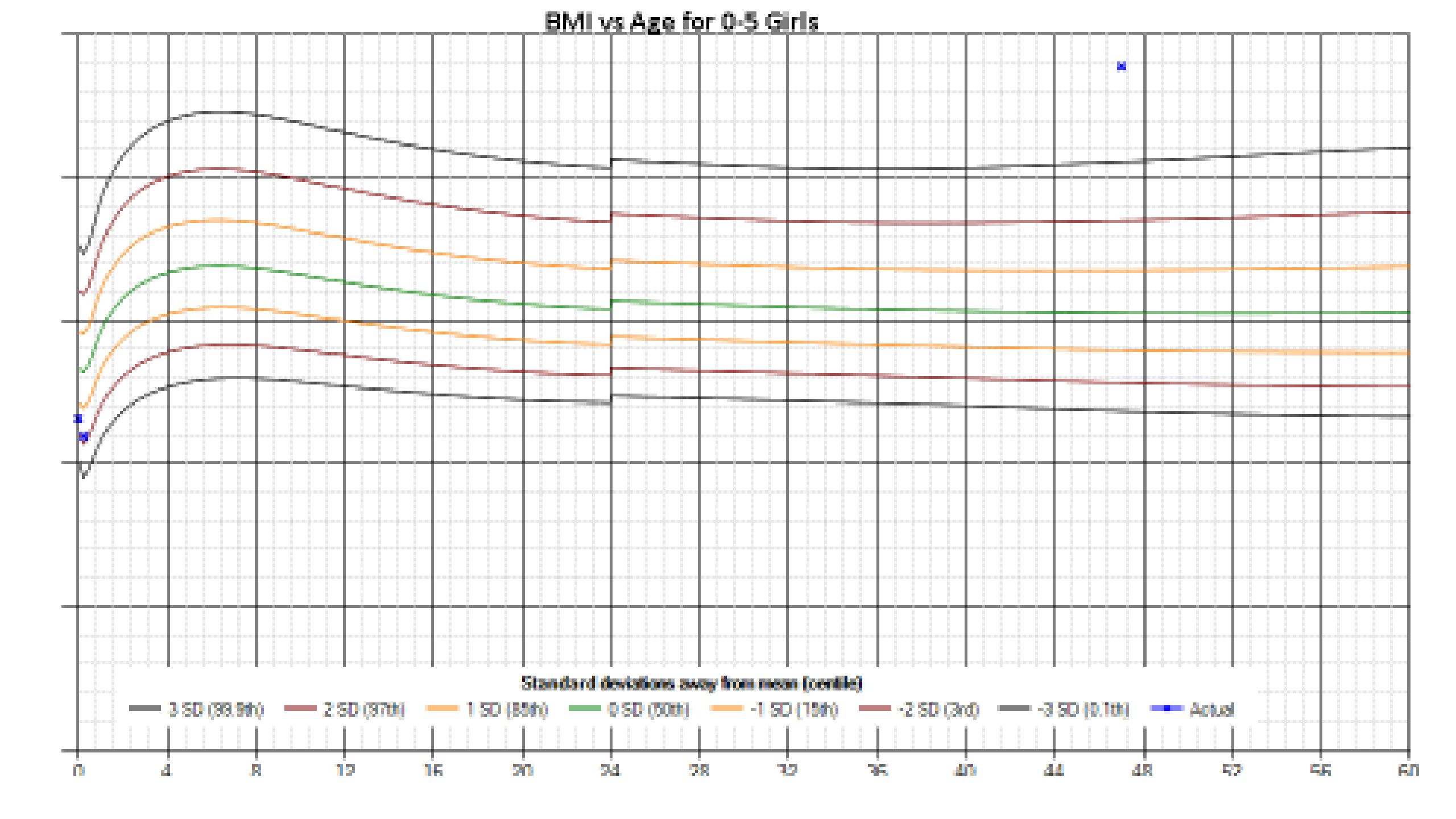
- Height was 107.3 cm (85th centile)
- Weight was 27.5 kilograms (>97 centile)
- BMI 23.89 >97 cent
- No obvious dysmorphic feature.
- Cardiorespiratory system was normal.
- Abdomen was big but soft, non tender with no obvious organomegaly.

Examination

- variable eye contact (looked at parents)
- constantly seeking attention from parents.
- many two to three word sentences (not clear).
- Refused many of my tasks.
- With the stethoscope she said “doctor” and started to listen to her parent’s chest.
- At one stage she opened the tap water, I told her “to close it “
- She started crying and screaming and demanded her mother to close it. Eventually she turned the tap off by herself when we ignored her.
- She wanted to leave the room/go home and was constantly asking her parents to do so.


Height vs Age for 0-5 Girls
Height (cm)
140
120
100
80
60
40
20
0
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
Age (months)
Standard deviations away from mean (centile)
3 SD (99.9th)
2 SD (97th)
1 SD (85th)
0 SD (50th)
-1 SD (15th)
-2 SD (3rd)
-3 SD (0.1th)
Actual


Weight vs Age for 0-5 Girls
Weight (kg)
30
25
20
15
10
5
0
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
Adjusted Age (months)
Standard deviations away from mean (centile)
3 SD (99.9th)
2 SD (97th)
1 SD (85th)
0 SD (50th)
-1 SD (15th)
-2 SD (3rd)
-3 SD (0.1th)
Actual


BMI vs Age for 0-5 Girls
Standard deviations away from mean (centile)
3 SD (99.9th)
2 SD (97th)
1 SD (85th)
0 SD (50th)
-1 SD (15th)
-2 SD (3rd)
-3 SD (0.1th)
Actual
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60

Impression

- Any thoughts?
- Behaviour
- Social/language skill
- BMI?

- Can you put it all together?

Assessments report

- Paediatric Speech-Language Therapist reported

“She had some meaningful single words but she has a lot of echolalia and some jargon. She also showed some social referencing skills and her eye contact was variable. “

- Psychologist

“Thought that she did not respond to social smiles and also made infrequent eye contact.”

Increase BMI

- Lifestyle most likely

But think syndrome/endocrine/metabolic problems.

- What do you think would be the features to direct you to either?

Case 2

11-year-old boy

Concerns :

Behavioral

Poor weight gain

Problem List:

1. **ADHD**
2. **Intellectual disability**
3. **Former premature infant**
4. **Chronic lung disease**
5. **Sleep onset difficulties**
6. **On Pediasure for previous weight issues**

Medication

1. Concerta 36mg in the morning
2. Methylphenidate immediate release 10mg in the morning, 10mg at noon
3. PediaSure up to 6 per daily
4. Clonidine 50 to 75µg nightly
5. Seretide 125/25 1 puff bid
6. Melatonin 6mg extended release nightly
7. Lax sachets 1 packet po daily

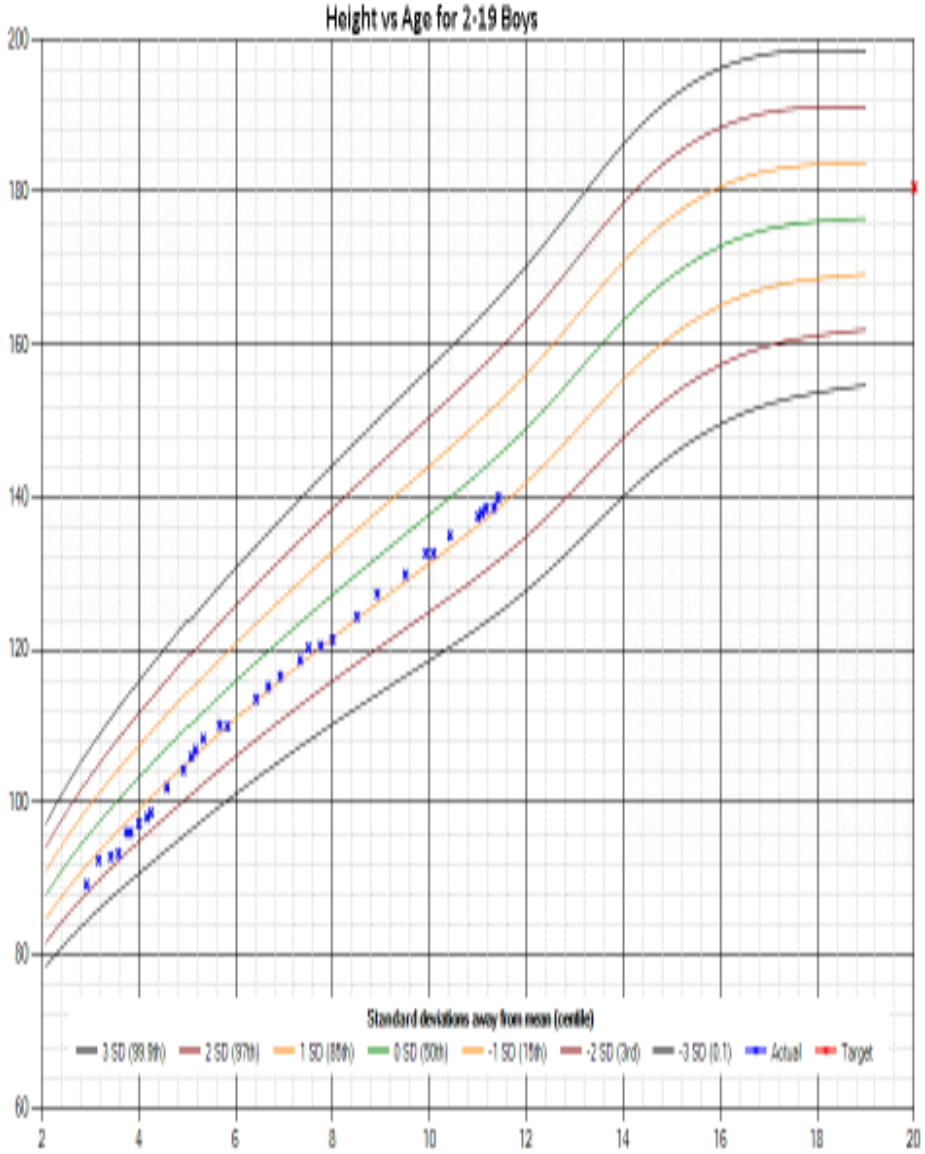
History

Behaviour

- New school
- very disruptive in class especially around 1:00 PM in the afternoon
- Struggles with routines at home

Poor weight gain

- weight - 26 kilograms as compared to 27.55 kilograms back in January
- Taking only 3 Pediasure , no supervision
- Normal bowel motions


Height vs Age for 2-19 Boys
200
180
160
140
120
100
80
60
2
4
6
8
10
12
14
16
18
20
Standard deviations away from mean (centile)
3 SD (99.9th)
2 SD (97th)
1 SD (85th)
0 SD (50th)
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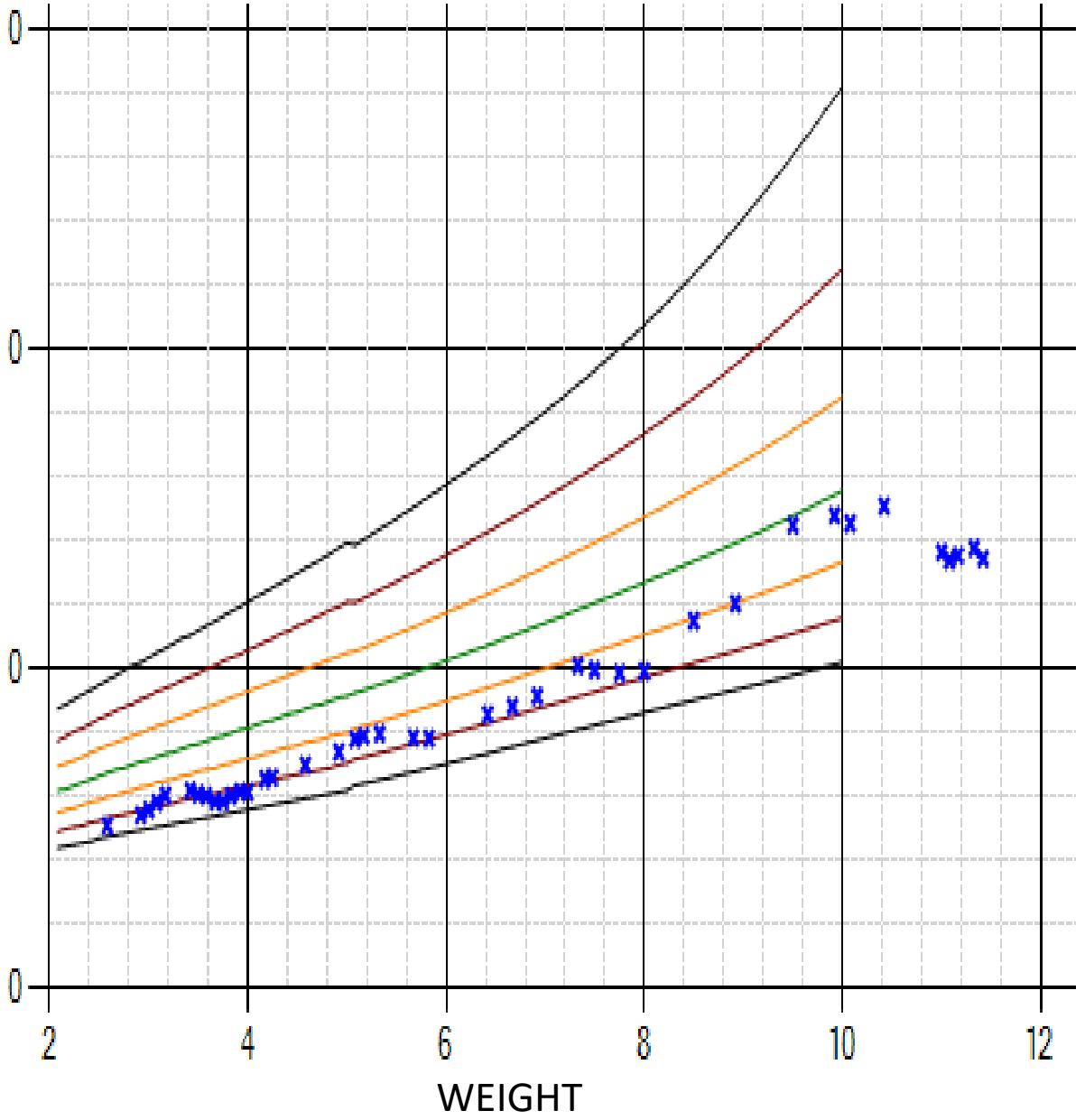
-2 SD (3rd)
-3 SD (0.1)
Actual
Target


0
0
0
0
2
4
6
8
10
12
WEIGHT

Examination

Blood pressure was 107/65,

Saturation was 96%

Heart rate was 97.

Cardiorespiratory system was normal.

His abdominal examination was unremarkable

Impression

- What are your thought ?
- Behaviour/stimulant medication
- Will you make changes to his medication?

- Weight loss?
- Any investigation

Here is the principle I use for WEIGHT

- Symptomology

Intake | Usage | Absorption | Losing/Gaining

- Systems

Investigation | Gather more info

- Impression/Explanation

Formulate diagnosis & treat | Go back to symptomology

Case 3

5 year old

Concern

1) Restricted food type
2) Social skill concern

History

Restricted diet

- always had problems with solid food (started at 6 months of age).
- Eat only ten food item (spaghetti, noodles, toast, yoghurt, custard, cheese, biscuits, donuts and liquorice).
- He dislikes some food texture and would not put any food in his mouth

Development

Social skill

- Good eye contact, share interests with his parents.
- many friends at day-care, happily speaking to other children
- Speak to family at home not other adults.
- He will raise his hand and asks question during mat time.

Language, motor, hearing and vision normal

Examination

Weight was 19.65 kg which is tracking around the 25th centile

Height was 106.6 cm which is also tracking on the 25th centile.

Cardiorespiratory normal

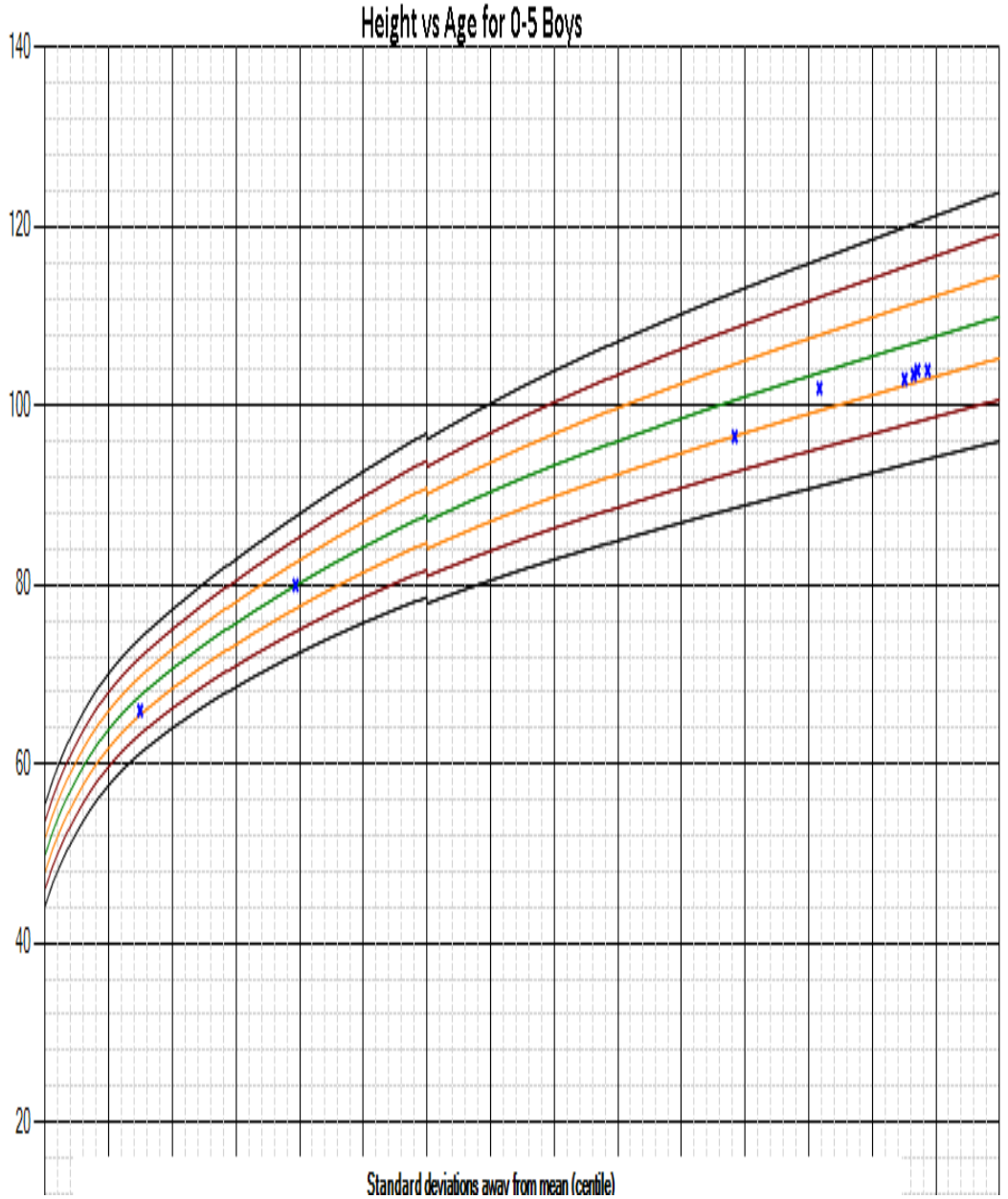
Abdomen was soft non-tender with no obvious organomegaly.

Normal neurology

good eye contact and he followed complex instructions.

He was able to point to 4 colours and did some simple mathematics with me.

On counting he used his fingers to indicate how many blocks were there but he said “8” when there was 8 blocks on the table and that was the only word I heard from him in clinic.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140
120
100
80
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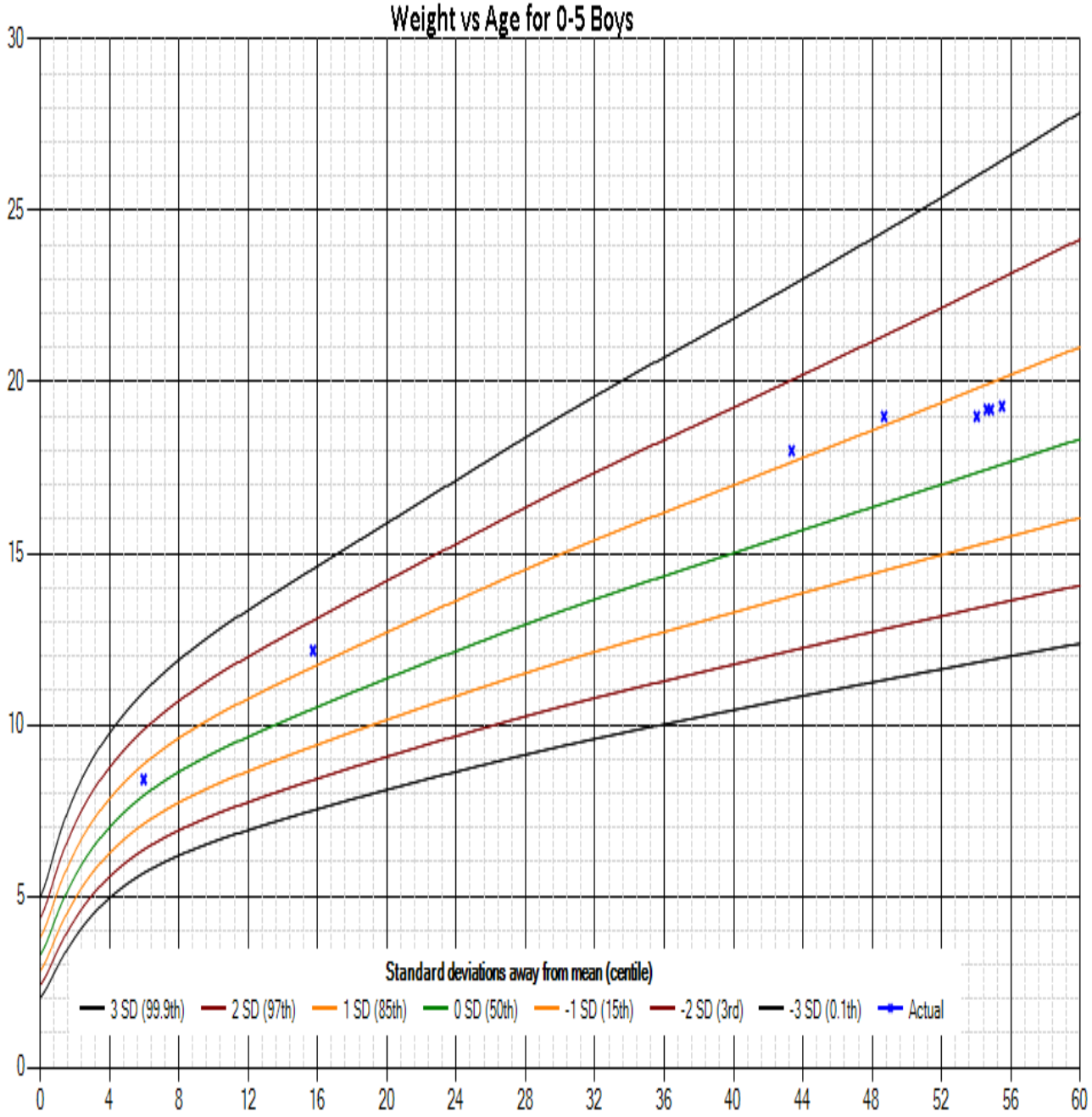
40
20
Standard deviations away from mean (centile)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-3 SD (0.1th)
Actual

Assessment

Teachers

- On one occasion in day-care, did not eat a piece of toasted bread because it was burned on one side
- Keep quiet especially towards adults.
- He will raise his hand and asks question during mat time.

Investigations

Normal

- B12 /Folate
- Calcium/phosphate
- Blood count
- Iron studies
- Liver and renal function
- Vitamin D 40mmol/L

Impression

- What are your thought ?
- Behaviour/social skill

- No weight loss
- Any investigation

DSM-5 Criteria for ARFID

- Food avoidance or restriction leading to persistent failure to meet nutritional needs, causing ≥ 1 of the following:
  - Significant weight loss
  - Significant nutritional deficiency
  - Dependence on tube feeding or oral supplements
  - Psychosocial impairment
- Not due to lack of available food or cultural practice
- No fear of weight gain or body image disturbance
- Not accounted for by another medical or psychiatric condition

DSM-5, 2013, APA

Case 4

10 ½ year old

1. Short stature –

- Emotional distress

2. Prepubertal

History

- Shortest in her class.
- Because of her physical stature, she is always upset and there were a few times that she refused to go to school because of this.

- Eat and drink well , bowel motions normal

History

- Her father is 164 centimetres and her mother is 148.5 centimetres.
- Calculated mid parental height was 150.
- Her height today was 125.2 centimetres (1st centile, Z score -2.54, but 25th centile based on corrected bone age) and her weight was 36.4 kilograms.
- Height velocity 1.6cm/year.
- She is Tanner 1 for breast and pubic hair

Investigations

Oct 2018

Normal full blood count, CRP, iron studies, liver function tests, renal function tests, thyroid function, prolactin, B12 and folate. \

wrist X-ray on the 7/11/2019 which suggested that her bone age was 7 years 10 months but her chronological age was 10 years 3 months(29 months delay).

Examination

Well

No neck webbing, hands normal.

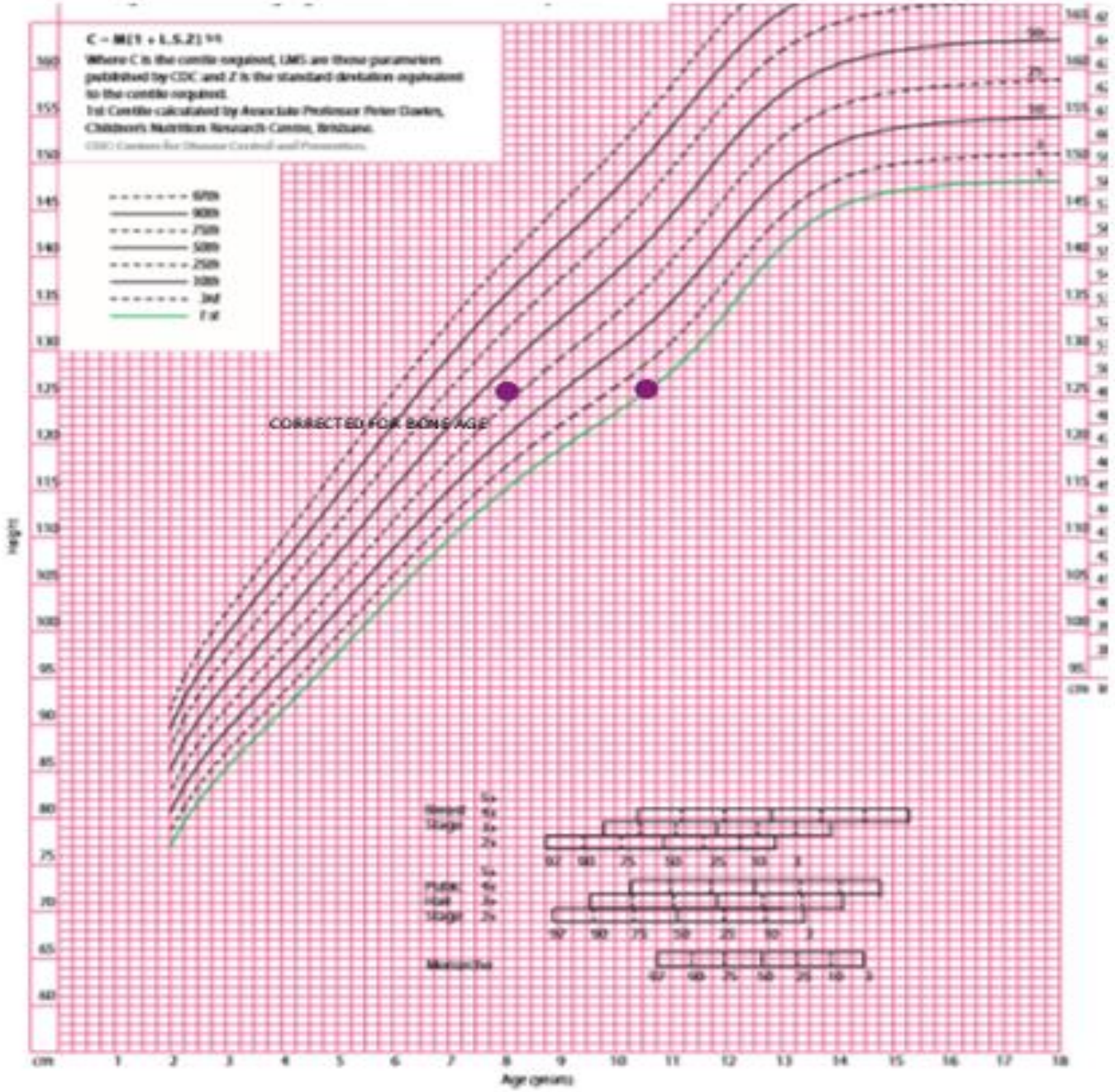
Cardiorespiratory normal

Abdomen was soft non-tender with no obvious organomegaly.

Normal body proportion

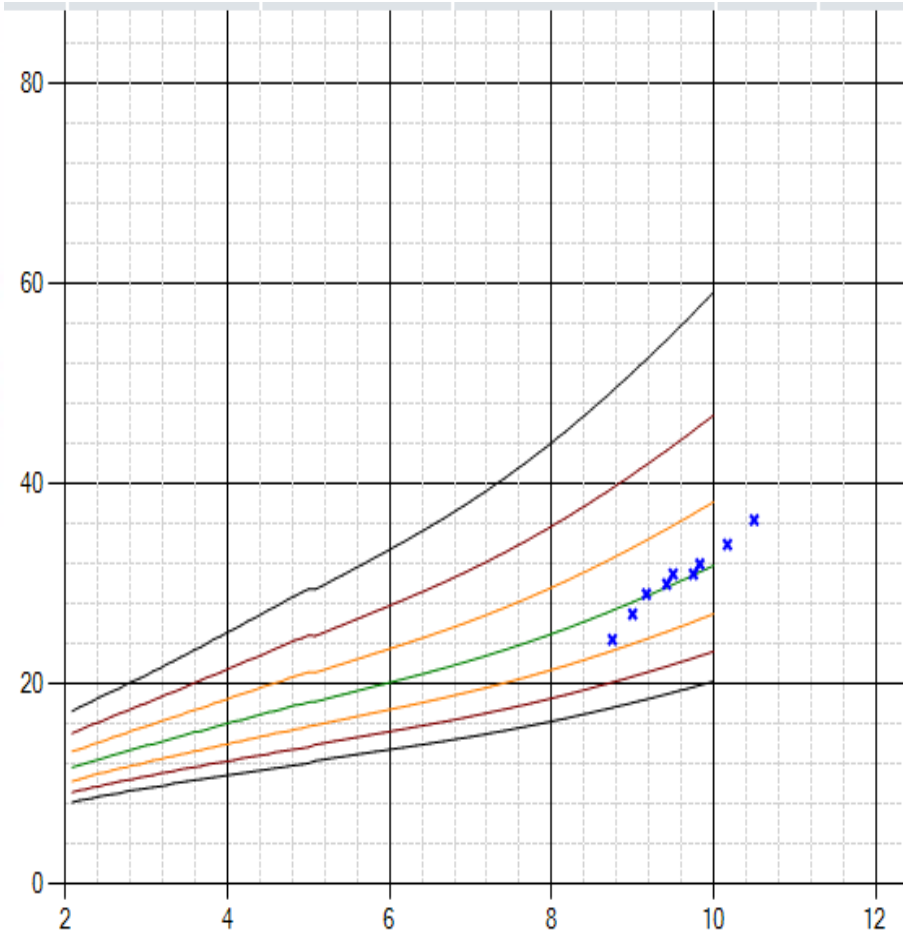
No signs of puberty

Thank you very much.



MPH

Weight



Impression

- What are your thought ?
- Emotional
- Short stature
- Any investigation ?
- ? Treatment

Growth hormone

INITIAL APPLICATION - growth hormone deficiency in children
Applications only from a paediatric endocrinologist or endocrinologist. Approvals valid for 9 months.

Prerequisites (tick boxes where appropriate)

☐ Growth hormone deficiency causing symptomatic hypoglycaemia, or with other significant growth hormone deficient sequelae (e.g. cardiomyopathy, hepatic dysfunction) and diagnosed with GH < 5 mcg/l on at least two random blood samples in the first 2 weeks of life, or from samples during established hypoglycaemia (whole blood glucose < 2 mmol/l using a laboratory device)

or

☐ Height velocity < 25th percentile for age adjusted for bone age/pubertal status if appropriate over 6 or 12 months using the standards of Tanner and Davies (1985)

and

☐ A current bone age is < 14 years (female patients) or < 16 years (male patients)

and

☐ Peak growth hormone value of < 5.0 mcg per litre in response to two different growth hormone stimulation tests. In children who are 5 years or older, GH testing with sex steroid priming is required

and

☐ If the patient has been treated for a malignancy, they should be disease free for at least one year based upon follow-up laboratory and radiological imaging appropriate for the malignancy, unless there are strong medical reasons why this is either not necessary or appropriate

and

☐ Appropriate imaging of the pituitary gland has been obtained

RENEWAL - growth hormone deficiency in children

Current approval Number (if known):.....

Applications only from a paediatric endocrinologist or endocrinologist. Approvals valid for 12 months.

Prerequisites (tick boxes where appropriate)

☐ A current bone age is 14 years or under (female patients) or 16 years or under (male patients)

and

☐ Height velocity is greater than or equal to 25th percentile for age (adjusted for bone age/pubertal status if appropriate) while on growth hormone treatment, as calculated over six months using the standards of Tanner and Davis (1985)

and

☐ Height velocity is greater than or equal to 2.0 cm per year, as calculated over 6 months

and

☐ No serious adverse effect that the patients specialist considers is likely to be attributable to growth hormone treatment has occurred

and

☐ No malignancy has developed since starting growth hormone

Here is the principle I use for HEIGHT

- Symptomology

Intake | Usage | Absorption | Losing/Gaining

Puberty | Genetics

- Systems

Investigation | Gather more info

- Impression/Explanation

Formulate diagnosis & treat | Go back to symptomology

Thank You