GROWTH IN KIDS: WHEN TO WORRY?

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DISCLOSURE

- I have no conflicts of interest to disclose
- I am 5’3”, but I like to wear heels
- My children are pretty tall

OBJECTIVES

- To review the approach to short stature
- To understand variants of normal and to develop an approach for abnormal growth
- To know when to refer and what to tell families before they see Endo
- To discuss special circumstances

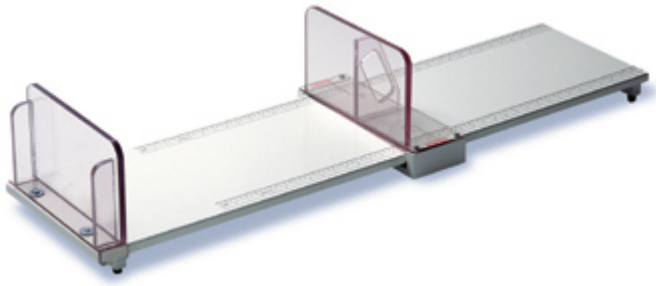
CASE

- 11 year-old boy is coming to see you for his yearly check-up
- The parents express concern that he is “too small”
- What do you want to know?

CASE

- Who is concerned, the parent or the child?
- Get a good GROWTH HISTORY
  - Has he always been small?
  - Are the other children who were smaller now surpassing him in height?
  - Clothes and shoe size
  - Parents height and puberty
- Get a good REVIEW OF SYSTEMS
- Get a good GROWTH CURVE

MEASUREMENT



GROWTH CURVES

- Which do we use?
- WHO growth curves
- CPEG growth curves
- Dietitians of Canada website

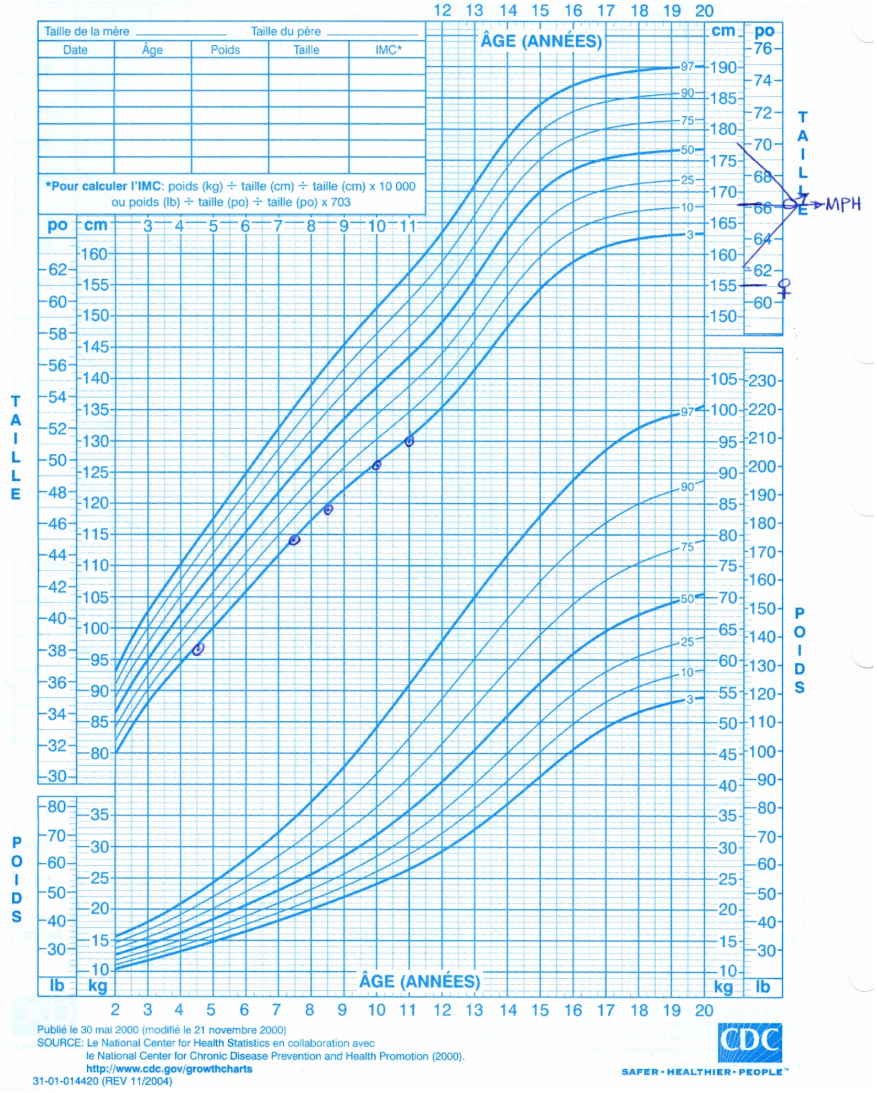
CASE

- He has always been one of the smallest in his class
- Clothes are size 10, he needs new clothes every school year
- No puberty yet, parents had normal puberty
- Dad 5’6” (168 cm), Mom 5’1” (155 cm)
- Otherwise healthy

CASE

- Well-looking
- Physical examination unremarkable
- Proportionate (armspan, upper:lower segment ratios)
- Prepubertal
- Growth curve?

Courbes de croissance des CDC pour les garçons de 2 à 20 ans



MIDPARENTAL HEIGHT

- Boys

$$\frac{\text{Mom's Height + Dad's Height + 13 cm}}{2}$$

- Girls

$$\frac{\text{Mom's Height + Dad's Height - 13 cm}}{2}$$

- +/- 10 cm to create a range

GENETIC SHORT STATURE

- Normal growth velocity (4 cm/year minimum)
- Short parents, short child
- Follow the curve
- Otherwise healthy, normal exam
- Normal bone age
- Normal puberty
- Reassurance!

CASE

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- What do you want to know?

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  - Has he always been small?
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  - Parents height and puberty
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- Get a good GROWTH CURVE

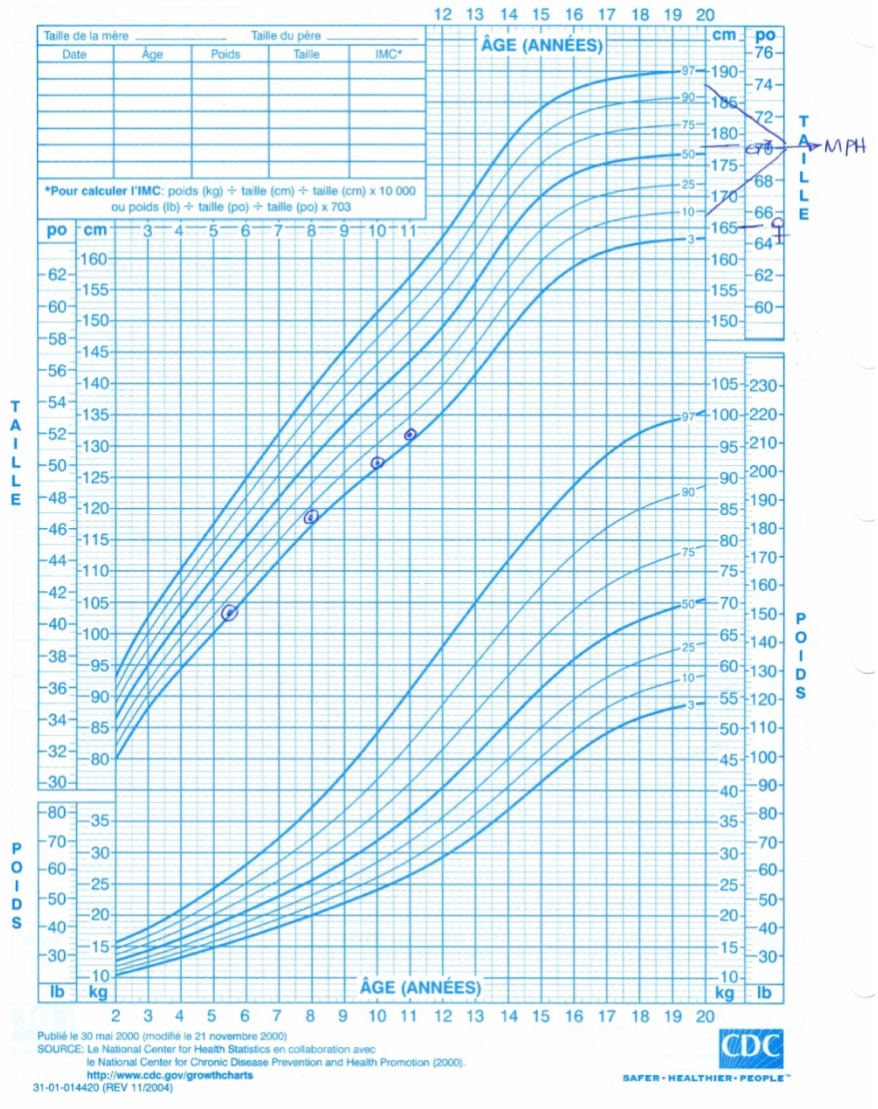
CASE

- Always small
- Otherwise healthy
- Mom 165 cm, Dad 178 cm
- Mom’s menarche at age 14
- Dad shaved at age 17

CASE

- Well-looking
- Physical examination unremarkable
- Proportionate (armspan, upper:lower segment ratios)
- Prepubertal
- Growth curve?

Courbes de croissance des CDC pour les garçons de 2 à 20 ans



Publié le 30 mai 2000 (modifié le 21 novembre 2000)
SOURCE: Le National Center for Health Statistics en collaboration avec le National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts
31-01-014420 (REV 11/2004)

CDC
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CONSTITUTIONAL DELAY

- Normal growth velocity (4 cm/year minimum)
- “Late bloomer”
- Positive family history
- Otherwise healthy
- Delayed bone age
- Reassurance!
- Follow-up

CONSTITUTIONAL DELAY

- Treatment in boys over 14 years, girls over 13 years
- Secondary sexual characteristics
- Psychological
- Bones
- No more than 6 months

SUMMARY

- Normal growth velocity → Variant of normal

- Genetic short stature
- Constitutional delay

CASE

- 9 year-old girl who is coming for routine follow-up
- Has not grown a lot since last check-up 1 year ago
- Crossed percentiles ($25^{th} \rightarrow 5^{th}$)
- Gained 2 cm in the past year
- Growth curve

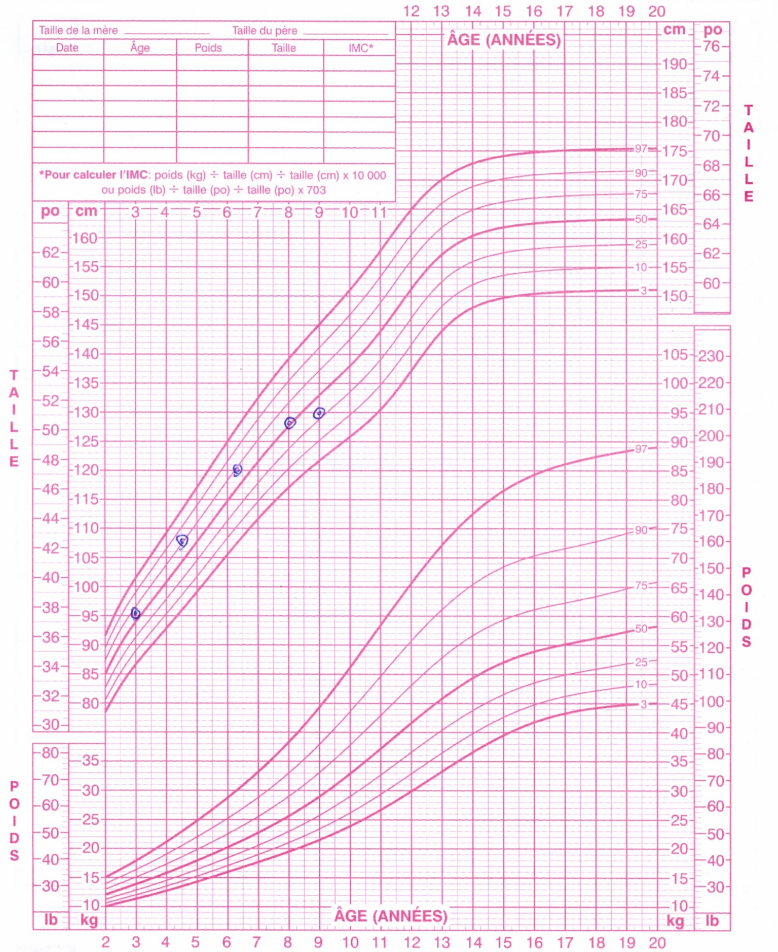
CASE

- Otherwise well
- A bit tired
- No puberty yet
- Parents are of average height, normal puberty
- Review of systems otherwise normal

CASE

- Well-looking
- Completely unremarkable physical examination
- No dysmorphic features
- Next step?

Courbes de croissance des CDC pour les filles de 2 à 20 ans



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CASE

- This is abnormal
- Growth velocity abnormal
- Approach?

ABNORMAL GROWTH VELOCITY

- Syndrome
- Chronic illness
- Endocrinopathy
  - Hypothyroidism
  - Growth hormone deficiency
  - Cortisol excess

ABNORMAL GROWTH VELOCITY

- Screen for chronic illness
  - CBC, ESR, BUN, creatinine, blood gas, LFTs, total protein, albumin, TTG with IgA, U/A
- Screen for hypothyroidism
  - TSH and free T4
- *No value in doing random GH levels*
- IGF-1 done as a screen in some centers, but it is not specific
- Bone age

CASE

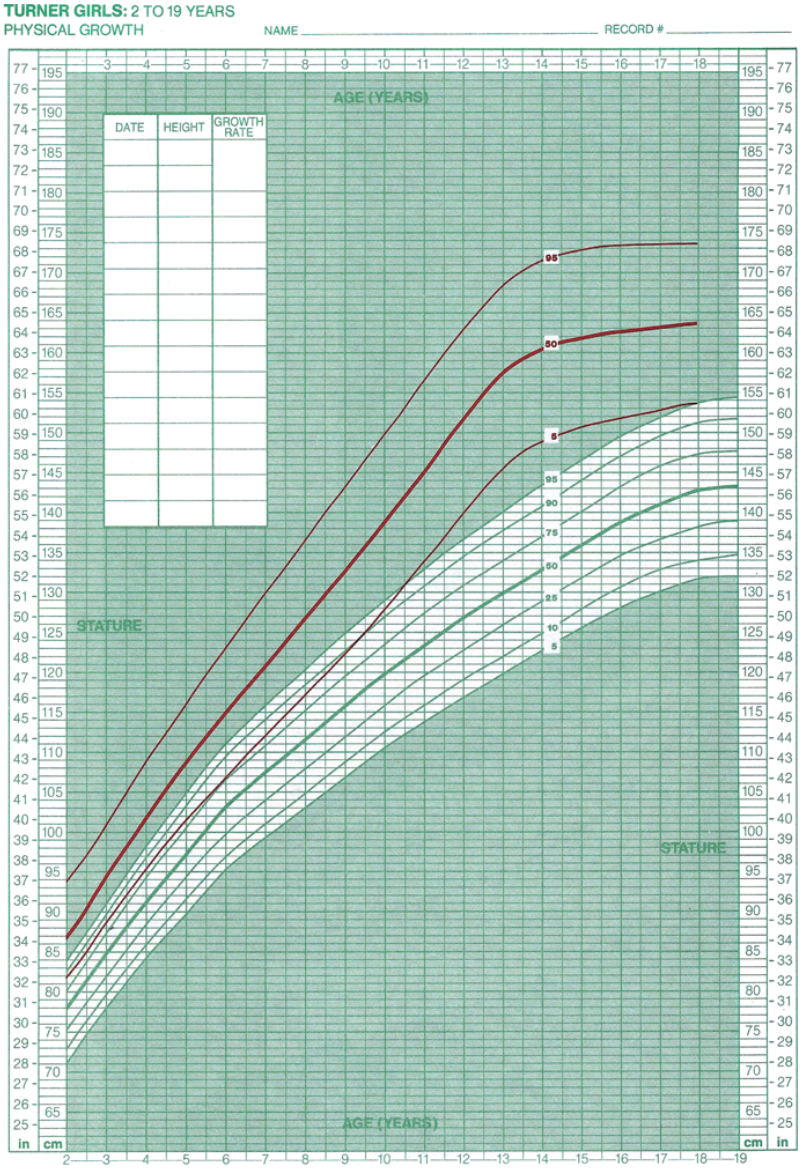
- TSH 56 mIU/L
- Started on Levo-thyroxine
- Growth improves

CASE

- All investigations normal
- What else must we always consider in a short girl?
- TURNER SYNDROME

TURNER SYNDROME

- Classic growth pattern: fall off curve around age 5-6 years
- Growth hormone is offered to all girls with Turner syndrome


TURNER GIRLS: 2 TO 19 YEARS
PHYSICAL GROWTH
NAME
RECORD #
NORMAL GIRLS*
UNTREATED TURNER PATIENTS**
*Percentiles derived from National Center for Health Statistics
**Turner Percentiles from Lyon, A.J., Preece, M.A., and Grant, D.B.
Growth curve for girls with Turner Syndrome. Archives of Disease in Childhood 60:932-935 (1985).
DATE
HEIGHT
GROWTH RATE
AGE (YEARS)
STATURE
95
50
5
95
90
75
50
25
10
5
in
cm
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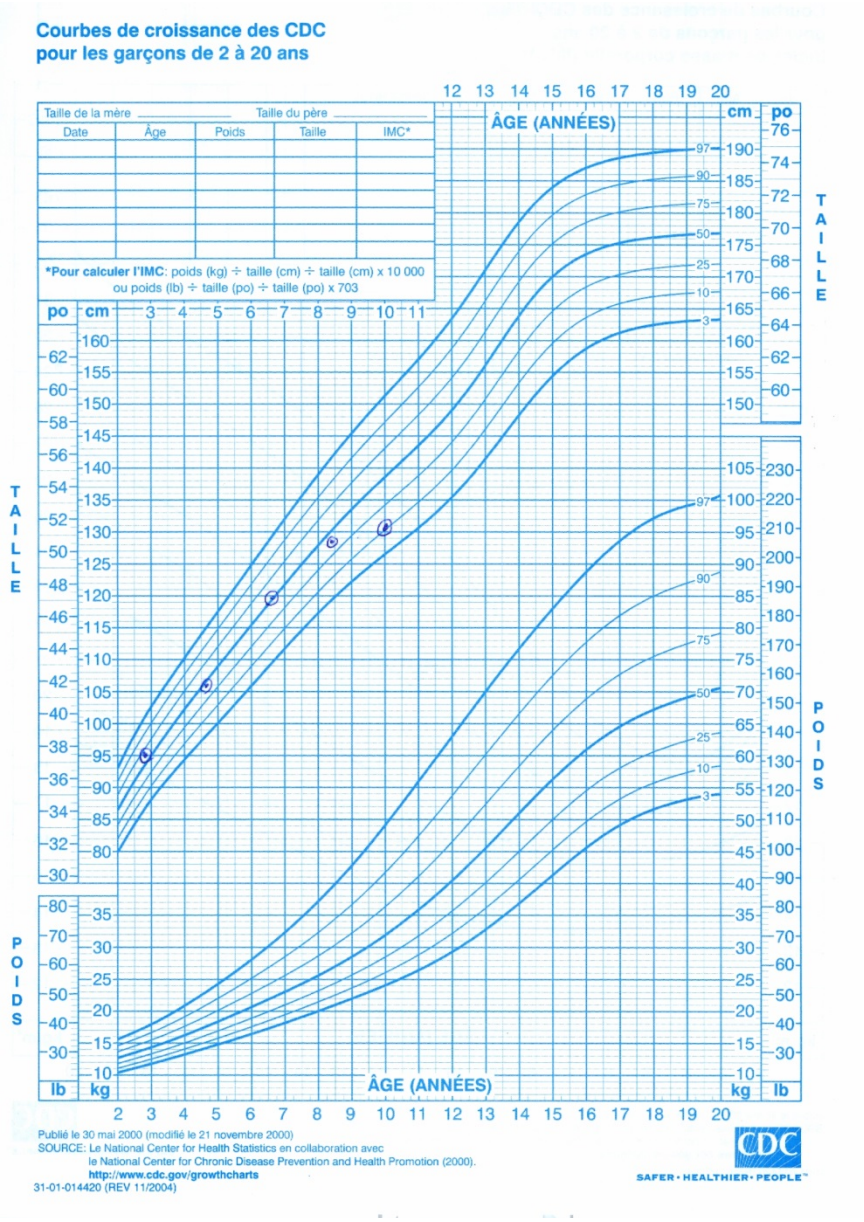
CASE

- 10 year-old boy
- Previously healthy
- Parents are concerned that he is shorter than his classmates
- Parents both at the 50th percentile
- He has fallen from the 50th to the 10th percentile for height

CASE

- Well-looking
- Completely unremarkable physical examination
- No dysmorphic features
- Next step?


Courbes de croissance des CDC
pour les garçons de 2 à 20 ans
Taille de la mère
Taille du père
Date
Âge
Poids
Taille
IMC*
*Pour calculer l'IMC: poids (kg) ÷ taille (cm) ÷ taille (cm) x 10 000
ou poids (lb) ÷ taille (po) ÷ taille (po) x 703
ÂGE (ANNÉES)
TAILLE
POIDS
97
90
75
50
25
10
3
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CASE

- This is abnormal
- Growth velocity abnormal
- Approach?

ABNORMAL GROWTH VELOCITY

- Syndrome
- Chronic illness
- Endocrinopathy
  - Hypothyroidism
  - Growth hormone deficiency
  - Cortisol excess

CASE

- Screen for chronic illness normal
- Thyroid function normal
- Next step?
  - Growth hormone stimulation testing
  - L-arginine
  - Clonidine
  - Estrogen priming

CASE

- Fails 2 growth hormone stimulation tests
- GH deficient
- Next step?
  - Imaging with MRI
  - Evaluation of other pituitary hormones

SUMMARY

- GROWTH VELOCITY
  - Normal
    - Genetic short stature
    - Constitutional delay
  - Abnormal (<4 cm/year)
    - Syndrome
    - Chronic illness
    - Endocrinopathy

REFERRALS

- Curve drifting before age 2
- Sports
- Bullying
- Treated with GH in another country
- Genetic syndrome other than Turner syndrome
  - Russell Silver
  - Prader Willi
  - Noonan
  - Achondroplasia

FDA APPROVED INDICATIONS FOR GH TREATMENT

- Pediatrics
  - GHD
  - Turner syndrome
  - Chronic renal failure
  - ISS
  - SHOX deficiency
  - SGA
- Adults
  - Adult onset GHD
  - Childhood onset GHD

WHAT ABOUT ISS?

- **Idiopathic short stature** is a condition characterized by a height more than 2 SD below the corresponding average height for a given age, sex and population
- 80% of all children referred for short stature will be labeled as ISS

ISS

- Familial short stature
- Non-familial short stature
  - Inevitably includes children with constitutional delay

ISS

- GH sufficient
- Normal body proportions
- No history of SGA
- No chromosomal abnormalities
- No dysmorphic syndromes
- No systemic, endocrine or nutritional diseases
- Diagnosis of exclusion

GH TREATMENT

- Chronic renal insufficiency 3-9 cm
- Turner syndrome 5-8 cm
- SGA 6 cm
- SHOX deficiency 8 cm
- ISS 3-7 cm

GH TREATMENT IN ISS

- Increases growth rate in the first year
- Controversies about final height
- Heterogeneous population
- Varied doses
- Most studies are uncontrolled
- Very few studies report adult height

GH TREATMENT IN ISS

- Best response:
  - Parents of normal height
  - Bone age delay

- It remains to be determined whether GH treatment significantly impacts adaptation, psychosocial function or QoL

WHAT'S THE MESSAGE?

- Otherwise healthy child
- Injections 6 times per week until growth is nearly complete
- Frequent visits to doctor

BOTTOM LINE

- Consider perceptions
- Clarify expectations
- There is still controversy despite FDA approval
- Cost
- Ethical aspects
- Long-term benefit and safety is unclear
- Exceptional situations – compassionate GH

THANK YOU!