Best Practices for Casting in EOS

Lindsay Andras MD

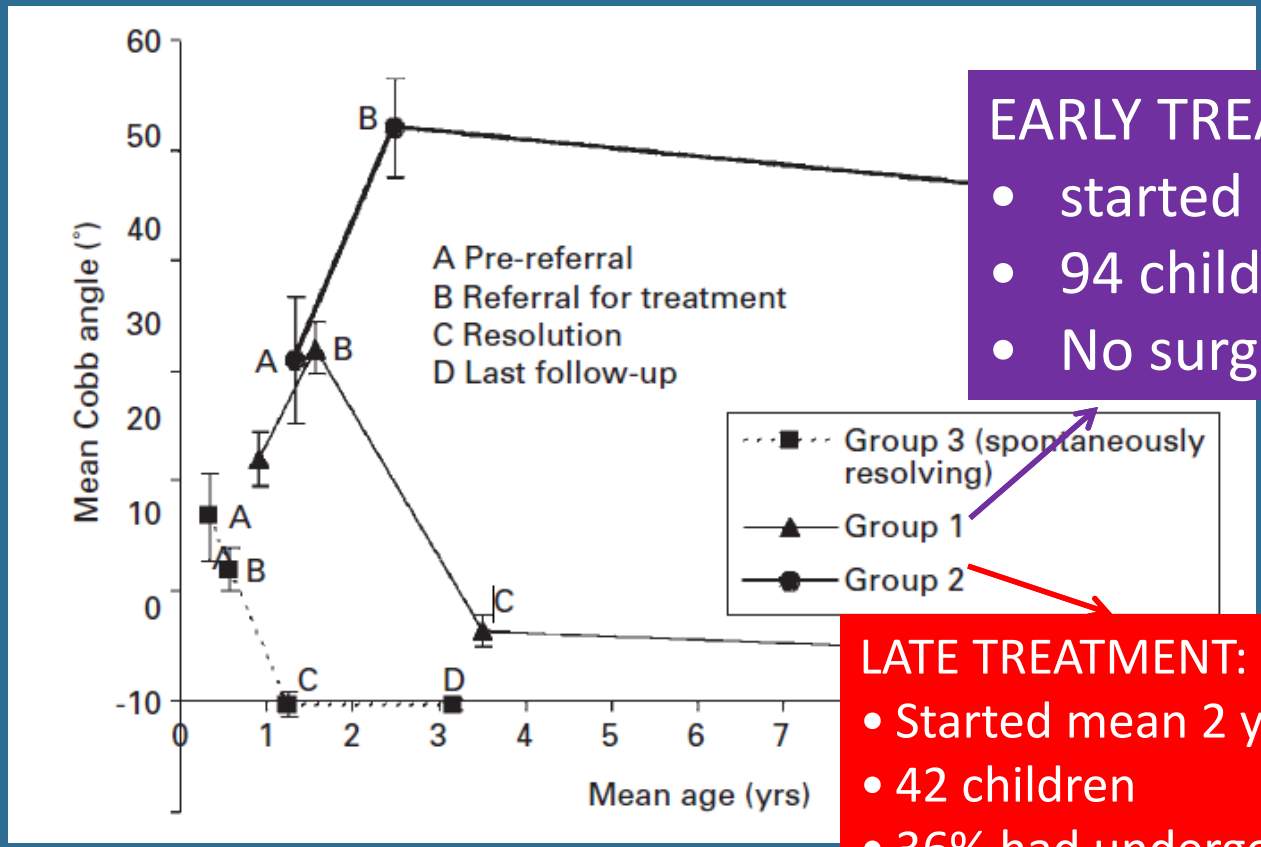
USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Review of the Level I Evidence on casting:

USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER



EARLY TREATMENT:

- started mean 1 yr 7mo
- 94 children
- No surgical treatment

LATE TREATMENT:

- Started mean 2 yr 6 mo
- 42 children
- 36% had undergone fusion (as may all the rest)

Mehta MH. Journal of Bone and Joint Surgery 2005

USC University of Southern California

Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER

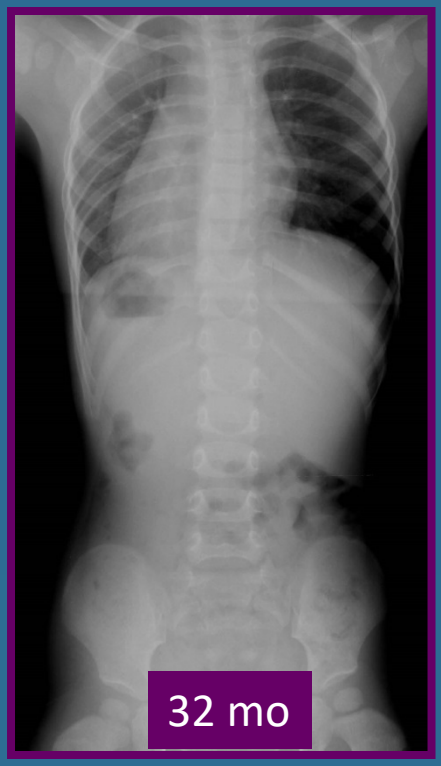
Idiopathic Indications

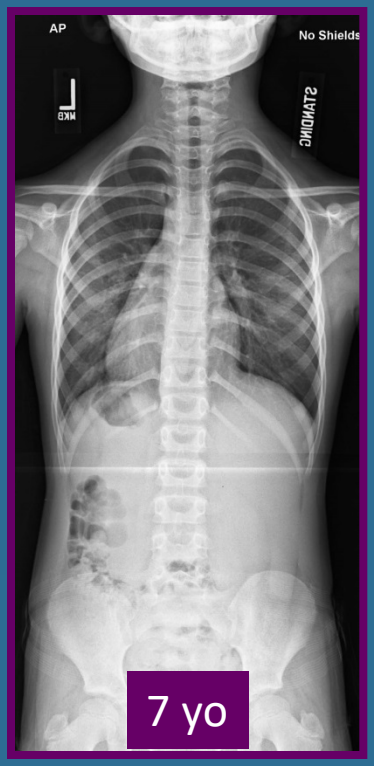
- RVAD >20 degrees
- Rib Phase 2

  (Rib Phase 1= no overlap of rib head on vertebral body; Rib Phase 2= overlap)
- <2 years of age

Sanders, D'Astous, Sturm et al. JPO 2009
- Idiopathic curves <60 and started at <20 months often results in full correction

6 casts -> bracing





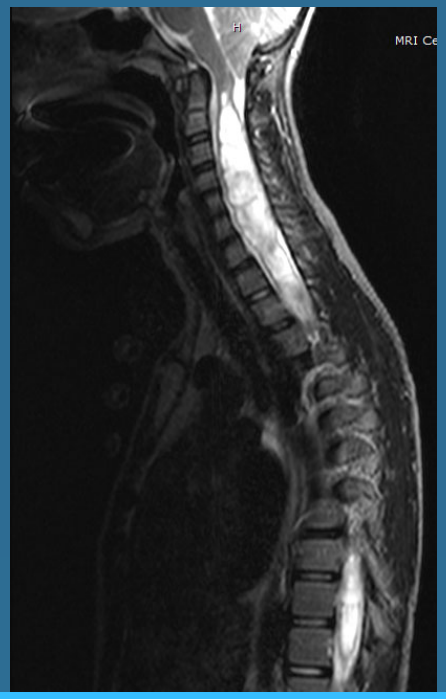
USC University of Southern California

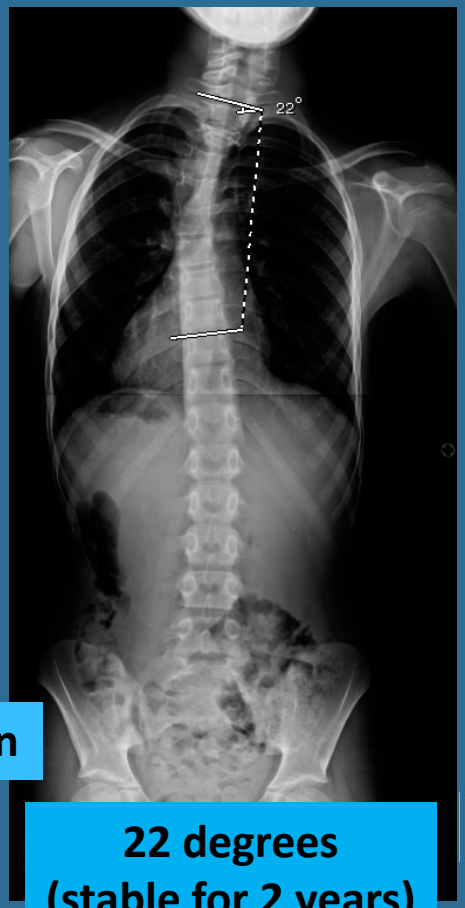
Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER

Courtesy of Jacques D'Astous

Idiopathic is a diagnosis of exclusion!

MRI at start of casting





33 degrees

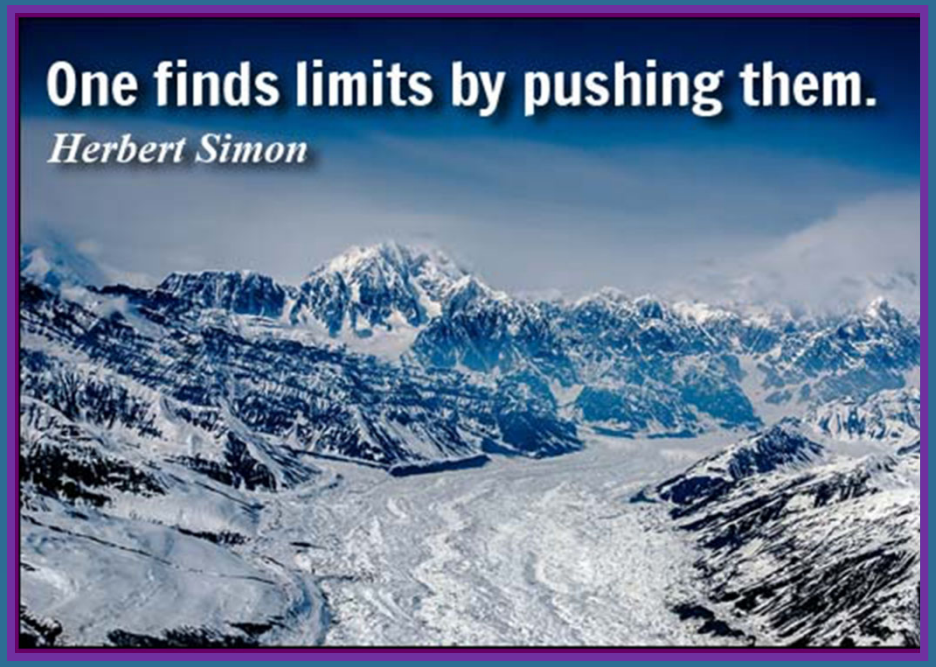
Treated with decompression

22 degrees
(stable for 2 years)

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Indications

- Syndromic?
- Congenital?
- Neuromuscular?



USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Goal in non-idiopathic EOS = delay surgery (ideally until final fusion)

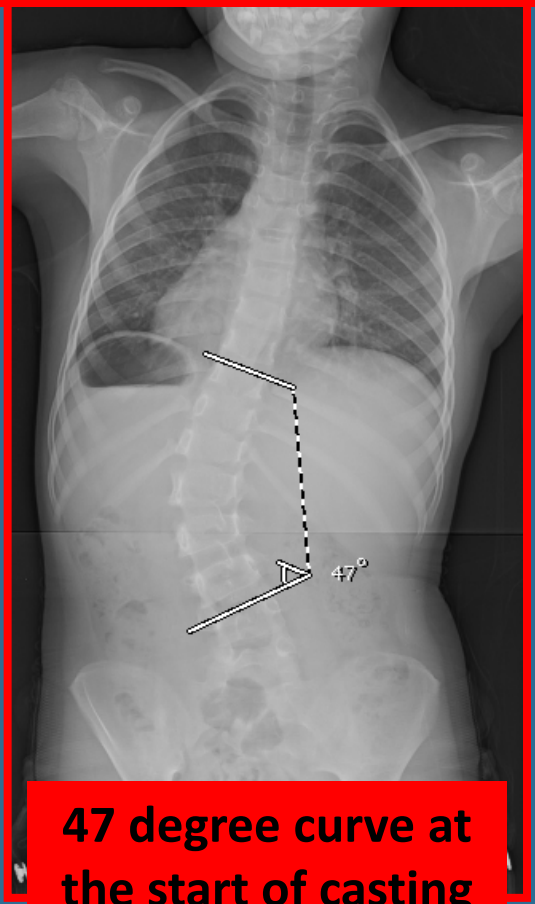
Fletcher et al. JPO 2012

- 29 patients(12 idiopathic; 17 nonidiopathic)
- Mean Cobb 68 precast->39 in cast-> 61 degrees
- Mean 39 month surgical delay
- 72% avoided growing spine surgery

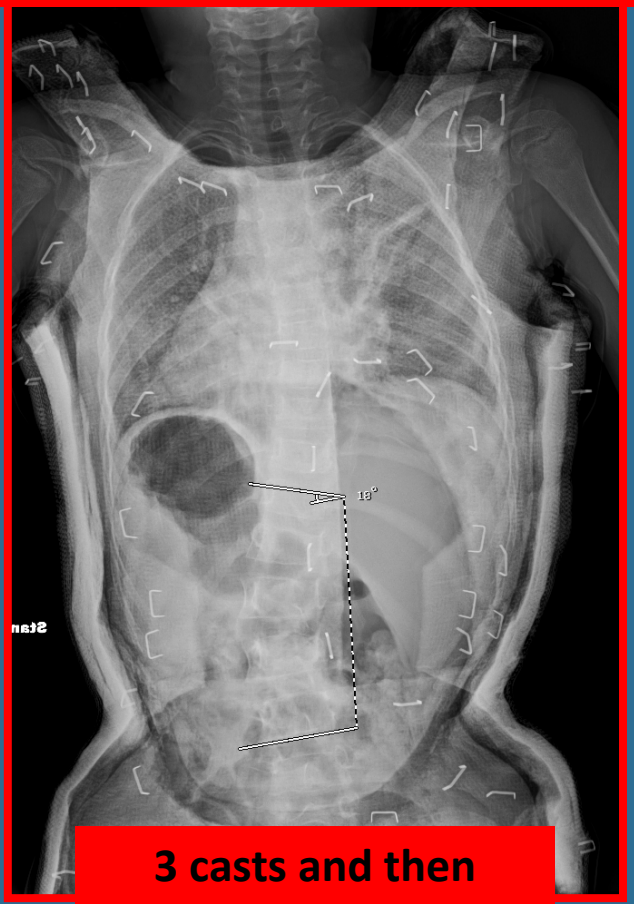
Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Syndromic

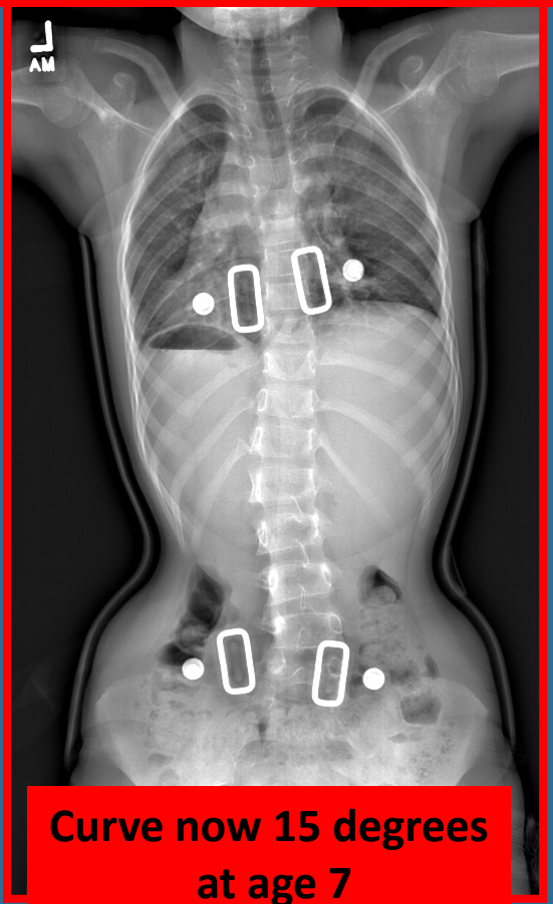
5 yo female with neurofibromatosis that had progressed despite bracing



47 degree curve at the start of casting



3 casts and then transitioned to brace



Curve now 15 degrees at age 7

USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

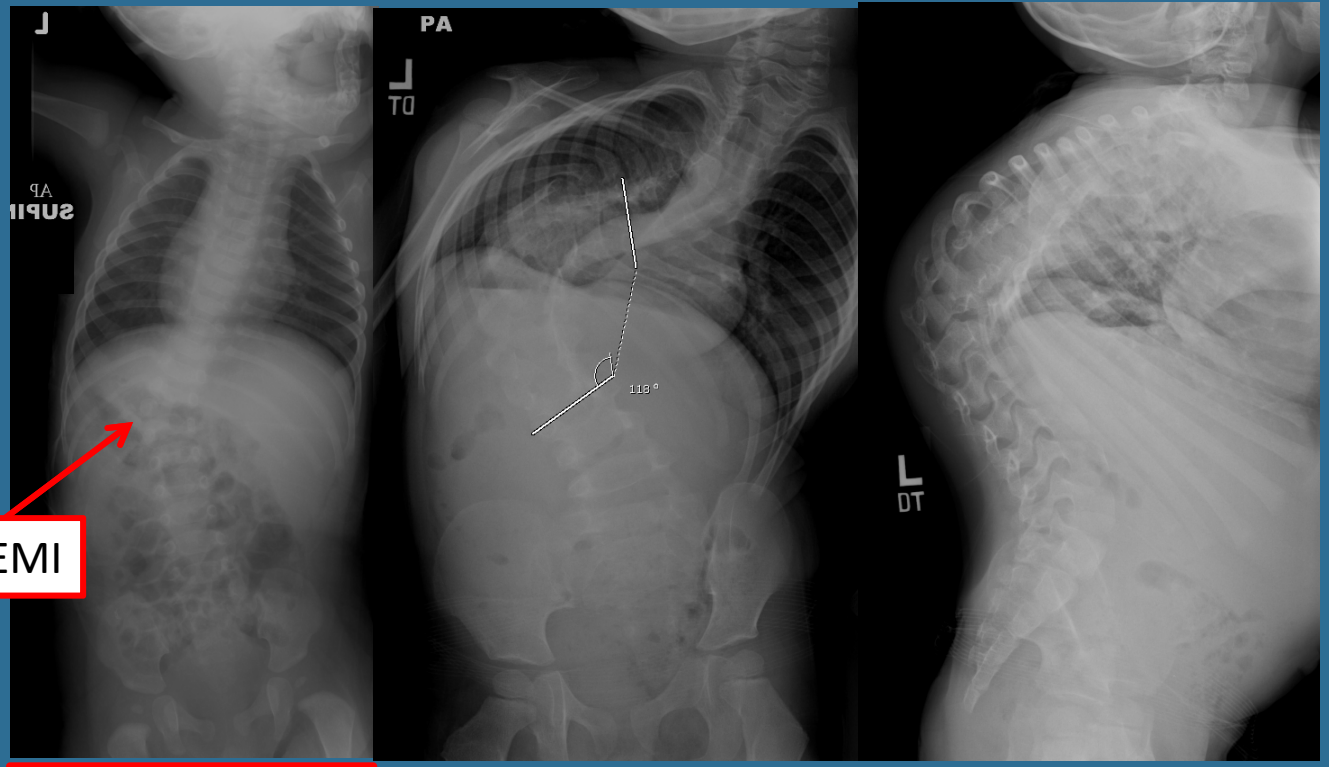
Congenital

- 11 patients
- Mean age at first cast=40 months
- Mean of 6.2 casts per patient
- Cobb 71->55 (p=0.005)
- T1 to T12: increased from 12.8 to 14.6

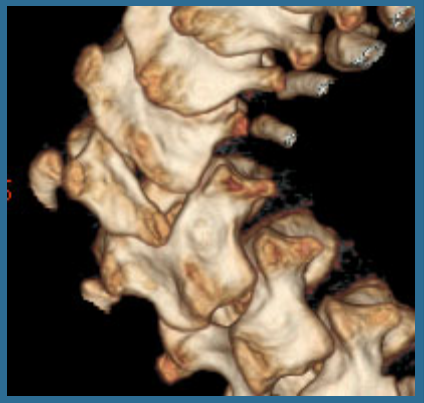
Demirkiran, Bekmez, Celilov, Ayvaz, Yazici. JPO 2015

Congenital

4yo male with VATER syndrome and hemivertebrae at thoracolumbar junction



HEMI



Returned with 110 degree curve

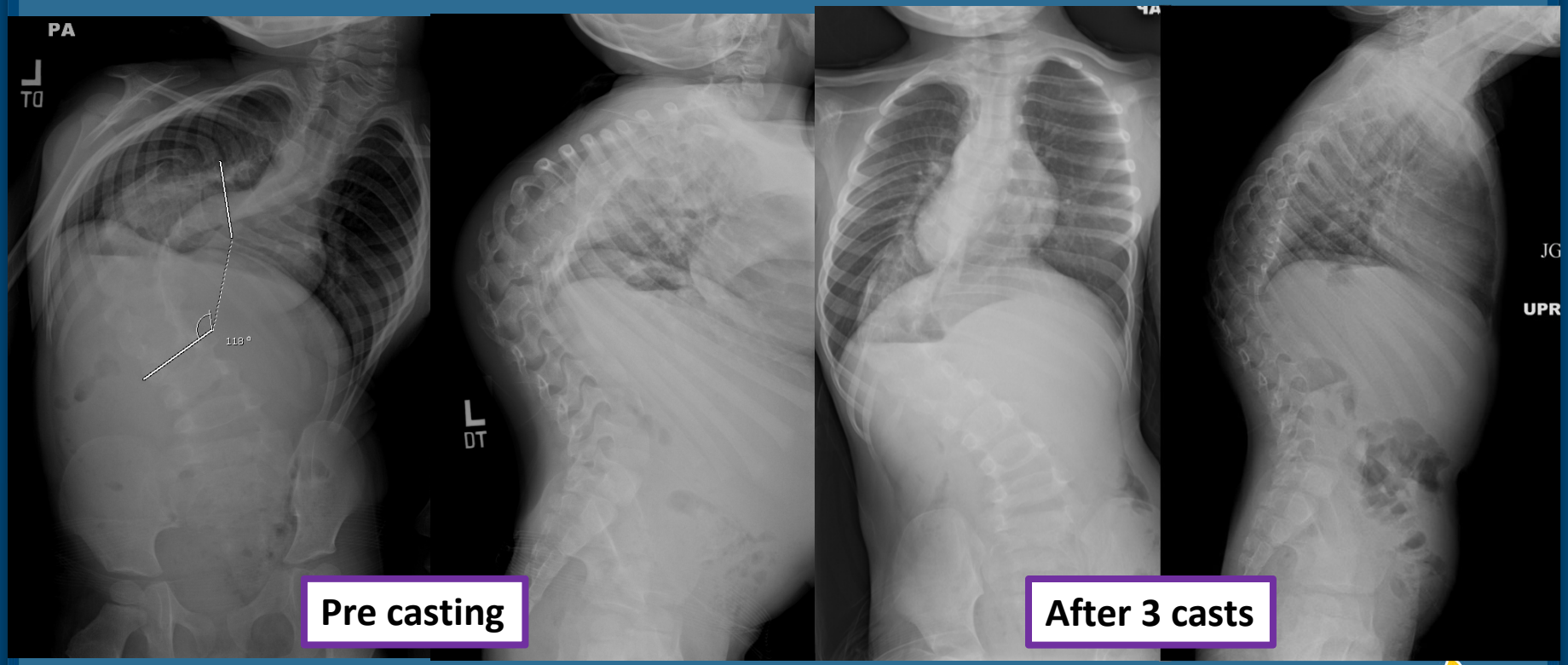
Seen at 6 mo
Lost to followup

USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Congenital

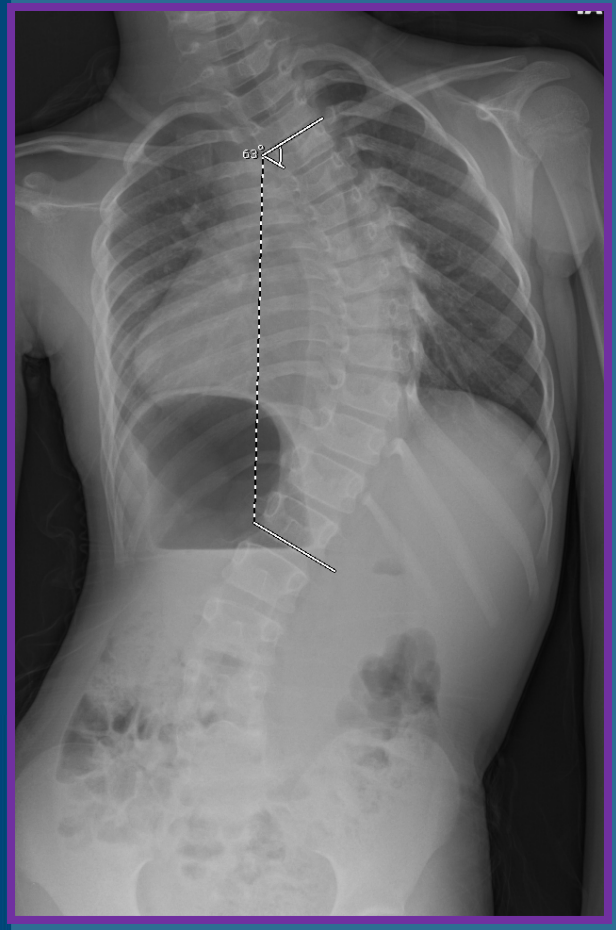
4yo male with VATER syndrome and hemivertebrae at thoracolumbar junction

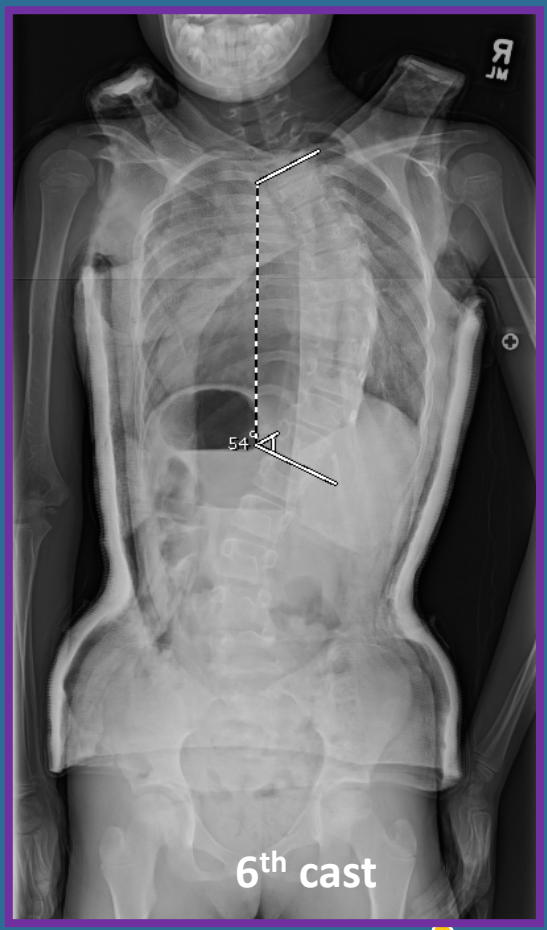


USC University of Southern California

Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER

Neuromuscular

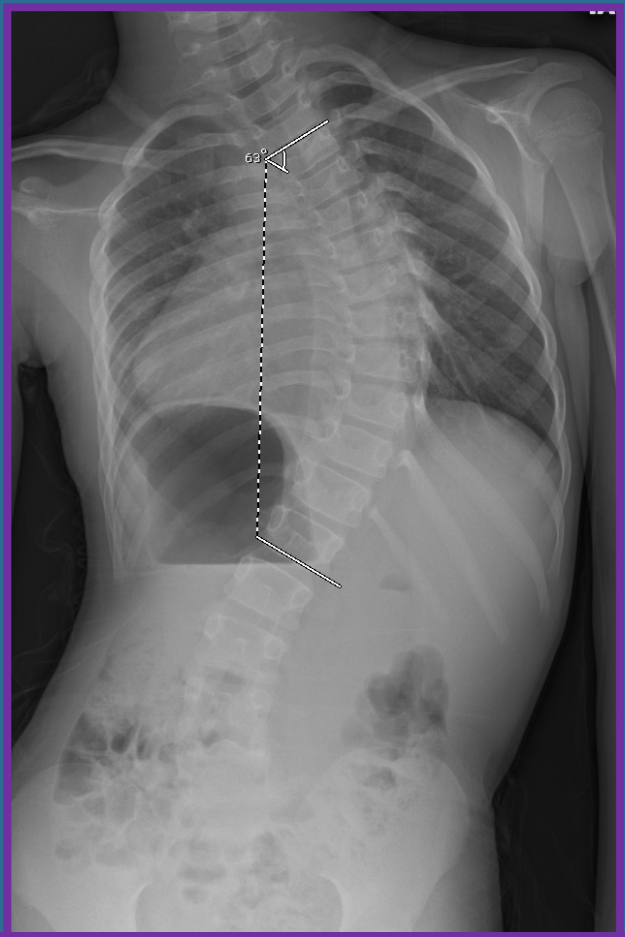


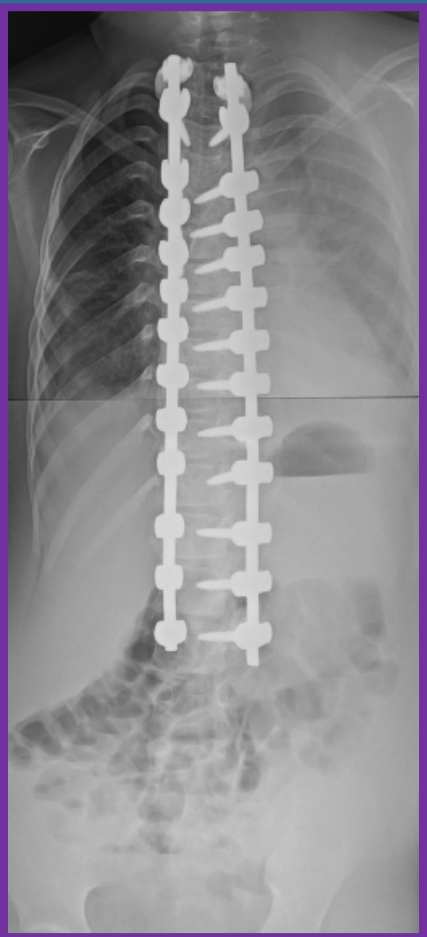


7 yo female with CP, GMFCS 1 and 63 degree curve that had progressed despite bracing

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Neuromuscular





Underwent PSF at age 9.5

T1-T12: at start of cast 17cm->22.5 at time of fusion

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

But its not always satisfying…

2 yo with Turner syndrome and 58 degree curve -> 68 degrees at age 4

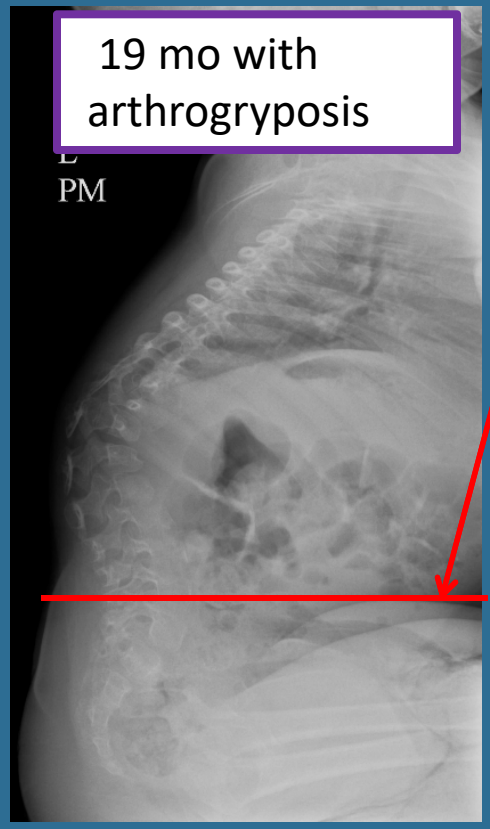
Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Contraindications to casting

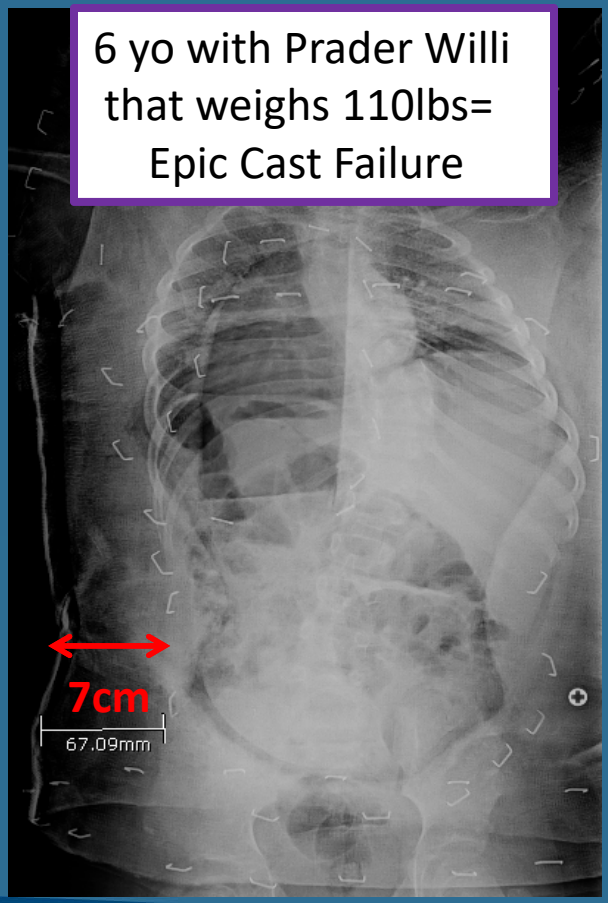
- Fragile pulmonary status
  -Increases Peak Inspiratory Pressure (Dhawale, Shah. JPO 2013)
- Fragile general status
  - codes in casts=bad news
  - tinsnips and youtube video of removal
- Sharp/rigid congenital curves
- C-spine/Stability issues

Contraindications to casting

- Well padded kids
  - chubby thighs or obesity = getting a good mold impossible



Chubby thighs Above the level of Iliac crest when sitting= impossible to mold



When and How often to cast ???

When:

- Better outcomes if initiated earlier

How often:

2 year olds = 2 months; 3 year olds = 3 months;

4 year olds= 4 months

VS

Q3 months

USC University of Southern California

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

When to stop

- What is the cure threshold? <10 degrees, <15 degrees, <20 degrees….
- Brace holiday in the summer (vs waterproof casts)

- When is conversion to growth friendly instrumentation indicated?

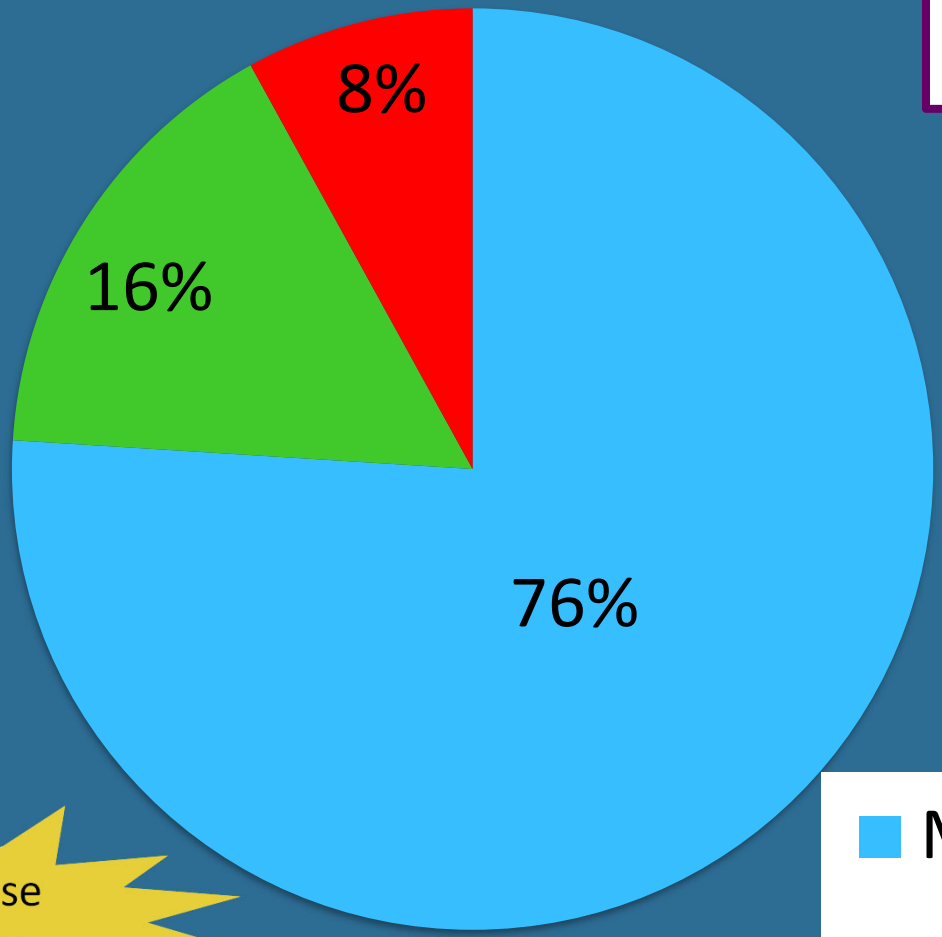
- When to fuse if using as a delay tactic? 10yo? Or based on T1-T12? or based on pulmonary function?

USC University of Southern California | Children's Hospital Los Angeles CHILDREN'S ORTHOPAEDIC CENTER

Cast Technique: Style

Survey: 55 respondents
Grzwyna, Glotzbecker et. al. ICEOS 2015

Beware of creating Rib deformity!!!!

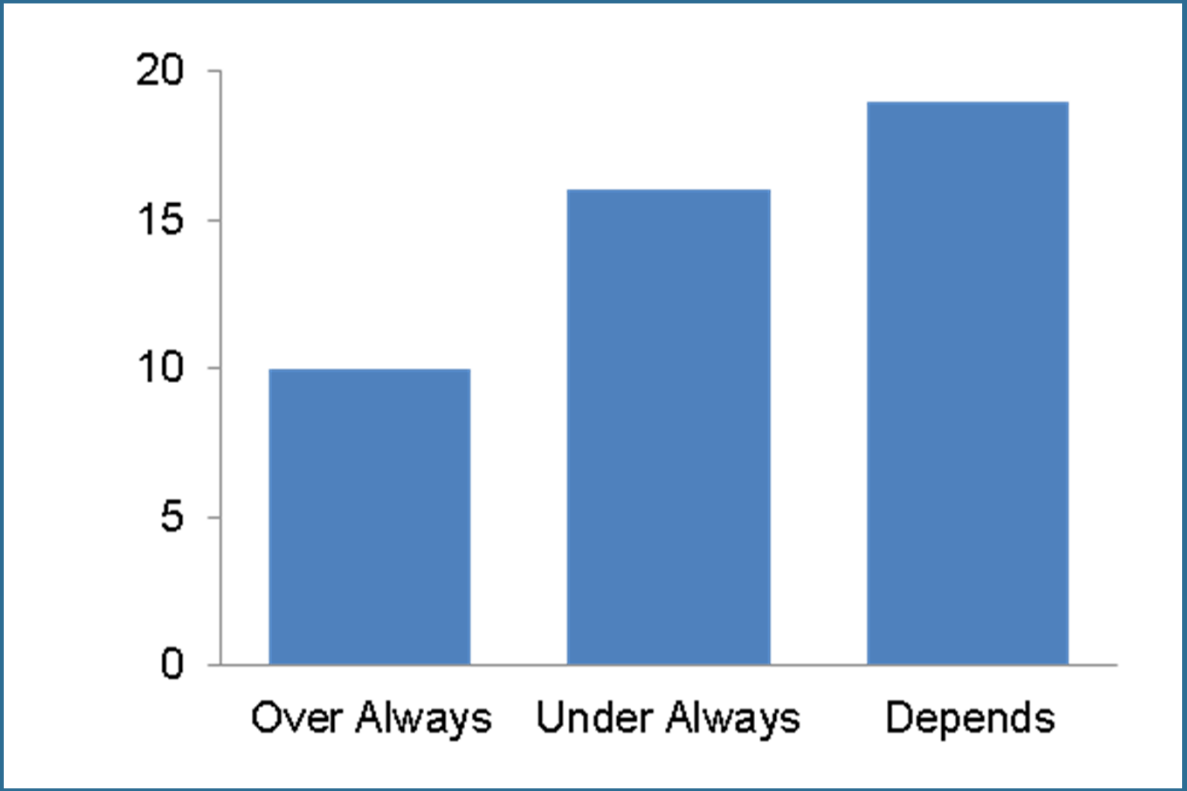


30% use straps

Mehta
Risser
Other

Cast Technique: Shoulders

Survey: 55 respondents
Grzwyna, Glotzbecker et. al. ICEOS 2015



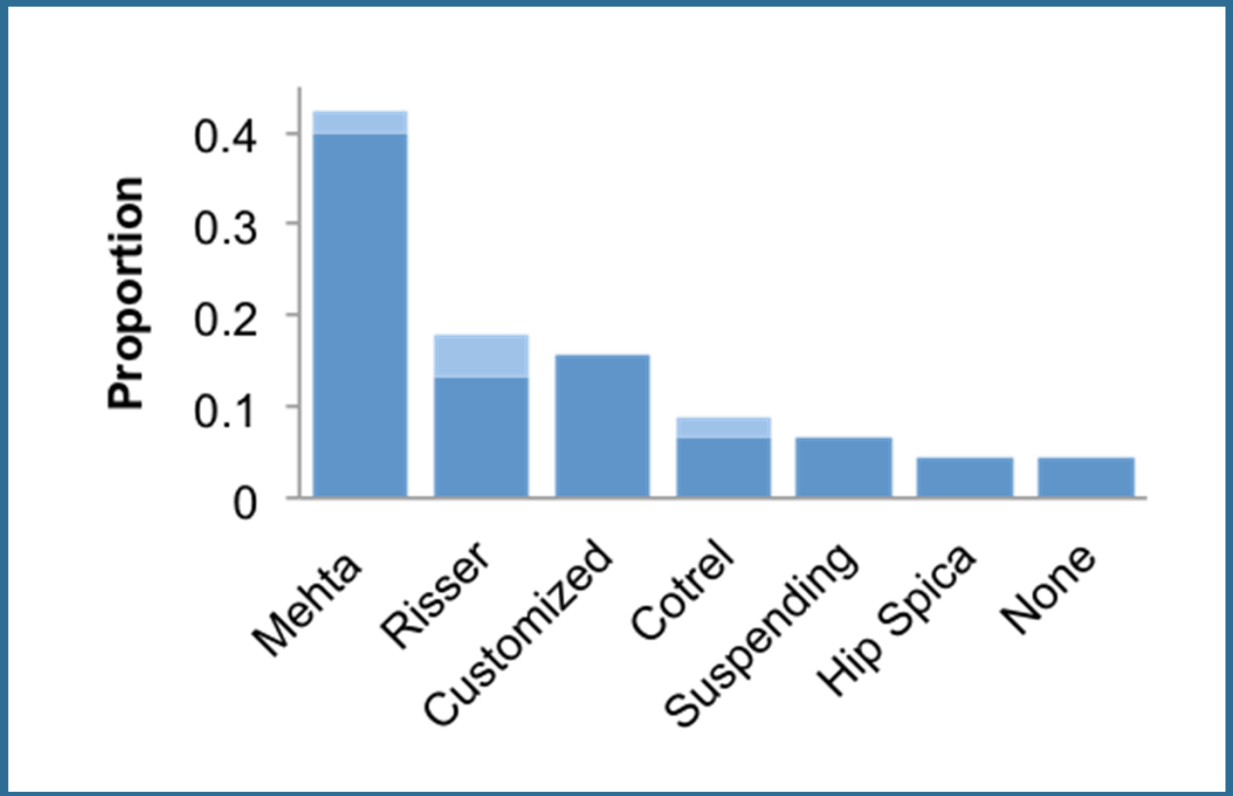
ICEOS 2017? ….stay tuned

USC University of Southern California

Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER

Cast Technique: Table

Survey: 55 respondents
Grzwyna, Glotzbecker et. al. ICEOS 2015



USC University of Southern California

Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER

In traction?

* 86% surveyed used head halter traction

Children's Hospital LOS ANGELES
CHILDREN'S ORTHOPAEDIC CENTER

Financial implications

Review of 20 cases of GR and casts

Procedure	MD Charges/Year	MD Collections/Year	Hospital Charges/Year	Hospital Collections/Year
Growing rod	$ 12,354.53	$ 2,554.88	$ 46,958.12	$ 13,388.27
EDF casting	$ 1,892.75	$ 731.10	$ 52,315.55	$10,213.00

$$$ for the surgeon= 29% of growing rod collections

…but may be very cost effective for hospital

USC University of Southern California

Children's Hospital LOS ANGELES

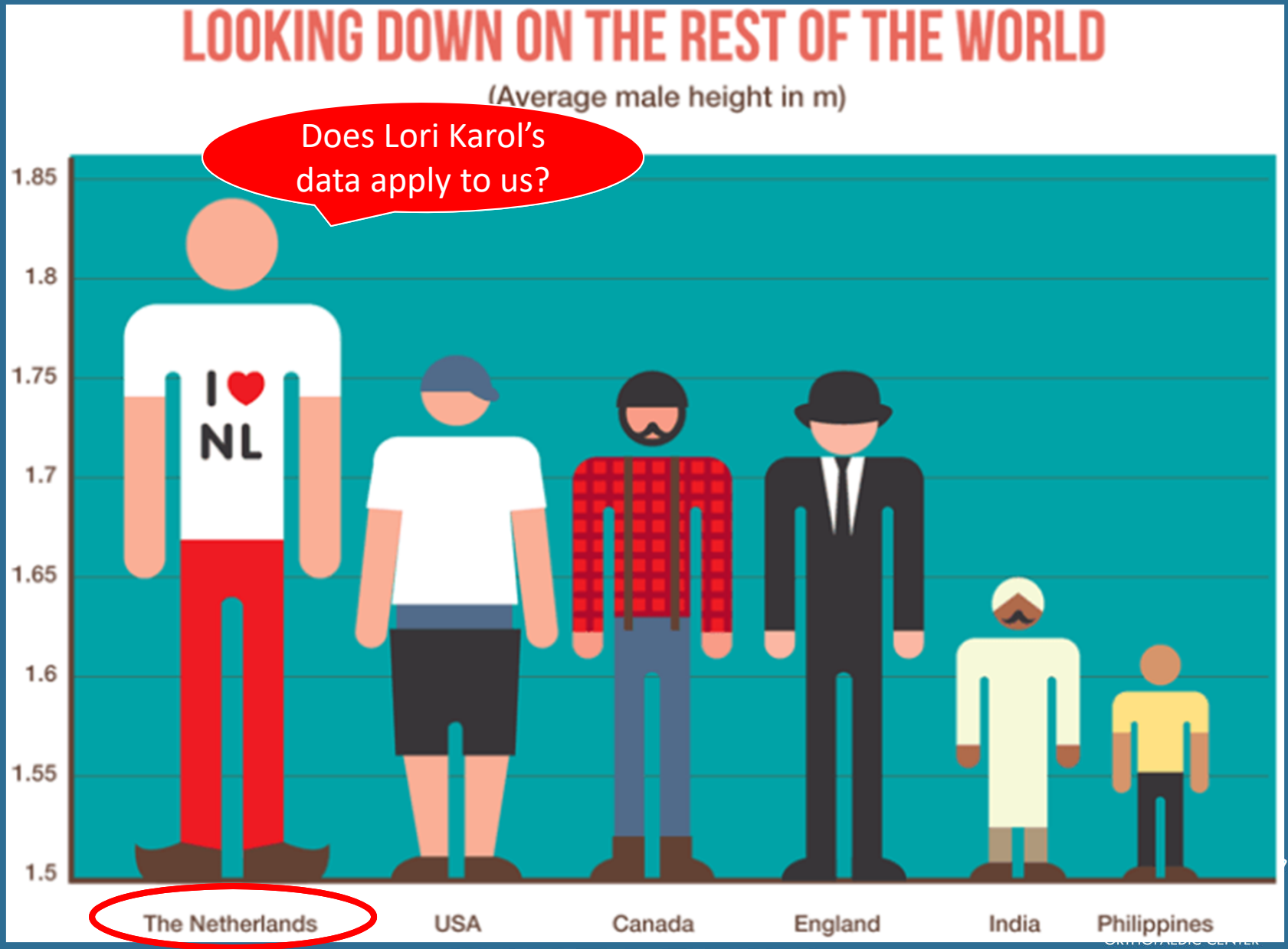
CHILDREN'S ORTHOPAEDIC CENTER

Conclusion

- Casting is an effective tool for both delaying and in some cases obviating need for surgical intervention
- Indications continue to be expanded
- Lack of randomized trials and a large amount of variability in timing and technique amongst surgeons

USC University of Southern California

Children's Hospital Los Angeles
CHILDREN'S ORTHOPAEDIC CENTER


LOOKING DOWN ON THE REST OF THE WORLD
(Average male height in m)
Does Lori Karol's data apply to us?
1.85
1.8
1.75
1.7
1.65
1.6
1.55
1.5
I ♥ NL
The Netherlands
USA
Canada
England
India
Philippines