

# ***Finding the Tipping Point: When Should Surgery Be Performed in Children with Early Onset Idiopathic Scoliosis?***

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# Background

- Lack of evidence has led to variation in EOS management among providers
  - CWSDSG - Vitale et al, CORR 2010
  - GSSG - Sponseller et al, JPO 2010
- Clear need for *higher level of evidence studies*

*When should we intervene in the child with EOS?*

# Equipoise: Can We Agree to Disagree?

- **‘Clinical Equipoise’ is the condition when there is no preference between available treatment options - all treatments are deemed equal**
- **Understanding the extent of equipoise between treatments, helps drive and focus research efforts**
- **Ethical foundation for randomized clinical trials**



# Determining Equipoise in Idiopathic EOS

## EOS Treatment Preference Survey

- 99 theoretical i-EOS case scenarios
- Cases varied by
  - Age (1, 2, 3, 6, 9 years)
  - Cobb angle (30, 60, 90° )
  - Rate of progression (0, 15, 30° over previous 6 months)
  - +/- Hyperkyphosis
  - +/- Spinal rigidity
- 11 surgeons recorded their treatment choice for each case scenario, responses were grouped into non-operative management vs. operative

# EOS Treatment Preference Survey

[Exit this survey](#)

1%

What would be your choice of management for this patient if they had shown

	Observation	Casting	Bracing	Rib based Distraction	Spine Based Distraction	Growth Guidance (e.g. Shilla)	Growth Modulation (e.g. VBS)	Spinal Fusion	Other-surgical
0° progression in the past 6 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15° progression in the past 6 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
30° progression in the past 6 months	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Infantile Idiopathic Scoliosis



- 1 year old Patient
- Cobb 30 degrees
- RVAD 20 degrees

**Non-operative treatment**

**Operative treatment**

Next

# Methods

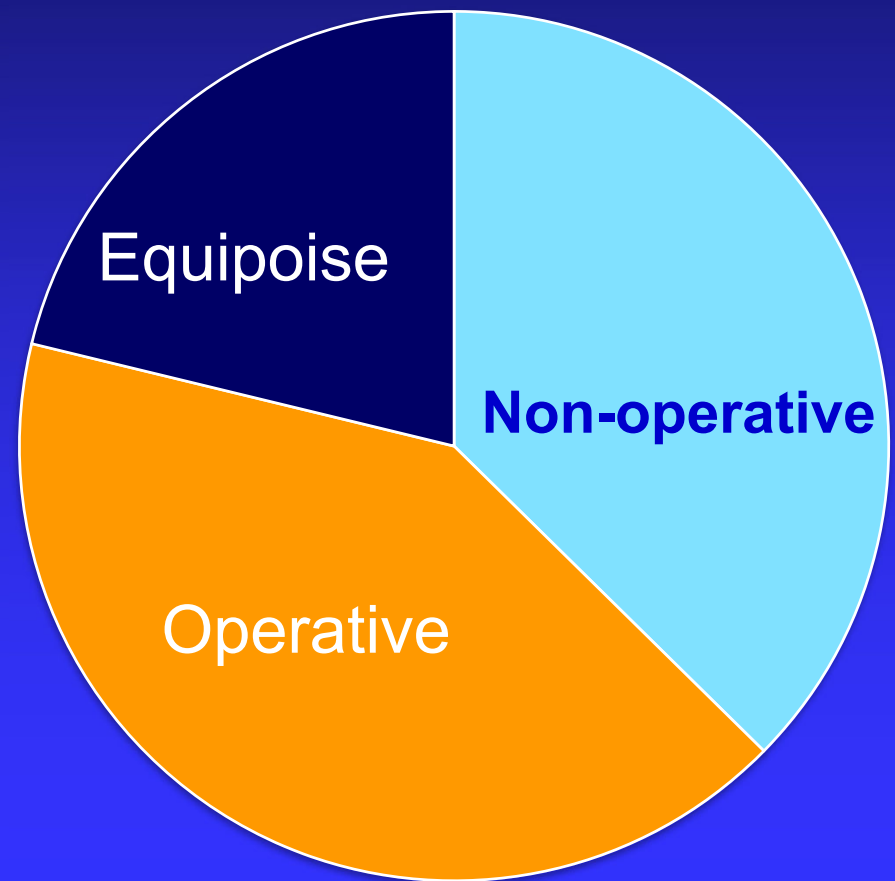
## Statistical Analysis

- Independent consultant with experience in consensus building
- Group consensus or uncertainty (equipoise) was identified with binomial distribution calculations
- Associations between each case variable (i.e. age, Cobb, etc.) and the tendency towards group agreement/disagreement were assessed with chi squared analysis

# Results

## What did we agree on?

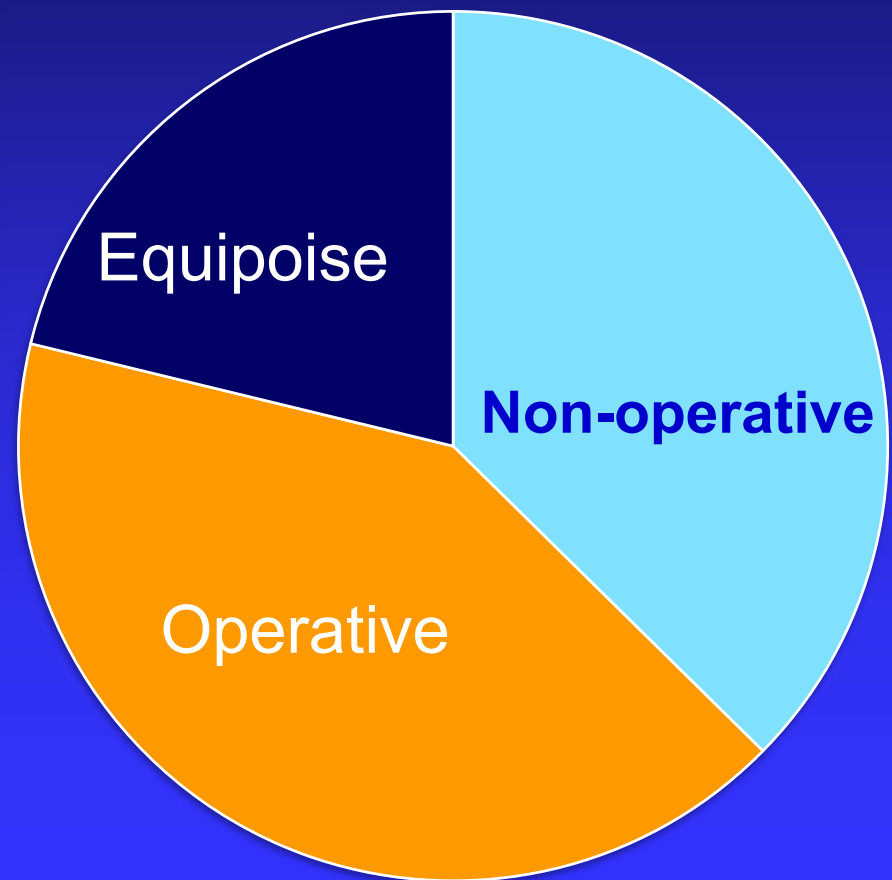
- There was *consensus* in 78/99 (78%) of all cases
  - Non-operative treatment in 37/99 (37%) cases
  - Operative Treatment in 41/99 (41%) cases.



# Results

## What didn't we agree on?

- Group *equipoise* in 21/99 (21%) of cases
- Characteristics of these cases included:
  - 60° Cobb angle
  - Rapidly progressing 90° curves in infancy
  - Slowly progressing 90° curves

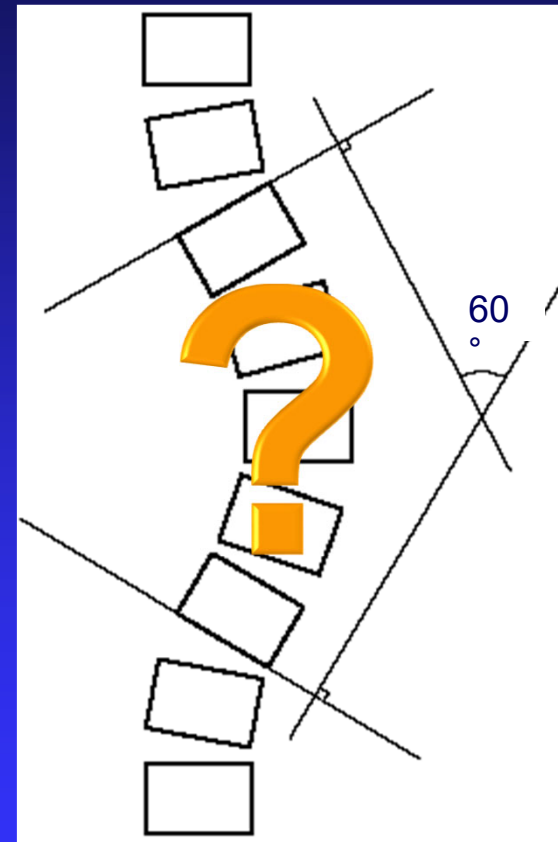




# Results

## Factors Associated with Management Choice

- Strong relationship between Cobb angle and group consensus ( $p < 0.001$ )
  - 89% of  $30^\circ$  curves managed conservatively
  - *High rate of equipoise for  $60^\circ$  curves*
  - 68% of  $90^\circ$  curves were managed surgically



*Surgeons were strongly influenced by Cobb angle when deciding between non-surgical vs. surgical treatment options*

# Results

## Factors Associated with Management Choice

- Frequency of group agreement was weakly related to:
  - age ( $p=0.103$ )
  - rate of progression ( $p=0.119$ )
- There was no *association* between group agreement and:
  - presence of kyphosis ( $p=0.817$ )
  - spinal rigidity ( $0.817$ )

*Rigidity and kyphosis were less important in driving surgical decision making*

# Discussion

## Implications for Future Research

- Retrospective analysis of existing databases should focus on the management of Idiopathic EOS in cases where high degrees of uncertainty were identified (e.g. children with 60° curves)
- This study provides an impetus and ethical justification for randomized clinical trials in cases where there is no evidence that one treatment option will provide a better outcome than another
- Efforts are underway to understand what clinical variables drive decision making when choosing between:
  - The non-surgical treatments (observe vs. brace vs. cast)
  - The surgical treatments (growth guidance vs. growth modulation vs. rib-based distraction vs. spine-based distractions vs. fusion)

# Limitations

- Small sample size; possible selection bias?
- *Other factors* may effect physician treatment choices (e.g. personal experience, training, etc.)
- *Theoretical* case scenarios
- The theoretical cases may have not accounted for *other clinical variables* that could affect treatment choice (e.g. spinal balance, bone quality)
- Limited number of possible values for each scenario