Growing Rods for Spinal Deformity: Characterizing Current Use

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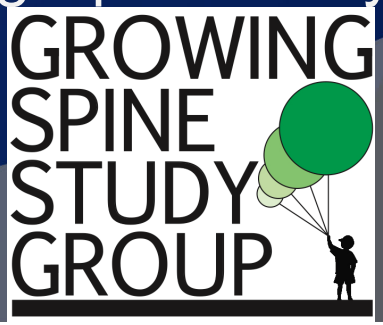

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Introduction

- Growing Rods (GR) are evolving in growth guidance for early onset scoliosis
  - One of several options
- Indications for surgical procedure determined by:
  - Expert consensus
  - Comparative studies
- No studies exist to characterize GR use among surgeons

Purpose

- To determine areas of consensus and variation in *principles* among surgeons who perform Growing Rod surgery through surveys
- To characterize current *use* of Growing Rods through analysis of database of GR patients

Methods

- 2 surveys of 17 surgeons
  - Surgeons' GR practice principles (17/19 responded)
  - Recommendations for specific cases of EOS (17/40)
- Survey results compared to data on 265 patients in the Growing Spine Study Group (GSSG) database
  - to examine whether practice coincides with principles

Results

Practice principles Survey

- Curve size was the most common indication for surgery (13/17)
  - Minimum curve 50-60^{o}
- Other surgical indications included:
  - Curve rigidity (8/17)
  - Brace intolerance (6/17)
- 82% (14/17) agreed the maximum age to start GR surgery is 8-10 years

Results

Practice Principles Survey

- 71% of surgeons (12/17) preferred to lengthen rods every 6 months
  - 29% of surgeons (5/17) experienced resistance from families to lengthening procedures

Results

Practice principles Survey vs. Growing Rod Database

	Principles Survey (17 Surgeons)	GSSG Database (265 Patients)
Pre-op Curve Size	(13/17) Most commonly selected indication → 73 ± 20° (10/13) Minimal curve = 50 - 60° → 87% of patients > 50°	

Results

Practice principles Survey vs. Growing Rod Database

	Principles Survey (17 Surgeons)	GSSG Database (265 Patients)
Pre-op Skeletal Age	**(14/17) Maximum = 8 – 10y**	**6.0 ± 2.5y** **94% of patients < 10y at GR insertion**

Results

Practice principles Survey vs. Growing Rod Database

	Principles Survey (17 Surgeons)	GSSG Database (265 Patients)
Contra-indications	(5/17) None (4/17) Myelo (3/17) Severe kyphosis (2/17) Chest wall deformities	All were represented

Results

Practice Principles Survey vs. Growing Rod Database

	Principles Survey (17 Surgeons)	GSSG Database (265 Pts)
Lengthening Interval	**(12/17) Every 6 months** →	**8.6 ± 5.1 months**

Results

Practice Principles Survey vs. Growing Rod Database

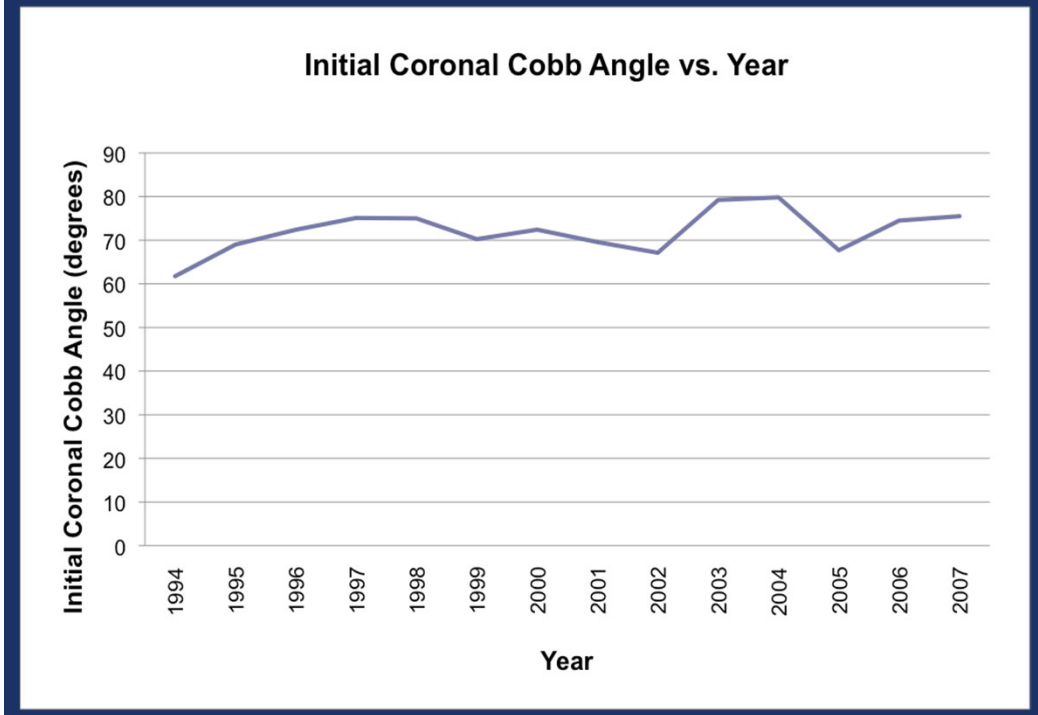
	Principles Survey (17 Surgeons)	GSSG Database (265 Patients)
Indication for Final Fusion	(13/17) Skeletal maturity (6/11 surgeons = Risser 4) (14/17) Complications: infection or implant failure (8/17) Curve progressing > 90° (7/17) Failure to distract	Mean age at Final Fusion : 12.1 ± 1.8y

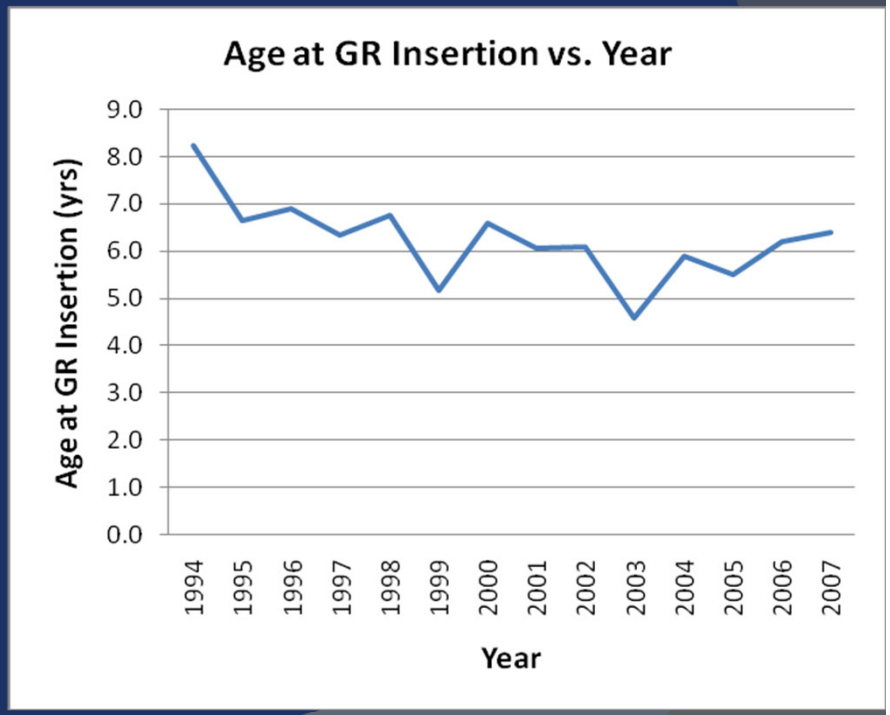
Results

Practice principles Survey vs. Growing Rod Database

	Principles Survey (17 Surgeons)	GSSG Database (265 Patients)
Final Treatment Method	(12/17) Replace everything ,add more anchors (4/17) Don't fuse if pt having no problem (1/17) Leave rods add more anchors (0/17) Bone graft with existing implants,(Including connectors)	(65/71) Definitive Fusion (4/71) Implants removed, no fusion (2/71) Rods left in place, no fusion

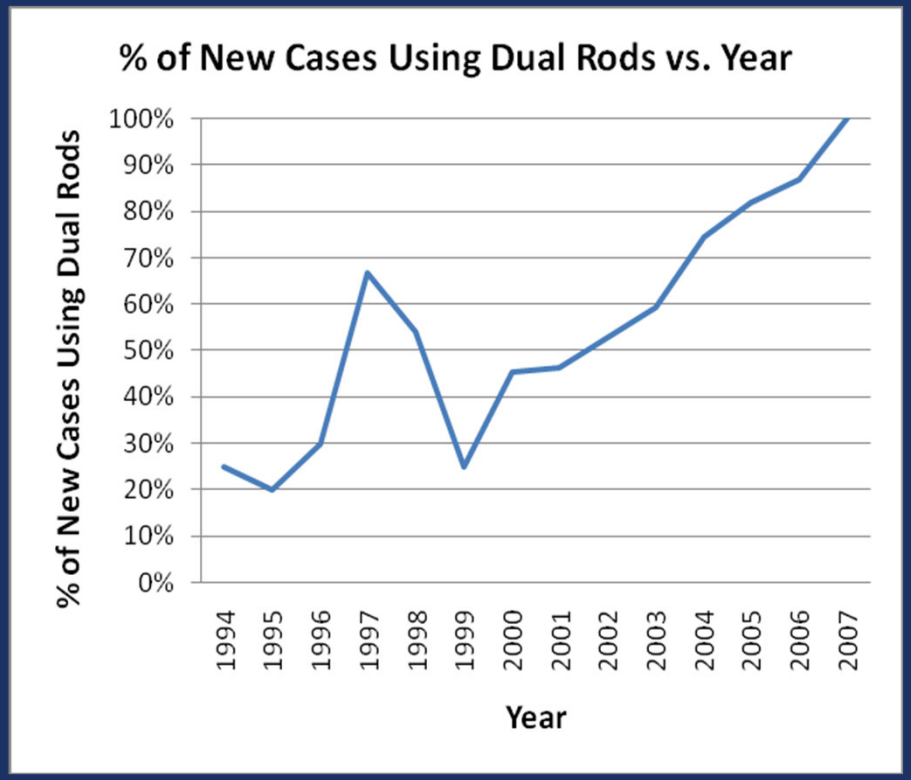
GSSG Database Trends over Time

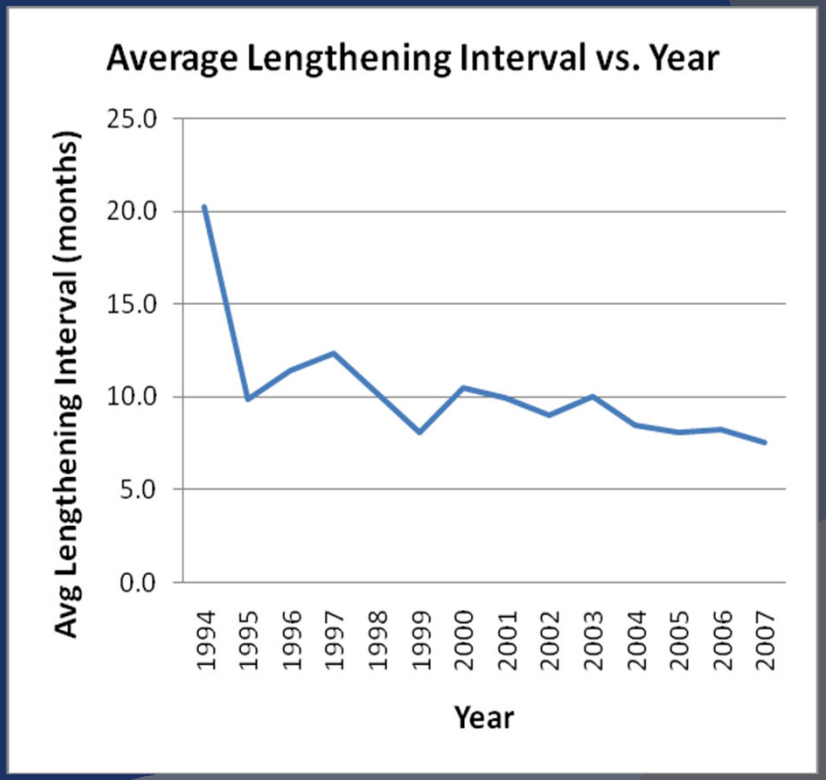




Results

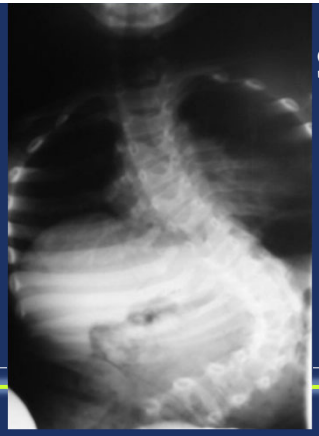
GSSG Database Trends





Results

Case Based Survey



Surgeons chose

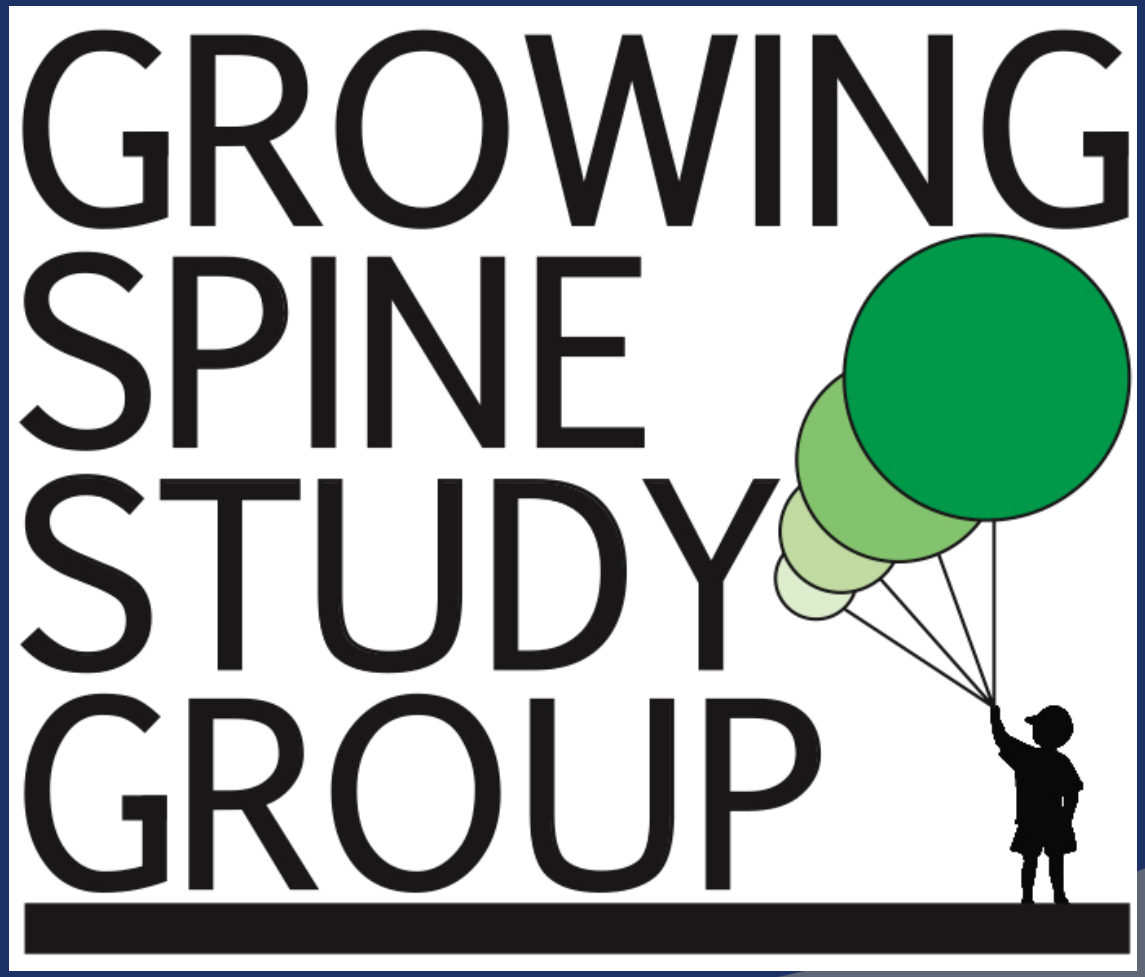
- Dual GR - 41.2%
- Non-op - 11.8%
- Shilla - 5.8%
- Immediate fusion - 11.8%
- VEPTR – 24%

- Surgeons asked their preferred treatment option for each patient
- Growing Rods (GR) were the most favored surgical treatment option
- There was a correlation between increasing curve size and the percentage of surgeons who chose GR over non-operative treatment, VEPTR, Shilla and fusion ($p=0.04$, $r=0.58$)

Conclusions

- Practice variation exists in GR treatment, but...
- There is consensus on indications for GR surgery:
  - Curve size > 50-60
  - Flexibility
  - Age <10
  - Less agreement on
    - Contra-indicated dx (?kyphosis, chest def, MM)
    - Lengthening interval
    - Final fusion method (evolving)
- Additional study of specifics may yield evidence

Thank you

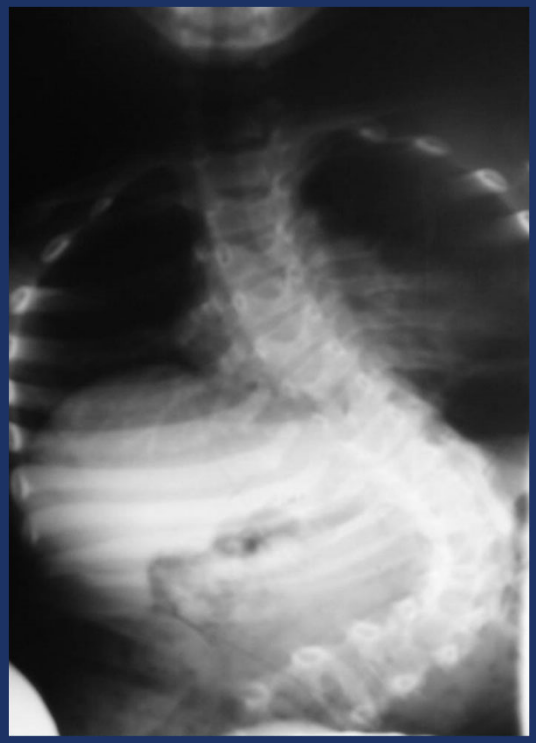


Materials and Methods
Summary

- 2 surveys of 17 surgeons
  1) General GR preferences
  2) Recommended treatment for specific cases of EOS
- Survey results compared to data on 265 patients in Growing Spine Study Group (GSSG) database to examine actual practice vs. stated preferences

Results

Sample Case from Case-Based Survey



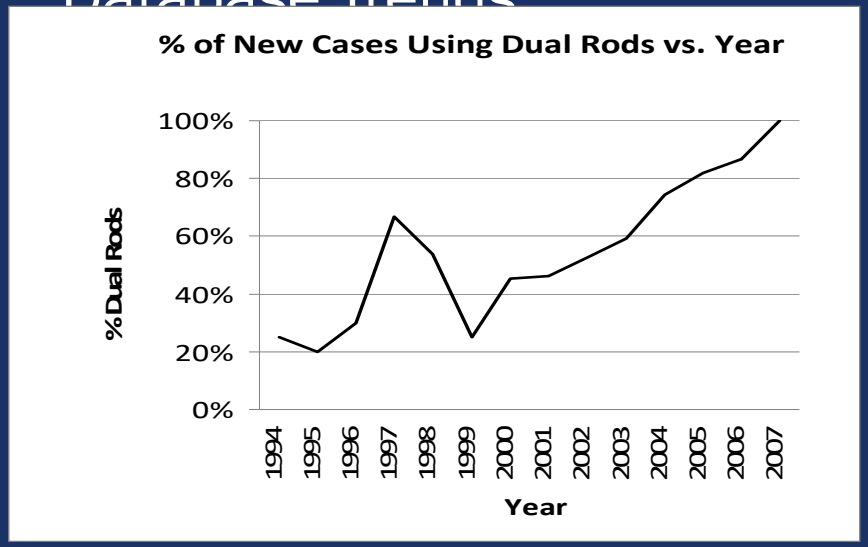
- **7y o w. Myelomeningocele**
- **T8-L4 Cobb = 100° (bends 36°)**

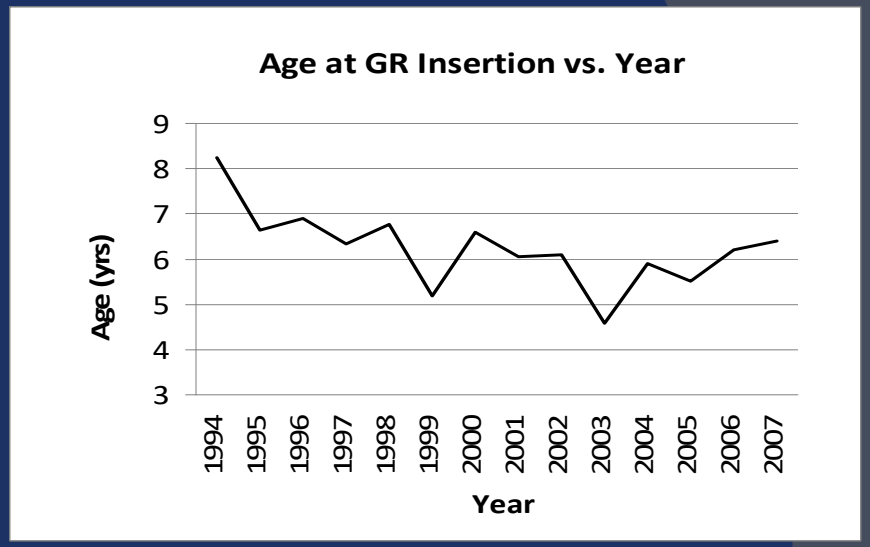
Surgeons chose

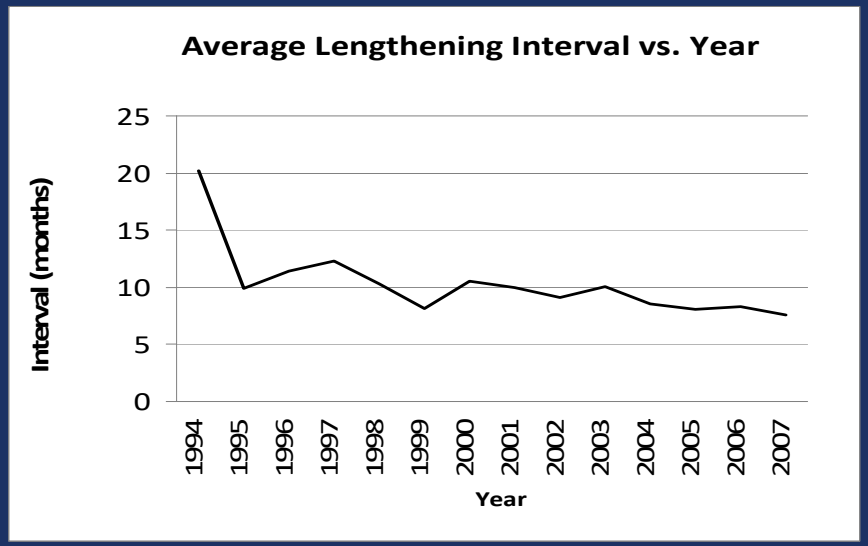
- Dual GR - 41.2%
- Non-op - 11.8%
- Shilla - 5.8%
- Immediate fusion - 11.8%
- VEPTR – 24%

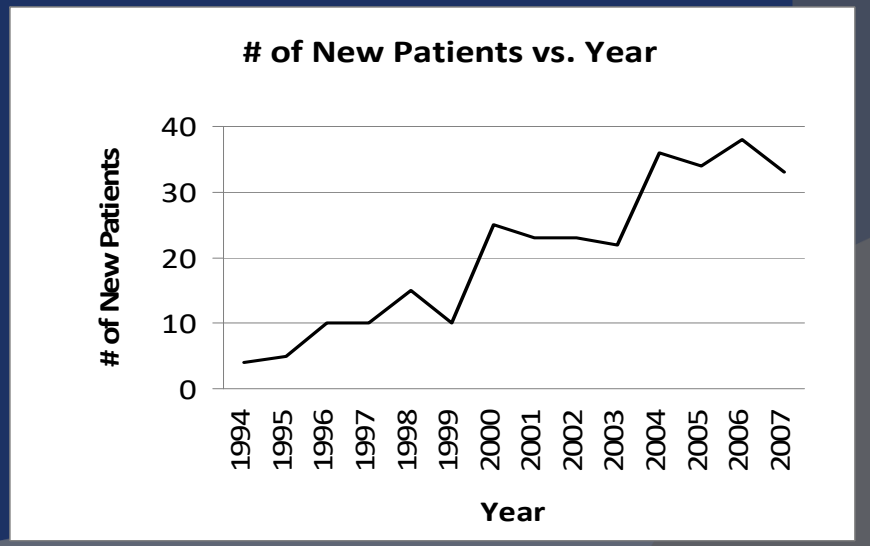
Results

Database Trends









Multi-Center GSSG Database Trends (265 patients)

Results

Case-Based Survey

- GRs most favored surgical treatment option, selected 31% more often than the next closest option

- Correlation between increasing curve size and percentage of surgeons who chose GRs over non-operative treatment, VEPTR, Shilla and fusion ($p=0.04$, $r=0.58$)

Conclusions

- Practice variation exists in GR treatment, but…
- Some consensus on indications for GR surgery
  - Curve size (>60 degrees)
  - Flexibility
  - Diagnosis (almost all included)
  - Age (<10 years)
- Most common intended lengthening interval 6 months, but not met in practice (8.6 ± 5.1 months)
- End of lengthening determined by diminishing clinical benefit or signs of skeletal maturity, little agreement beyond this

Materials and Methods

Preference Questionnaire

Surgeon Name:
Date:

1. **Please state your minimum criteria for starting growing rod treatment.**
   - **a) ___ Curve size (___ degrees)**
   - **b) ___ Curve flexibility (please describe)**
   - **c) ___ Brace intolerance**
   - **d) ___ Other factors (please describe)**

2. **What is the oldest age patient on whom you would start growing rod treatment (assume chronologic age equals skeletal age)?**

3. **Are there some diagnoses you have chosen not to use growing rods for when patients otherwise would have met your criteria? If yes, please explain which diagnoses and why.**

4. **The following questions concern your general protocol for growing rod lengthenings:**

   Part I

   Please select the one option that BEST fits your protocol

   - **a) ___ I lengthen at regular time intervals**
     - **___ Every six months**
     - **___ Every twelve months**
     - **___ Other (please specify)**
   - **b) ___ I lengthen at different intervals according to age (please describe)**
   - **c) ___ I lengthen depending on when the curve has increased**
     - **___ 10 degrees**
     - **___ 20 degrees**
     - **___ Other (please describe)**
   - **d) ___ Other rationale and factors (please describe)**

   Part II

   How do you schedule the lengthenings?

   - **a) ___ Family's responsibility to schedule**
   - **b) ___ Office's responsibility to schedule**

   Have you had families who are resistant to regular lengthening recommendations? If so, why?

Materials and Methods
Preference Questionnaire

5. The following questions concern your general protocol for final fusion. Please include numbers for objective measures like age and maturity indicators (Risser, TRC, Oxford hip score, Tanner) if used. You may check more than one.

Part I

Which of the following do you consider to be indications for final fusion?

a) ___ Curve fails to distract further at a regular lengthening
b) ___ Curve progresses despite lengthening. If so, what is the degree at which you would perform final fusion?
c) ___ Repeated complications
d) ___ Patient is skeletally mature. If so, what do you use to determine this?
    ___ Tanner (Stage: ___)
    ___ Risser (Value: ___)
    ___ Bone age (Age: ___)
    ___ Chronologic age (Age ___)
    ___ Failure to gain height
e) ___ Other/comments

Part II

How do you perform your definitive fusion at the end of growth?

a) ___ Bone graft with existing implants, including tandem connectors
b) ___ Add more intermediate anchors but leave rods and connectors (Type: ____)
c) ___ Replace everything and add more intermediate anchors
d) ___ I do not always do fusion if patient is having no problems with implants
e) ___ Other/comments