After institutional review board approval, all lumbar spine MRIs performed in children under six years of age at our institution in the past seven years were reviewed. Seventy patients were enrolled after excluding those with abnormal findings and those outside the WHO 10th–90th percentile of weight-for-age. SED was measured using a standardized technique by a pediatric neuroradiologist. Linear regression was used to estimate a weight based formula for SED. Analysis of variance and bootstrap methods were used to evaluate our formula against four commonly cited formulae. The quality of predictions was evaluated using the mean absolute prediction error (MAPE).

**INTRODUCTION**
- Epidural catheters placed for perioperative analgesia have well documented clinical benefits in children.
- Placement of epidural catheters in infants and toddlers are often technically challenging due to patient size and variation in anatomy.
- Research that aims to provide approximate skin to epidural space depth in this population is limited to direct needle measurement and ultrasonography.
- These methods are perhaps less than accurate given the great variability in trajectory of direct needle placement or views obtained by ultrasound.
- Magnetic resonance imaging is the most comprehensive imaging modality of the spine.

**METHODS**
- After institutional review board approval, all lumbar spine MRIs performed in children under six years of age at our institution in the past seven years were reviewed.
- Seventy patients were enrolled after excluding those with abnormal findings and those outside the WHO 10th – 90th percentile of weight-for-age.
- SED was measured using a standardized technique by a pediatric neuroradiologist.
- Linear regression was used to estimate a weight based formula for SED.
- Analysis of variance and bootstrap methods were used to evaluate our formula against four commonly cited formulae.
- The quality of predictions was evaluated using the mean absolute prediction error (MAPE).

**RESULTS**
- The estimated weight based formula is given by:
  \[ SED = 9 + 0.62 \times \text{Weight} \]
- SED is skin to epidural space depth
- SED is given in millimeters
- Weight is given in kilograms

**MEAN ABSOLUTE PREDICTION ERRORS**
- MRI based MAPE: 3.8 mm (95% CI: 3.2 – 4.5)
- Bosenberg 1 MAPE: 4.7 mm (95% CI: 0.4 – 1.3)
- Bosenberg 2 MAPE: 5.6 mm (95% CI: 1.2 – 2.4)
- Uemura MAPE: 4.3 mm (95% CI: 0.2 – 0.8)
- Hasan MAPE: 4.2 mm (95% CI: 0.2 – 0.9)

**DISCUSSION**
- We demonstrate that the MRI based formula provides a more accurate estimate of the skin to epidural space depth in young children.
- This formula predicts the epidural depth with a MAPE of 3.8 which is more accurate than all other commonly cited formulae, particularly the “gold standard” formula of 1 millimeter/kilogram.
- Direct needle measurements are less accurate in predicting depth due to variability of needle placement.
- It has been previously shown that flexion of the spine does not increase the skin to epidural space depth.
- We hope that these data will increase the safety of pediatric epidural placement and thereby improve outcomes of children undergoing surgery.

**REFERENCES**