



Publication summary of the **AO Spine Knowledge Forum Deformity – Prospective Evaluation of Elderly Deformity Surgery (PEEDS)**

March 2026

Peer-reviewed Journal Articles:

1. Raj A, Shear-Yashuv H, Aljamaal Y, Oitment C, Rienmueller A, Matsuyama Y, Qiu Y, Sardi JP, Dahl BT, Spruit M, de Kleuver M, Polly DW, Pellise F, Cheung KM, Alanay A, Lenke LG, Shaffrey CI, Berven SH, Lewis SJ, Group PS and Deformity AOSKF. *What functional benefits can older patients expect after adult spinal deformity surgeries? Subanalysis from the Prospective Evaluation of Elderly Deformity Surgery (PEEDS) study with 5 year follow up.* Spine J 2026.

<https://www.ncbi.nlm.nih.gov/pubmed/41519475>
2. Lewis SJ, Matsuyama Y, Qiu Y, Kelly M, Smith JS, Dahl BT, Spruit M, de Kleuver M, Polly DW, Pellise-Urquiza F, Cheung KM, Alanay A, Lenke LG, Shaffrey CI, Berven SH, Group PS and Deformity AOSKF. *Outcome of Prospective Evaluation of Elderly Deformity Surgery (PEEDS): A Multicenter International Study on Patients Over 60 years of Age Undergoing Multilevel Spinal Deformity Corrections.* Global Spine J 21925682251407627, 2025.

<https://www.ncbi.nlm.nih.gov/pubmed/41439665>
3. Campos Daziano M, Daunt L, Vashishth V, Seider E, Abbas A, Rienmueller A, Matsuyama Y, Qiu Y, Kelly M, Smith JS, Dahl BT, Spruit M, de Kleuver M, Polly DW, Sembrano J, Pellise-Urquiza F, Cheung KMC, Alanay A, Lenke LG, Shaffrey CI, Berven SH, Lewis SJ, Group PS and Deformity AOSKF. *Can Social Function Improve in Older Patients Undergoing Multi-Level Spinal Deformity Surgery?* Global Spine J 21925682251411237, 2025.

<https://www.ncbi.nlm.nih.gov/pubmed/41454904>
4. Sardi JP, Smith JS, Gum JL, Rocos B, Charalampidis A, Lenke LG, Shaffrey CI, Cheung KMC, Qiu Y, Matsuyama Y, Pellise F, Polly DW, Jr., Sembrano JN, Dahl BT, Kelly MP, de Kleuver M, Spruit M, Alanay A, Berven SH, Lewis SJ and AO Spine Knowledge Forum Deformity. *Opioid Use Prior to Adult Spine Deformity Correction Surgery is Associated With Worse Pre- and Postoperative Back Pain and Prolonged Opioid Demands.* Global Spine J ((15)3): 1749-1759, 2025.

<https://www.ncbi.nlm.nih.gov/pubmed/38832400>
5. Jentzsch T, Lewis SJ, Oitment C, Rienmuller A, Martin AR, Nielsen CJ, Shear-Yashuv H, de Kleuver M, Qiu Y, Matsuyama Y, Lenke LG, Alanay A, Pellise-Urquiza F, Cheung KMC, Spruit M, Polly DW, Sembrano JN, Shaffrey CI, Smith JS, Kelly MP, Dahl B, Berven SH and AO Spine Knowledge Forum Deformity. *The Influence of Multilevel Spinal Deformity Surgery on the*

EuroQol 5 Dimensions' (EQ-5D) Questionnaire and Residential Status in the Elderly: A Prospective, Observational, Multicenter Study. Global Spine J (14(7)): 1978-1989, 2023.

<https://www.ncbi.nlm.nih.gov/pubmed/36943086>

6. Hassan FM, Lenke LG, Berven SH, Kelly MP, Smith JS, Shaffrey CI, Dahl BT, de Kleuver M, Spruit M, Pellise F, Cheung KMC, Alanay A, Polly DW, Jr., Sembrano J, Matsuyama Y, Qiu Y, Lewis SJ and AO Spine Knowledge Forum Deformity. *Independent Prognostic Factors Associated With Improved Patient-Reported Outcomes in the Prospective Evaluation of Elderly Deformity Surgery (PEEDS) Study.* Global Spine J (14(8)): 2298-2310, 2023.

<https://www.ncbi.nlm.nih.gov/pubmed/37154697>

7. Nielsen CJ, Lewis SJ, Oitment C, Martin AR, Lenke LG, Qiu Y, Cheung KM, de Kleuver M, Polly DW, Shaffrey CI, Smith JS, Spruit M, Alanay A, Matsuyama Y, Jentsch T, Rienmuller A, Shear-Yashuv H, Pellise F, Kelly MP, Sembrano JN, Dahl BT, Berven SH and AO Spine Knowledge Forum Deformity. *Stratifying outcome based on the Oswestry Disability Index for operative treatment of adult spinal deformity on patients 60 years of age or older: a multicenter, multi-continental study on Prospective Evaluation of Elderly Deformity Surgery (PEEDS).* Spine J 21 (11): 1775-1783, 2021.

<https://www.ncbi.nlm.nih.gov/pubmed/34273569>

Conference Proceedings:

Podium/Oral Presentations

1. Abdelgawaad AS, Lewis SJ, Kleuver Md, Qiu Y, Matsuyama Y, Alanay A, Pellise F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith JS, Kelly MP, Dahl B, Berven S, Lenke LG, PEEDS Study Group and AO Spine Knowledge Forum Deformity. *Does osteoporosis increase the risk of mechanical and junctional failures in older patients undergoing ASD surgery?* 20th Annual Meeting of the German Spine Society (DWG) Wiesbaden, Germany. December 10 - 12, 2025.
2. Kato S, Rienmueller A, Klineberg E, Yilgor C, Kleuver Md, Qiu Y, Matsuyama Y, Alanay A, Pellise F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith JS, Kelly MP, Dahl B, Berven S, Lenke LG, Lewis SJ, PEEDS Study Group and AO Spine Knowledge Forum Deformity. *Underreporting Bias of Proximal Junctional Kyphosis and Failure in Adult Spine Deformity Surgery: a Multicenter Radiological Review Using Multiple Diagnostic Criteria.* 20th Annual Meeting of the German Spine Society (DWG) Wiesbaden, Germany. December 10 - 12, 2025.
3. Kato S, Klineberg E, Yilgor C, Kleuver Md, Qiu Y, Matsuyama Y, Alanay A, Pellise F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith JS, Kelly MP, Dahl B, Berven S, Lenke LG, Lewis SJ, PEEDS Study Group and AO Spine Knowledge Forum Deformity. *Underreporting Bias of Proximal Junctional Kyphosis and Failure in Adult Spine Deformity Surgery: a Multicenter Radiological Review Using Multiple Diagnostic Criteria.* Eurospine Copenhagen, Denmark. October 22-24, 2025.
4. Kato S, Klineberg E, Yilgor C, Kleuver Md, Qiu Y, Matsuyama Y, Alanay A, Pellise F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith JS, Kelly MP, Dahl B, Berven S, Lenke LG, Lewis

- SJ, PEEDS Study Group and AO Spine Knowledge Forum Deformity. *Underreporting Bias of Proximal Junctional Kyphosis and Failure in Adult Spine Deformity Surgery: a Multicenter Radiological Review Using Multiple Diagnostic Criteria*. Scoliosis Research Society (SRS) 60th Annual Meeting & Course 2024 Charlotte, NC, USA. September 16-20, 2025.
5. Kato S, Klineberg E, Yilgor C, Kleuver Md, Qiu Y, Matsuyama Y, Alanay A, Pellise F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith JS, Kelly MP, Dahl B, Berven S, Lenke LG, Lewis SJ, PEEDS Study Group and AO Spine Knowledge Forum Deformity. *Underreporting of proximal junctional kyphosis and failure in adult spine deformity surgery: a multicenter radiological review using multiple diagnostic criteria*. 14th Combined Meeting of the APSS (Spine) and APPOS (Paediatric Orthopaedic) Kuala Lumpur, Malaysia. June 20-22, 2025.
6. Daunt L, Vashishth V, Seider E, Daziano MC, Neuman B, Ames C and Lewis S. *Surgery improves social function of older adult spinal deformity (ASD) patients*. Global Spine Congress 2025 Rio de Janeiro, Brazil. May 28-31, 2025.
7. Kato S, Klineberg E, Yilgor C, Kelly M, Lenke L, Shaffrey C, Cheung K, Berven S, Qiu Y, Matsuyama Y, Pellise F, Sembrano JN, Dahl B, Spruit M, Alanay A and Lewis S. *Underreporting of proximal junctional kyphosis and failure in adult spine deformity surgery: a multicenter radiological review using multiple diagnostic criteria*. Global Spine Congress 2025 Rio de Janeiro, Brazil. May 28-31, 2025.
8. Kato S, Klineberg E, Yilgor C, Kelly M, Lenke L, Shaffrey C, Berven SH, Qiu Y, Matsuyama Y, Pellisé F, Sembrano J, Dahl B, Alanay A and Lewis S. *Underreporting Bias of Proximal Junctional Kyphosis and Failure in Adult Spine Deformity Surgery: A Multicenter Radiological Review Using Multiple Diagnostic Criteria*. 16th International Turkish Spine Congress La Blanche Island, Bodrum, Tukiye. May 22-25, 2025.
9. Shawky A. *Underreporting of proximal junctional kyphosis and failure in adult spine deformity surgery: a multicenter radiological review using multiple diagnostic criteria* 14th Pan Arab Spine Society Conference Dubai, UAE. January 24 - 26, 2025.
10. Sardar Z, Miller MR, Zuckerman MS, Lewis MS, Kleuver Md, Qiu Y, Matsuyama Y, Lenke L, Alanay A, Pellisé F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith J, Kelly M, Dahl B, Berven S and AO Spine Knowledge Forum Deformity. *Comparison of Elderly Patients with Spinal Deformity Fused From the Upper Versus the Lower Thoracic/Thoracolumbar Spine to the Sacrum. Prospective Evaluation of Elderly Deformity Surgery (PEEDS) Study*. North American Spine Society (NASS) 39th Annual Meeting Chicago, IL, USA. September 25-28, 2024.
11. Sardar Z, Miller R, Zuckerman S, Lewis S, Kleuver Md, Qiu Y, Matsuyama Y, Lenke L, Alanay A, Pellisé F, Cheung K, Spruit M, Polly D, Sembrano J, Shaffrey C, Smith J, Kelly M, Dahl B, Berven S and AO Spine Knowledge Forum Deformity. *Comparison of Elderly Patients with Spinal Deformity Fused from the Upper Versus the Lower Thoracic/thoracolumbar Spine to the Sacrum. Prospective Evaluation of Elderly Deformity Surgery (Peeds) Study*. Scoliosis Research Society (SRS) 59th Annual Meeting & Course 2024 Barcelona, Spain. September 10-14, 2024.
12. Polly D, Lewis S, Ravinsky R and Odland K. *Prospective Evaluation Of Elderly Deformity Surgery Variability* Global Spine Congress 2024 Bangkok, Thailand. May 15-18, 2024.
13. Lewis SJ. *Opioid use at baseline is associated with greater baseline and 2- year back pain scores in older patients undergoing asd surgery*. North American Spine Society (NASS) 38th Annual Meeting Los Angeles, CA, USA. October 18-21, 2023.
14. Lewis SJ. *5-Year outcomes of prospective evaluation of elderly deformity surgery: A multicenter international study on patients over 60 years of age*. North American Spine Society (NASS) 38th Annual Meeting Los Angeles, CA, USA. October 18-21, 2023.
15. Lewis SJ, Berven SH, Matsuyama Y, Lenke LG, Kelly MP, Shaffrey CI, Dahl BT, Kleuver MD, Spruit M, Pellisé-Urquiza F, Cheung K, Alanay A, Polly DW, Sembrano JN, Qiu Y and AO Spine Knowledge Forum Deformity. *Long-term Outcome of Prospective Evaluation of Elderly*

- Deformity Surgery (PEEDS): A Multicenter International study on patients over 60 years of age.* Global Spine Congress 2023 Prague, Czech Republic. May 31-June 3, 2023.
16. Lewis SJ. *5-Year outcomes of prospective evaluation of elderly deformity surgery: A multicenter international study on patients over 60 years of age.* Global Spine Congress 2023 Prague, Czech Republic. May 31-June 3, 2023.
 17. Nielsen CJ, Lewis SJ, Berven SH, Matsuyama Y, Lenke LG, Kelly MP, Shaffrey CI, Dahl BT, Kleuver MD, Spruit M, Pellise F, Cheung K, Alanay A, Polly DW, Sembrano JN, Qiu Y and AO Spine Knowledge Forum Deformity. *Stratifying Outcome Based On The Oswestry Disability Index For Operative Treatment Of Adult Spinal Deformity On Patients 60 Years Of Age Or Older: A Multicenter, Multi-Continental Study On Prospective Evaluation Of Elderly Deformity Surgery (Peeds).* Global Spine Congress 2021 Paris, France. November 3-6, 2021.
 18. Berven SH, Lenke LG, Venezia M, Qui Y, Kelly M, Shaffrey CI, Dahl BT, Kleuver Md, Spruit M, Pellisé-Urquiza F, Cheung KM, Alanay A, JR DWP, Sembrano J, Matsuyama Y, Lewis SJ and AO Spine Knowledge Forum Deformity. *Adverse Events in Multilevel Surgery in Elderly Patients: The Prospective Evaluation of Elderly Deformity Surgery (PEEDS).* Global Spine Congress 2021 Paris, France. November 3-6, 2021.
 19. Shear-Yashuv H, Lewis SJ, Jentzsch T, Oitment C, Rienmüller A, Martin AR, Nielsen CJ, Kleuver MD, Qiu Y, Matsuyama Y, Lenke LG, Alanay A, Pellisé F, Cheung KM, Spruit M, Polly DW, Sembrano JN, Shaffrey CI, Smith JS, Kelly MP, Dahl BT and Berven SH. *Assessing Key Functional Outcomes after Multilevel Fusion for Adult spinal Deformity in Patients Over Sixty Years of Age: A Prospective, Observational, Multicenter Study with 2-Year Follow-Up.* Scoliosis Research Society (SRS) 56th Annual Meeting & Course 2021 St. Louis, Missouri, USA. September 22-25, 2021.
 20. Oitment C, Lewis SJ, Rienmüller A, Jentzsch T, Shear-Yashuv H, Martin AR, Nielsen CJ and Berven SH. *Assessing Pain as a Primary Factor in the Surgical Treatment of Adult Spinal Deformity Surgery in Patients over 60 Years of Age.* Scoliosis Research Society (SRS) 56th Annual Meeting & Course 2021 St. Louis, Missouri, USA. September 22-25, 2021.
 21. Berven SH, Lenke LG, Venezia M, Street J, Martin A, Smith J, Kleinberg E, Qui Y, Kelly M, Shaffrey CI, Dahl BT, Kleuver Md, Spruit M, Pellisé-Urquiza F, Cheung KM, Alanay A, JR DWP, Sembrano J, Matsuyama Y, Lewis SJ and AO Spine Knowledge Forum Deformity. *Adverse Events in Multilevel Surgery in Elderly Patients with Spinal Deformity: Report of the Prospective Evaluation of Elderly Deformity Surgery (PEEDS).* Scoliosis Research Society (SRS) 56th Annual Meeting & Course 2021 St. Louis, Missouri, USA September 22-25, 2021. **[Russell A. Hibbs Award for Best Clinical Research]**
 22. Berven SH, Lenke LG, Venezia M, Qui Y, Kelly M, Shaffrey CI, Dahl BT, Kleuver Md, Spruit M, Pellisé-Urquiza F, Cheung KM, Alanay A, JR DWP, Sembrano J, Matsuyama Y, Lewis SJ and AO Spine Knowledge Forum Deformity. *Complications of Multilevel Surgery in Elderly Patients: The Prospective Evaluation of Elderly Deformity Surgery (PEEDS).* Scoliosis Research Society (SRS) 56th Annual Meeting & Course 2021 St. Louis, Missouri, USA. September 22-25, 2021. **[Russell A. Hibbs Award for Best Clinical Research]**
 23. Nielsen CJ, Lewis SJ, Berven SH, Matsuyama Y, Lenke LG, Kelly MP, Shaffrey CI, Dahl BT, Kleuver MD, Spruit M, Pellise F, Cheung K, Alanay A, Polly DW, Sembrano JN, Qiu Y and AO Spine Knowledge Forum Deformity. *Change in Oswestry Disability Index at 24 months following Multilevel Spinal Deformity Surgery in Patients over 60 years of age: A Multicenter International Prospective Study.* 20th Annual Scientific Conference of the Canadian Spine Society (CSS) Whistler, BC, Canada. February 26-29, 2020.
 24. Lewis S, Matsuyama Y, Lenke L, Kelly M, Shaffrey C, Dahl B, de Kleuver M, Spruit M, Pellisé F, Cheung K, **Alanay A**, Polly D, Sembrano J, Qiu Y and Berven S. *Demographics of a Prospective Evaluation of Elderly Deformity Surgery: Who is choosing to undergo these procedures?* 20th

- Annual Scientific Conference of the Canadian Spine Society (CSS) Whistler, BC, Canada. February 26-29, 2020.
25. Berven SH, Matsuyama Y, Lenke LG, Kelly M, Shaffrey CI, Dahl BT, de Kleuver M, Spruit M, Pellisé F, Cheung KM, **Alanay A**, Polly D, Sembrano J, Qiu Y and Lewis SJ. *Outcome of multilevel spinal deformity surgery in patients over 60 years of age: A multicenter international prospective study*. 20th Annual Scientific Conference of the Canadian Spine Society (CSS) Whistler, BC, Canada. February 26-29, 2020.
 26. Lewis SJ, Matsuyama Y, Lenke LG, Kelly M, Shaffrey CI, Dahl BT, de Kleuver M, Spruit M, Pellisé-Urquiza F, Cheung K, Alanay A, Polly DW, Sembrano J, Qiu Y and Berven SH. *Outcome of multilevel spinal deformity surgery in patients over 60 years of age: A multicenter international prospective study*. Scoliosis Research Society (SRS) 54th Annual Meeting & Course 2019 Montreal, QC, Canada. September 18-21, 2019.
 27. **Kato S**, Lewis SJ, Berven SH, Lenke LG, Shaffrey CI, Polly DW, Alanay A, Qiu Y, Cheung KM, Kleuver MD and Ito M. *Preoperative Characteristics of Elderly Patients Enrolled in the Prospective Evaluation of Elderly Deformity Surgery: (PEEDS) Trial of Multilevel Spinal Fusion*. Scoliosis Research Society (SRS) 52nd Annual Meeting & Course 2017 Philadelphia, PA, USA. September 06 - 09, 2017.

Poster or Virtual Presentations

1. Lewis S. *What are the risk factors for not reaching patient acceptable symptom state (PASS+) using the ODI after adult deformity surgery in patients above 60 years?* 25th Annual Scientific Conference of the Canadian Spine Society La Malbaie QC Canada. February 25 - 28, 2025.
2. Hassan FM, Berven SH, Kelly MP, Smith JS, Shaffrey CI, Dahl BT, Kleuver MD, Spruit M, Pellisé F, Cheung K, Alanay A, Polly DW, Sembrano J, Matsuyama Y, Yiu Y, Lewis SJ, Lenke LG and AO Spine Knowledge Forum Deformity. *Independent prognostic factors associated with improved patient-reported outcomes in the Prospective Evaluation of Elderly Deformity Surgery (PEEDS) Study*. Global Spine Congress 2023 Prague, Czech Republic. May 31-June 3, 2023.
3. **Polly DW**, Berven SH, Qiu Y, Lenke LG, Kelly M, Shaffrey CI, Dahl BT, de Kleuver M, Spruit M, Pellisé-Urquiza F, Cheung KM, Alanay A, Sembrano J, Matsuyama Y and Lewis SJ. *Variability in surgical approach in the treatment of elderly patients undergoing primary spinal deformity surgery*. Global Spine Congress 2021 Paris, France. November 3-6, 2021.
4. **Kwan K**, Lewis SJ, Lenke LG, Shaffrey CI, Berven SH, Qiu Y, Matsuyama Y, Pellisé F, Jr. DWP, Sembrano JN, Kelly MP, Dahl B, Spruit M, Alanay A, Smith JS and Cheung KM. *Geographic variation in the philosophy of adult spinal deformity management and patient outcomes: a propensity score matching analysis from the Prospective Evaluation Deformity Surgery (PEEDS) study*. North American Spine Society (NASS) 36th Annual Meeting Boston, MA, USA. September 29-October 2, 2021.
5. Nielsen CJ, Lewis SJ, Berven SH, Matsuyama Y, Lenke LG, Kelly MP, Shaffrey CI, Dahl BT, Kleuver MD, Spruit M, Pellisé F, Cheung K, Alanay A, Polly DW, Sembrano JN, Qiu Y and AO Spine Knowledge Forum Deformity. *Change in Oswestry Disability Index at 24 months following Multilevel Spinal Deformity Surgery in Patients over 60 years of age: A Multicenter International Prospective Study*. Scoliosis Research Society (SRS) 55th Annual Meeting & Course 2020 virtual. September 9-13, 2020.

6. Lewis SJ, Qiu Y, Lenke LG, Kelly M, Shaffrey CI, Dahl BT, Kleuver Md, Spruit M, Pellisé-Urquiza F, Cheung KM, Alanay A, JR DWP, Sembrano J, Matsuyama Y, Berven SH and AO Spine Knowledge Forum Deformity. *SRS-22r Score of a Prospective Evaluation of Elderly Deformity Surgery: A Prospective Observational, Multicenter Study* Scoliosis Research Society (SRS) 55th Annual Meeting & Course 2020 virtual. September 9-13, 2020.
7. Polly D, Berven S, Qiu Y, Lenke L, Kelly M, Shaffrey C, Dahl B, de Kleuver M, Spruit M, **Pellisé F**, Cheung K, Alanay A, Sembrano J, Matsuyama Y and Lewis S. *Variability in surgical approach in the treatment of elderly patients undergoing primary spinal deformity surgery*. 14th Annual Meeting of the German Spine Society (DWG) Munich, Germany. November 28-30, 2019.
8. Lewis S, Matsuyama Y, Lenke L, Kelly M, Shaffrey C, Dahl B, de Kleuver M, Spruit M, Pellisé F, Cheung K, **Alanay A**, Polly D, Sembrano J, Qiu Y and Berven S. *Demographics of a Prospective Evaluation of Elderly Deformity Surgery: Who is choosing to undergo these procedures?* 14th Annual Meeting of the German Spine Society (DWG) Munich, Germany. November 28-30, 2019.
9. Berven SH, Matsuyama Y, Lenke LG, Kelly M, Shaffrey CI, Dahl BT, de Kleuver M, Spruit M, Pellisé F, Cheung KM, **Alanay A**, Polly D, Sembrano J, Qiu Y and Lewis SJ. *Outcome of multilevel spinal deformity surgery in patients over 60 years of age: A multicenter international prospective study*. 14th Annual Meeting of the German Spine Society (DWG) Munich, Germany. November 28-30, 2019.
10. **Kato S**, Lewis S, Berven S, Lenke L, Shaffrey C and Polly D. *Preoperative Characteristics of Elderly Patients Undergoing multilevel spinal fusion surgery – A preliminary report from Prospective Evaluation of Elderly Deformity Surgery: PEEDS*. 17th Annual Scientific Conference of the Canadian Spine Society (CSS) Montreal, QC, Canada. Feb 22-25, 2017.