

# 7. ADVISE<sup>™</sup> Augmented technology platforms: A clinical perspective

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## Background

While pre- and postoperative imaging for measurement and planning is standard in spinal fusion care, numerous efforts have been made in recent years to optimize pedicle screw placement through intraoperative navigation techniques. However, technologies to assist in rod bending and placement have stagnated. Currently available rod system technologies, such as the Bendini® Spinal Rod Bending System, are primarily aimed at reducing OR time. However, biomechanical studies were able to show further benefits: computer-bent rods provide 60% lower residual forces than manually bent rods, which significantly reduces the risk of screw failure<sup>1</sup>. A decrease in screw loosening<sup>2</sup> and a significant decline in rod breakage<sup>3</sup> 1 year after surgery provide clinical evidence that the precision of rod bending is of significant importance. To avoid new problems caused by deformities unintentionally created intraoperatively, tools are needed to assist the surgeon in monitoring, managing, and achieving the proper level of correction for each patient.

## ADVISE<sup>™</sup> - Your Intraoperative Advantage

ADVISE<sup>™</sup> is a radiation free Augmented Reality (AR) software that runs on an Apple iPad. ADVISE<sup>™</sup> stands for Advanced Dynamic Visualization of Intraoperative Spinal Equilibrium. The software assists the surgeon in objectively measuring the patient's specific conditions intraoperatively compared with preoperative planning to achieve a patient-tailored construct for optimal correction, fixation and outcome. Thanks to the familiar, easily accessible hardware and a simple learning curve, ADVISE<sup>™</sup> is easy to use. It can be applied for all indications of in-situ posterior fixation or correction.

For intraoperative use, the iPad is covered with a sterile sleeve. By scanning the surgical field in three dimensions or using additional markers placed on the towers, the integrated iPad camera identifies the positions of each pedicle screw head based on the screw towers. During this process, the respective tower is displayed in yellow. Once the registration of a screw is complete, the color changes to blue. After having done this for all screws, ADVISE<sup>™</sup> calculates the size and shape of the rods to be used. The user can select any available rod to test the placement and adjust the position of the rod with gestures. Templates of ideally bent rods for a given screw orientation are mapped in the coronal and sagittal planes. The bending of the rod can be done over the iPad along these templates to initially obtain appropriate correction and avoid re-bending. For spondylolisthesis and trauma cases where predefined correction values are to be achieved, specially developed modules offer the possibility of taking these correction values into account in the rod bending.

## Conclusions

ADVISE<sup>™</sup> is an easy-to-use, iPad-based AR-enabled platform. The surgeon will be assisted in obtaining precisely fitted curved rods that will benefit all patients, but especially those with weakened bones (e.g., cancer, osteoporosis). It can be used for all types of cases, saving time, shortening the time of surgery that could possibly leading to fewer infections in more complex cases, and helps reduce radiation exposure for patients, surgeons and OR staff. In addition to controlled fixation, predictive correction helps maximize outcomes. Clinical data are needed for further insight.

1. Tohmeh AG, Isaacs RE, Dooley ZA, Turner AWL. Long Construct Pedicle Screw Reduction and Residual Forces are Decreased Using a Computer-Assisted Spinal Rod Bending System. NuVasive®, Inc. May 14.

2. Ohba T, Ebata S, Oda K, Tanaka N, Haro H. Utility of a Computer-assisted Rod Bending System to Avoid Pull-out and Loosening of Percutaneous Pedicle Screws. Clin Spine Surg. 2021 Apr 1;34(3):E166-E171.

3. V. Fiere, S. Fuentes, E. Burger, T. Raabe, P. Passias, et al. Patient-Specific Rods show a reduction in rod breakage incidence. Medicrea Whitepaper. October 2017.