GPS KNEE

VALUE ANALYSIS BRIEF

Clinical and Economic Value of the Advita GPS™ System for Knee

advita ORTHO

Advancing: Life

INTRODUCTION

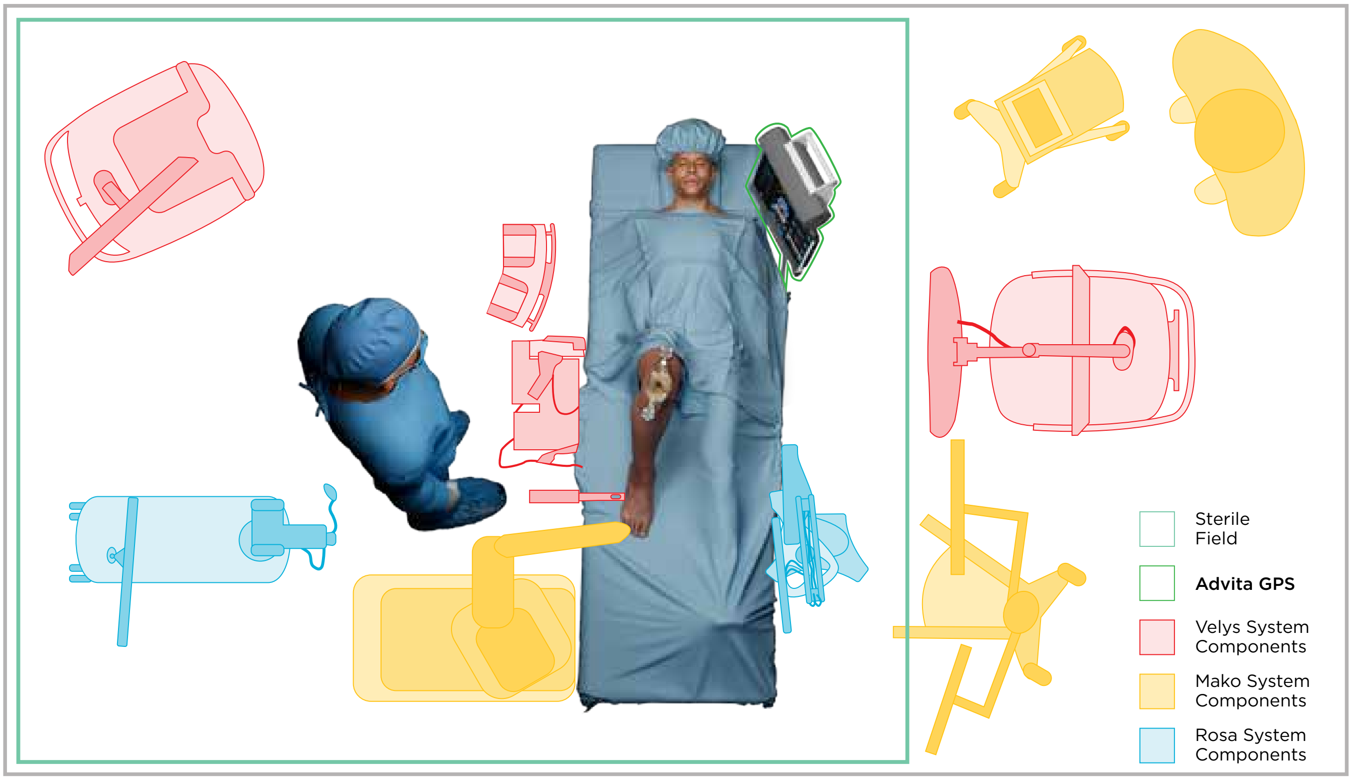
Today's surgical landscape demands more—greater precision, efficiency and value.

Advita GPS™ is designed to meet the demands, delivering a surgeon-centric solution without the cost or complexity of robotics.

Combining cost-efficiency, streamlined portability and data-driven clinical performance through Newton balancing and GPS guidance, this advanced technology empowers you to perform total knee arthroplasty (TKA) with greater control and patient-driven consistency. Whether you're focused on improved intraoperative control or enhanced precision, GPS is built to elevate performance and outcomes without compromise.

Compact Footprint for Seamless O.R. Integration

Advita GPS enables quick setup in the operating room and seamless transfer between surgical settings, including outpatient centers.



Small Footprint[1-9]

96.6% **SIZE REDUCTION** COMPARED TO MAKO

93.6% **SIZE REDUCTION** COMPARED TO ROSA

92.3% **SIZE REDUCTION** COMPARED TO VELYS

Lightweight[1-8]

98.7% **WEIGHT REDUCTION** COMPARED TO MAKO

98.5% **WEIGHT REDUCTION** COMPARED TO ROSA

96.5% **WEIGHT REDUCTION** COMPARED TO VELYS

Lower OR noise exposure compared with robotic-assisted TKA
Published studies have shown that robotic-assisted TKA is associated with higher noise levels than non-robotic techniques, with reported sound exposure in some cases exceeding recommended occupational health thresholds.[9-14]

GPS Knee Surgical Performance

Accurate Alignment

- Alignment achieved with GPS knee has demonstrated closer agreement with preoperative plans compared with conventional techniques.[15-18]

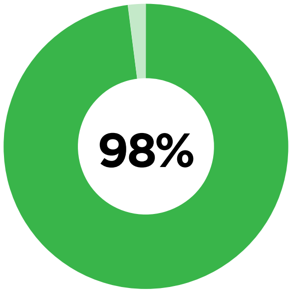
1.3°
Postoperative HKA with GPS
vs -2.4° conventional (p=0.021)[16]

7.5%
HKA angle outliers with GPS
vs 23.5% conventional (p=0.01)[16]

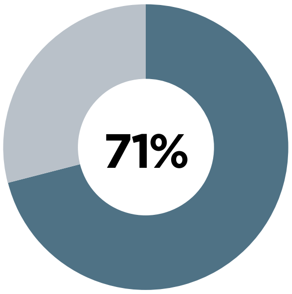
- GPS use was associated with a 1.6° improvement in mechanical lateral distal femoral angle (mLDFA) versus conventional instrumentation (p = 0.003).[15]
- GPS Knee improved alignment accuracy for novice surgeons, without significantly increasing operative time.[16]

Reproducible Results

- Guided surgical planning demonstrates more consistent restoration of joint line–related radiographic parameters compared with conventional techniques.[15]
- Normal patellar height was achieved in 98% of GPS Knee cases, as assessed by the Blackburne–Peel Index, compared with 71% in conventional guides (p = 0.002).[15]



GPS System



Conventional Guides (p = 0.002)

Workflow Compatiblity

GPS Knee supports multiple contemporary alignment philosophies and adapts to individual surgical workflows.[19-20]

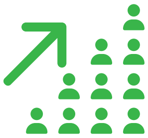
Learning Curve

GPS Knee enables rapid proficiency in intra-operative planning.[21]

6.4 +/- CASES

Average number of cases to planning proficiency

Average intraoperative planning time is reduced by 50% after the learning phase.



Faster completion of the first 50 cases correlated with a shorter learning curve.

Fast

Compared with robotic-assisted TKA, navigation-based systems such as GPS have demonstrated shorter surgical times, with a mean reduction 9.87 minutes reported in a systematic review and meta-analysis (p=0.04).[22]

Newton Soft Tissue Assessment and Consistency

Newton balancing is a force-controlled technique that quantifies medial and lateral soft tissue gaps throughout the full range of motion to support reproducible knee balancing.

Newton™ balancing is a force-controlled technique that quantifies medial and lateral soft tissue gaps throughout the range of motion.[23-25]

Reproducible soft tissue balance has been associated with improved functional outcomes and patient satisfaction.

- In a cadaveric study, use of the Newton Knee Technique demonstrated higher interobserver reliability for medial and lateral gap measurements compared with conventional techniques (medial ICC: 0.87 vs 0.60 (p=0.002); lateral ICC: 0.92 vs 0.25) (p=0.0001).[24]
- Measurement reliability was observed across surgeon experience levels, with no statistically significant differences between senior and junior surgeons.[24]

Accuracy of soft tissue balance[26]

- In a clinical series, targeted gap balance was achieved consistently across multiple flexion angles (15°, 45°, 75°, and 105°), with no significant differences in mediolateral laxity throughout the range of motion.[26]

Clinical Outcomes and Patient Satisfaction

High Patient Satisfaction[27]

- User satisfaction remained high at one year, with a Net Promoter Score of 9.46 ± 1.34.

Improved Short-Term Functional Outcomes[28]

- GPS Knee usage demonstrated a statistically significant association with higher KSS function scores, including the Walking and Stairs subcomponents, versus conventional surgery ($p < 0.04$).

Better Outcomes[28]

- In a comparative clinical study, use of Newton was associated with significantly greater improvements in KSS compared to a control group ($p<0.0001$). After multivariable adjustment, the balancer group demonstrated a 7 ± 2-point greater improvement in KSS Knee scores ($p < .0001$) and a 4 ± 2-point greater improvement in KSS Function scores ($p = .040$).

4 ± 2
KSS Function Scores

7 ± 2
KSS Knee Scores

9.46 ± 1.34
Net Promoter Score

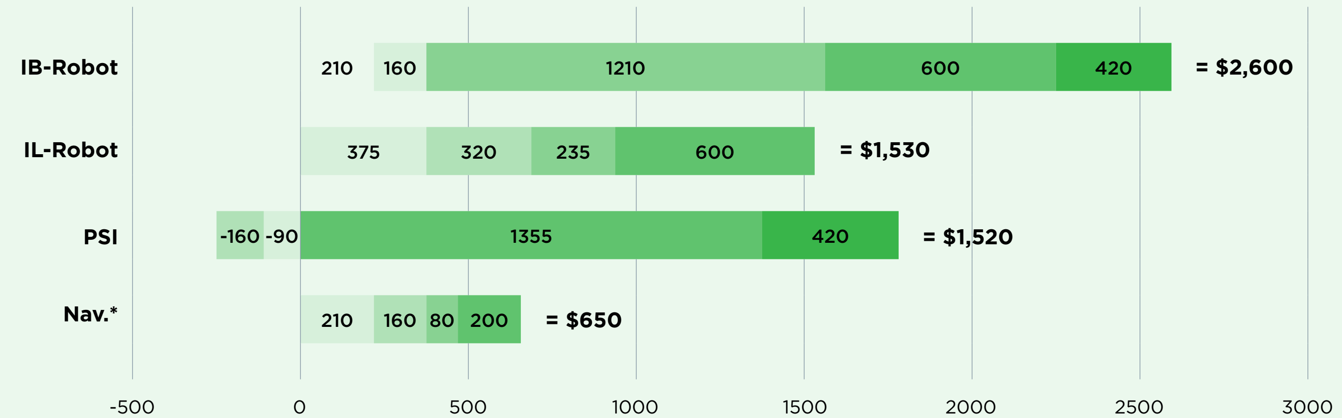
Economic Impact and Cost Savings

GPS delivers a compelling economic advantage compared to robotic systems

- GPS requires no capital cost or maintenance fees, eliminating upfront investment barriers.
- Reusable and recyclable active trackers lower cost-per-case compared to other robotic and navigation technologies.
- Computer-assisted TKA is associated with lower payer costs while delivering favorable clinical outcomes compared with conventional TKA.[29]
- Among advanced alignment technologies, imageless navigation has demonstrated the lowest additional procedural cost relative to conventional primary TKA, with lower added cost compared with patient-specific instrumentation (MyKnee), imageless robotics (NAVIO) and image-based robotic systems (MAKO).[30*]

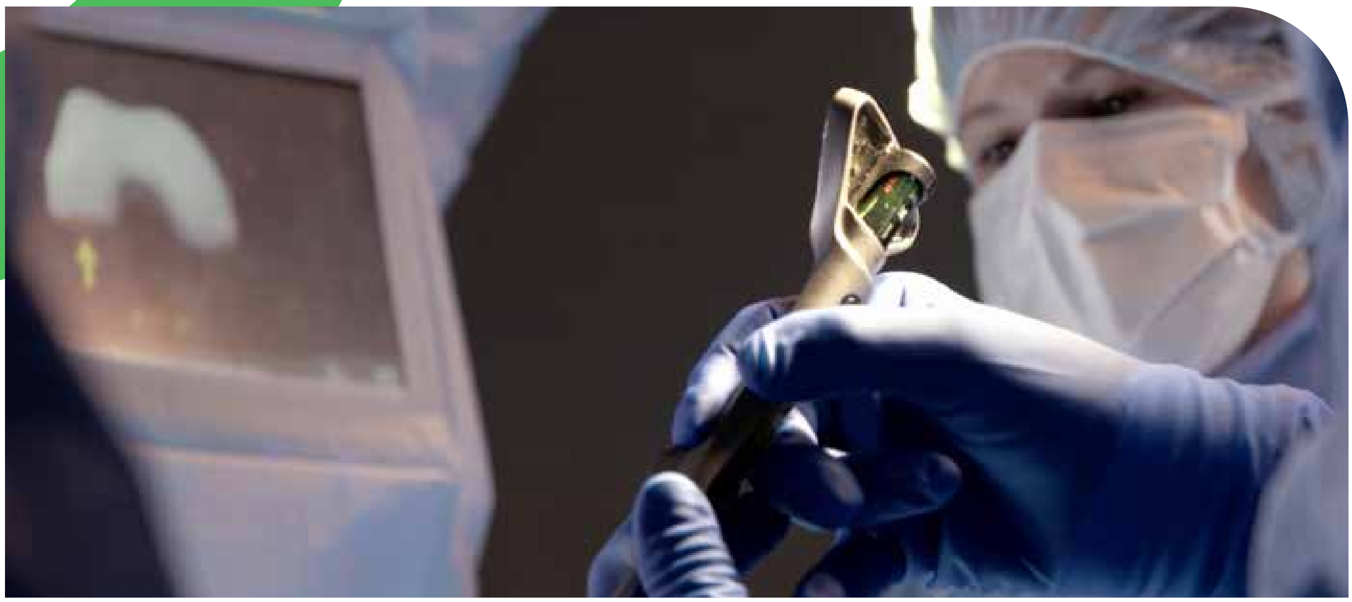
Additional Intraoperative Technology Costs[30*]

Comparison of additional procedural costs for navigation, patient-specific instrumentation, and robotic technologies relative to conventional primary TKA. Values are shown in U.S. dollars per cost.



IB = Image-Based | IL = Imageless | PSI = Patient-Specific Instrumentation | Nav = Navigation.[30*]

*Imageless navigation in this comparison refers to PiGalileo.



Cost of Robotic Procedures Over Conventional TKA

- Robotic-assisted TKA has been associated with approximately $2,400 higher procedural costs compared with conventional TKA.[31]
- In a hospital-based cost analysis, robotic-assisted TKA was associated with approximately 10% higher total hospital costs compared with conventional TKA, primarily driven by operative time, operating room

Relative hospital cost ratios for robotic-assisted TKA (roTKA) compared with conventional TKA (cTKA) by cost category. Values are presented as multipliers (×) and reflect roTKA relative to cTKA. P values indicate statistical significance of between-group difference

Cost category	cTKA (n = 1795)	roTKA (n = 263)	P value
Implant	—	1.03×	0.076
Supply excluding implant	—	2.17×	<.0001
Supply (medications)	—	0.95×	0.79
Supply cost total	—	1.18×	<.0001
Personnel PACU	—	0.98×	0.018
Personnel inpatient	—	0.84×	<.0001
Personnel OR	—	1.12×	<.0001
Personnel cost total	—	1.05×	0.0001
Total hospital cost	—	1.10×	<.0001

REFERENCES:

1. Inabathula A, Semerdzhiev DI, Srinivasan A, Amirouche F, Puri L, Piponov H. Robots on the Stage: A Snapshot of the American Robotic Total Knee Arthroplasty Market. JBJS Open Access 2024;9:e24.00063. https://doi.org/10.2106/JBJS.OA.24.00063.
2. Stryker - PN 213956 Rev AB 01/22. Mako Technical User Guide 2022.
3. Zimmer CAS - 3500.6-GLBL-en ROSA Hip System User Manual and Surg Tech V1.1-digital. ROSA Hip - User Manual and Surgical Technique V1.1 2024.
4. Depuy Synthes - IFU-0902-60-022 Rev M. VELYS - Robotic-assisted Solution - for Total Knee - User Guide - Software v1.6 2023.
5. Depuy Synthes - 182475-210707 VELYS vs Mako Footprint Evidence. The VELYS Robotic-Assisted Solution versus Mako - A comparison of system compactness 2021.
6. Smith & Nephew Orthopaedics GmbH. REAL INTELLIGENCE CORI for Knee Arthroplasty User Manual 2020.
7. Smith & Nephew Orthopaedics GmbH. CORI Robotics Cart - Quick Start Guide 2021.
8. OMNIlife science, Inc. - IFU-037 REV F JAN 2020. OMNIBoticsTM Station - Instructions for Use 2020.
9. Zhang H, Jiang X, Jin B, Zhang H, Liang J. Current developments in robotic assistance technology for total knee arthroplasty: a comprehensive overview. J Orthop Surg 2025;20:80. https://doi.org/10.1186/s13018-025-05490-z.
10. Goffin JSO, MacDonald DRW, Neilly D, Munro C, Ashcroft GP. Evaluation of sound levels in elective orthopaedic theatres during primary hip and knee arthroplasty. Surg J R Coll Surg Edinb Irel 2022;20:225–30. https://doi.org/10.1016/j.surge.2021.05.009.
11. Goffin J, MacRae E, Farrow L, Whittaker D, Dixon J, Rankin I, et al. Study on impact of robotic-assisted orthopaedic industrial noise (SIREN). Arch Orthop Trauma Surg 2024. https://doi.org/10.1007/s00402-024-05303-8.
12. Kwan SA, Ong AC, Lutz RW, Lau VW, Santoro AJ, Deirmengian GK. Noise-Induced Hearing Loss: Should Surgeons Be Wearing Ear Protection During Primary Total Joint Arthroplasty? HSS J Musculoskelet J Hosp Spec Surg 2024:15563316241254352. https://doi.org/10.1177/15563316241254352.
13. Willemot L, Gilmour A, Mulford J, Penn D. Noisy Robots? Comparison of Occupational Noise Levels Between Robotic-Assisted and Conventional Total Knee Arthroplasty. Arthroplasty Today 2024;30:101581. https://doi.org/10.1016/j.artd.2024.101581.

14. Pagan DN, Cruz-Ossa N, Cade W, D'Apuzzo MR, Carvajal JA, Hernandez VH. Noise-Related Injury During Robotic Versus Manual Total Knee Arthroplasty. J Arthroplasty 2025;0. https://doi.org/10.1016/j.arth.2025.02.022.

15. de Andrés-Torán A, Padilla-Eguiluz NG, Hernández-Esteban P, Gómez-Barrena E. Guided Personalized Surgery (GPS) in Posterostabilized Total Knee Replacement: A Radiological Study. J Clin Med 2025;14:429. https://doi.org/10.3390/jcm14020429.

16. Shon O-J, Kim GB, Lee HG. The Usefulness of a Simplified Navigation-Based Instrumentation for a Novice Surgeon in Primary Total Knee Arthroplasty: A Retrospective Analysis of a Randomized Controlled Trial. Clin Orthop Surg 2023;15:425–35. https://doi.org/10.4055/cios22289.

17. Saiki Y, Ojima T, Kabata T, Hayashi S, Tsuchiya H. Accuracy of different navigation systems for femoral and tibial implantation in total knee arthroplasty: a randomised comparative study. Arch Orthop Trauma Surg 2021;141:2267–76. https://doi.org/10.1007/s00402-021-04205-3.

18. Hannan R, Free M, Arora V, Harle R, Harvie P. Accuracy of computer navigation in total knee arthroplasty: A prospective computed tomography-based study. Med Eng Phys 2020;79:52–9. https://doi.org/10.1016/j.medengphy.2020.02.003.

19. Angibaud L, Chinimilli P, Boux De Casson F, Jung A. The Impact of Surgical Workflow on Bone Cut Parameters Evolution in Total Knee Arthroplasty: Transitioning from Measured Resection to Gap Balancing Surgical Workflow, 2024, p. 7–2. https://doi.org/10.29007/sxjt.

20. Angibaud L, Chinimilli P, Fan W, Boux De Casson F, Jung A, Huddleston J. Definition of the Laxity Goals During a Total Knee Arthroplasty Tends To Be Surgeon Specific, 2024, p. 11–5. https://doi.org/10.29007/zr8l.

21. Boux De Casson F, Huddleston J, Fan W, Jung A, Angibaud L. Assessing the Learning Curve of Advanced Intra-Operative Planning For Total Knee Arthroplasty, 2024, p. 36–31. https://doi.org/10.29007/xvbp.

22. Melinte MA, Simionescu L, Tăbăcar M, Blănaru V, Melinte RM. Comparison between robotic-assisted and navigation-assisted total knee arthroplasty shows comparable outcomes: A systematic review and meta-analysis. J Orthop 2025;68:96–104. https://doi.org/10.1016/j.jor.2025.01.039.

23. Rueff M, Glenboski J, Lacaille R, Angibaud L. Intraarticular Quasi-Constant Force Tension in Total Knee Arthroplasty Regardless of Joint Gap and Knee Size. EPiC Ser. Health Sci., vol. 5, EasyChair; 2022, p. 154–7. https://doi.org/10.29007/9217.

24. Boux de Casson F, Angibaud L, Kerveillant F, Nogaret F, Ruffin J, Duporté L, et al. Navigated instrumentation and ligament tensioning device enhances initial gap acquisition during total knee arthroplasty procedure: A cadaveric study. J Exp Orthop 2025. https://doi.org/10.1002/jeo2.70107.

25. Angibaud L, Kerveillant F, Dubard P, Torrollion M, Rueff M, Fan W, et al. Reliability of Laxity Acquisitions Under Controlled Load Environment During Navigated Total Knee Arthroplasty. EPiC Ser. Health Sci., vol. 5, EasyChair; 2022, p. 15–8. https://doi.org/10.29007/nxdl.

26. Fan W, Angibaud L, Jung A, Hamad C, Davis M, Zirgibel B, et al. Gap Balancing Throughout the Arc of Motion with Navigated TKA and a Novel Force-Controlled Distractor: A Review of the First 273 Cases. J Arthroplasty 2023;0. https://doi.org/10.1016/j.arth.2023.03.011.

27. Boux De Casson F, Angibaud L, Naji O. Navigated Tibia First Total Knee Arthroplasty Using a Ligament Tensioning Device, Clinical Results at 1Y Follow-up, 2026, p. 55–50. https://doi.org/10.29007/kx3m.

28. Fan W, Dai Y, Giordano G. CAOS TKA Provides Improved Functional Outcomes Compared to Conventional TKA. EPiC Ser. Health Sci., vol. 4, EasyChair; 2020, p. 74–7. https://doi.org/10.29007/mhqn.

29. Tian Y, Ahmed AG, Hiredesai AN, Huang LW, Patel AM, Ghomrawi HMK. The Cost-Effectiveness of Computer-Assisted Compared with Conventional Total Knee Arthroplasty: A Payer's Perspective. JBJS 2024;106:1680. https://doi.org/10.2106/JBJS.23.00555.

30. Christen B, Tanner L, Ettinger M, Bonnin MP, Koch PP, Calliess T. Comparative Cost Analysis of Four Different Computer-Assisted Technologies to Implant a Total Knee Arthroplasty over Conventional Instrumentation. J Pers Med 2022;12:184. https://doi.org/10.3390/jpm12020184.

31. Aggarwal VA, Sun J, Sambandam SN. Outcomes following robotic assisted total knee arthroplasty compared to conventional total knee arthroplasty. Arch Orthop Trauma Surg 2024. https://doi.org/10.1007/s00402-024-05231-7.

32. Fang CJ, Mazzocco JC, Sun DC, Shaker JM, Talmo CT, Mattingly DA, et al. Total Knee Arthroplasty Hospital Costs by Time-Driven Activity-Based Costing: Robotic vs Conventional. Arthroplasty Today 2022;13:43–7. https://doi.org/10.1016/j.artd.2021.11.008.

GLOBAL HEADQUARTERS
2320 NW 66TH COURT
GAINESVILLE, FL 32653-1630 USA

(833) 4-ADVITA
advita.com