

Technology Use in Primary THA and Associated Costs

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INTRODUCTION: The integration of enabling technologies, such as computer navigation and robotics, in primary total hip arthroplasty (THA) has accelerated in the last decade. These innovations are designed to enhance the precision of implant placement and potentially improve patient outcomes. However, the financial implications of their use remain inadequately defined. This study examined standardized episode-of-care costs for technology-assisted versus manual THA, including index hospitalization and 90-day postoperative costs.

METHODS: We identified 513 primary THAs performed with enabling technologies (handheld navigation, fluoroscopic-assisted navigation, and image-based robotics) from our institutional total joint registry from 2018 to 2023. Cases were propensity-score matched 1:1 to manual THAs, controlling for age, sex, BMI, femoral head size/material, surgical approach, and implant construct. Twenty-five patients required reoperation within the 90-day postoperative period, of which 11 (44%) were technology-assisted. Standardized costs included hospital charges (adjusted using Medicare cost-to-charge ratios) and professional fees (calculated using Medicare reimbursement rates). Capital acquisition and service fees for enabling technologies were not included.

RESULTS: Mean procedure costs were slightly higher with enabling technologies (\$17,377 vs. \$16,814; $p < 0.001$). Postoperative 90-day costs were also higher (\$2,661 v. \$1,440; $p = 0.01$), leading to higher total episode-of-care costs (\$20,038 v. \$18,255; $p < 0.001$). Compared to matched manual THAs all enabling technologies had higher mean procedure costs including \$17,976 for handheld navigation, \$16,276 for image-based robotics, and \$16,439 for fluoroscopic-assisted computer navigation. Handheld navigation and image-based robotics were also associated with higher total episode-of-care costs compared to their matched manual groups.

DISCUSSION AND CONCLUSION: Technology-assisted primary THAs were associated with slightly higher procedure costs than manual techniques. As use of enabling technologies expands, a thorough evaluation of cost-effectiveness and other benefits, beyond direct procedure costs and clinical outcomes, is important to inform value-based care.