## Achieving Cost Savings with Cementless Fixation in Total Knee Arthroplasty: A 20 Year Markov Analysis

Michael Booth, Hayden N Box, Hany S Bedair

INTRODUCTION: Total knee arthroplasty (TKA) is increasingly performed in younger, high-demand patients, raising concerns about the long-term durability of traditional cemented implants. Cementless TKA offers the potential for biologic fixation and improved longevity, but its cost-effectiveness remains uncertain.

METHODS:

A Markov decision model was used to compare the 20-year cost of cemented versus cementless primary TKA in a cohort of 10,000 patients beginning at age 50. The model incorporated implant costs, revision rates, operating room (OR) time, and other relevant clinical variables. Sensitivity analyses were conducted to assess the impact of implant failure rates, implant cost markups, and OR time savings.

RESULTS: The 20-year cost of cementless TKA ($20,829) was slightly higher than cemented TKA ($20,573). However, key variables significantly influenced cost-effectiveness. When the cementless failure hazard ratio was reduced to 0.8, a cost savings of $1,676 was observed. Conversely, a hazard ratio of 1.2 led to a $1,768 increase in cost. A cost-neutral threshold was achieved with a 19% cementless implant markup or 13 minutes of OR time saved. Additional savings were observed when OR time costs exceeded $54 per minute. Other variables, such as cement cost and patient age, had minimal impact.

DISCUSSION AND CONCLUSION: Cementless TKA can be cost-neutral or cost-saving over 20 years if specific conditions such as implant pricing and reduced OR time are met. While clinical outcomes appear comparable between implant types, careful consideration of cost drivers and institutional practices is necessary. Cementless TKA may be a viable, cost-effective option in selected patient populations, though further research is needed to refine these thresholds and evaluate long-term outcomes.