A Cost-Utility Analysis of a Preoperative 12-Week Smoking Cessation Program in Adults Undergoing Elective Shoulder Arthroplasty

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INTRODUCTION: Smoking negatively impacts outcomes in shoulder arthroplasty, increasing the risk of complications such as infections, delayed wound healing, and revision surgeries. These risks contribute to higher healthcare costs and reduced patient quality of life. While clinical benefits of smoking cessation programs (SCPs) are well-documented, their cost-effectiveness in the context of reverse shoulder arthroplasty (RSA) has not been comprehensively analyzed. This study evaluates the cost-utility of a 12-week preoperative SCP for smokers undergoing elective shoulder arthroplasty, assessing healthcare costs, quality-adjusted life years (QALYs), and net monetary benefits (NMB).

METHODS: A decision-analysis model was developed using TreeAge Pro 2021 to compare two strategies: implementing a preoperative 12-week SCP or no SCP. The model was designed for a hypothetical smoker with glenohumeral arthritis indicated for elective shoulder arthroplasty. Inputs included event probabilities, costs (adjusted to 2024 USD), and health utility scores derived from literature. The model evaluated 5-year cumulative costs and QALYs. Probabilistic sensitivity analysis (1,000 Monte Carlo simulations) and univariate sensitivity analysis were conducted to account for uncertainty. Incremental cost-effectiveness ratios (ICERs) and incremental net monetary benefits (INMBs) were calculated at a willingness-to-pay threshold of $100,000/QALY.

RESULTS:

SCP emerged as the preferred strategy in 91.3% of probabilistic simulations. Base-case analysis demonstrated that SCP reduced average costs to $33,575 compared to $38,729 for no SCP, with QALY gains of 5.77 versus 5.71. The mean INMB for SCP was $10,835 (95% CI: $10,299–$11,371), while the ICER was -$90,705/QALY, indicating both cost savings and superior effectiveness. Sensitivity analysis revealed that the QALY for patients avoiding revision surgery was the most influential variable in model outcomes. SCP decreased the likelihood of revision surgery, reduced healthcare utilization, and improved patient-reported outcomes.

DISCUSSION AND CONCLUSION: A preoperative 12-week SCP is a highly cost-effective strategy for smokers undergoing elective shoulder arthroplasty. By significantly reducing complications and revision surgery rates, SCP not only lowers healthcare costs but also enhances patient quality of life, reflected in greater QALY gains over five years. The results highlight the importance of SCP as a preoperative optimization measure, providing economic value and clinical benefits. Future research should investigate the impact of smoking intensity and duration on SCP outcomes to further refine its utility in surgical populations.