Informing Surgical Decision-Making through Evidence: A Randomized Trial-Based Cost-Utility Analysis of Periacetabular Osteotomy plus Arthroscopy for Hip Dysplasia

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Background

- Hip dysplasia is a common cause of hip pain in young active adults, leading to physical impairments and reduced quality of life.[1]
- The most common surgical treatment is the Bernese periacetabular osteotomy (PAO), which has evolved as the standard of care.[2]
- Studies have shown that PAO is associated with low complication rates and a 74% joint survival rate at 18 years.[3]
- Despite the benefits, 60-85% of patients have concomitant intraarticular pathology that cannot be corrected with PAO alone.[4]
- Hip arthroscopy plus PAO, however, is associated with higher hospitalization costs. The cost-effectiveness of PAO alone compared to hip arthroscopy plus PAO has not been explored.

Objective

- To assess the cost-utility of hip arthroscopy at the time of PAO compared with PAO alone over a 2-year time horizon from the perspective of a third-party payer.
- A scenario analysis adopting a societal perspective was conducted to incorporate patient time costs and productivity losses associated with each procedure.

Methods

Table 1. Key Input Parameters used in the Model

Parameter	PAO plus arthroscopy n=62	PAO alone n=55	Source
PROPr utility scores, mean (SD)			
Baseline	0.45 (0.19)	0.44 (0.16)	Derived from trial[5]
1 year	0.23 (0.19)	0.25 (0.18	Derived from trial[5]
2 years	0.22 (0.21)	0.24 (0.16)	Derived from trial[5]
iHOT-33, proportion with MCID ≥10	0.93	0.87	Derived from trial[5]
iHOT-33 scores, mean (SD)			
Baseline	31.4 (15.8)	35.7 (15.3)	Derived from trial[5]
2 years	71.3 (21.9)	75.4 (19.2)	Derived from trial[5]
Health system cost of procedure, mean (SD)			
Hospital costs	15,550 (5,496)	11,587 (3,785)	Derived from trial[5]
Physician cost	17,092 (12,876)	13,837 (9,823)	Derived from trial[5]
Total cost of procedure	33,140 (17,995)	25,654 (13,837)	Derived from trial[5]

- The cost utility analysis was conducted using data from a multi-centre randomized-controlled trial.[5]
- Patients were recruited between May 2018 and January 2024 from study sites in Canada (The Ottawa Hospital) and the United States (University of Washington, St. Louis).[5]
- **Primary effectiveness outcome**: quality-adjusted life-years (QALYs) calculated using the PROMIS Global 10 (Global Health v 1.2) converted to PROPr utility scores. Administered pre-operatively (baseline) and at 6, 12, and 24 months post-operatively.
- **Secondary effectiveness outcome**: Minimal clinically important difference (MCID) of 10 or greater between baseline and 24 months using the International Hip Outcome Tool (iHOT-33).
- **Costs** included supplies, implantation, hospitalization, and reoperation costs obtained from the respective hospital case costing departments. Time loss from work was included in the societal perspective.
- To account for missing data, we performed multiple imputation by chained equations. To account for the potential impact of differences in baseline characteristics between the two interventions as well as the correlations between costs and effects, seemingly unrelated regressions (SUR) were used.

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Results

Table 2. Costs, QALYs, and Incremental Cost-Effectiveness Ratio

	PAO plus arthroscopy (n=62)	PAO alone (n=55)	Mean difference (95% CI)
Unadjusted total health system cost ($), mean (95% CI)	$46,257 ($44,398, $48,112)	$40,265 ($37,467, $43,065)	$5,989 ($3,344, $8,636)
Unadjusted QALYs	0.59 (0.50, 0.67)	0.62 (0.53, 0.71)	-0.03 (-0.15, 0.09)
Adjusted* incremental cost, mean (95% CI)	**$5,822** ($3,070, $8,574)		
Adjusted* incremental QALY, mean (95% CI)	**-0.04** (-0.13, 0.05)		
Cost ($) per QALY gained	PAO plus arthroscopy is dominated (more costly and less effective)		

*Adjusted for intervention type, study site, age, sex, and Body Mass Index.
Abbreviations: QALY; Quality-adjusted life-year.

Figure 1. Cost-effectiveness plane of the PAO plus arthroscopy compared to PAO alone

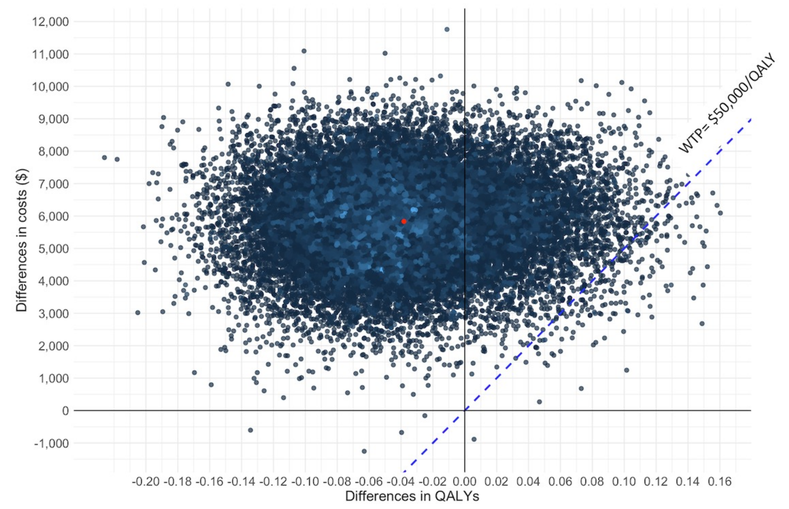
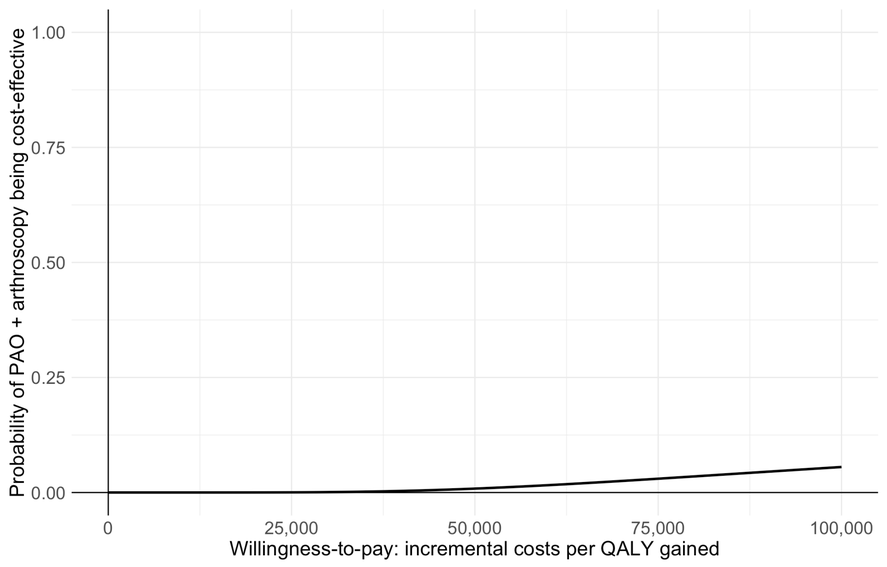


Figure 2. Cost-effectiveness acceptability curve



Conclusions

- From a societal perspective, PAO plus arthroscopy was still more costly ($4,950 more) and less effective (-0.03).
- When the iHOT-33 was included as an outcome, PAO plus arthroscopy resulted in $6,938 more costs and less patients achieved a clinically meaningful improvement in iHOT-33 scores (-0.06).
- Adding arthroscopy to PAO increased costs and did not improve health outcomes and was not cost-effective from both third-party payer and societal perspectives.

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