

# Cost-effectiveness analysis of arthroscopic injection of a bioadhesive hydrogel implant in conjunction with microfracture for the treatment of focal chondral defects of the knee – an Australian perspective

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## BACKGROUND AND OBJECTIVE

- Articular cartilage is avascular and has poor repair ability, thus, any injury or damage to the cartilage can affect joint function and mobility<sup>1</sup>
- JointRep, a novel Chitosan-based scaffold therapy, is a bioadhesive hydrogel arthroscopically injected to facilitate cartilage regeneration<sup>2</sup>
- This study aimed to compare the cost-effectiveness of JointRep with microfracture surgery compared to microfracture alone from the Australian healthcare system perspective, in patients with symptomatic focal chondral defects (Outerbridge Grade 3 or 4) of the knee who had failed conservative treatment and were indicated for surgery

## METHODS

- A two-state de novo Markov model was developed (Figure 1)

Figure 1: Decision Analytic Structure of the Economic Evaluation



- **Time horizon:** Three years
- **Cycle length:** One year
- **Discount rate:** Costs and outcomes were discounted at 5%<sup>3</sup>
- **Model outcomes:** Costs, Quality-adjusted life years (QALYs), and Incremental cost-effectiveness ratio (ICER)

### MODEL INPUTS

- **The Patient baseline characteristics:** JointRep trial<sup>2</sup> were sourced from a pivotal post-market clinical trial<sup>2</sup>
- **Identical survival probability:** Applied in both treatment arms and was calculated using Australian general population mortality risks<sup>4</sup> due to osteochondral defects and that a combination of JointRep and microfracture offered no additional survival benefit.
- **Efficacy measure:** Western Ontario and McMaster Universities Osteoarthritis index (WOMAC) Likert score recorded in JointRep trial<sup>2</sup>
- **Utility** was derived by mapping WOMAC scores to EQ-5D scores using a published algorithm 5 (Table 1).
- **Cost inputs** were based on published Australian costs from AR-DRGs 6,7, Medicare Benefits Schedule 8, and Prostheses List 9 (Table 2).

Table 1: Model Utilities

Timepoint	JointRep + Microfracture		Microfracture alone	
	WOMAC Mean (SD) <sup>a</sup>	Utility <sup>b</sup>	WOMAC Mean (SD) <sup>a</sup>	Utility <sup>b</sup>
Baseline	56.5 (10.5)	0.419	54.7 (4)	0.479
Year 1 <sup>c</sup>	-	0.907	-	0.654
0-6 months	7.1 (8.8)	0.899	27.3 (4.3)	0.709
6-12 months	4.6 (7.1)	0.915	40.7 (14.4)	0.599
Year 2	2.8 (5.6)	0.926	46.3 (12.8)	0.548
Year 3	3.9 (7.6)	0.920	47.5 (12.8)	0.541

SD=Standard Deviation; WOMAC=Western Ontario and McMaster Universities Osteoarthritis index; <sup>a</sup>WOMAC score ranges from 0-96 with higher score indicating worse HRQoL; <sup>b</sup>Weighted by gender distribution in each treatment arm; <sup>c</sup>Year 1 utility was calculated as an average of utility values estimated at 6 months and 12 months

Table 2: Cost Inputs Used in Model

Resource item	Total cost	Source/Assumption
JointRep	AU \$6,022	Prostheses List <sup>9</sup>
Surgical Services <sup>a</sup>	AU \$4,861	MBS Handbook <sup>8</sup> ; AR-DRG <sup>6,7</sup>
Follow-up visit <sup>b</sup>	AU \$34/visit	MBS Handbook <sup>8</sup>
MRI scan <sup>c</sup>	AU \$605	MBS Handbook <sup>8</sup>

AR-DRG=Australian Refined Diagnosis Related Groups; MBS=Medicare Benefits Schedule; MRI=Magnetic Resonance Imaging; <sup>a</sup>Includes cost of pre- anesthesia consultation, initiation anesthesia, anesthesia, arthroscopic surgery for microfracture procedure, assistance, and hospital stays; <sup>b</sup>Model includes follow-up visit cost at year 1 (4 visits per year), and Year 2 onwards (2 visits per year); <sup>c</sup>Includes cost of 2 visits in Year 1

## RESULTS

- JointRep with microfracture showed substantial QALY gain, and was found to be more cost-effective than microfracture alone [ICER: AU\$6,328/ QALY gained] (Table 3)
- One-way sensitivity analysis (OWSA) showed that results were most sensitive to utility at year 1, 2, & 3 post-receipt of either of the treatments. The ICER never exceeded AU\$8,000 in OWSA (Figure 2).
- Probabilistic sensitivity analysis showed that at a willingness-to-pay threshold above AU\$45,000/ QALY gain, JointRep with microfracture would be 96% more cost-effective than microfracture surgery alone (Figure 3).

Table 3: Results of Base-Case Analysis

	Total cost	Total QALYs	Incremental costs	Incremental QALYs	ICER (\$/QALY)
JointRep + Microfracture	AU\$12,996	2.61	AU\$6,022	0.95	AU\$6,328
Microfracture alone	AU\$6,974	1.66	-	-	-

Figure 2: One-way Sensitivity Analysis Results

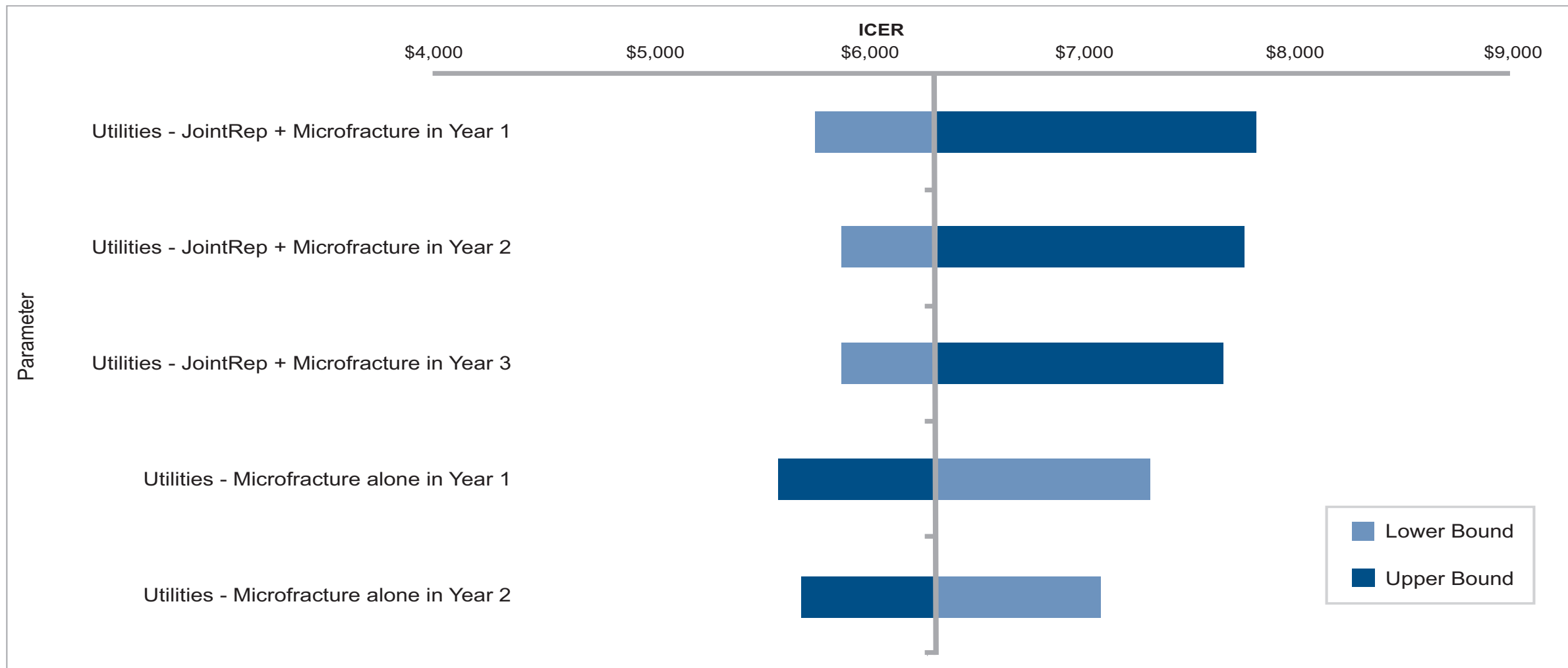
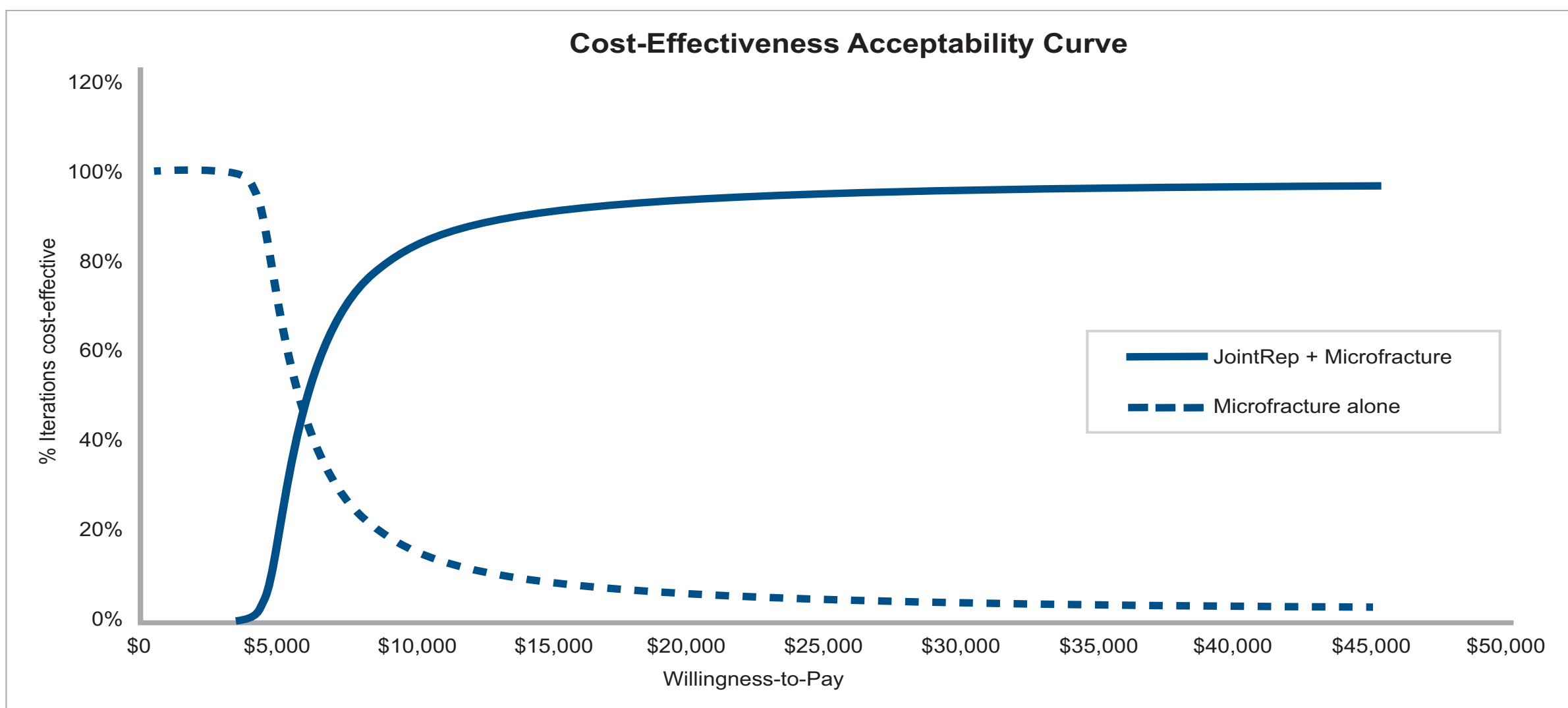


Figure 3: Probabilistic Sensitivity Analysis Results



## CONCLUSION

- JointRep with microfracture may be a highly cost-effective treatment option compared to microfracture alone
- Model results were robust to varying parameters in sensitivity and scenario analysis
- Further exploration is required in large, randomized trials with longer follow-up duration

### REFERENCES

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