

# Markov Model-Based Cost-Effectiveness Evaluation of ROSA® vs. Manual Total Knee Arthroplasty: Sweden Payer perspective

Niraj Parikh, MS<sup>1</sup>, Nadine Jamous, BSc (Hons), PG Dip<sup>2</sup>, Anatheia Cora Cristea, MMS (Med. Mgmt)<sup>3</sup>, Joy Ong, MSc<sup>3</sup>, Ardalan Rahimi, MD<sup>4</sup>

<sup>1</sup>Zimmer Biomet, Warsaw, IN, USA, <sup>2</sup>Zimmer Biomet, Swindon, United Kingdom, <sup>3</sup>NHTA Sweden AB, Stockholm, Sweden, <sup>4</sup>Orthopedic Section, Karolinska Institutet Danderyd Hospital, Danderyd, Sweden

## Introduction

The purpose of this study was to investigate from the Sweden payer perspective the cost-effectiveness of ROSA® total knee arthroplasty (TKA) versus conventional manual TKA (mTKA).

## Methods

A Markov model simulated the lifetime outcomes of TKA patients at average age 65 years (Figure 1). ROSA® costs included robot rental, service, and implant costs. For both groups, data from systematic reviews was used to determine early (<1 year) and late (> 1 year) revision rates after surgery. Basecase model evaluation was limited to time-horizon of 3 years owing to implant contract limitations in Sweden. Outcomes were measured in quality-adjusted life-years (QALYs). Costs and effects were discounted at 3% and average annual number of procedures determined at 224 procedures. Costs and QALYs were organized into incremental cost-effectiveness ratios (ICERs). Willingness-to-pay (WTP) thresholds was set at SEK 750,000/QALY. One-way sensitivity analyses (OWSA), scenario analysis and probabilistic sensitivity analysis (PSA) evaluated the effect of data uncertainty.

## Results

ROSA® TKA produced 1.567 QALYs versus 1.566 QALYs for mTKA (Table 1). Total costs per case for ROSA® TKA were SEK 96,924 (224 cases/robot, basecase). The basecase ICERs for ROSA® TKAs was dominant and net monetary benefit (NMB) calculated was SEK 9,698. The model remained cost-effective for lower annual number of cases (100 surgeries) but was not cost-effective at 50 surgeries (Table 2). ICER at time horizon of 15 and 20 years did remain cost-effective. The model remained robust and dominant for the OWSA scenarios (Table 3). PSA showed the probability of ROSA® being cost-effective at 78.3%.

## Conclusion

ROSA® Knee System, an innovative technology demonstrates promising potential cost-savings compared to the current standard of care in patients with TKA procedure. As the technology becomes more available in Sweden, registry data and other research activities can contribute to our understanding the long-term benefits.

Figure 1. General Schematic of the Markov model

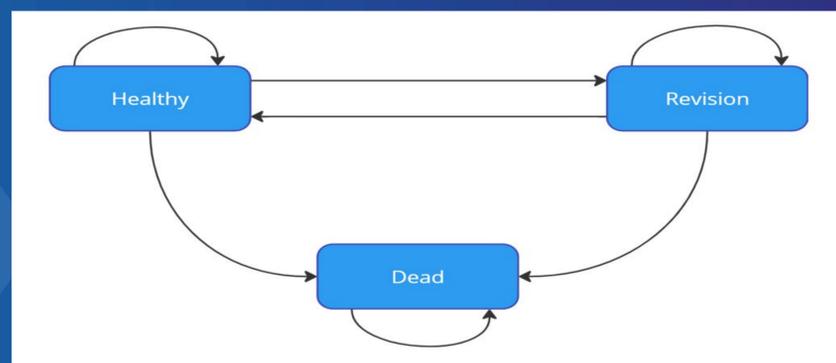


Table 1. Basecase Results

	Costs (SEK)	QALYs	Incremental		ICER	NMB (WTP*ΔQALY) - ΔCosts
			Costs (SEK)	QALYs		
ROSA®	96,924	1.567	-8,970	0.00097	Dominant	9,698
mTKA	105,894	1.566				

Table 2. Scenario analysis

Parameter	Scenario	Incremental costs (SEK)	Incremental QALYs	ICER
Base case		-8,970.26	0.0010	Dominant
Discount costs and effects	5%	-9,664	0.0010	Dominant
Discount costs and effects	0%	-8,548	0.0009	Dominant
Discount costs and effects	3% costs, 0% effects	-8,970	0.0010	Dominant
Time horizon	5	-5,673	0.0027	Dominant
Time horizon	10	-629	0.0061	Dominant
Time horizon	15	47	0.0086	SEK 5,493
Time horizon	20	5,856	0.0102	SEK 576,228
Starting age	45 years	-9,022	0.0010	Dominant
Starting age	55 years	-9,009	0.0010	Dominant
Length of rental agreement	5 years	-11,950	0.0027	Dominant
Length of rental agreement	10 years	-11,991	0.0061	Dominant
No. of ROSA cases	50 cases	3,711	0.0010	SEK 3,825,917
No. of ROSA cases	100 cases	-4,452	0.0010	Dominant
No. of ROSA cases	300 cases	-9,893	0.0010	Dominant
No. of ROSA cases	400 cases	-10,574	0.0010	Dominant
No. of ROSA cases	600 cases	-11,254	0.0010	Dominant
Half-cycle correction turned off	No	-9,813	0.0014	Dominant
No disutility	No	-8,970	0.0004	Dominant

Table 3: One-way Sensitivity Analysis Results

Parameter	Basecase value*	Lower Limit (LL)*	Upper Limit (UL)*
Probability - Early failure mTKA	0.78%	0.702%	0.858%
Probability - Late failure mTKA	1.50%	1.350%	1.650%
Probability - Early failure ROSA	0.30%	0.270%	0.330%
Probability - Late failure ROSA	0.60%	0.540%	0.660%
Utilities - Revision/Complication	0.78	0.6975	0.853
Utilities - Healthy	0.83	0.7434	0.909
Proportion - Septic Revision mTKA	26.70%	24.0%	29.4%
Proportion - Septic Revision ROSA	21.00%	18.9%	23.1%
Disutility - Septic Revision	0.200	0.18	0.22
Discount - Costs	3%	0.00%	5%
Discount - Effects	3%	0.00%	5%
ROSA cases	224.0	201.60	246.40

\*ICER Dominant for all parameters