

Background

- By 2030, the demand for primary total hip arthroplasties is estimated to grow by 174% to 572,000, leading to the projection of increase of total hip revisions by 137% between 2005 and 2030.¹
- The mean charge for arthroplasty revision surgeries was 76.0% higher than that of matched primary joint replacements. Although reimbursement for revisions is also higher, it often fails to cover the substantial financial cost, placing a significant burden on patients undergoing revision procedures.²
- OR3O™* with oxidized zirconium (OxZr), hereafter referred to as OR3O, is designed to improve the clinical outcomes and economic impacts of hip revision procedures.

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Methods

- Primary THA procedures conducted between November 2016 and March 2024 were identified from the Premier PINC AI Healthcare database.
- Study population were selected using appropriate ICD-10-PCS codes, a series of inclusion and exclusion criteria. And the OR3O revision system was identified using keywords from billing records.
- After applying the inclusion and exclusion criteria, eligible patients were assigned to two individual cohorts. Patients whose first hip revision during the study period used OR3O were assigned to OR3O cohort; patients who did not receive any revision systems of Smith+Nephew, i.e., OR3O, R3, POLAR3, or REDAPT, in their first hip revision visit were assigned to non-OR3O cohort.
- To facilitate the comparability, a 1:3 propensity score matching with a caliper of 0.03 was executed.
- Demographic, hospital, and baseline clinical characteristics were used for matching between OR3O and non-OR3O cohorts.
- Hypothesis testing, generalized linear and logistic regression models were applied to evaluate differences in costs and clinical outcomes between cohorts.

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A matched comparison of hip revision with and without the OR3O™ revision system in 2,009 patients illustrates that patients treated with OR3O™ had fewer odds of periprosthetic joint Infection/wound Infection, infection & inflammatory reaction, and had reduced length of stay and surgery time.

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Table 1: Baseline Covariates Before and After Propensity Score Matching (PSM)

		Before PSM					After PSM					
Variable	Level	OR30 (N=512)		Non-OR30 (N=56,623)		P-val	OR30 (N=505)		Non-OR30 (N=1,504)		P-val	SMD
		N	%	N	%		N	%	N	%		
Demographic Characteristics												
Race	Asian	9	1.80	365	0.60	<0.001	9	1.80	21	1.40	0.837	0.030
	Black	41	8.00	3784	6.70		41	8.10	114	7.60		0.022
	White	381	74.40	48932	86.40		381	75.40	1161	77.20		-0.027
	Others	76	14.80	2826	5.00		74	14.70	208	13.80		0.006
Gender	Female	285	55.70	32522	57.40	0.418	280	55.40	844	56.10	0.793	-0.015
	Male	227	44.30	24095	42.60		225	44.60	660	43.90		0.015
Year of Procedure	2017	1	0.20	7377	13.00	<0.001	1	0.20	3	0.20	0.942	0.000
	2018	1	0.20	10556	18.60		1	0.20	3	0.20		0.000
	2019	0	0.00	10703	18.90		0	0.00	0	0.00		0.000
	2020	103	20.10	8835	15.60		100	19.80	297	19.70		0.005
	2021	134	26.20	7589	13.40		134	26.50	370	24.60		0.041
	2022	211	41.20	9224	16.30		207	41.00	653	43.40		-0.051
	2023	62	12.10	2297	4.10		62	12.30	178	11.80		0.015
Age	Mean ± Std	68.7 ± 12.2		69.4 ± 11.9		0.282	68.6 ± 12.2		68.5 ± 11.9		0.732	0.017
	Median	70.5		70.0			70.0		69.0			
Clinical Characteristics												
Myocardial Infarction	Yes	44	8.60	3770	6.70	0.081	43	8.50	119	7.90	0.667	0.019
Obesity	Yes	145	28.30	14467	25.50	0.153	144	28.50	422	28.10	0.844	0.008
Depression	Yes	117	22.90	13213	23.30	0.797	115	22.80	356	23.70	0.680	-0.019
Hypertension	Yes	387	75.60	40612	71.70	0.053	380	75.20	1133	75.30	0.970	0.000
Congestive Heart Failure	Yes	52	10.20	6333	11.20	0.462	50	9.90	140	9.30	0.694	0.022
Diabetes Mellitus w/o Comp.	Yes	91	17.80	9421	16.60	0.492	91	18.00	259	17.20	0.682	0.017
Diabetes Mellitus w/ Comp.	Yes	58	11.30	4993	8.80	0.046	58	11.50	143	9.50	0.200	0.059
Charlson Comorbidity Index	Mean ± Std	1.02 ± 1.52		1.00 ± 1.51		0.282	1.00 ± 1.50		0.95 ± 1.44		0.663	0.039
	Median	0		0			0		0			
Hospital Characteristics												
Hospital Teaching	Yes	249	48.60	29872	52.80	0.063	245	48.50	732	48.70	0.952	-0.009
	No	263	51.40	26751	47.20		260	51.50	772	51.30		0.009
Hospital Urban/Rural	Rural	42	8.20	4509	8.00	0.842	41	8.10	121	8.00	0.958	0.005
	Urban	470	91.80	52114	92.00		464	91.90	1383	92.00		-0.005
Region	Midwest	87	17.00	13109	23.20	<0.001	86	17.00	250	16.60	0.958	0.014
	Northeast	122	23.80	9856	17.40		119	23.60	371	24.70		-0.033
	South	206	40.20	25077	44.30		205	40.60	597	39.70		0.021
	West	97	18.90	8581	15.20		95	18.80	286	19.00		-0.003
		000-099	44	8.60	3338		5.90	43	8.50	117		7.80
Hospital Size (No. of Beds)	100-199	55	10.70	8091	14.30	<0.001	54	10.70	170	11.30	0.913	-0.018
	200-299	79	15.40	10217	18.00		79	15.60	261	17.40		-0.045
	300-399	54	10.50	8863	15.70		52	10.30	139	9.20		0.037
	400-499	48	9.40	7606	13.40		47	9.30	138	9.20		0.007
	500+	232	45.30	18508	32.70		230	45.50	679	45.10		0.002

Covariates between matching cohorts with absolute value of standard mean difference (SMD) < 0.1 were considered well-balanced.

Summary of Results

- Among a total of 57,135 unique patients with hip revision procedures , 6-month baseline period, and 12-month follow-up period, 505 patients treated with OR3O hip revision system were matched with 1504 non-OR3O patients with well-balanced baseline variables.
- Patients with OR3O had 31% lower odds of periprosthetic joint Infection/wound Infection (odds ratio [OR] 0.69, 95% confidence interval [CI] 0.48-0.97, p-value=0.037), and 40% lower odds of infection & inflammatory reaction (OR 0.6, CI 0.48-0.75, p<0.001) within one year compared with non-OR3O patients.
- Mean length of stay (LOS) at index admission of patients with OR3O was 4.45 versus 5.23 days of non-OR3O patients p=0.001.
- Patients with OR3O had reduced surgery time (254.62 versus 277.96 minutes, p=0.029) compared with non-OR3O patients.
- Multiple complications during or after index procedures, for example, acute myocardial infarction, mechanical complications, etc., were evaluated in the study as well but no significant difference in those outcomes was found between cohorts.

Table 2: Outcomes

		After Propensity Score Match				
Category	Outcome	OR3O %	Non-OR3O %	OR	95% CI of OR	P-val
Periprosthetic Joint Infection/ Wound Infection	30 Days	5.74	7.78	0.72	(0.47,1.08)	0.129
	90 Days	7.33	9.91	0.72	(0.49,1.03)	0.085
	180 Days	7.92	11.24	0.68	(0.47,0.96)	0.036
	365 Days	8.51	11.9	0.69	(0.48,0.97)	0.037
Infection & Inflammatory Reaction	30 Days	22.18	32.45	0.59	(0.47,0.75)	<0.001
	90 Days	24.55	34.31	0.62	(0.49,0.78)	<0.001
	180 Days	24.95	35.57	0.6	(0.48,0.75)	<0.001
	365 Days	25.94	36.84	0.6	(0.48,0.75)	<0.001
Sepsis/ Septicemia/ Shock	7 Days	4.36	6.38	0.67	(0.41,1.05)	0.096
	90 Days	5.94	9.37	0.61	(0.4,0.9)	0.018
	180 Days	6.73	10.04	0.65	(0.43,0.94)	0.027
Category	Outcome	OR3O mean	Non-OR3O mean	Ratio/ Diff.	Ratio/Difference (95% CI)	P-val
Length of Stay	Days (Ratio)	4.45	5.23	0.85	(0.78,0.93)	0.001
Surgery Time	Minutes (Mean Diff.)	254.62	277.96	-23.34	(-44.27,-2.41)	0.029

Conclusion

- The OR3O system with OxZr in hip revision demonstrates statistically superior resource use and clinical outcomes compared to non-OR3O systems. This is important in an age when providers are expected to provide quality services at reduced budgets, and when patients need options to lower the risk of complications following surgery.

References

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