



# Negative Pressure Wound Therapy and Hardware Salvage: A National Database Analysis of Orthopedic Implant Infections

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## Background

Orthopedic hardware infection remains a major challenge in orthoplastic surgery and frequently necessitates explantation.

Negative pressure wound therapy (NPWT) is widely used to optimize wound environment and control bioburden.

Its effect on hardware retention at a population level remains unclear.

## Research Objectives

- To evaluate the association between NPWT and hardware removal in patients with infected orthopedic implants.

## Methods

- Data source: TriNetX database (2005–2025)
- Population: Patients with infected implants of the hip, knee, shoulder, spine, and extremities
- Exposure: NPWT within 3 months of infection
- Matching: 1:1 propensity score matching (age, BMI, race/ethnicity, HTN, DM, nicotine, chemotherapy, radiation)
- Final cohorts: 11,691 NPWT vs. 11,691 matched controls
- Outcomes: Hardware removal at 30, 45, 60, 90 days, 6 months, 1 year

## Results

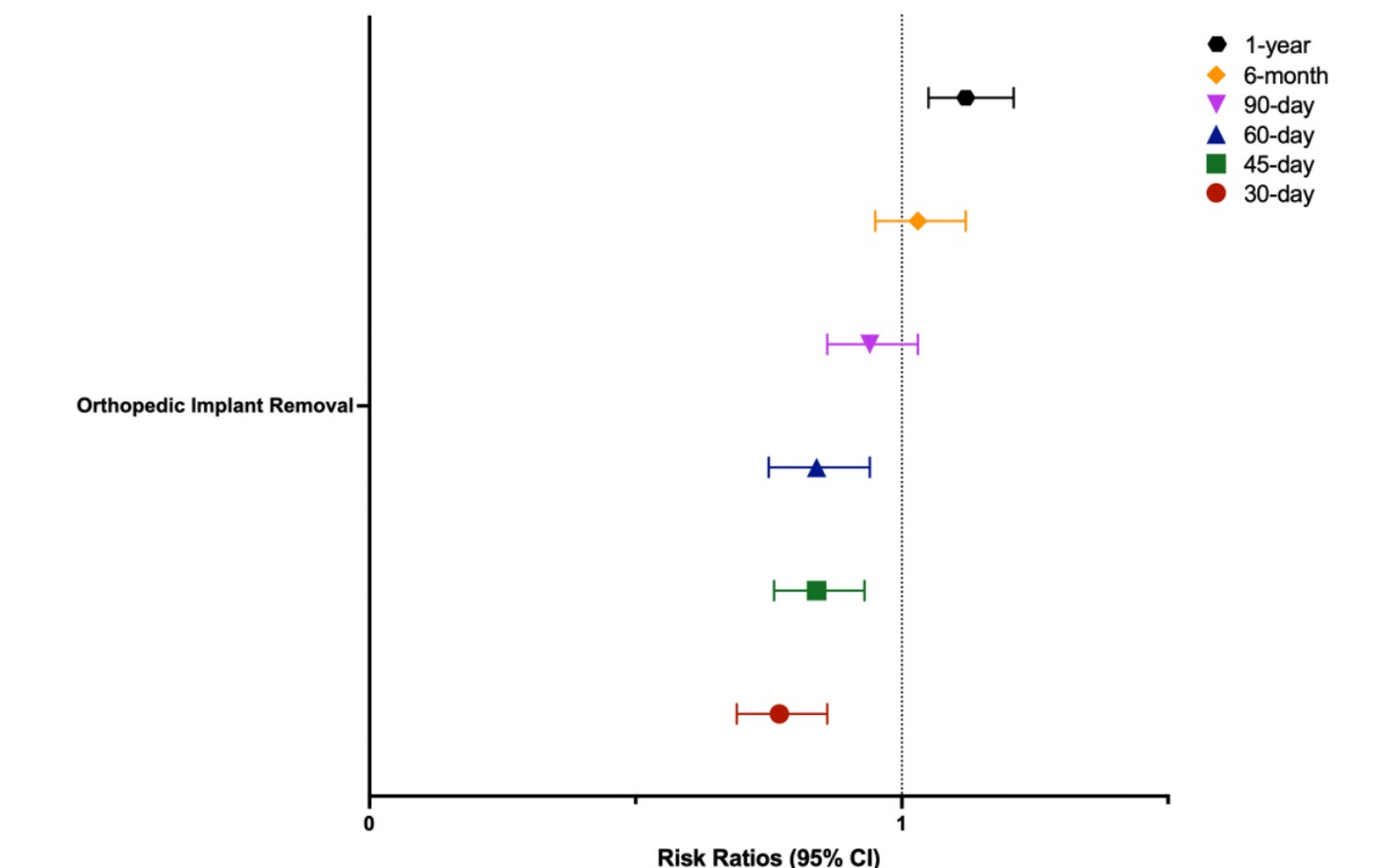
**Table 1.** Baseline Characteristics Before and After Propensity Matching of Patients with Infected Orthopedic Hardware by Negative Pressure Wound Therapy Exposure

Characteristic	Before Propensity Matching			After Propensity Matching		
	NPWT Cohort (n=11,694)	Control Cohort (n=177,825)	p-value	NPWT Cohort (n=11,691)	Control Cohort (n=11,691)	p-value
Age at Index, mean ± SD	57.8 ± 17.1	59.5 ± 17.7	<0.0001	57.8 ± 17.1	57.7 ± 17.3	0.6881
Female	5,308 (45.40%)	78,646 (46.26%)	0.0705	5,308 (45.40%)	5,242 (44.88%)	0.3857
Male	6,382 (54.59%)	91,287 (53.70%)	0.0624	6,382 (54.59%)	6,438 (55.07%)	0.4618
White	9,136 (78.15%)	120,217 (70.72%)	<0.0001	9,136 (78.15%)	9,274 (79.33%)	0.0274
Black or African American	1,530 (13.09%)	17,354 (10.21%)	<0.0001	1,530 (13.09%)	1,508 (12.89%)	0.6687
Asian	123 (1.05%)	3,480 (2.05%)	<0.0001	123 (1.05%)	106 (0.91%)	0.2589
American Indian or Alaska Native	79 (0.67%)	1,099 (0.65%)	0.7033	79 (0.67%)	80 (0.68%)	0.9366
Native Hawaiian or Pacific Islander	40 (0.34%)	657 (0.39%)	0.4531	40 (0.34%)	39 (0.33%)	0.9103
Other Race	329 (2.81%)	5,177 (3.05%)	0.1582	329 (2.81%)	326 (2.79%)	0.9054
Unknown Race	454 (3.88%)	22,008 (12.95%)	<0.0001	454 (3.88%)	358 (3.06%)	0.0006
Hispanic or Latino	804 (6.88%)	9,373 (5.51%)	<0.0001	804 (6.88%)	822 (7.03%)	0.6435
Not Hispanic or Latino	8,635 (73.86%)	111,255 (65.45%)	<0.0001	8,635 (73.86%)	8,809 (75.35%)	0.0089
Unknown Ethnicity	2,252 (19.26%)	49,364 (29.04%)	<0.0001	2,252 (19.26%)	2,060 (17.62%)	0.0012
BMI (mean ± SD)	31.5 ± 8.54	30.3 ± 7.79	<0.0001	31.5 ± 8.54	31.1 ± 8.23	0.0013
0–18.5 kg/m <sup>2</sup>	734 (6.28%)	7,319 (4.31%)	<0.0001	734 (6.28%)	737 (6.30%)	0.9356
18.5–25 kg/m <sup>2</sup>	3,094 (26.47%)	33,412 (19.65%)	<0.0001	3,094 (26.47%)	3,145 (26.91%)	0.4508
25–30 kg/m <sup>2</sup>	4,388 (37.53%)	45,505 (26.77%)	<0.0001	4,388 (37.53%)	4,491 (38.41%)	0.1652
30–35 kg/m <sup>2</sup>	4,161 (35.59%)	39,210 (23.07%)	<0.0001	4,161 (35.59%)	4,158 (35.57%)	0.9673
35–40 kg/m <sup>2</sup>	3,116 (26.65%)	26,152 (15.38%)	<0.0001	3,116 (26.65%)	3,006 (25.71%)	0.1018
40–100 kg/m <sup>2</sup>	2,511 (21.48%)	18,505 (10.89%)	<0.0001	2,511 (21.48%)	2,392 (20.46%)	0.0559
Essential Hypertension	7,570 (64.75%)	74,566 (43.86%)	<0.0001	7,570 (64.75%)	7,508 (64.22%)	0.3968
Hyperlipidemia	4,874 (41.69%)	44,245 (26.03%)	<0.0001	4,874 (41.69%)	4,953 (42.36%)	0.2953
Diabetes Mellitus	3,909 (33.44%)	34,413 (20.24%)	<0.0001	3,909 (33.44%)	3,825 (32.77%)	0.243
Nicotine Dependence	3,468 (29.66%)	27,086 (15.93%)	<0.0001	3,468 (29.66%)	3,362 (28.76%)	0.1274
Personal History of Cancer	1,460 (12.49%)	12,871 (7.57%)	<0.0001	1,460 (12.49%)	1,386 (11.86%)	0.1388
Personal History of Irradiation	427 (3.65%)	3,289 (1.94%)	<0.0001	427 (3.65%)	390 (3.34%)	0.1876
Personal History of Chemotherapy	353 (3.02%)	2,360 (1.39%)	<0.0001	353 (3.02%)	342 (2.93%)	0.6719
Coagulation Disorders	2,257 (19.30%)	13,954 (8.82%)	<0.0001	2,257 (19.30%)	2,047 (17.50%)	0.0004
COPD	1,947 (16.65%)	14,676 (8.63%)	<0.0001	1,947 (16.65%)	1,842 (15.76%)	0.0624
Vitamin D Deficiency	1,946 (16.65%)	16,601 (9.77%)	<0.0001	1,946 (16.65%)	1,868 (15.98%)	0.1674
Immune Disorders	581 (4.97%)	4,522 (2.66%)	<0.0001	581 (4.97%)	547 (4.68%)	0.2994
Peripheral Artery Disease	1,453 (12.43%)	9,088 (5.35%)	<0.0001	1,453 (12.43%)	1,324 (11.32%)	0.0091
Anticoagulant Use	9,383 (80.26%)	75,728 (44.55%)	<0.0001	9,383 (80.26%)	9,394 (80.35%)	0.8565
Antibiotic Use	9,132 (78.11%)	74,705 (43.95%)	<0.0001	9,132 (78.11%)	9,255 (79.16%)	0.0497
Corticosteroid Use	8,218 (70.29%)	82,741 (48.67%)	<0.0001	8,218 (70.29%)	8,324 (71.20%)	0.1276

**Table 2.** Cumulative Hardware Removal Outcomes of Patients with Infected Orthopedic Hardware Through 30 Days, 45 Days, 60 Days, 90 Days, 6 Months, and 1 Year by Negative Pressure Wound Therapy Exposure

Outcome	Time Point	NPWT Cohort (n, %)	Control Cohort (n, %)	Risk Ratio (95% CI)	p-value
Orthopedic Implant Removal	30 days	464 (6.60%)	870 (8.58%)	0.77 (0.69–0.86)	<0.0001
Orthopedic Implant Removal	45 days	554 (7.88%)	947 (9.34%)	0.84 (0.76–0.93)	0.0008
Orthopedic Implant Removal	60 days	582 (8.27%)	1,001 (9.87%)	0.84 (0.75–0.94)	0.0016
Orthopedic Implant Removal	90 days	725 (10.31%)	1,108 (10.93%)	0.94 (0.86–1.03)	0.1931
Orthopedic Implant Removal	6 months	902 (12.82%)	1,259 (12.42%)	1.03 (0.95–1.12)	0.4336
Orthopedic Implant Removal	1 year	1,168 (15.94%)	1,497 (14.19%)	1.12 (1.05–1.21)	0.0012

**Figure 1.** Cumulative Hardware Removal Risk Ratios of Patients with Infected Orthopedic Hardware by Negative Pressure Wound Therapy Exposure



**Conclusion**

NPWT was associated with reduced hardware removal in the first 60 days, supporting its role in early implant salvage.