



This is a repository copy of *Quantifying the risk of prosthetic joint infections following invasive dental procedures and the effect of antibiotic prophylaxis.*

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/191801/>

Version: Supplemental Material

Article:

Thornhill, M. orcid.org/0000-0003-0681-4083, Gibson, T., Pack, C. et al. (5 more authors) (2023) Quantifying the risk of prosthetic joint infections following invasive dental procedures and the effect of antibiotic prophylaxis. *Journal of the American Dental Association*, 154 (1). 43-52.e12. ISSN 0002-8177

<https://doi.org/10.1016/j.adaj.2022.10.001>

Article available under the terms of the CC-BY-NC-ND licence (<https://creativecommons.org/licenses/by-nc-nd/4.0/>).

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>

Supplementary Appendix

Contents:

Data Source	Page 2
Identifying if IDP were covered by AP or not	Page 2
Power calculation	Page 3
Table S1. CPT, ICD-9-CM and ICD-10-PCS procedure codes for identifying when a prosthetic joint replacement occurred and what type of joint was involved.	Page 4
Table S2. CDT and ICD-9 Procedure codes for invasive, intermediate and non-invasive dental procedures, and codes for specific types of invasive dental procedure	Page 5
Table S3. Data Attrition Steps	Page 6
Table S4. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with prosthetic hip joints developing LPJI.	Page 7
Table S5. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with prosthetic knee joints developing LPJI.	Page 8
Table S6. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with other types of prosthetic joint developing LPJI.	Page 9
Table S7. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with multiple prosthetic joint types developing LPJI.	Page 10
Table S8. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients developing LPJI where the type of prosthetic joint is unknown .	Page 11
Table S9. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 1-month case period (month 1 before LPJI admission) and the preceding 12-month control period (months 2-13 before LPJI admission)	Page 12
Table S10. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 2-month case period (months 1-2 before LPJI admission) and the preceding 12-month control period (months 3-14 before LPJI admission)	Page 13
References	Page 14

Data Source:

The IBM[®] MarketScan[®] databases integrate de-identified patient-level health-data across a series of healthcare related databases. We linked data, including prescription benefits data, from the MarketScan[®] Commercial (private health insurance cover provided mainly by employers as a benefit for their employees), Medicare-Supplemental (top up health insurance cover provided by employers for their retirees to improve the basic cover provided by Medicare) and Dental (insurance cover for private dental care) databases.^{1,2} We also accessed the MarketScan[®] multi-state Medicaid database and identified patients in receipt of Medicaid services that included medical, dental and prescription benefits, for inclusion in the study. Because the MarketScan[®] data are deidentified in compliance with the Health Insurance Portability and Accountability Act of 1996 (HIPAA), and meet limited-use dataset criteria, studies using the data are exempt IRB review.³ All enrollees over 18, with more than 16 months of linked medical, dental and prescribing data from October 1st 2009 through December 31st, 2019, who developed LPJI were included in the study.

Identifying if IDP were covered by AP or not:

Prescription benefits data were used to identify whether each dental procedure was likely to have been AP-covered or not using methodology previously described⁴ and briefly outlined here. For each patient in the cohort, that patient's prescription benefits data was searched for antibiotic prophylaxis (AP) prescriptions matching the 2007 AHA recommendations.⁵ These were identified in the database using the following prescribing criteria (a) mode of antibiotic delivery – oral, (b) antibiotic – amoxicillin, clindamycin, cephalexin, azithromycin or clarithromycin, (c) dosage - 2g for amoxicillin, 600 mg for clindamycin, 2g for cephalexin, 500mg for azithromycin or 500mg for clarithromycin. Our earlier study identified that dentists often prescribed multiple courses of AP cover as a single prescription, in order to ensure that patients had sufficient supplies to cover several invasive dental procedure visits i.e. to avoid the patient having to fill a separate prescription for each invasive dental procedure visit. They also often prescribed at the end of a course of dental treatment so that the patient would have supplies available in advance for a future course of dental treatment. To address these eventualities, we evaluated several different algorithms against the gold standard of the actual prescribing and dental records of 80 patients at high IE-risk, 40 moderate-risk and 40 low-unknown risk patients. The algorithm that best identified when an invasive dental procedure was likely to have been covered by AP included the 3 elements above (a-c) where the number of day's supply of the antibiotic was ≤ 5 and the time between the prescription fill date and the invasive dental procedure date was ≤ 73 where the number of day's supply = 1, ≤ 146 where day's supply = 2, ≤ 219 where day's supply = 3, ≤ 292 where day's supply = 4 or ≤ 365 where day's supply = 5. Using this algorithm had 88% (95% CI 82-92%) sensitivity and 96% (95% CI 94-97%) specificity for identifying when a dental procedure was likely to have been covered by AP⁴ and this was the algorithm employed in the current study to determine if a dental procedure was likely to have been covered by AP or not.

Power Calculation

The method for sample size evaluation for multiply matched case-control studies using a quantitative covariate are given by Lachin.⁶ This sample size calculation is relevant to case-crossover studies. The input variables for the calculation were:

N (number of sets [each set contains nD cases and nH controls]) = 2,344 (number of LPJI infections)

Power = 0.90

Sigma (standard deviation of the quantitative exposure variable) = 0.707, 1, 1.414, 1.732, 2.

nD (number of cases per set) = 3

nH (number of controls per set) = 12

R2 (coefficient of determination) = 0

Alpha = 0.05

Producing the following power calculations assuming a range of values for the standard deviation of the quantitative exposure of interest as defined above:

Number of LPJI	Total N	N case periods	N control periods	Variance of continuous exposure	Standard Deviation of quantitative exposure	Odds Ratio
2344	35160	7032	28128	0.5	0.707	1.056
				1	1	1.039
				2	1.414	1.028
				3	1.732	1.023
				4	2	1.020

Assuming the standard deviation of the quantitative exposure variable of interest is 1 and each set of matched case-controls consists of 3 cases (3 case months) and 12 matched controls (12 control months), a total of 2,344 matched sets (2,344 LPJI hospital admissions with linked dental data) will provide >90% power to detect an odds ratio of 1.039, i.e., a 3.9% higher likelihood of dental-procedures, in the 3-month ‘risk-period’ than the matched ‘control-period’.

Table S1. CPT, ICD-9-CM and ICD-10-PCS procedure codes for identifying when a prosthetic joint replacement occurred and what type of joint was involved.

Procedures	CPT	ICD-9-CM	ICD-10-PCS
Hip joint Replacement (Arthroplasty)	27125, 27130, 27132, 27134, 27137, 27138	00.70, 00.71, 00.72, 00.73, 81.51, 81.52, 81.53 V43.64	All codes starting: 0SR901 through 0SR906 and 0SR90J. Or: 0SRB01 through 0SRB06 and 0SRB0J. Or: 0SRA00 through 0SRA03 and 0SRA0J. Or: 0SRE00 through 0SRE03 and 0SRE0J. Or 0SRR01 through 0SRR03 and 0SRR0J. Or 0SRS01 through 0SRS03 and 0SRS0J.
Knee Joint Replacement (Arthroplasty)	27445, 27446, 27447, 27486, 27487, 27488	00.80, 00.81, 00.82, 00.83, 00.84, 81.54, 81.55, V43.65	All codes starting: 0SRC0J through 0SRC0N and 0SRC06. Or: 0SRD0J through 0SRD0N and 0SRD06.
Other Joint Replacement (Arthroplasty)	23470, 23472, 23473, 23474, 24360, 24361, 24362, 24363, 24365, 24366, 24370, 24371, 25240, 25442, 25446, 26530, 26531, 27700, 27702, 27703, 27704,	81.56, 81.57, 81.59, 81.73, 81.80, 81.81, 81.84, 81.88, 81.97 V43.60, V43.61, V43.62, V43.63, V43.66, V43.69	All codes starting: 0RR0 through 0RR9 and 0RRA through 0RRX, Or: 0SR0 through 0SR8 and 0SRF through 0SRQ,
All Joint Replacements (Arthroplasties)	All of the above	All of the above	All of the above

Table S2. CDT and ICD-9 Procedure codes for invasive, intermediate and non-invasive dental procedures, and codes for specific types of invasive dental procedure

Procedures	CDT Codes	ICD-9 Codes
Invasive Dental Procedure Codes i.e. those procedures that 'should' be covered by AP	D0180, D0472-4, D1110, D1120, D3221, D3310, D3320, D3330, D3332-3, D3346-8, D3351-3, D3410, D3421, D3425-32, D3450, D3460, D3470, D3910, D3920, D4210-2, D4230-1, D4240-1, D4245, D4249, D4260-1, D4263-8, D4270, D4273-8, D4283, D4341-2, D4346, D4355, D4381, D4910, D4921, D6010-3, D6040, D6050, D6080-1, D6100-4, D7111, D7140, D7210, D7220, D7230, D7240-1, D7250-1, D7260-1, D7270, D7272, D7280, D7282-3, D7285-6, D7290-5, D7310-1, D7320-1, D7340, D7350, D7410-5, D7465, D7440-1, D7450-1, D7460-1, D7471-3, D7485, D7490, D7510-1, D7520-1, D7530, D7540, D7550, D7560, D7610, D7630, D7671, D7710, D7730, D7770, D7941, D7943-50, D7952-3, D7955, D7960, D7963, D7970-2, D7981-3, D7991, D7996-8	2301, 2309, 2311, 2319, 235, 236, 2370-3, 240, 2411-2, 242, 2431-2, 2439, 244, 245, 246, 2491, 2499, 2502, 251, 252, 253, 254, 2551, 2559, 2591-4, 2599, 260, 2612, 2621, 2629-32, 2641-2, 2649, 270, 271, 2721-4, 2731-2, 2741-3, 2749, 2751-7, 2759, 2761-4, 2769, 2771-3, 2779, 2791-2, 2799, 9654
Intermediate Dental Procedure Codes i.e. those procedures that 'may' be covered by AP	D0120, D0150, D2150, D21601, D2330-2, D2335, D2390, D2392-4, D2520, D2530, D2542-4, D2620, D2630, D2642-4, D2651-2, D2662-4, D2710, D2712, D2720-2, D2740, D2750-2, D2780-3, D2790-2, D2794, D2799, D2929-34, D2960-2, D4999, D6051-2, D6055-7, D6065-7, D6075-7, D6545, D6548-9, D6600-15, D6624, D6634, D6710, D6720-2, D6740, D6750-2, D6780-3, D6790-4, D7620, D7640, D7650, D7660, D7670, D7680, D7720, D7740, D7750, D7760, D7771, D7780	232, 233, 2341, 2342, 2343, 2349
Non-Invasive Dental Procedure Codes i.e. those procedures for which there is no AP recommendation	All CPT dental procedure codes not listed as being Red or Yellow.	All ICD-9 dental procedure codes not listed as being Red or Yellow.
Codes for Specific Types of Invasive Dental Procedure		
Scaling	D1110, D1120, D4341-2, D4346, D4355, D4381, D4910, D4921,	9654
Extractions	D7111, D7140, D7210, D7220, D7230, D7240-1, D7250-1,	2301, 2309, 2311, 2319,
Endodontic Procedures	D3221, D3310, D3320, D3330, D3332-3, D3346-8, D3351-3, D3410, D3421, D3425-32, D3450, D3460, D3470, D3910, D3920,	2370-3,
Surgical Procedures (including oral and periodontal surgical procedures and biopsies)	D0472-4, D4210-2, D4230-1, D4240-1, D4245, D4249, D4260-1, D4263-8, D4270, D4273-8, D4283, D7260-1, D7270, D7272, D7280, D7282-3, D7285-6, D7290-5, D7310-1, D7320-1, D7340, D7350, D7410-5, D7465, D7440-1, D7450-1, D7460-1, D7471-3, D7485, D7490, D7510-1, D7520-1, D7530, D7540, D7550, D7560, D7610, D7630, D7671, D7710, D7730, D7770, D7941, D7943-50, D7952-3, D7955, D7960, D7963, D7970-2, D7981-3, D7991, D7996-8	240, 2411-2, 242, 2431-2, 2439, 244, 245, 246, 2491, 2499, 2502, 251, 252, 253, 254, 2551, 2559, 2591-4, 2599, 260, 2612, 2621, 2629-32, 2641-2, 2649, 270, 271, 2721-4, 2731-2, 2741-3, 2749, 2751-7, 2759, 2761-4, 2769, 2771-3, 2779, 2791-2, 2799,

Table S3. Data Attrition Steps

Attrition Steps	All Patients		Commercial/ Medicare Supplemental Patients		Medicaid Patients	
	People	Events	People	Events	People	Events
Enrolled in data base at least one month 2009-2019	197,924,079		168,855,655		29,068,424	
Had drug coverage entire time enrolled	158,902,117		133,102,194		25,799,923	
Age >=17 as of Jan 1, 2019	128,847,010		113,344,362		15,502,648	
Dental coverage at least one month 2007-2019	36,797,581		21,294,933		15,502,648	
Inpatient PJI admission 2009-2019	13,682	23,873	9,202	14,976	4,480	8,897
15 months continuous enrolment required before PJI	11,117	18,839	7,952	12,809	3,165	6,030
Require no joint replacement within 3 months of PJI	2,979	3,060	1,827	1,876	1,152	1,184
Require dental cover entire 15 months before PJI	2,285	2,344	1,133	1,160	1,152	1,184
Prosthetic Joint type present						
Hip only		304		122		182
Knee only		759		412		347
Other joint only		55		25		30
Multiple joints		398		254		144
Unknown		828		347		481

Table S4. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with prosthetic **hip joints** developing LPJI.

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values
Invasive - all	14.3	13.7	1.048 (0.752-1.461) p=0.783 [†] , p=1*	12	9.2	1.298 (0.891-1.893) p=0.175 [†] , p=1*	2.3	4.4	0.549 (0.254-1.185) p=0.127 [†] , p=1*
Invasive - no AP cover	11.3	10.8	1.044 (0.721-1.513) p=0.818 [†] , p=1*	9.7	7	1.377 (0.904-2.097) p=0.137 [†] , p=1*	1.7	4.1	0.432 (0.176-1.063) p=0.068 [†] , p=0.612*
Invasive - AP cover	3.0	2.8	1.058 (0.509-2.201) p=0.879 [†] , p=1*	2.3	2.2	1.037 (0.454-2.368) p=0.932 [†] , p=1*	0.7	0.3	2.00 (0.366-10.919) p=0.423 [†] , p=1*
Intermediate - all	7.7	7.1	1.074 (0.694-1.663) p=0.749 [†] , p=1*	5.3	4.2	1.223 (0.721-2.075) p=0.455 [†] , p=1*	2.3	2.8	0.836 (0.382-1.828) p=0.653 [†] , p=1*
Intermediate - no AP cover	4.7	4.9	0.951 (0.538-1.682) p=0.864 [†] , p=1*	3.3	2.9	1.130 (0.577-2.211) p=0.722 [†] , p=1*	2.0	2.3	0.863 (0.364-2.044) p=0.737 [†] , p=1*
Intermediate - AP cover	3.0	2.2	1.297 (0.659-2.554) p=0.452 [†] , p=1*	2	1.3	1.397 (0.904-2.097) p=0.137 [†] , p=1*	0.3	0.5	0.725 (0.108-4.865) p=0.741 [†] , p=1*
Non-Invasive - all	12.0	16.4	0.756 (0.539-1.059) p=0.104 [†] , p=0.936*	9.7	8.7	1.103 (0.747-1.631) p=0.621 [†] , p=1*	2.3	7.8	0.334 (0.157-0.709) p=0.004 [†] , p=0.036*
Non-Invasive - no AP cover	10.0	12.8	0.801 (0.552-1.160) p=0.240 [†] , p=1*	8	6.2	1.255 (0.808-1.950) p=0.313 [†] , p=1*	2.0	7.2	0.315 (0.140-0.708) p=0.005 [†] , p=0.045*
Non-Invasive - AP cover	2.0	3.6	0.606 (0.273-1.348) p=0.220 [†] , p=1*	1.7	2.4	0.739 (0.312-1.749) p=0.492 [†] , p=1*	0.3	0.6	0.571 (0.070-4.644) p=0.601 [†] , p=1*

Notes: AP = antibiotic prophylaxis, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month. [†]Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S5. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with prosthetic **knee joints** developing LPJI.

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values
Invasive - all	36.3	42.8	0.844 (0.684-1.041) p=0.113 [†] , p=1* [*]	33	36.2	0.907 (0.726-1.133) p=0.390 [†] , p=1* [*]	3.3	6.6	0.505 (0.261-0.978) p=0.043 [†] , p=0.387* [*]
Invasive - no AP cover	26.3	34.3	0.763 (0.598-0.973) p=0.029 [†] , p=0.261* [*]	24.3	28.8	0.840 (0.650-1.085) p=0.181 [†] , p=1* [*]	2.3	6.0	0.388 (0.178-0.846) p=0.017 [†] , p=0.153* [*]
Invasive - AP cover	10.0	8.5	1.177 (0.783-1.770) p=0.434 [†] , p=1* [*]	8.7	7.4	1.168 (0.755-1.805) p=0.486 [†] , p=1* [*]	1.0	0.6	1.73 (0.442-6.779) p=0.431 [†] , p=1* [*]
Intermediate - all	12.7	18.5	0.702 (0.502-0.981) p=0.038 [†] , p=0.342* [*]	8.3	13.7	0.624 (0.413-0.944) p=0.026 [†] , p=0.234* [*]	4.3	4.8	0.907 (0.513-1.602) p=0.737 [†] , p=1* [*]
Intermediate - no AP cover	11.7	14.2	0.831 (0.585-1.180) p=0.301 [†] , p=1* [*]	8.3	10.5	0.808 (0.535-1.222) p=0.313 [†] , p=1* [*]	3.7	4.3	0.86 (0.463-1.597) p=0.633 [†] , p=1* [*]
Intermediate - AP cover	1.0	4.2	0.249 (0.079-0.790) p=0.018 [†] , p=0.162* [*]	0.0	3.2	0.000 (0, inf) p=0.989 [†] , p=1* [*]	0.7	0.5	1.266 (0.298-5.378) p=0.749 [†] , p=1* [*]
Non-Invasive - all	43.7	45.3	0.968 (0.810-1.157) p=0.719 [†] , p=1* [*]	34.7	35.2	0.987 (0.807-1.208) p=0.902 [†] , p=1* [*]	9.0	10.2	0.903 (0.616-1.324) p=0.601 [†] , p=1* [*]
Non-Invasive - no AP cover	34.3	35.8	0.965 (0.788-1.181) p=0.729 [†] , p=1* [*]	27.3	27.3	1.000 (0.795-1.257) p=1 [†] , p=1* [*]	7.7	9.2	0.854 (0.565-1.292) p=0.455 [†] , p=1* [*]
Non-Invasive - AP cover	9.3	9.6	0.979 (0.674-1.422) p=0.910 [†] , p=1* [*]	7.3	7.8	0.947 (0.621-1.444) p=0.801 [†] , p=1* [*]	1.3	0.9	1.372 (0.479-3.924) p=0.556 [†] , p=1* [*]

Notes: AP = antibiotic prophylaxis, Inf = infinity, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month.

[†]Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S6. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with **other types of prosthetic joint** developing LPJI.

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values
Invasive - all	2.7	2.2	1.189 (0.535-2.640) p=0.671 [†] , p=1*	1.3	1.9	0.695 (0.241-2.005) p=0.501 [†] , p=1*	1.3	0.3	4.147 (1.014-16.954) p=0.048 [†] , p=0.432*
Invasive - no AP cover	1.7	1.3	1.235 (0.465-3.277) p=0.672 [†] , p=1*	0.3	1.1	0.325 (0.043-2.435) p=0.274 [†] , p=1*	1.3	0.2	5.333 (1.194-23.829) p=0.028 [†] , p=0.252*
Invasive - AP cover	1.0	0.9	1.089 (0.307-3.860) p=0.895 [†] , p=1*	1.0	0.8	1.196 (0.332-4.303) p=0.784 [†] , p=1*	0.0	0.1	0 (0-Inf) p=0.997 [†] , p=1*
Intermediate - all	1.3	1.5	0.886 (0.295-2.660) p=0.829 [†] , p=1*	0.3	1.2	0.277 (0.036-2.135) p=0.218 [†] , p=1*	1.0	0.3	3.094 (0.675-14.188) p=0.146 [†] , p=1*
Intermediate - no AP cover	1.3	1.0	1.341 (0.427-4.209) p=0.615 [†] , p=1*	0.3	0.8	0.436 (0.054-3.502) 0.435 [†] , p=1*	1.0	0.2	4 (0.807-19.818) p=0.090 [†] , p=0.81*
Intermediate - AP cover	0.0	0.5	0.000 (0.000-Inf) p=0.996 [†] , p=1*	0.0	0.4	0.000 (0-Inf) p=0.997 [†] , p=1*	0.0	0.1	0 (0-Inf) p=0.997 [†] , p=1*
Non-Invasive - all	3.3	2.8	1.161 (0.591-2.282) p=0.665 [†] , p=1*	1.7	2.1	0.824 (0.336-2.021) p=0.672 [†] , p=1*	1.7	0.8	2.375 (0.754-7.484) p=0.140 [†] , p=1*
Non-Invasive - no AP cover	2.7	2.2	1.195 (0.574-2.489) p=0.634 [†] , p=1*	1.0	1.5	0.727 (0.244, 2.171) p=0.568 [†] , p=1*	1.7	0.7	2.681 (0.833-8.630) p=0.098 [†] , p=0.882*
Non-Invasive - AP cover	0.7	0.7	1.000 (0.205-4.873) p=1 [†] , p=1*	0.7	0.6	1.151 (0.229-5.780) p=0.864 [†] , p=1*	0.0	0.1	0 (0-Inf) p=0.997 [†] , p=1*

Notes: AP = antibiotic prophylaxis, Inf = infinity, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month.

[†]Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S7. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients with **multiple prosthetic joint types** developing LPJI.

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values
Invasive - all	22.7	24.9	0.905 (0.690-1.186) p=0.468 [†] , p=1*	19.0	22.1	0.851 (0.633-1.144) p=0.286 [†] , p=1*	3.7	2.8	1.283 (0.658-2.501) p=0.465 [†] , p=1*
Invasive - no AP cover	16.0	19.2	0.829 (0.604-1.138) p=0.246 [†] , p=1*	13.0	16.9	0.757 (0.533-1.076) p=0.121 [†] , p=1*	3.3	2.2	1.444 (0.716-2.912) p=0.305 [†] , p=1*
Invasive - AP cover	6.7	5.8	1.170 (0.700-1.954) p=0.550 [†] , p=1*	6.0	5.2	1.172 (0.682-2.015) p=0.566 [†] , p=1*	0.3	0.6	0.562 (0.067-4.684) p=0.594 [†] , p=1*
Intermediate - all	7.0	11.3	0.632 (0.403-0.992) p=0.046 [†] , p=0.414*	4.7	8.9	0.531 (0.306-0.923) p=0.025 [†] , p=0.225*	2.3	2.4	0.97 (0.449-2.096) p=0.938 [†] , p=1*
Intermediate - no AP cover	4.0	7.9	0.519 (0.287-0.938) p=0.030 [†] , p=0.270*	2.7	6.5	0.417 (0.202-0.860) p=0.018 [†] , p=0.162*	2.0	1.4	1.371 (0.562-3.343) p=0.488 [†] , p=1*
Intermediate - AP cover	3.0	3.4	0.889 (0.448-1.765) p=0.738 [†] , p=1*	2.0	2.4	0.838 (0.358-1.963) p=0.018 [†] , p=1*	0.3	1.0	0.406 (0.062-2.663) p=0.347 [†] , p=1*
Non-Invasive - all	19.7	27.4	0.730 (0.557-0.957) p=0.023 [†] , p=0.207*	15.0	22.8	0.676 (0.498-0.918) p=0.012 [†] , p=0.108*	4.7	4.6	1.019 (0.561-1.850) p=0.951 [†] , p=1*
Non-Invasive - no AP cover	15.7	21.5	0.747 (0.554-1.008) p=0.056 [†] , p=0.504*	11.0	17.7	0.652 (0.459-0.926) p=0.017 [†] , p=0.153*	4.7	3.8	1.224 (0.667-2.248) p=0.514 [†] , p=1*
Non-Invasive - AP cover	4.0	5.9	0.678 (0.368-1.247) p=0.211 [†] , p=1*	4.0	5.2	0.777 (0.420-1.435) p=0.420 [†] , p=1*	0.0	0.8	0 (0-Inf) p=0.992 [†] , p=1*

Notes: AP = antibiotic prophylaxis, Inf = infinity, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month.

[†]Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S8. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the 3-month case period (months 1-3 before LPJI admission) and the preceding 12-month control period (months 4-15 before LPJI admission) for patients developing LPJI where the type of prosthetic joint is **unknown**.

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values
Invasive - all	34.3	40.4	0.859 (0.699-1.055) p=0.147†, p=1*	24.0	29.8	0.801 (0.621-1.034) p=0.089†, p=0.801*	10.3	10.6	0.978 (0.704-1.300) p=0.895†, p=1*
Invasive - no AP cover	28.3	37.2	0.770 (0.613-0.967) p=0.024†, p=0.216*	20.3	27.4	0.736 (0.559-0.971) p=0.030†, p=0.270*	8.0	9.9	0.84 (0.570-1.240) p=0.381†, p=1*
Invasive - AP cover	5.7	3.1	1.635 (0.997-2.680) p=0.051†, p=0.459*	3.7	2.4	1.447 (0.752-2.785) p=0.268†, p=1*	2.0	0.6	2.105 (0.872-5.000) p=0.098†, p=0.882*
Intermediate - all	12.3	17.8	0.727 (0.522-1.013) p=0.059†, p=0.531*	9.0	11.0	0.821 (0.544-1.239) p=0.347†, p=1*	3.3	6.8	0.589 (0.326-1.066) p=0.080†, p=0.720*
Intermediate - no AP cover	9.3	15.8	0.632 (0.432-0.923) p=0.018†, p=0.162*	6.7	9.7	0.698 (0.436-1.116) p=0.133†, p=1*	2.7	6.6	0.505 (0.260-0.982) p=0.044†, p=0.396*
Intermediate - AP cover	3.0	2.0	1.428 (0.695-2.934) p=0.333†, p=1*	2.3	1.3	1.846 (0.724-4.706) p=0.199†, p=1*	0.7	0.2	4.69 (0.579-38.009) p=0.148†, p=1*
Non-Invasive - all	35.3	45.8	0.788 (0.645-0.963) p=0.020†, p=0.180*	24.0	29.5	0.823 (0.642-1.054) p=0.123†, p=1*	11.3	16.3	0.73 (0.519-1.026) p=0.070†, p=0.630*
Non-Invasive - no AP cover	29.7	41.4	0.738 (0.594-0.917) p=0.006†, p=0.054*	20.3	26.4	0.783 (0.599-1.023) p=0.072†, p=0.648*	9.3	15.2	0.655 (0.451-0.951) p=0.026†, p=0.234*
Non-Invasive - AP cover	5.7	4.4	1.247 (0.746-2.083) p=0.400†, p=1*	3.7	3.1	1.183 (0.610-2.294) p=0.620†, p=1*	2.0	1.1	1.603 (0.679-3.783) p=0.282†, p=1*

Notes: AP = antibiotic prophylaxis, Inf = infinity, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month.

†Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S9. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the **1-month case period** (month 1 before LPJI admission) and the preceding 12-month control period (months 2-13 before LPJI admission).

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted†, and adjusted* p values
Invasive - all	102	121.8	0.839 (0.687-1.024) p=0.085†, p=0.765*	86.0	97.7	0.877 (0.703-1.095) p=0.248†, p=1*	16.0	24.2	0.698 (0.432-1.128) p=0.142†, p=1*
Invasive - no AP cover	79.0	98.9	0.801 (0.639-1.005) p=0.055†, p=0.495*	67.0	78.3	0.853 (0.664-1.095) p=0.248†, p=1*	12.0	20.6	0.620 (0.356-1.082) p=0.092†, p=0.828*
Invasive - AP cover	23.0	22.8	1.007 (0.664-1.528) p=0.974†, p=1*	19.0	19.3	0.983 (0.616-1.568) p=0.942†, p=1*	4.0	3.4	1.11 (0.453-2.721) p=0.819†, p=1*
Intermediate - all	39.0	52.6	0.760 (0.556-1.038) p=0.085†, p=0.765*	24.0	36.6	0.655 (0.443-0.998) p=0.049†, p=0.441*	15.0	16.0	0.949 (0.591-1.525) p=0.829†, p=1*
Intermediate - no AP cover	29.0	41.2	0.725 (0.505-1.041) p=0.082†, p=0.738*	18.0	28.4	0.645 (0.405-1.029) p=0.066†, p=0.594*	11.0	12.8	0.886 (0.506-1.549) p=0.670†, p=1*
Intermediate - AP cover	10.0	11.4	0.887 (0.481-1.636) p=0.701†, p=1*	6.0	8.2	0.739 (0.327-1.673) p=0.469†, p=1*	4.0	3.2	1.170 (0.479-2.855) p=0.730†, p=1*
Non-Invasive - all	107.0	133.8	0.817 (0.678-0.985) p=0.034†, p=0.306*	84.0	95.0	0.893 (0.72-1.105) p=0.299†, p=1*	23.0	38.8	0.631 (0.424-0.939) p=0.023†, p=0.207*
Non-Invasive - no AP cover	85.0	109.7	0.795 (0.644-0.980) p=0.032†, p=0.288*	66.0	76.1	0.879 (0.692-1.116) p=0.289†, p=1*	19.0	33.6	0.605 (0.390-0.937) p=0.024†, p=0.216*
Non-Invasive - AP cover	22.0	24.1	0.923 (0.613-1.389) p=0.701†, p=1*	18.0	18.9	0.956 (0.606-1.508) p=0.847†, p=1*	4.0	5.2	0.807 (0.317-2.053) p=0.652†, p=1*

Notes: AP = antibiotic prophylaxis, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month. †Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

Table S10. Case-crossover analysis comparing the incidence of different dental procedures (with and without antibiotic prophylaxis (AP) cover) in the **2-month case period** (months 1-2 before LPJI admission) and the preceding 12-month control period (months 3-14 before admission).

Dental Procedures	All LPJI Patients			Commercial/Medicare Supplemental LPJI Patients			Medicaid LPJI Patients		
	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values	Case-Period Proc/m	Control-Period Proc/m	OR (95% CI) Unadjusted [†] , and adjusted* p values
Invasive - all	106.0	123.2	0.861 (0.746-0.994) p=0.041 [†] , p=0.369*	86.5	99.2	0.868 (0.739-1.021) p=0.088 [†] , p=0.792*	19.5	24.1	0.834 (0.611-1.140) p=0.255 [†] , p=1*
Invasive - no AP cover	78.0	101.6	0.77 (0.652-0.909) p=0.002 [†] , p=0.018*	62.0	81.1	0.76 (0.629-0.918) p=0.004 [†] , p=0.036*	16.0	20.5	0.806 (0.571-1.137) p=0.219 [†] , p=1*
Invasive - AP cover	28.0	21.5	1.283 (0.968-1.701) p=0.083 [†] , p=0.747*	24.5	18.1	1.355 (0.993-1.849) p=0.055 [†] , p=0.495*	3.5	3.4	1.0 (0.487-2.052) p=1 [†] , p=1*
Intermediate - all	42.5	54.0	0.804 (0.647-0.999) p=0.049 [†] , p=0.441*	29.0	37.3	0.785 (0.600-1.027) p=0.077 [†] , p=0.693*	13.5	16.7	0.842 (0.584-1.214) p=0.357 [†] , p=1*
Intermediate - no AP cover	33.0	42.1	0.801 (0.626-1.025) p=0.078 [†] , p=0.702*	22.5	29.1	0.784 (0.579-1.062) p=0.116 [†] , p=1*	10.5	13.0	0.837 (0.550-1.274) p=0.407 [†] , p=1*
Intermediate - AP cover	9.5	11.9	0.818 (0.521-1.286) p=0.384 [†] , p=1*	6.5	8.2	0.794 (0.450-1.403) p=0.428 [†] , p=1*	3.0	3.7	0.861 (0.412-1.803) p=0.692 [†] , p=1*
Non-Invasive - all	113.5	135.0	0.855 (0.749-0.976) p=0.021 [†] , p=0.189*	85.5	96.0	0.900 (0.772-1.049) p=0.178 [†] , p=1*	28.0	39.0	0.747 (0.575-0.971) p=0.029 [†] , p=0.261*
Non-Invasive - no AP cover	92.5	110.8	0.850 (0.735-0.984) p=0.030 [†] , p=0.270*	68.0	77.2	0.892 (0.751-1.059) p=0.191 [†] , p=1*	24.5	33.7	0.757 (0.572-1.001) p=0.051 [†] , p=0.459*
Non-Invasive - AP cover	21.0	24.2	0.883 (0.651-1.198) p=0.425 [†] , p=1*	17.5	18.8	0.936 (0.668-1.312) p=0.702 [†] , p=1*	3.5	5.3	0.697 (0.335-1.450) p=0.334 [†] , p=1*

Notes: AP = antibiotic prophylaxis, LPJI = late prosthetic joint infection, OR = odds ratio, Proc/m = procedures per month. [†]Unadjusted p value, *adjusted p value using Bonferroni's correction for multiple comparisons.

References:

1. IBM Watson Health. *The IBM MarketScan Research Databases for Life Sciences Researchers - Data Brochure*. Somers, NY: IBM Watson Health; April 2019 2019.
2. IBM Watson Health. *The Truven Health MarketScan Databases for health services researchers - White Paper*. Somers, NY: IBM Watson Health; April 2019 2019.
3. US Department for Health and Human Services. Health Insurance Portability and Accountability Act 1996. <https://www.hhs.gov/hipaa/index.html>. Published 1996. Accessed April 6th 2022, 2022.
4. Thornhill MH, Gibson TB, Durkin MJ, et al. Prescribing of antibiotic prophylaxis to prevent infective endocarditis. *JADA*. 2020;151(11):835-845.
5. Wilson W, Taubert KA, Gewitz M, et al. Prevention of infective endocarditis: guidelines from the American Heart Association: a guideline from the American Heart Association Rheumatic Fever, Endocarditis, and Kawasaki Disease Committee, Council on Cardiovascular Disease in the Young, and the Council on Clinical Cardiology, Council on Cardiovascular Surgery and Anesthesia, and the Quality of Care and Outcomes Research Interdisciplinary Working Group. *Circulation*. 2007;116(15):1736-1754.
6. Lachin JM. Sample size evaluation for a multiply matched case-control study using the score test from a conditional logistic (discrete Cox PH) regression model. *Stat Med*. 2008;27(14):2509-2523.