

# Reduced numbers of elective joint replacement procedures in Australia during the COVID-19 pandemic, 2020–2022: a registry data analysis study

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The osteoarthritis burden in Australia is growing,<sup>1</sup> partly because of population growth, population ageing, and high rates of obesity and sports-related knee injuries.<sup>2</sup> Joint replacement is an effective treatment for people with advanced osteoarthritis; the number of procedures performed in Australia increased markedly during 2003–2019, and is projected to rise further.<sup>3</sup>

The coronavirus disease 2019 (COVID-19) pandemic, however, dramatically reduced the number of elective joint replacement procedures undertaken in Australia.<sup>4</sup> The aims of our study were to provide an updated estimate of the shortfall in elective hip, knee, and shoulder replacements undertaken in public and private hospitals, nationally and by state and territory; and to determine the increase in the surgical caseload required to overcome the shortfall of procedures for public sector patients during 2020–2022.

For our retrospective observational study, we analysed Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) data for elective procedures undertaken during 1 January 2012 – 31 December 2022. We included primary hip replacements (total conventional and resurfacing

hip replacements; all diagnoses except neck of femur fracture), knee replacements (unicompartmental and total knee replacements; all diagnoses), and shoulder replacements (total resurfacing anatomic, stemless or stemmed anatomic, and stemmed reverse shoulder replacements; all diagnoses except fracture). We projected the annual number of elective joint replacements during 2020–2026 from pre-pandemic data (2012–2019) in a Poisson regression model that included an offset based on the log of the predicted number of people aged 65 years or older, taken from the most conservative Australian Bureau of Statistics projection of population growth (series C).<sup>5</sup> We compared the annual numbers of elective hip, knee, and shoulder replacements during 2020–2022 with our projections for public and private sector patients, overall and by state and territory. We also estimated the increase in surgical caseload required to compensate procedure shortfalls for public sector patients by the end of 2024, 2025, or 2026 (Supporting Information, part 1). Statistical analyses were performed in SAS 9.4. As the AOANJRR is a Federal Quality Assurance Activity under the *Commonwealth Health Insurance Act 1973*, this study did not require formal ethics approval.

## 1 Incidence of elective hip, knee, and shoulder replacement procedures, and differences from projected incidence based on 2012–2019 incidence data, Australia, 2019–2022\*

Procedure/hospital type	Procedure numbers						
	2019	2020	2020 difference	2021	2021 difference	2022	2022 difference
All procedures	104 900	100 306	–13 590	110 080	–9 555	106 125	–19 162
Public	30 857	24 641	–9522	25 172	–10 657	21 038	–16 426
Private	74 043	75 665	–4068	84 908	1102	85 087	–2736
Hip replacement	38 108	36 645	–4431	40 068	–3003	39 628	–5399
Public	11 886	9681	–3303	9736	–3894	8562	–5704
Private	26 222	26 964	–1128	30 332	892	31 066	305
Knee replacement	60 779	57 587	–8446	63 128	–5937	59 810	–12 210
Public	17 431	13 667	–5743	14 094	–6140	11 413	–9618
Private	43 348	43 920	–2703	49 034	204	48 397	–2592
Shoulder replacement	6013	6074	–916	6884	–990	6687	–2155
Public	1540	1293	–550	1342	–760	1063	–1327
Private	4473	4781	–366	5542	–230	5624	–829

\* Data source: Australian Orthopaedic Association National Joint Replacement Registry. The numbers of elective hip, knee, and shoulder replacement procedures during 2012–2022, and projected numbers for 2020–2026, overall and by state and territory, are depicted in the Supporting Information, figures 1–9 and summarised for 2019–2022, overall and by state and territory, in the Supporting Information, tables 1–9.

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## 2 Estimated caseload increase required to overcome public sector elective hip, knee, and shoulder replacement procedure deficits by the end of 2024, 2025, or 2026

State/territory	Increased caseload, for target date		
	2024	2025	2026
Australia	16%	10%	8%
Victoria	27%	17%	13%
Western Australia	18%	11%	8%
New South Wales	14%	9%	7%
Queensland	14%	9%	7%
South Australia	10%	7%	5%
Australian Capital Territory	5%	3%	2%
Northern Territory	0	0	0
Tasmania	0	0	0

The shortfall in elective joint replacement procedures (ie, difference between actual and projected numbers) was 13 590 in 2020, 9555 in 2021, and 19 162 in 2022; the shortfall was larger for public than private procedures (overall: 36 605 of 42 307, 86.5%) (Box 1). To clear the backlog accumulated during 2020–2022 by the end of 2024, the national annual caseload would need to increase by 16%, by 10% to clear it by the end of 2025, or by 8% to clear it by the end of 2026 (Box 2). During 2019, 23 966 of 104 900 joint replacements (23%) were undertaken in Victoria, but the shortfall of 16 242 procedures in Victoria during 2020–2022 comprised 38% of the national backlog (Supporting Information, table 7 and figure 7).

An estimated 42 307 fewer elective joint replacements were undertaken in Australia during 2020–2022 than projected from the annual numbers for 2012–2019. The reduction was greatest in Victoria, but procedure numbers declined in most states and territories, and 86.5% of the shortfall was in public hospital procedures. It has previously been reported that 5503 fewer elective joint replacement procedures were undertaken in Australia in 2020 than in 2019, and also that the differences in procedure numbers were particularly large in Victoria and for

public hospitals.<sup>4</sup> Similar reductions in elective joint replacement numbers have been reported in other countries.<sup>6–9</sup>

As the AOANJRR records almost all joint replacement procedures in Australia, we are confident of the quality of the data underlying our projections. By estimating changes by joint replacement type, state and territory, and by hospital type (public and private), we believe our findings apply to a wide variety of settings. However, we assumed that the annual number of elective joint replacements would have continued to increase after 2019 and that the reductions found are attributable to the effects of the COVID-19 pandemic. As the AOANJRR records only the insurance status of the hospital at which a joint replacement is performed, we cannot comment on “private outsourcing” of public patients. Some people may have been inappropriately booked for surgery<sup>10</sup> but subsequently managed effectively using alternative models of care.

The number of elective joint replacement procedures performed in Australia has declined substantially since the onset of the COVID-19 pandemic. Public sector patients have been disproportionately affected. A national approach to reducing waiting time for public elective joint replacements is urgently needed.

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**Competing interests:** Christopher Wall, Christopher Vertullo, David Gill, and Paul Smith are clinical directors of the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR). Richard Page is a clinical advisor to the AOANJRR. Christopher Wall has received payments from Stryker for educational presentations. Christopher Vertullo is director of Knee Research Australia. Christopher Vertullo and David Gill are members of Prosthesis List Advisory Committee clinical advisory groups. Paul Smith is chair of the Canberra Orthopaedic Research and Education Foundation, and director of the Trauma and Orthopaedic Research Unit at the Australian National University. Richard Page and Paul Smith have received institutional support from various orthopaedic device companies.

**Data sharing:** Patient-level AOANJRR data are not publicly available for sharing.

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## Supporting Information

Additional Supporting Information is included with the online version of this article.