

A cost comparison of pembrolizumab: Fixed and weight-based dosing

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Background

Early clinical studies of pembrolizumab used weight-based dosing strategies, leading to the TGA approval of weight-based doses of 2mg/kg every three weeks (Q3W)¹⁻². In more recent trials conducted by the sponsor company, a fixed dose regimen was introduced, subsequently leading to the approval of fixed doses of 200mg Q3W and 400mg every six weeks (Q6W) for all indications³.

Pharmacokinetic equivalence has been demonstrated between the two dosing strategies, with no significant differences in efficacy or toxicity. Fixed dosing regimens are PBS (Pharmaceutical Benefits Scheme) funded and routinely used in Australia.

Whilst fixed dose regimens have the advantage of increased convenience, elimination of wastage and a reduced chance of dosing errors, they may create unforeseen financial implications.

Objectives

To model and compare the cost of weight-based dosing of pembrolizumab to standard fixed dosing regimens (Figure 1).

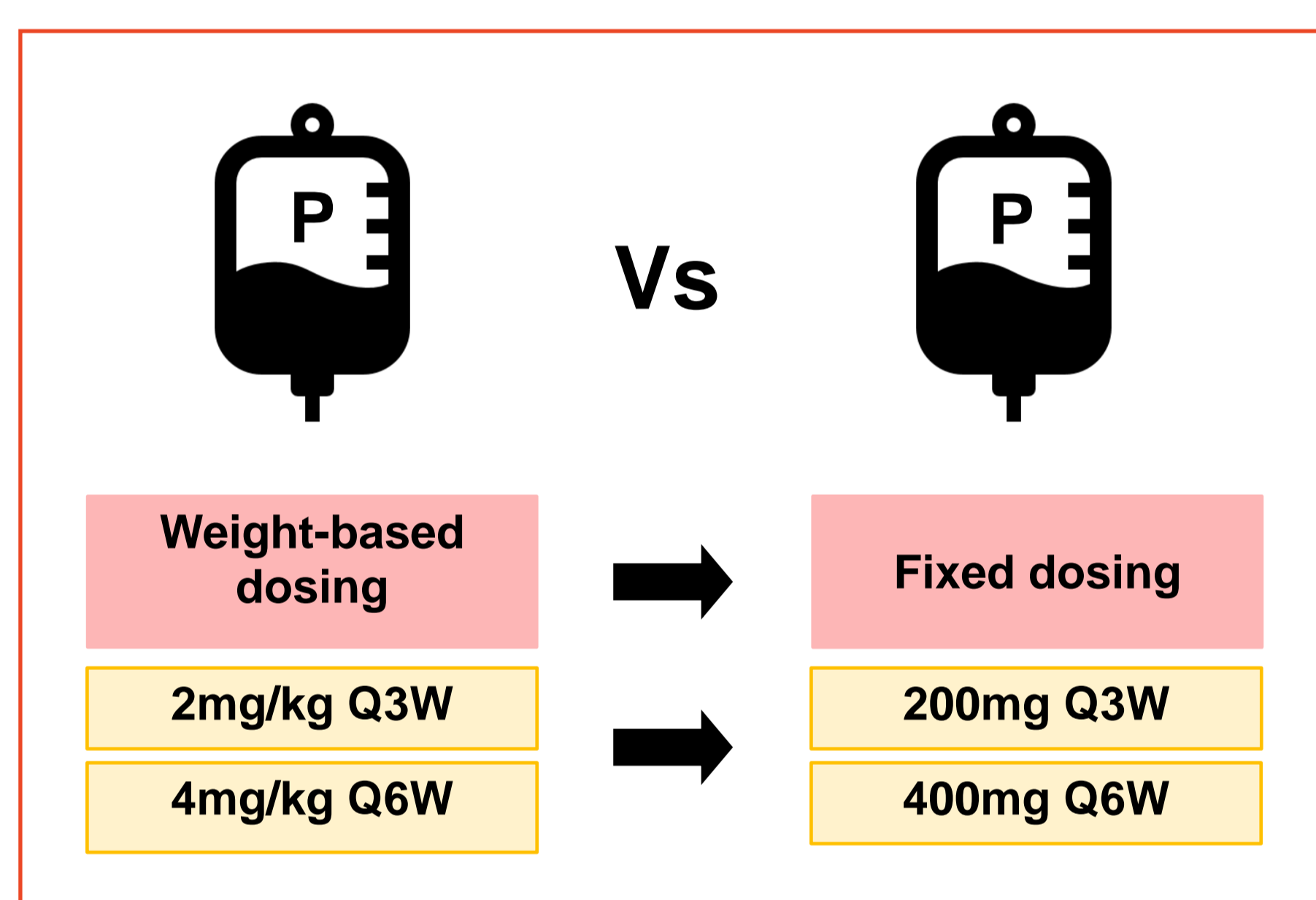


Figure 1: Cost comparison - weight-based dosing versus fixed dosing

Methods

A single centre, retrospective review was conducted. Patients who were commenced on pembrolizumab at The Alfred Hospital between January 2022 and December 2022 were included.

Patients were excluded if doses were given without patient weight being recorded, if they commenced treatment prior to the study period, or if doses were administered as part of a clinical trial.

Patients were identified from pharmacy dispensing records following which patient demographic and treatment data were extracted from the hospital's electronic medical record system. Doses administered to these patients during the study period were recorded.

Costs of weight-based doses were calculated and compared to the cost of fixed dosing. Variables such as acquisition cost, funding mechanisms and waste minimisation were considered. Waste minimisation was based around whether the remainder of the unused pembrolizumab left in the vial was discarded or used for the next patient.

Primary outcome:

The cost difference between:

- Weight-based dosing (2mg/kg Q3W and 4mg/kg Q6W) and
- Fixed dosing of pembrolizumab (200mg Q3W and 400mg Q6W).

Secondary outcomes:

Comparison of preparation cost, and PBS reimbursement margins of pembrolizumab for both fixed-dosing and weight-based dosing regimens.

Results

Fifty-two patients met the inclusion criteria. Baseline patient demographics are summarised in Table 1. A total of 211 doses of pembrolizumab were administered, 161 were Q3W doses, and 50 were Q6W doses (Figure 2).

Table 1: Patient demographics (n = 52)

Male gender, n (%)	33 (63)
Median age, years (Range)	68 (22 - 94)
Ave. weight, kg (SD)	74.3 (17.2)
Average weight kg per dose administered (SD)	77.6 (19.0)
Average doses received per patient, n (Range)	4.1 (1 - 12)

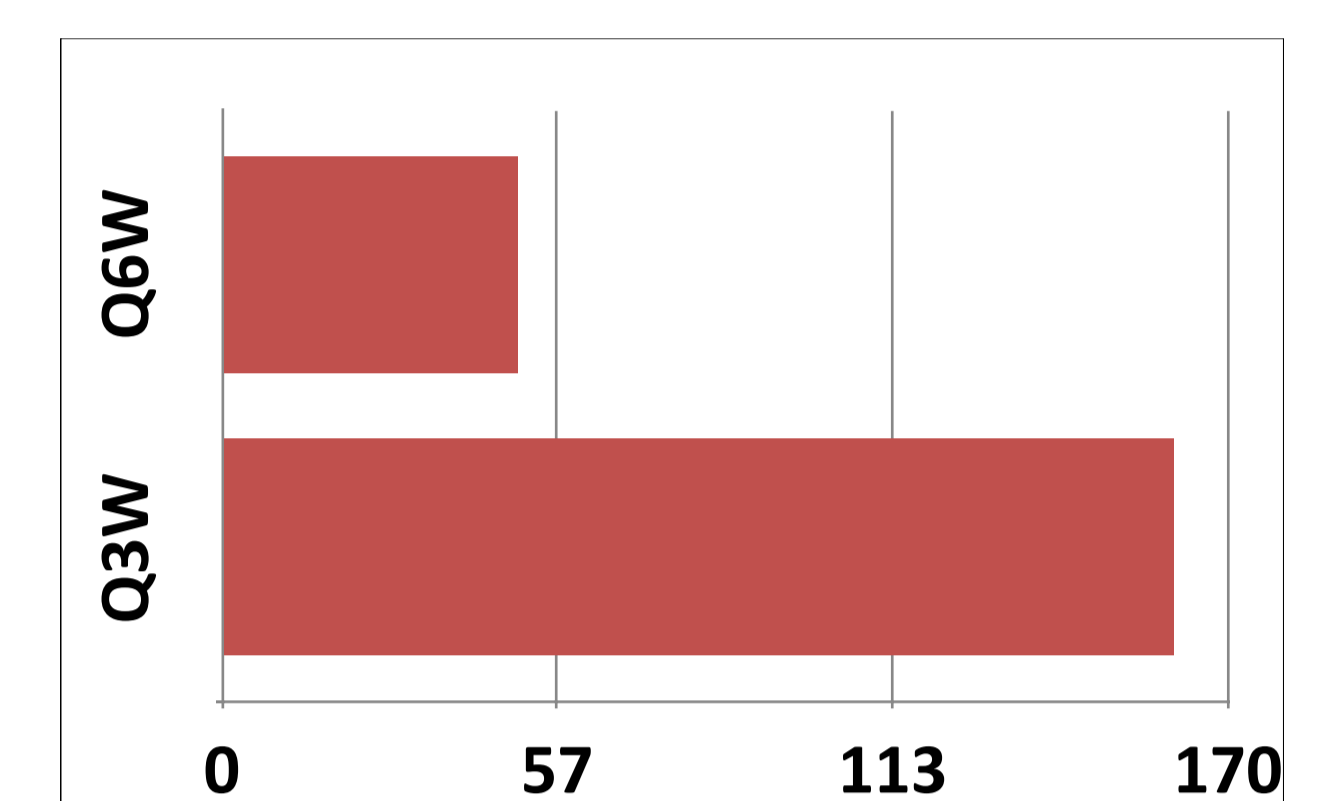


Figure 2: No. doses administered

Weight-based dosing models with waste minimisation strategies included, equated to an average medication acquisition cost of \$5933 per dose for the 2mg/kg Q3W regimen, or \$11,867 per dose for 4mg/kg Q6W; an average cost avoidance of \$1713 per Q3W dose, and \$3425 per Q6W doses, compared to fixed dose regimens (Table 2).

Table 2: Acquisition cost comparison per dose administered

	Fixed dose	Weight-based dose	Cost avoidance
Q3W	\$7646	\$5933	\$1713
Q6W	\$15,292	\$11,867	\$3425

Using weight-based dosing instead of fixed dosing during this study period would have resulted in a total cost avoidance of \$467,996 (23.5% of total expenditure) for the included patients.

If weight-based doses were capped at 200mg Q3W and 400mg Q6W for patients weighing above 100kg, an additional \$27,113, or a further 1.3% of costs could have been avoided.

Under the current funding arrangement, PBS dispensing of pembrolizumab receives a fixed fee, irrespective of the dose dispensed - resulting in no difference in reimbursement between weight-based and fixed doses. Differences in preparation costs between weight-based and fixed doses were deemed negligible.

Discussion

Fixed dosing of pembrolizumab has a number of advantages, mainly through increased convenience and improved safety from the reduced chance of dosing errors.

However, if weight-based dosing had been utilised for the patients included in this study, a **23.5% cost avoidance in medication acquisition costs** could have been realised. This is based on the assumption of zero medication wastage. These differences may amount to tens of thousands of dollars throughout the course of treatment for a single patient.

Significant cost avoidance for the Australian health system could be achieved via weight-based dosing of pembrolizumab. The potential cost benefits, at both institution and government level, should be further explored.

References

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