Evaluation of Health and Economic Impact of Vein-to-Vein Time in the Treatment of B-Cell Lymphoma with Chimeric Antigen Receptor T-Cell Therapies: a Systematic Review

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BACKGROUND AND IMPORTANCE

Chimeric antigen receptor (CAR) T-cell therapies have transformed the treatment landscape of relapsed/refractory large B-cell lymphoma (r/r LBCL). However, their clinical success poses new challenges in expanding indications, sustainability, and manufacturing optimization. **Evidence suggests that extended vein-to-vein time (V2Vt) may compromise clinical efficacy and economic value**.

AIM AND OBJECTIVES: The aim of this study is to evaluate the impact of V2Vt on both clinical and economic outcomes in the treatment of r/r LBCL with currently approved CAR T-cell therapies.

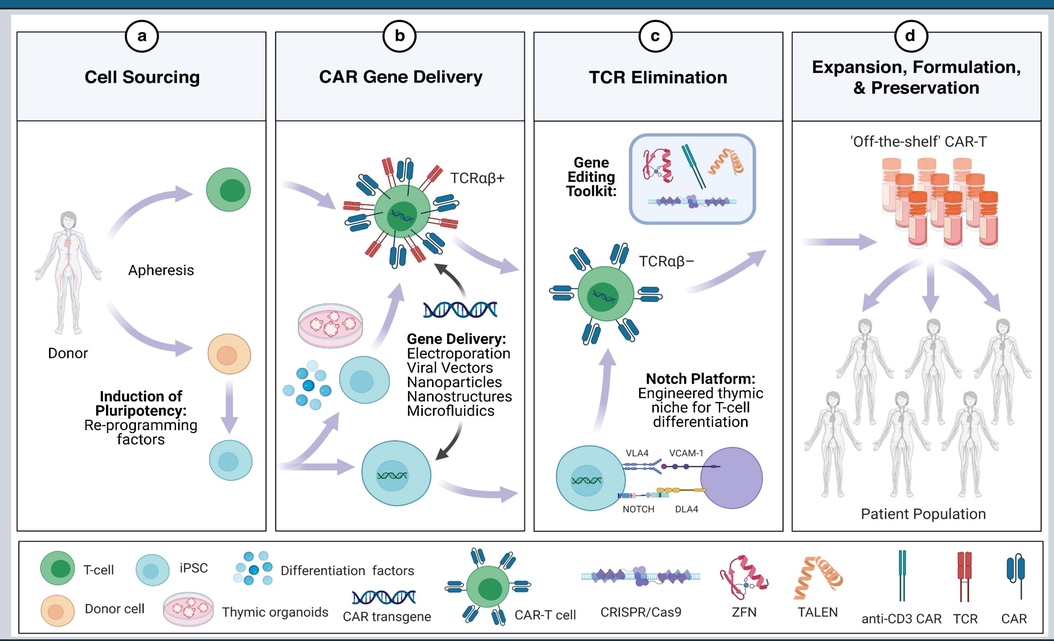


Figure 1. Accelerating vein-to-vein cell therapy workflows with new bioanalytical strategies. Donor-derived allogeneic adoptive CAR-T workflow.

MATERIALS AND METHODS

A systematic literature review was conducted according to updated **PRISMA guidelines** using PubMed, Web of Science, and Scopus databases. **Studies published between 2020 and 2025 reporting quantitative data on the association between V2Vt and economic or survival outcomes**, such as life years (LYs), quality-adjusted life years (QALYs), and cost-effectiveness analyses, were included. Data were collected, extracted, analyzed, and qualitatively synthesized.

RESULTS

Five studies met the inclusion criteria. **In the >3-line setting**, reducing V2Vt from 54 to 24 days was associated with a gain of 3.2 LYs and 2.4 QALYs per patient, with an incremental cost of USD 92,587 per QALY gained for axicabtagene ciloleucel compared with tisagenlecleucel. **Even smaller reductions in V2Vt**, from 37 to 24 days, **were clinically relevant, translating into an additional 2.5 LYs and 1.9 QALYs**. Similarly, **in the second-line setting**, axicabtagene ciloleucel, characterized by a higher prevalence of short V2Vt (<36 days), demonstrated an incremental gain of 0.56 QALY compared with lisocabtagene maraleucel, along with a total cost reduction of USD 13,156. Moreover, economic models with a 50-year time horizon identified **axicabtagene ciloleucel as a dominant treatment option**, with a net monetary benefit of USD 96,407 at a willingness-to-pay threshold of USD 150,000 per QALY.

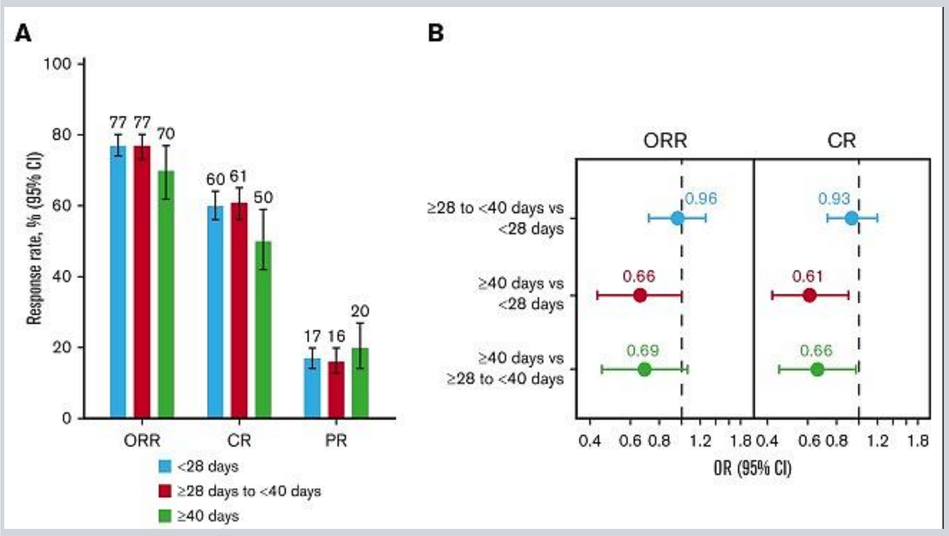
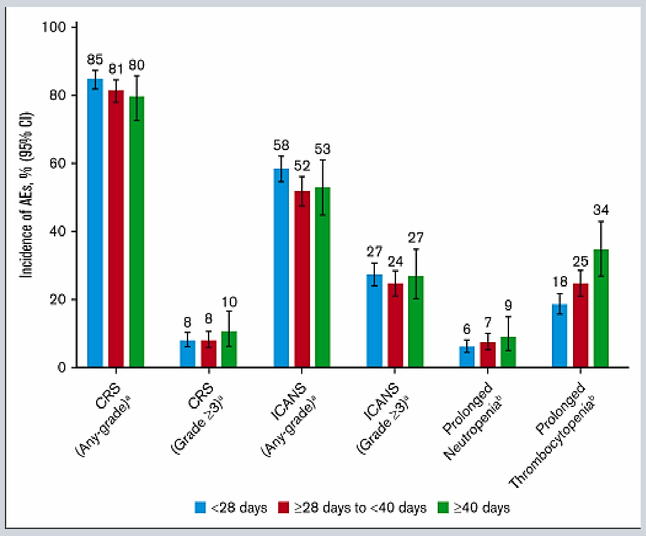


Figure 2. Axi-cel response rates (**A**) and incidence of axi-cel adverse events (**B**) by V2Vt.



Outcomes	Axi-cel	Liso-cel	Incremental
Total LYs	9.29	8.56	0.72
Pre-progression LYs	7.09	6.57	0.52
Post-progression LYs	2.20	1.99	0.21
Total QALYs	7.25	6.69	0.56
Pre-progression QALYs	5.72	5.31	0.41
Post-progression QALYs	1.53	1.38	0.15
Costs	$815,369	$828,525	-$13,156
ICER			**Dominant; more effective and less costly**
NMB			**$96,407**

Axi-cel, axicabtagene ciloleucel; ICER, incremental cost-effectiveness ratio; liso-cel, lisocabtagene maraleucel; LY, life year; NMB, net monetary benefit; QALY, quality-adjusted life year

Figure 3. Cost-effectiveness analysis (discounted) – base case (USD 2023).

CONCLUSION AND RELEVANCE

Available evidence demonstrates that reducing V2Vt not only improves survival and quality of life but also represents a key determinant of the economic sustainability of CAR-T therapies. Therefore, implementing procurement strategies aimed at accelerating manufacturing and logistic processes is essential to secure timely and efficient therapy delivery.

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