Government development of ‘made-in-Canada’ CAR-T cell immunotherapies: assessing cost, risk, access, and alternatives

Description

Brett J Skinner

ABSTRACT

Summary: Chimeric Antigen Receptor T, or CAR-T cell immunotherapy, is a novel treatment that genetically engineers a patient’s own T-cells to recognize and attack cancer cells. CAR-T therapeutics have been available in the United States since May 2017, and in Canada since September 2018. As of July 1, 2024, six CAR-T products had been authorized for marketing by both the U.S. Food and Drug Administration (FDA) and Health Canada. One drug was later withdrawn from the Canadian market. Health technology assessment (HTA) is a prerequisite of the public reimbursement process in Canada and is conducted by the Canadian Drug Agency (CDA), formerly known as the Canadian Agency for Drugs and Technologies in Health (CADTH). The five commercially available CAR-T products were recommended for public reimbursement by CDA. However, the prices for these therapies exceeded the cost effectiveness threshold used by CDA and therefore its recommendations were conditional on pricing adjustment. CAR-T has been eligible for public funding under US Medicare since 2017. By contrast, as of July 1, 2024, only six of the 10 Canadian provinces have authorized CAR-T products for public reimbursement. Lack of public funding is a significant barrier to accessing CAR-T immunotherapy, in addition to several other obstacles to treatment affecting patient access. Federal and provincial governments have been reluctant to extend funding eligibility for commercial products, preferring instead to invest in public development of a made-in-Canada capacity for manufacturing CAR-T therapies. Alternative funding models could more efficiently and more immediately improve access using commercially available CAR-T therapies in Canada.

Authors credentials and affiliations:

1. BJ Skinner PhD, Canadian Health Policy Institute (CHPI).

Disclosure: This article was researched and published through CHPI’s Centre for Access to Innovative Medicines, which is partly sponsored by research-based pharmaceutical companies. Dr. Skinner is the lead researcher for the Centre. Background research for this paper was subcontracted by Dr. Skinner.

Status: Peer reviewed.

Submitted: 16 AUG 2024 | **Published**: 03 OCT 2024

Citation: Brett J Skinner (2024). Government development of ‘made-in-Canada’ CAR-T cell immunotherapies: assessing cost, risk, access, and alternatives. *Canadian Health Policy*, OCT 2024. https://doi.org/10.54194/IOWR5712; canadianhealthpolicy.com.

References

Adams CP, Brantner VV. (2006). Estimating the cost of new drug development: is it really 802 million dollars? Health Aff (Millwood). 2006;25(2):420-428. doi:10.1377/hlthaff.25.2.420.

Adams CP, Brantner VV. (2010). Spending on new drug development. Health Econ. 2010;19(2):130-141. d0oi:10.1002/hec.1454.

Ayala Ceja M, Khericha M, Harris CM, Puig-Saus C, Chen YY. (2024). CAR-T cell manufacturing: Major process parameters and next-generation strategies. J Exp Med. 2024 Feb 5; 221(2): e20230903. doi: 10.1084/jem.20230903. Epub 2024 Jan 16. PMID: 38226974; PMCID: PMC10791545.

Baumol, W. J., Panzar, J. C., & Willig, R. D. (1983). Contestable Markets: An Uprising in the Theory of Industry Structure: Reply. The American Economic Review, 73(3), 491–496. http://www.jstor.org/stable/1808145.

Boubakri, Narjess; Jean-Claude Cosset; Omrane Guedhami. (2005). Liberalization, corporate governance and the performance of privatized firms in developing countries. Journal of Corporate Finance, Volume 11, Issue 5, 2005, Pages 767-790, ISSN 0929-1199, https://doi.org/10.1016/j.jcorpfin.2004.05.001. (https://www.sciencedirect.com/science/article/pii/S0929119904000641)

British Columbia Ministry of Health (2024). News release: https://news.gov.bc.ca/releases/2024HLTH0012-000321.

Canadian Drug Agency (CDA) (2023). CADTH Reimbursement Recommendation Tisagenlecleucel (Kymriah). Canadian Journal of Health Technologies, September 2023, Volume 3, Issue 9.

Canadian Institute for Health Information (2023). National Health Expenditure Database.

CBC News. (2020). Alberta becomes 3rd province to offer promising leukemia and lymphoma treatment: ‘Establishing the CAR T-cell therapy program in Alberta is an enormous leap forward’. Posted: Aug 24, 2020 1:49 PM EDT | Last Updated: August 24, 2020

Cui, C., Feng, C., Rosenthal, N., Wade, S. W., Curry, L., Fu, C., & Shah, G. L. (2022). Hospital Costs and Healthcare Resource Utilization (HRU) for Chimeric Antigen (CAR) T-Cell Therapy and Stem Cell Transplant (SCT) in Patients with Large B-Cell Lymphoma (LBCL) in the United States (US). Blood, 140(Supplement 1), 2161-2162.

Danzon, Patricia M. and Michael F. Furukawa (2003). Prices And Availability Of Pharmaceuticals: Evidence From Nine Countries. Health Affairs 2003 22:Suppl1, W3-521-W3-536.

DeWenter, Kathryn, L., and Paul H. Malatesta. (2001). “State-Owned and Privately Owned Firms: An Empirical Analysis of Profitability, Leverage, and Labor Intensity.” American Economic Review, 91 (1): 320–334. DOI: 10.1257/aer.91.1.320

DiMasi J, Grabowski H, Vernon J. (2004). R&D costs and returns by therapeutic category. Drug Inf J. 2004;38(3):211-223. doi:10.1177/009286150403800301.

DiMasi J, Grabowski H. (2007). The cost of biopharmaceutical R&D: is biotech different? Manage Decis Econ. 2007;28(4-5):469-479. doi:10.1002/mde.1360.

DiMasi JA, Grabowski HG, Hansen RW. (2016). Innovation in the pharmaceutical industry: new estimates of R&D costs. J Health Econ. 2016;47:20-33. doi:10.1016/j.jhealeco.2016.01.012.

DiMasi JA, Hansen RW, Grabowski HG. (2003). The price of innovation: new estimates of drug development costs. J Health Econ. 2003;22(2):151-185. doi:10.1016/S0167-6296(02)00126-1.

Fiorenza, S., Ritchie, D. S., Ramsey, S. D., Turtle, C. J., & Roth, J. A. (2020). Value and affordability of CAR T-cell therapy in the United States. Bone marrow transplantation, 55(9), 1706-1715.

Geethakumari, P.R., Ramasamy, D.P., Dholaria, B. et al. (2021). Balancing Quality, Cost, and Access During Delivery of Newer Cellular and Immunotherapy Treatments. Curr Hematol Malig Rep 16, 345–356 (2021). https://doi.org/10.1007/s11899-021-00635-3.

Government of Manitoba. (January 9, 2023). News Release – Manitoba. Manitoba Government Invests $6.6 Million to Create Innovative CAR-T Cancer Therapy Program at CancerCare Manitoba. https://news.gov.mb.ca/news/?archive=&item=57439.

Gye, A., Goodall, S., & Lourenco, R. D. A. (2022). A systematic review of health technology assessments of chimeric antigen receptor T-cell therapies in young compared with older patients. Value in Health, 25(1), 47-58.

Hunter, Adam. (2023). CBC News. Posted: Feb 21, 2023 7:14 PM EST | Last Updated: February 21, 2023. Sask. now offering ‘revolutionary’ treatment for patients with specific cancers: 1 of 5 provinces to offer CAR T therapy. https://www.cbc.ca/news/canada/saskatchewan/sask-cancer-treatment-1.6755613 .

IQVIA (22024). White Paper. Access to oncology pharmaceutical innovations in Canada. ARUSHI SHARMA, Practice Leader, Oncology, RWS SHOGHAG KHOUDIGIAN, Ph.D., Associate Principal, RWS PURVA BAROT, MBA, Consultant, RWS.

Jayasundara K, Hollis A, Krahn M, Mamdani M, Hoch JS, Grootendorst P. (2019). Estimating the clinical cost of drug development for orphan versus non-orphan drugs. Orphanet J Rare Dis. 2019;14(1):12. doi:10.1186/s13023-018-0990-4.

Lichtenberg, Frank R. and Tomas J. Philipson (2002). The Dual Effects of Intellectual Property Regulations: Within- and Between- Patent Competition in the US Pharmaceuticals Industry. The Journal of Law and Economics 2002 45: S2, 643-672. URL: https://doi.org/10.1086/374703.

Mackensen, A., Müller F., Mougiakakos D., Böltz S., Wilhelm A., Aigner M., Völkl S., Simon D., Kleyer A., Munoz L., et al. (2022). Anti-CD19 CAR T cell therapy for refractory systemic lupus erythematosus. Nat. Med. 28:2124–2132. 10.1038/s41591-022-02017-5.

Mestre-Ferrandiz J, Sussex J, Towse A. (2012). The R&D cost of a new medicine. Office of Health Economics. January 12, 2012. https://www.ohe.org/publications/rd-cost-new-medicine/.

Megginson, William, L., and Jeffry M. Netter. (2001). “From State to Market: A Survey of Empirical Studies on Privatization.” Journal of Economic Literature, 39 (2): 321–389. DOI: 10.1257/jel.39.2.321

Ontario Auditor General (2017). 2017 Annual Report.

Paul SM, Mytelka DS, Dunwiddie CT, et al. (2010). How to improve R&D productivity: the pharmaceutical industry’s grand challenge. Nat Rev Drug Discov. 2010;9(3):203-214. doi:10.1038/nrd3078.

Prasad V, Mailankody S. (2017). Research and development spending to bring a single cancer drug to market and revenues after approval. JAMA Intern Med. 2017;177(11):1569-1575. doi:10.1001/jamainternmed.2017.3601.

Ran T, Eichmüller SB, Schmidt P, Schlander M. (2020). Cost of decentralized CAR T-cell production in an academic nonprofit setting. Int. J. Cancer. 2020; 147: 3438–3445. https://doi.org/10.1002/ijc.33156.

Rebeira, Mayvis (2022). QALYs and Value Assessment. Canadian Health Policy, NOV 2022. Toronto: Canadian Health Policy Institute. ISSN 2562-9492, https://doi.org/10.54194/DFUL2957, www.canadianhealthpolicy.com.

Riccardo, David (1821). Principles of Political Economy.

Sertkaya A, Beleche T, Jessup A, Sommers BD. (2024). Costs of Drug Development and Research and Development Intensity in the US, 2000-2018. JAMA Netw Open. 2024;7(6):e2415445. doi:10.1001/jamanetworkopen.2024.15445.

Sterner RC, Sterner RM. (2021). CAR-T cell therapy: current limitations and potential strategies. Blood Cancer J. 2021 Apr 6;11(4):69. doi: 10.1038/s41408-021-00459-7. PMID: 33824268; PMCID: PMC8024391.

Sun D, Gao W, Hu H, Zhou S. (2022). Why 90% of clinical drug development fails and how to improve it? Acta Pharm Sin B. 2022 Jul;12(7):3049-3062. doi: 10.1016/j.apsb.2022.02.002. Epub 2022 Feb 11. PMID: 35865092; PMCID: PMC9293739.

Wang, V., Gauthier M., Decot V., Reppel L., and Bensoussan D. (2023). Systematic review on CAR-T cell clinical trials up to 2022: Academic center input. Cancers. 15:1003. 10.3390/cancers15041003.

Wouters OJ, McKee M, Luyten J. (2020). Estimated research and development investment needed to bring a new medicine to market, 2009-2018. JAMA. 2020;323(9):844-853. doi:10.1001/jama.2020.1166.