Uncovering the Cost of Red Blood Cell (RBC) and Platelet (PLT) Transfusions in Africa, Asia, Oceania, and the Americas and Exploring Related Implications in a Trial Example

Authors: Alexa Molinari,¹ Athanasios Zomas,² Hüseyin Emre Selvi,³ Eunji Heo,⁴ Inbal Weiss,⁵ Paulo Vitor dos Santos Souza,⁶ Lorena Canon,⁷ Paola Stefan,¹ Rosarin Sruamsiri,⁸ Victoria Federico Paly¹

Affiliation at Time of Research Initiation: ¹Takeda Pharmaceuticals America, Inc., Lexington, MA, USA, ²Takeda Pharmaceuticals International AG, Zurich, Switzerland, ³Takeda Ilac Saglik, Istanbul, Turkiye, ⁴Takeda Pharmaceuticals Korea Co., Ltd., ⁵Takeda Israel Ltd, Petah Tikva, Israel, ⁶Takeda Distribuidora Ltda, São Paulo, SP, Brazil, ⁷Takeda Colombia S.A.S, Bogotá, Colombia, ⁸Takeda Thailand Ltd, Bangkok, Thailand

Background

- As oncology treatments advance, their holistic value becomes ever more important, particularly cost burden and health system constraints. First-line Hodgkin's Lymphoma (FLHL) regimens in adults per recently updated treatment guidelines (NCCN)¹ include treatment recommendations from trials that aimed to assess regimen adaptations that optimize efficacy while improving the safety profile of older regimens, lending to the importance of close management and safety considerations.
- The phase 3 HD21 study in patients aged <60 years with newly diagnosed advanced Hodgkin lymphoma compared treatment with interim PET-guided brentuximab vedotin, etoposide, cyclophosphamide, doxorubicin, dacarbazine, dexamethasone (iPET BrECADD) versus interim PETguided escalated bleomycin, etoposide, doxorubicin, cyclophosphamide, vincristine, procarbazine, prednisone (iPET eBEACOPP). iPET BrECADD was observed to provide a statistically significant improvement in treatment-related morbidity (TRMB) in addition to efficacy benefit.² In addition to TRMB benefit, the iPET BrECADD regimen also demonstrated lower rates of blood transfusions compared to iPET eBEACOPP (see Table 1 for rates in the safety population and transfusion sub-
- During the clinical decision-making stage, supportive therapy such as blood transfusions, are not always considered, which adds to patient/health system burdens due to accumulated costs and possibly the labile availability of blood products.^{4,5,6}

Objectives

 The objective of this analysis was to estimate the cost of RBC and PLT transfusions among countries in Africa, Asia (South & East Asia vs Western Asia/ Middle East), Oceania, and the Americas, and apply these estimates to the HD21 trial's transfusion rates for illustrative purposes.

Methods

Figure 1 to the right describes the methods and process followed to perform the transfusion cost collection and executing the trial example costing exercise.

Regional Scope and References

- This analysis' included countries across the following regions: North America (United States [US]), South America (Brazil [BR] Colombia [CO]), the Middle East (Israel [IL], Turkey [TK], Saudi Arabia [SA]), Asia (India [IN], Japan [JP], Singapore [SG], Malaysia [MY]), Oceania (Australia [AU]), and Africa (South Africa [ZA]) to contextualize transfusion costs based on publicly available costing references to support either diagnosis-related group (DRG) or via micro-costing approaches as reported in Figure 1
- The objective of this analysis was to estimate the cost of RBC and PLT transfusions among countries in Africa, Asia (South & East Asia vs Western Asia/ Middle East), Oceania, and the Americas, and apply these estimates to the HD21 trial's transfusion rates for illustrative purposes.

Cost Component Inclusion

• The components factored into per-transfusion cost estimates varied by country, influenced by local guidelines and available tariff systems. For instance, in the case of the United States, the estimates incorporated the unit cost (either 1x RBC, 2x RBC, or 1x RBC), procedural charges, associated testing, and freeze/thaw costs.

Red Blood Cell (RBC) Cost Estimation:

• Where pricing data existed for a single RBC unit (with base volumes ranging from 250–500 mL), those rates were recorded. Two-unit (2U) RBC transfusion costs were calculated to represent the average transfusion scenario within therapeutic contexts relevant to our trial exercise

Platelet (PLT) Cost Estimation

• For platelet transfusions, a similar methodology was applied. However, in countries using general categorical pricing for blood-product transfusions without specifying by subtype, the assumed cost including product and infusion support—was treated as equivalent to RBC transfusion. Unlike RBC transfusions, only single-unit platelet transfusion costs were estimated, reflecting variability in practice across regions with the exception of Japan which reported microunit pricing (instead the micro unit was multiplied 10x to find an equivalent volume in Japanese units as other country single-units).

Cost Adjustments

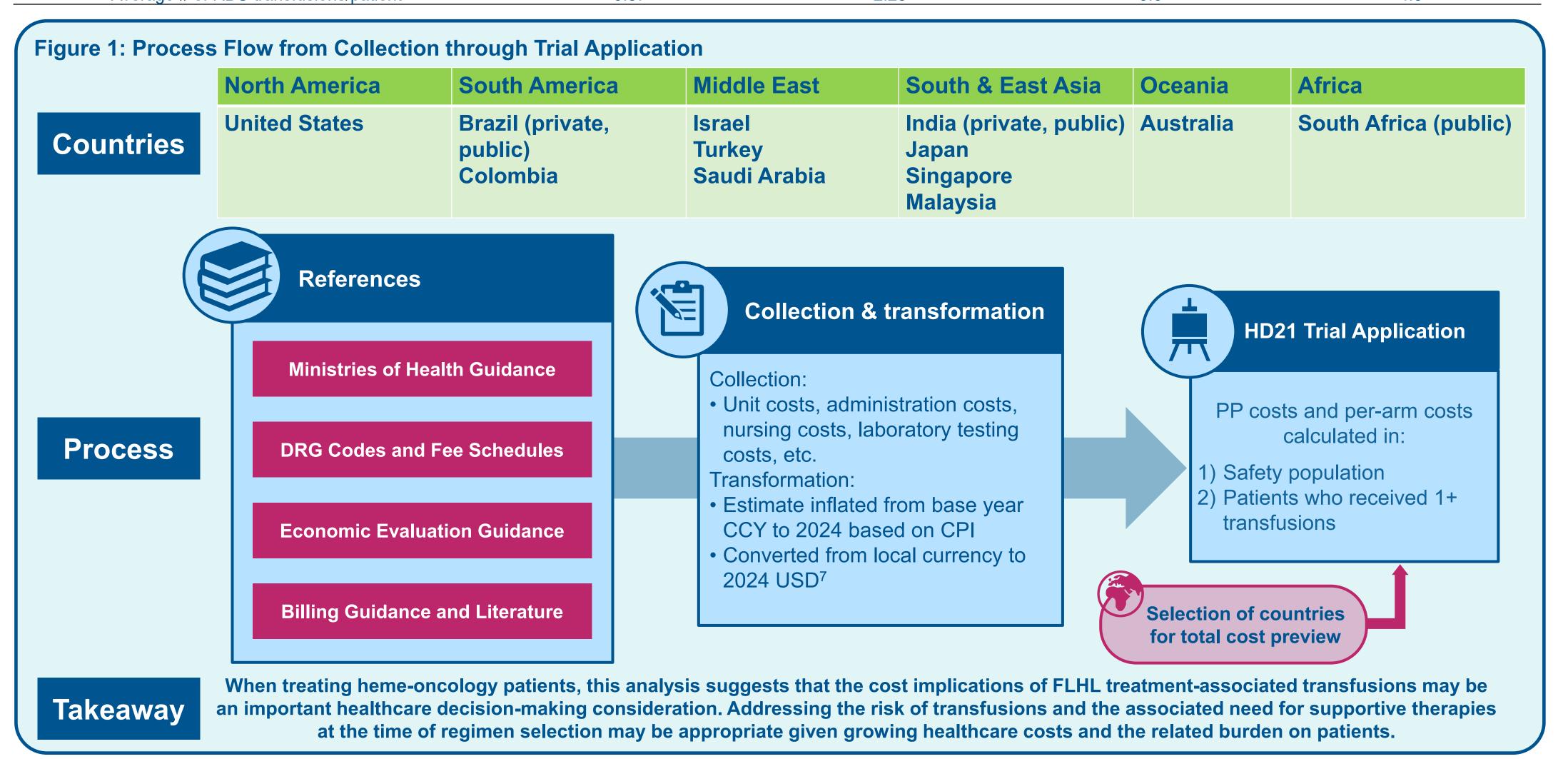
 All cost estimates were adjusted to their respective 2024 values based on each country's Consumer Price Index (CPI). Inflation adjustments were derived using data from statistical bureaus, national banks, or global online resources. Additionally, all inflated costs were converted into US dollars (USD) as the standard currency for index calculation8.

HD21 Trial Application Example

 The objective of this analysis was to estimate the cost of RBC and PLT transfusions among countries in Africa, Asia (South & East Asia vs Western Asia/ Middle East), Oceania, and the Americas, and apply these estimates to the HD21 trial's transfusion rates for illustrative purposes.

Table 1. Variables referenced from the HD21 trial organized by treatment arm and study population

	Safaty D	opulation	Transfusion Populations						
Variable of Interest	Salety P	opulation	(patients with 1≤ RBC, patients 1≤ PLT, respectively)						
	iPET BrECADD	iPET eBEACOPP	iPET BrECADD	iPET eBEACOPP					
RBC transfusions among safety population	647	1670	See safety est.	See safety est.					
PLT transfusions among safety population	277	637	See safety est.	See safety est.					
Patients with RBC transfusions, n (%)	179 (24)	387 (52.2)	179 (100%)	387 (100%)					
Patients with PLT transfusions, n (%)	125 (16.7)	249 (33.6)	125 (100%)	249 (100%)					
Max # of RBC transfusions in single patient	20	19	20	19					
Max # of PLT transfusions in single patient	11	15	11	15					
Average # of RBC transfusions/patient	0.87	2.25	3.6	4.3					



Results

- Transfusion-related costs varied widely across the included countries, reflecting differences in healthcare systems and perspectives, as well as differences in costing approaches. The estimates from each country's costing exercise can be found in the final two columns of **Table 2** for two-unit (2U) RBC transfusions and single unit (1U) platelet transfusions, rounded to the nearest whole dollar.
- Differences in drug unit costs between countries contributed to the majority of the difference in per RBC and per PLT transfusion costs. Average 1U RBC unit (note, 1U not 2U), 1U PLT unit, and administration/personnel costs were \$135, \$201, and \$343 with an IQR of \$104, \$426, and \$257, respectively. Drug cost contributed, on average, to 63% and 50% of overall RBC and PLT transfusion costs, respectively (SA estimate conservatively addressed only in admin/personal analysis, but not in the unit analysis).
- The median illustrative cost per RBC and PLT transfusion globally (per included countries in Table 2) were comparatively lower in the BrECADD arm (\$932/2U RBC and \$285/1U PLT) compared to the eBEACOPP arm (\$1,113/2U RBC and \$337/1U PLT) of the transfusion population (see Figures 2a and 2b). In the safety population, the median illustrative cost per RBC and PLT transfusion globally followed a similar trend in the BrECADD arm (\$205/2U RBC and \$48/1U PLT) arm vs the eBEACOPP arm (\$533/2U RBC and \$111/1U PLT), see Figures 3a and 3b for further context per country.

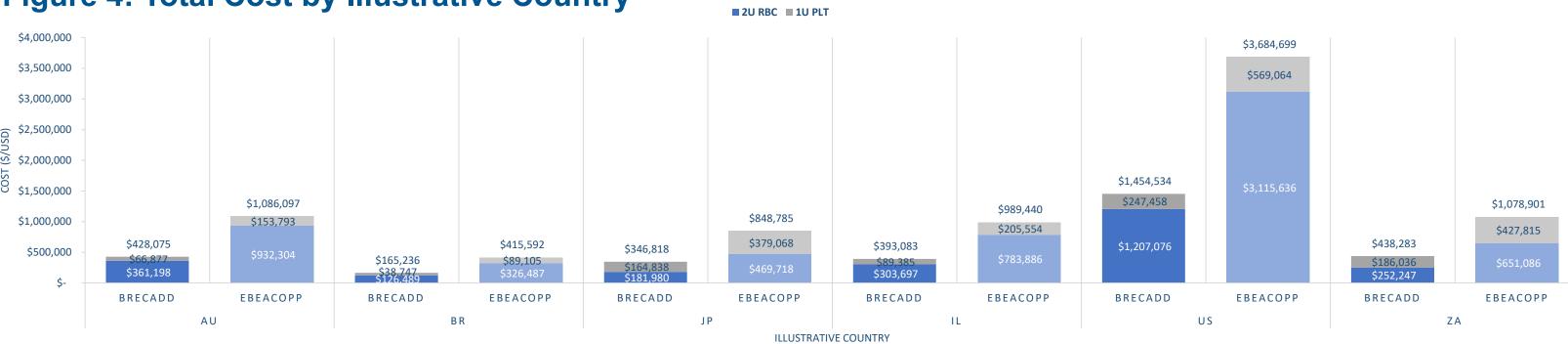
Table 2: Costing Method by Country Assessed with 2U RBC Estimates and 1U PLT Estimates

CTRY Source(s) for costs and curr		RBC costing method			PLT costing method			d	Orig. CCY	2U RBC	1U PLT	
	ce(s) for costs and currency conversions	Admin	Nursing	Testing	Unit	Admin	Nursing	Testing	Unit	CCY, Year	USD, 2024	USD, 2024
AU	AU Medicare Fees ⁹ National Blood Authority ¹⁰	Χ			2X	Х			X	AUD, 2024	\$558	\$241
BR (private)	Brazilian Medical Association (AMB), ¹¹ Central Bank of Brazil ¹²	X	X		2X	X	X		X	BRL, 2024	\$196	\$514
BR (public)	SIGTAP ¹³	X *	X		2X	X	X		X	BRL, 2024	\$99	\$92
CO	SOAT TARIFF MANUAL 2024,14 VS DECREE 2644 202215	X			2X	X			X	ARS Pesos, 2024	\$236	\$36
IN (public)	Ministry of Health and Family welfare, ¹⁶ Government of India's Ministry of Finance: Department of Expenditure Pay Research Unit, ¹⁷ Indian Red Cross ¹⁸ , Reserve Bank of India ¹⁹	X			2X	X			X	INR, 2024	\$119	\$119
IN (private)	Ministry of Health and Family welfare, ¹⁶ Government of India's Ministry of Finance: Department of Expenditure Pay Research Unit, ¹⁷ Indian Red Cross ¹⁸ , Reserve Bank of India ¹⁹				X				X	INR, 2024	\$26	\$4
IL	Ministry of Health Tariff 2024 ²⁰	X	X		2X	X			X	NIS,2024	\$469	\$323
JP	Japan Red Cross ²¹			X	2X			X	10X^	Yen, 2022	\$281	\$589
MY	Federal Government Gazette: Fees (Medical) (Cost of Services) Order 2014 ²²	X			2X	X			X	RM, 2014	\$77	\$44
SA	Saudi Council of Health Insurance (CCHI) ²³ , Literature citing microcosting per CCHI ²⁴	X			X	N/A	N/A	N/A	N/A	USD, 2023	\$2,488	N/A
SG	Ministry of Health ¹⁸ Agency for Care Effectiveness ¹⁸	X			2X	N/A	N/A	N/A	N/A	SGD, 2020	\$1,966	N/A
TK	Social Security Institution: Healthcare Implementation Communique Annex-3, ¹⁹ Turkish Statistical Institute (TURKSTAT) ^{20,26,27,28}	X	X		2X	X	X		X	TL, 2024	\$63	\$54
US	"2023 Final Payment rate" from HOPPS, ²¹ CPT & HCPCS codes per AABB billing guide 23/24, ²² and PFS rates ²³	2X	X	X	2X	X	X	X	X	USD, 2023	\$1,866	\$893
ZA (public)	South African Uniform Patient Fee Schedule 2024: Private ward in a Public Facility, ²⁴ SANBS ^{25,32,33}	X	X		2X	X	X		X	Rand, 2024	\$390	\$672

Figure 2b: Average 1U PLT Per-Patient Cost in Figure 2a: Average 2U RBC Per-Patient Cost in the Transfusion Population the Transfusion Population ■2U RBC: BrECADD ■2U RBC: eBEACOPP Figure 3b: Average 1U PLT Per-Patient Cost Figure 3a: Average 2U RBC Per-Patient Cost in the Safety Population in the Safety Population

• Figure 4 below presents the total cost for 2U RBC and 1U PLT transfusions by trial arm via the AU, BR (private), JP, IL, the US, and ZA costing approaches for illustration. These totals were calculated as the country estimates (\$558, \$196, \$281, \$469, \$1866, and \$390 respectively) applied to the number of RBC/PLT transfusion events accounted for by arm (see table 1 for respective rates). The illustrative "total" cost for each arm resulted in cost savings realized as \$658,022 by the AU costing perspective, \$250,355 by the private BR costing perspective, \$501,967 by the JP costing perspective, \$596,358 by the IL costing perspective, \$2,230,166 by the US costing perspective, and \$640,618 by the ZA costing perspective. A 61% savings was observed for RBC costs and 57% in PLT costs, illustrative of the proportional reduction in transfusion rates between iPET BrECADD and iPET eBEACOPP.

Figure 4: Total Cost by Illustrative Country



Limitations

- The scope of countries included was limited in terms of breadth from each region and trended towards countries that treat patients within hospital systems and refer to a DRG system. Costing methods varied based on data or cost guidance availability, introducing potential inconsistencies between countries. For example, South Korea was addressed in the exercise but not included in the final reporting due to disparities on cost and responsibility between the national payer and patients based on disease/condition (i.e. an estimated RBC transfusion cost of ~\$100 USD, absent of disclosed covered costs such as admin/unit costs as well as a varied. undisclosed coverage rate based on condition, providing additional uncertainty).^{29,30,31,34,35,36}
- Acquisition costs related to the blood units themselves varied greatly in cost, payment, and availability across countries and therefore was not included in these analyses. This limitation relates to global differences in blood product procurement and policy, especially given challenges experienced for reliable regional supply.
- This analysis looked to estimated costs per 2U RBC and 1U PLT transfusions; however, in many cases there is a need for additional blood units within a transfusion, multiple instances of transfusion, and management of transfusion-related adverse events which have not been captured in this analysis.
- Local clinical expert validation was not conducted and should inform future related word to ensure costing reflects real world clinical

Conclusions

 When treating heme-oncology patients, this analysis suggests that the cost implications of FLHL treatment-associated transfusions may be an important healthcare decision-making consideration. Addressing the risk of transfusions and the associated need for supportive therapies at the time of regimen selection may be appropriate given growing healthcare costs and the related burden on patients and health systems

Disclosures: All authors were employed by Takeda Pharmaceuticals and may hold stock in employing company at the time of research initiation.

Abbreviations (excluding country names and currencies):

1U, one unit; 2U, two unit; CCY, currency; CPI, consumer price index; DRG, diagnosis-related group; FLHL, First/front-line Hodgkins's lymphoma; iPET eBEACOPP, interim PET-guided escalated bleomycin, etoposide, doxorubicin, cyclophosphamide, vincristine, procarbazine, prednisone; iPET BrECADD, interim PET-guided brentuximab vedotin, etoposide, cyclophosphamide, doxorubicin, dacarbazine, dexamethasone; NCCN, National Comprehensive Care Network; PLT, platelet; PP, per-patient; pvt, private; pub, public; RBC, red blood cell

- 1. The Lancet. Blood transfusion: updates. The Lancet 2024; 402(13425): 1315-1321. [Accessed April 2025]. Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(24)01315-1/fulltext.
- 2. National Comprehensive Cancer Network. NCCN Guidelines: Hodgkin's Lymphoma. [Accessed April 2025]. Available from: https://www.nccn.org/professionals/physician_gls/pdf/hodgkins.pdf 3. Takeda Internal Data. TDN-000375353. [Accessed April 2025]. 4. World Health Organization. Blood safety and availability. [Accessed April 2025]. Available from: https://www.who.int/news-room/fact-sheets/detail/blood-safety-and-availability 5. Wiley Online Library. American Journal of Hematology 2024; 99(5): 652-665. [Accessed April 2025]. Available from: https://onlinelibrary.wiley.com/doi/full/10.1002/ajh.26940.
- PubMed. Blood safety and novel practices. [Accessed April 2025]. Available from: https://pubmed.ncbi.nlm.nih.gov/31631023 OANDA Corporation, Currency Converter, [Accessed April 2025], https://www.oanda.com/currency-converter/en/
- 8. Bureau of Labor Statistics. CPI Inflation Calculator. [Accessed April 2025]. https://www.bls.gov/data/inflation_calculator.htm?pubDate=20250409
- 10. National Blood Authority, Australia. National Product Pricing List. [Accessed April 2025]. Available from: https://blood.gov.au/national-product-price-list.
- 9. Australian Government, Department of Health and Aged Care. Medicare Benefits Schedule item 13706. [Accessed April 2025]. Available from: https://www9.health.gov.au/mbs/search.cfm?q=13706&sopt=S.
- 11. AMB Associação Médica Brasileira. Healthcare guidelines. [Accessed April 2025]. Available from: https://amb.org.br. 12. Central Bank of Brazil. Cotacoes e boletins. [Accessed April 2025]. Available from: https://www.bcb.gov.br/estabilidadefinanceira/historicocotacc 13. SIGTAP Database. Brazilian Healthcare Procedures. [Accessed April 2025]. Available from: http://sigtap.datasus.gov.br.

- 14. Consultorsalud. Manual Tarifario SOAT 2024 version. [Accessed April 2025]. Available from: https://consultorsalud.com/manual-tarifario-soat-2024-version-pdf/
- 15. Colombian Government. Decreto 2644 de 2022 Nivel Nacional. [Accessed April 2025]. Available from: https://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?dt=S&i=140183. 16. Ministry of Health and Family Welfare, Government of India. [Accessed April 2025]. Available from: https://mohfw.gov.in/ 17. Department of Expenditure, Government of India. Annual Report on Pay and Allowances. [Accessed April 2025]. Available from: https://doe.gov.in/annual-report-pay-and-allowances
- 18. Indian Red Cross Society. Blood unit rates analysis. [Accessed April 2025]. Available from: https://indianredcross.org/ircs/bloodunitrates 19. Reserve Bank of India. Financial stability indicators. [Accessed April 2025]. Available from: https://website.rbi.org.in/web/rbi.
- 21. Japanese Red Cross Society. Transfusion medicine fee structures. [Accessed April 2025]. Available from: https://www.jrc.or.jp/mr/transfusion/mfee/. 22. Ministry of Health, Malaysia. Health database and pricing systems. [Accessed April 2025]. Available from: https://www.moh.gov.my/index.php/database_stores/attach_download/387/257 23. Council of Health Insurance. Insurance data insights. [Accessed April 2025]. Available from: https://www.chi.gov.sa/en/pages/default.aspx.
- https://www.thefreelibrary.com/The+Direct+Medical+Costs+of+Sickle+Cell+Disease+in+Saudi+Arabia%3a...-a0829977562. Published [. Accessed April 28, 202 25. Ministry of Health, Singapore. [Accessed April 2025]. https://www.moh.gov.sg/ 26. Agency for Care Effectiveness. [Accessed April 2025] https://www.ace-hta.gov.sg/.

^The estimate for platelet transfusion in Japan was multiplied to reflect a volume more comparable to those delivered

27. Health Services Pricing Commission, Turkey. Healthcare overview. Published Online. [Accessed April 2025]. Available from: https://www.mondaq.com/turkey/healthcare/1494832/health-services-pricing-commission-decision-published.

- 32. National Department of Health, South Africa. Uniform Patient Fee Schedule. [Accessed April 2025]. Available from: https://www.health.gov.za/uniform-patient-fee-schedule/. 33. South African National Blood Service (SANBS), Blood transfusion rates, [Accessed April 2025], Available from: https://sanbs.org.za/. 20. Ministry of Health, Israel. Health policies and budgeting. [Accessed April 2025]. Available from: https://www.gov.il/en/departments/ministry of health/govil-landing-page 34. Park M, Kim SK, Han KS. Current state of blood management services in Korea. Ann Lab Med. 2022;42(3):306-310. doi:10.3343/alm.2022.42.3.306. [Accessed from: https://www.annlabmed.org/journal/view.html?doi=10.3343/alm.2022.42.3.306]
- 24. Al-Nounou A, Al-Momen A. The Direct Medical Costs of Sickle Cell Disease in Saudi Arabia: Insights from a Single Center Study. Free Online Library.
 - 35. Jang S. Park J. Lee M. A decline in overutilization of transfusion after total knee arthroplasty using pharmacological agents for patient blood management in South Korea: an analysis based on the Korean National Health Insurance

28. Central Bank of Turkey. Consumer Price Inflation Data. [Accessed April 2025]. Available from: https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Statistics/Inflation+Data/Consumer+Prices. 29. Centers for Medicare & Medicaid Services. Hospital Outpatient PPS overview. [Accessed 24 Oct 2024]. Available from: https://www.cms.gov/medicare/payment/prospective-payment-systems/hospital-outpatien

31. Centers for Medicare & Medicaid Services. PFS Look-up Tool Overview. [Accessed 24 Oct 2024]. Available from: https://www.cms.gov/medicare/physician-fee-schedule/search/overview.

30. Association for the Advancement of Blood & Biotherapies. Coverage and reimbursement insights. [Accessed 24 Oct 2024]. Available from: https://www.aabb.org/regulatory-and-advocacy/advocacy/coverage-reimburse

Poster presentation at International Society for Health Economics and Outcomes Research (ISPOR), May 13–16, 2025, Montreal, Canada. For questions or comments, please contact Alexa Molinari: alexa.molinari@takeda.com.

source/default-document-library/positions/cms-opps-cy2024-final-rule-summary-and-payment-rates