Perspectives
World Reports

# The Transformative Potential of Artificial Intelligence in Latin American Research

Ricardo Becker, MD, PhD, and Michelle Ghert, MD, FRCSC

*Investigation performed at the Hospital de Clínicas de Porto Alegre, Porto Alegre, Rio Grande do Sul, Brazil*




- Substantial disparities exist between Latin America and high-income countries in research capacity, and artificial intelligence (AI) has emerged as a powerful tool to accelerate scientific development and reduce this gap.
- Orthopaedic research in Latin America faces persistent barriers, including limited funding, lack of trained investigators, and insufficient data infrastructure, that restrict innovation and international collaboration.
- By automating complex and time-consuming tasks, AI can lower research costs, improve efficiency, and enhance project quality across all stages, from data analysis to manuscript preparation.
- The growing adoption of AI in the region is already strengthening academic productivity, fostering collaboration, and supporting Latin America's transition to a more equitable and innovative research environment.


All forms of artificial intelligence (AI) (Table 1) embrace the capability of machines to learn, identify patterns, and execute complex tasks using vast amounts of data. In orthopaedics, AI has revolutionized diagnostic, predictive, and research processes worldwide. In Latin America, historical and structural challenges have hindered scientific progress and technological adoption. The region grapples with low public and private research investment, lack of qualified personnel in scientific methodology, and inadequate infrastructure for clinical data collection and integration[1,2]. These issues have led to fragmented scientific output with limited impact compared with that of high-income countries. Nonetheless, AI presents an unprecedented opportunity to address some of these disparities[3].

## Research Challenges in Latin America

The research investment gap between Latin America and developed nations is striking. In 2022, the United States devoted approximately U.S. $892 billion (3.6% of gross domestic product [GDP]) to research and development, whereas Brazil, the regional leader, allocated only approximately 1.16% of its GDP in 2023: approximately U.S. $25 billion[4,5]. Such constrained budgets hinder the ability to sustain qualified multidisciplinary teams and provide equitable compensation for professionals, such as research coordinators, biostatisticians, laboratory scientists, and site investigators, thereby deterring new researchers from entering the field. In countries such as Brazil and Mexico, most orthopaedic surgeons prioritize clinical practice, which offers immediate financial returns, over scientific efforts. Furthermore, inadequate investment restricts access to technologies such as data management platforms, custom-made implants, navigation systems, and advanced imaging, thereby impeding innovation and the generation of high-quality local evidence[6].

In addition to financial constraints, Latin America's limited scientific output stems from structural and human resource deficiencies. The shortage of professionals trained in research methodology, randomized controlled trials, data governance, and regulatory processes remains a critical bottleneck. Even in institutions with adequate infrastructure and financial support, recruiting experienced researchers is difficult[7,8]. This gap reflects the limited incorporation of research education in postgraduate orthopaedic and surgical training programs, which remain largely focused on clinical practice rather than scientific investigation[9].

Finally, a lack of adequate research infrastructure remains one of the main barriers to scientific progress in Latin America. Institutions often lack standardized data collection systems, interoperable databases, and secure digital platforms, which limits both the generation of local evidence and participation in international research networks[10]. A notable example is the International Orthopaedic Multicenter Study in Fracture Care (INORMUS), which, despite enrolling >14,000 patients across 14 low-income and middle-income countries,

**Disclosure:** The Disclosure of Potential Conflicts of Interest forms are provided with the online version of the article (http://links.lww.com/JBJS/J63).

**J Bone Joint Surg Am.** 2026 Jan 5 • 0(0): 1-4 • http://dx.doi.org/10.2106/JBJS.25.01431

including several in Latin America, faced challenges in data quality and recruitment due to the absence of hospital digital infrastructure and trained clinical research personnel[11].

## The Transformative Potential of AI in Latin American Research

AI is a powerful tool with great potential to mitigate the structural barriers that limit scientific productivity in Latin America. By automating complex and time-consuming tasks, AI can substantially reduce operational costs, for example, by up to 80% of personnel expenses[12,13]. In recent years, scientific publications using AI as a research tool have grown substantially across the region, reflecting the progress of digitalization and the increasing interest in data-driven solutions[7]. A recent systematic review evaluating the use of AI tools in different areas of health care in Brazil exemplifies this trend, including 25 articles on screening and diagnostic methods authored by Brazilian researchers, with 44% of studies employing machine learning (ML) to predict clinical outcomes and most focusing on ophthalmologic and infectious diseases[14].

> ***AI is a powerful tool with great potential to mitigate the structural barriers that limit scientific productivity in Latin America.***

In orthopaedics, a current Colombian study demonstrated how AI can enhance research assistance and education. The authors highlighted that tools such as ChatGPT (OpenAI) and SciSpace (PubGenius) can automate literature searches, data analysis, manuscript drafting, and statistical interpretation, enabling residents to conduct research with greater independence and efficiency despite limited institutional resources. They also emphasized the need to integrate AI literacy into residency programs, noting that training young physicians in these technologies can improve research quality, ensure ethical data use, and strengthen global collaboration[15].

**Table 1. Glossary of Key AI Terms in the Article**

| Term | Definition* |
|---|---|
| Artificial intelligence (AI) | Ability of machines to perform tasks that require human intelligence, such as learning and decision-making |
| Machine learning (ML) | AI approach that learns patterns from data to make predictions or classifications |
| Deep learning (DL) | Advanced ML using multilayered neural networks to process complex data, especially images |
| Computer vision | AI method that interprets and analyzes images or videos to detect patterns or structures |
| Algorithm | A step-by-step mathematical procedure that guides how AI systems process data |
| Data governance | Rules and standards that ensure responsible, secure, and ethical management of data |

*Definitions were adapted from recent reviews on AI in health care and orthopaedics[12,18,27].

Another example of AI application in Latin America comes from a study on osteoporosis screening, which illustrates how AI can expand diagnostic access in resource-limited settings[16]. Conducted by a Brazilian research team, this study validated a predictive ML algorithm allowing for the early detection of bone density changes based on established osteoporosis predictors and measurements from Osseus, a portable, noninvasive, and low-cost device that uses electromagnetic waves and ML algorithms to estimate bone mineral density. Osseus was developed by LAIS/UFRN (Laboratório de Inovação Tecnológica em Saúde/Universidade Federal do Rio Grande do Norte) in partnership with IFRN/NAVI (Instituto Federal do Rio Grande do Norte/Núcleo Avançado de Inovação Tecnológica). Evaluating 505 patients, the model reduced the need for costly dual x-ray absorptiometry (DXA) examinations and identified at-risk patients earlier. This innovation demonstrates the interplay of big data and ML, which can enable early screening and efficient use of clinical data and resources.

Barriers such as limited infrastructure and high implementation costs for pathology technology remain another major challenge. Many Latin American laboratories lack scanners, adequate data storage, and interoperable information systems, which are essential prerequisites for any AI-driven solution. Because ML and deep learning (DL) algorithms depend on large volumes of high-quality, structured, and well-annotated data, the absence of standardized digital workflows directly limits the feasibility and scalability of these technologies. The region also faces a notable shortage of professionals, with only 17 pathologists per 1 million inhabitants, compared with >50 in North America, which further constrains the capacity to generate, curate, and validate the data sets required for AI model development and safe clinical use.

In response to these constraints, a recent study proposed the use of DL algorithms capable of analyzing histologic images to infer genetic mutations, offering a potentially cost-effective strategy to strengthen diagnostic capacity. However, even such innovative approaches reinforce the central message that AI alone cannot overcome structural deficiencies: investment in digital infrastructure, data standardization, and workforce development remains indispensable for ensuring that AI systems can be trained, implemented, and monitored effectively[17].

Advances in radiology and AI have been particularly prominent in Brazil and Chile, driving the modernization of medical practice across the region. In Brazil, the Sociedade Paulista de Radiologia (SPR) has led educational and scientific initiatives, including the first Latin American Meeting on AI in Health and dedicated AI tracks at the Jornada Paulista de Radiologia, featuring hands-on courses in DL, ethics, and regulation. The country also maintains permanent study groups in imaging informatics and quantitative imaging, focused on biomarker standardization and clinical algorithm validation. In Chile, the National Artificial Intelligence Policy has stimulated the creation of graduate programs, research groups, and the Digital Hospital project, which implemented the nation's first AI-based diabetic retinopathy screening system using computer vision. Together, these initiatives reflect a joint effort to expand digital infrastructure, strengthen professional training, and integrate AI into clinical radiology[18].

The Latin American AI Index report (ILIA 2024), which assesses the maturity, governance, and ethical development of AI across 19 countries in the region, has recently identified health care as one of the most dynamic and rapidly evolving sectors[19]. AI applications in diagnostics, outcome prediction, and clinical decision support are proliferating across the continent, indicating increased institutional engagement and investment. Notably, medical and clinical sciences now account for 11.5% of all AI-related publications in Latin America, surpassing traditional disciplines such as physics and engineering. This trend suggests a regional shift toward health-centered innovation and applications with a direct societal impact.

As this expansion unfolds, Latin American countries are simultaneously strengthening ethical and governance frameworks to ensure the responsible integration of AI in health care, emphasizing equity, transparency, and data protection. Regional guidance, such as the Pan American Health Organization's Ethical Guidelines for AI in Health (2021)[20], lays down foundational principles of fairness, accountability, explainability, and the reduction of algorithmic bias. National strategies, including Brazil's Estratégia Brasileira de Inteligência Artificial (EBIA)[21] and Mexico's National AI Agenda[22], further support socially inclusive innovation and robust data governance. Experts in digital pathology and oncology highlight the importance of locally generated data sets that reflect regional populations and disease patterns, which help to prevent the importation of biases from high-income settings and aid in developing transparent, auditable, and community-sensitive models.

In summary, multiple examples demonstrate how AI is creating momentum for long-needed modernization in Latin American health care, offering cost-effective technological solutions that can expand diagnostic capacity and optimize clinical workflows. At the research level, AI is enabling the development of more standardized and interoperable data sets, thus strengthening multicenter collaboration and improving the quality and scalability of data analysis. Collectively, these advances position AI as a transformative driver of sustainable medical innovation and research equity across the region.

## Authors' Insight

Over the past few years, researchers across Latin America have clearly experienced how AI tools enhance project design, data management, manuscript writing, and international collaboration. As orthopaedic surgeons and investigators, we have personally observed a substantial improvement in the efficiency and quality of multicenter orthopaedic research, both within and beyond Brazil. A practical example is the difference in regulatory processes between 2 large international trials (coordinated by M.G. and colleagues). The Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) trial[23], published in *JAMA Oncology* in 2022, required nearly 3 times longer for local ethical approval at our institution in 2016 compared with the ongoing Proximal Femur Reconstruction or Internal Fixation for Metastases (PERFORM) trial (https://performtrial.com). The implementation of AI-assisted platforms has markedly facilitated the PERFORM approval process in our institution by streamlining regulatory documentation, automating contract workflows, and expediting communication between investigators and administrative offices.

This institutional experience has been consistent across other multicenter collaborations in which our group participates. The use of AI-assisted systems has substantially accelerated internal approvals, data identification, and database cleaning for several data-sharing projects, including the International Cohort of Appendicular Tumor Surgery (iCATS)[24], the International Data Integration Collaboration for Ewing Sarcoma (INDICATES)[25], and the Brazilian multicenter epidemiological study on the giant cell tumor of bone[26]. In practical terms, these tools automate tasks that traditionally required extensive manual effort, for example, screening electronic health records to identify eligible cases, flagging missing or inconsistent variables, harmonizing terminology across sites, and generating standardized reports for regulatory review. Communication between centers has also been streamlined through automated alerts, real-time dashboards, and AI-supported document routing systems that notify investigators when protocol amendments, data queries, or ethics-board requirements are ready for review. Integrating AI into our institutional workflow has reduced administrative delays, minimized personnel demands, and, importantly, shortened the overall research cycle, from protocol submission and regulatory approval to data analysis and manuscript preparation[26]. ■

Ricardo Becker, MD, PhD[1,2]
Michelle Ghert, MD, FRCSC[3,4]

[1]Hospital de Clínicas de Porto Alegre, Porto Alegre, Rio Grande do Sul, Brazil

[2]Universidade Federal do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil

[3]Department of Orthopaedics, University of Maryland School of Medicine, Baltimore, Maryland

[4]Department of Surgery, McMaster University, Hamilton, Ontario, Canada

Email for corresponding author: rbecker@hcpa.edu.br

## References


1. Pirsch S, Sabán M, Lede D, Cintia C. Challenges and Recommendations in Data Governance for the Development of Artificial Intelligence in Health in Latin American and the Caribbean. Accessed 2025 Oct 25. https://transformhealthcoalition.org/wp-content/uploads/2024/04/Policy-Document-ENG.pdf?utm_source=chatgpt.com
2. Hartinger SM, Palmeiro-Silva YK, Llerena-Cayo C, Blanco-Villafuerte L, Escobar LE, Diaz A, Sarmiento JH, Lescano AG, Melo O, Rojas-Rueda D, Takahashi B, Callaghan M, Chesini F, Dasgupta S, Posse CG, Gouveia N, Martins de Carvalho A, Miranda-Chacón Z, Mohajeri N, Pantoja C, Robinson EJZ, Salas MF, Santiago R, Sauma E, Santos-Vega M, Scamman D, Sergeeva M, Souza de Camargo T, Sorensen C, Umaña JD, Yglesias-González M, Walawender M, Buss D, Romanello M. The 2023 Latin America report of the *Lancet* countdown on health and climate change: the imperative for health-centred climate-resilient development. Lancet Reg Health Am. 2024 Apr 23;33:100746.
3. Vaishya R, Vaish A. Resultados de la investigación en ortopedia y medicina del deporte en América Latina [Research output in orthopedics and sports medicine from Latin America]. Acta Ortop Mex. 2024 Nov-Dec;38(6):419-20.
4. World Bank Group. Research and development expenditure (% of GDP). 2024. Accessed 2025 Oct 17. https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS
5. Organisation for Economic Co-operation and Development. Health at a Glance 2023. Accessed 2025 Dec 9. https://www.oecd.org/en/publications/2023/11/health-at-a-glance-2023_e04f8239.html
6. Organisation for Economic Co-operation and Development. Main Science and Technology Indicators (MSTI). Accessed 2025 Oct 17. https://www.oecd.org/en/data/datasets/main-science-and-technology-indicators.html
7. Restrepo D, Quion J, Vásquez-Venegas C, Villanueva C, Anthony Celi L, Nakayama LF. A scoping review of the landscape of health-related open datasets in Latin America. PLOS Digit Health. 2023 Oct 25;2(10):e0000368.
8. Frech S, Muha CA, Stevens LM, Trimble EL, Brew R, Perin DP, Luciani S, Mohar A, Piñeros M, Vidaurre T, Morgan DR, Hawk ET, Schmeler KM, Foxhall LE, Rabadan-Diehl C, Duran D, Rendler-Garcia M, Cazap EL, Santini L, Zoss W, Delgado LB, Pearlman PC, Given L, Hohman K, Lopez MS, Kostelecky B. Perspectives on strengthening cancer research and control in Latin America through partnerships and diplomacy: experience of the National Cancer Institute's Center for Global Health. J Glob Oncol. 2018 Sep;4:1-11.
9. Lewandrowski KU, Elfar JC, Li ZM, Burkhardt BW, Lorio MP, Winkler PA, Oertel JM, Telfeian AE, Dowling Á, Vargas RAA, Ramina R, Abraham I, Assefi M, Yang H, Zhang X, Ramírez León JF, Fiorelli RKA, Pereira MG, de Carvalho PST, Defino H, Moyano J, Lim KT, Kim HS, Montemurro N, Yeung A, Novellino P. The changing environment in postgraduate education in orthopedic surgery and neurosurgery and its impact on technology-driven targeted interventional and surgical pain management: perspectives from Europe, Latin America, Asia, and the United States. J Pers Med. 2023 May 18;13(5):852.
10. Chomsky-Higgins K, Miclau TA, Mackechnie MC, Aguilar D, Avila JR, Dos Reis FB, Balmaseda R, Barquet A, Ceballos A, Contreras F, Escalante I, Elias N, Vincenti SI, Lozano C, Medina F, Merchan G, Segovia J, Guerado E, Quintero JE, Morshed S, Bhandari M, Miclau T 3rd. Barriers to clinical research in Latin America. Front Public Health. 2017 Apr 18;5(APR):57.
11. Pouramin P, Li CS, Sprague S, Busse JW, Bhandari M. A multicenter observational study on the distribution of orthopaedic fracture types across 17 low- and middle-income countries. OTA Int. 2019 Apr 9;2(3):e026.
12. Chatterjee S, Bhattacharya M, Pal S, Lee SS, Chakraborty C. ChatGPT and large language models in orthopedics: from education and surgery to research. J Exp Orthop. 2023;10(1):128.
13. Shool S, Adimi S, Saboori Amleshi R, Bitaraf E, Golpira R, Tara M. A systematic review of large language model (LLM) evaluations in clinical medicine. BMC Med Inform Decis Mak. 2025 Mar 7;25(1):117.
14. Mancini LM, Torres LEV, Coelho JAPM, da Fonseca NB, Cordeiro PFD, Cavalcante SSN, Dermeval D. Diagnostic and screening AI tools in Brazil's resource-limited settings: systematic review. JMIR AI. 2025 Sep 10;4:e69547.
15. Perez RDA, Garcia RL. Artificial intelligence in orthopedic research assistance: a resident's perspective. Musculoskelet Surg. 2025 Dec;109(4):381-8.
16. Albuquerque GA, Carvalho DDA, Cruz AS, Santos JPQ, Machado GM, Gendriz IS, Fernandes FRS, Barbalho IMP, Santos MM, Teixeira CAD, Henriques JMO, Gil P, Neto ADD, Campos ALPS, Lima JG, Paiva JC, Morais AHF, Lima TS, Valentim RAM. Osteoporosis screening using machine learning and electromagnetic waves. Sci Rep. 2023 Aug 8;13(1):12865.
17. Coudry RA, Assis EACP, Frassetto FP, Jansen AM, da Silva LM, Parra-Medina R, Saieg M. Crossing the Andes: challenges and opportunities for digital pathology in Latin America. J Pathol Inform. 2024 Feb 27;15:100369.
18. Kitamura FC, do Nascimento FBP, Elizondo-Riojas G, Chaves H, Henríquez Leighton H, Salinas-Miranda E, Júlio T, da Rocha AJ, Nomura CH. Forging connections in Latin America to advance AI in radiology. Radiol Artif Intell. 2022 Aug 31;4(5):e220125.
19. Cepal. ILIA_2024 2 3 CONTENIDO. Latin American Artificial Intelligence Index (ILIA 2024). Accessed 2025 Oct 30. https://www.cepal.org/pt-br/comunicados/o-indice-latino-americano-inteligencia-artificial-ilia-mantem-chile-brasil-uruguai-como
20. Pan American Health Organization (PAHO). Ethics and governance of artificial intelligence for health: guidance on the ethical use of AI in health. 2021. Accessed 2025 Dec 15. https://iris.paho.org/handle/10665.2/54692
21. Ministério da Ciência, Tecnologia e Inovação. Estratégia Brasileira de Inteligência Artificial (EBIA). Brasilia: MCTI; 2021. Accessed 2025 Dec 15. https://www.gov.br/mcti/pt-br/acompanhe-o-mcti/transformacaodigital/estrategia-brasileira-de-inteligencia-artificial
22. OECD. OECD Digital Government Studies. Digital Government in Mexico: Sustainable and Inclusive Transformation. 2020. Accessed 2025 Dec 15. https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/01/digital-government-in-mexico_61e168b9/6db24495-en.pdf
23. Ghert M, Schneider P, Guyatt G, Thabane L, Vélez R, O'Shea T, Randall RL, Turcotte R, Wilson D, Wunder JS, Baptista AM, Cheng EY, Doung YC, Ferguson PC, Giglio V, Hayden J, Heels-Ansdell D, Khan SA, Sampath Kumar V, McKay P, Miller B, van de Sande M, Zumárraga JP, Bhandari M; Prophylactic Antibiotic Regimens in Tumor Surgery (PARITY) Investigators. Comparison of prophylactic intravenous antibiotic regimens after endoprosthetic reconstruction for lower extremity bone tumors: a randomized clinical trial. JAMA Oncol. 2022 Mar 1;8(3):345-53.
24. van de Sande MAJ, Bus MP, Coindre JM. International Cohort of Appendicular Tumor Surgery (iCATS): A Collaborative Registry for Outcomes in Limb Salvage Surgery. 2023. Accessed 2025 Nov 1. https://boomconsensus.org/boom-consensus-scientific-content-lt
25. van de Sande MAJ. International Data Integration Collaboration for Ewing Sarcoma (INDICATES): Global Initiative for Harmonized Data Integration and AI-Based Predictive Modeling. 2024. Accessed 2025 Dec 11. https://sites.google.com/view/daspo/home
26. Becker RG, Galia CR, Pestilho JFCS, Antunes BP, Baptista AM, Guedes A. Giant cell tumor of bone: a multicenter epidemiological study in Brazil. Acta Ortop Bras. 2024 Mar 22;32(1):e273066.
27. Sussman L, Garcia-Robledo JE, Ordóñez-Reyes C, Forero Y, Mosquera AF, Ruíz-Patiño A, Chamorro DF, Cardona AF. Integration of artificial intelligence and precision oncology in Latin America. Front Med Technol. 2022 Oct 13;4:1007822.