

Artificial intelligence in the diagnosis of hematologic diseases

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Leukemia diagnostics are complex and, according to the current guidelines for diagnosis and classification, require the integration of multiple modalities: cytomorphology, immunophenotyping, conventional karyotyping, fluorescence *in situ* hybridization, and a broad range of molecular methods. Together, these techniques define the precise nature of the disease and increasingly carry significant prognostic – and especially therapeutic – implications, enabling personalized treatment strategies.

At the same time, many of these diagnostic methods are phenotype-based and heavily reliant on expert interpretation, leading to variability in reproducibility across laboratories and investigators. This is precisely where artificial intelligence (AI) can make a substantial impact. The algorithms developed for AI-assisted diagnostics not only accelerate turnaround times but also

significantly enhance reproducibility, making diagnostic results less dependent on individual examiners. This results in faster, more accurate, and clinically meaningful findings that can be directly translated into targeted therapy for patients.

In the coming years, AI, including large language models used for diagnostic reporting, will elevate the entire diagnostic process to a new level. This will provide a stronger foundation for the use of increasingly effective and targeted therapeutic agents. Close collaboration between hematologists, diagnostic laboratories, and therapeutic teams is of great value to patients and should be implemented swiftly. Only through such integrated efforts can we use resources effectively, in the best interest of each individual patient and the health-care system as a whole.

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Date of reception: 06-07-2025

Date of acceptance: 06-08-2025

DOI: 10.24875/SANGREE.M25000034

Available online: 02-10-2025

Sangre. 2025;44(Supl 2):47

www.revistasangre.com

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