

Editorial letter

CLAIR 2025: Artificial Intelligence as a Catalyst for the Future of Laboratory Medicine

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The Clinical Laboratories Artificial Intelligence Revolution (CLAIR) 2025 symposium, held in Belgrade on March 28, 2025, marked an important milestone in shaping the global dialogue around artificial intelligence (AI) in laboratory medicine. Initiated by the IFCC Division of Emerging Technologies, in collaboration with the Serbian Society for Clinical Laboratory Medicine and Science (SCLM) and the University Clinical Center of Serbia/Center for Medical Biochemistry, the symposium was designed not only as a scientific gathering but also as a forward-looking forum to envision how AI will transform diagnostics, patient care, and healthcare systems in the years to come.

At the heart of CLAIR 2025 was a clear call for innovation with future oriented vision. The opening keynote by Damien Gruson emphasized that AI has already moved beyond pilot projects and experimental phases to become a genuine driver of transformation. No longer a distant possibility, AI now requires strategic integration into laboratory workflows and healthcare systems.

The program was structured around three forward-looking axes:

1. Data as the foundation of AI: Speakers highlighted that high-quality, standardized, and interoperable datasets are indispensable for reliable AI solutions. Presentations by Sanja Stankovic, and Anna Carobene underscored the critical role of data governance, normalization, and quality assurance.
2. AI in clinical decision support: Case studies in endocrinology, cardiology, and oncology, together with contributions from Sarina Yang and colleagues, illustrated how AI tools can integrate laboratory and imaging data to support diagnosis, personalize treatments, and improve clinical workflows.
3. Future perspectives: Forward-looking talks addressed exposomics, generative AI, and the profound challenges of cybersecurity and privacy. These discussions confirmed that the scope of AI extends far beyond technical processes, encompassing the broader health ecosystem.

While technological innovation dominated the program, equity, ethical and governance issues were never far

from the debate. Anna Carobene eloquently reminded the audience that algorithmic bias, inequitable access, and lack of transparency risk undermining the promise of AI if not addressed. Echoing these concerns, Alexander Haliassos and colleagues warned that cybersecurity threats and data privacy breaches represent existential challenges for laboratories adopting cloud-based AI platforms. A recurrent message was that AI must be guided by principles of fairness, accountability, and transparency. This requires international collaboration and harmonization of standards, ensuring that AI tools not only improve efficiency but also protect patient dignity and equity.

The CLAIR initiative highlights the leadership role of the IFCC Emerging Technologies Division. By launching this symposium, the Division reaffirmed its mission to anticipate technological disruptions and to equip laboratories with the knowledge, infrastructure, and governance models needed for responsible adoption. The Division's proactive vision goes beyond assessing tools; it encompasses fostering multidisciplinary collaboration, promoting digital literacy among laboratory professionals, and building bridges between technology developers, clinicians, regulators, and patients.

By positioning CLAIR as a global platform, the Division aims to ensure that AI is not just implemented but implemented responsibly and inclusively.

The vision that emerged from CLAIR 2025 is unambiguous: AI will become an indispensable partner in laboratory medicine. Its transformative potential spans early error detection, predictive diagnostics, real-time decision support, and more sustainable resource management. Yet, harnessing this potential requires collective effort. Looking ahead, laboratories and scientific societies must take the lead in shaping AI for meaningful, human-centered healthcare. This means aligning innovation with ethical responsibility, ensuring equitable access to technology, and maintaining strong human oversight in all clinical applications. CLAIR 2025 was not a conclusion but a beginning, a foundation on which to build a global, collaborative effort to shape the role of AI in laboratory medicine. The IFCC Emerging Technologies Division invites the international community to join in this endeavor, ensuring that AI serves not only science and medicine but also society at large.