

IFCC SYMPOSIUM 5 - What 21st century IFCC leadership should be: history, vision, implementation, and opportunities?

PIONEERING DISRUPTIVE INNOVATION IN LABORATORY MEDICINE

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Laboratory medicine is undergoing a paradigm shift, driven by disruptive innovations that redefine diagnostics, disease prevention, and patient management. Emerging technologies, including artificial intelligence (AI), hyperautomation, exposome analytics, and point-of-care testing (POCT), are transforming laboratory workflows, increasing accessibility, and optimizing precision medicine. These innovations enhance disease prediction and risk stratification, particularly in non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, and cancer.

Exposome-based diagnostics are revolutionizing personalized healthcare by integrating genetic, metabolic, and environmental data to provide a holistic view of disease progression. AI-powered analytics further augment laboratory medicine by refining diagnostic accuracy, automating workflows, and enhancing decision-making in real-time. In cardiovascular medicine, for example, integrating AI-driven biomarkers with exposome data allows for earlier detection and targeted interventions, reducing healthcare burdens. Meanwhile, POCT and mobile health (m-Health) technologies are decentralizing diagnostics, providing rapid, on-site testing in primary care, pharmacies, and home settings. Wearable biosensors and digital monitoring tools enable continuous disease surveillance and early intervention, bridging the gap between laboratory medicine and personalized care. Despite these advancements, challenges remain in ensuring regulatory compliance, standardizing quality control measures, and integrating new technologies into routine clinical practice. Addressing these issues requires interdisciplinary collaboration, policy-driven initiatives, and a commitment to innovation. By embracing disruption and fostering sustainable implementation, laboratory medicine will continue to lead the next wave of healthcare transformation, optimizing patient outcomes and redefining the future of diagnostics.

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TRANSFORMING SCIENTIFIC COMMUNICATION FOR THE 21ST CENTURY

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Scientific communication is at a pivotal crossroads in the 21st century, shaped by the rapid evolution of digital technology, open-access initiatives, and interdisciplinary collaboration. Traditional models of disseminating scientific knowledge, such as peer-reviewed journals and academic conferences, are no longer sufficient to meet the growing demands for accessibility, inclusivity, and real-time engagement. This transformation is driven by the need for efficient, transparent, and equitable communication channels that serve diverse global audiences, including scientists, policymakers, and the public.

Central to this evolution is the digitalization of research dissemination through preprint repositories, open-access platforms, and multimedia formats such as video abstracts and interactive infographics. Social media and online forums enable real-time dialogue and collaboration, breaking down geographical and institutional barriers. Moreover, advancements in artificial intelligence (AI) are revolutionizing scientific communication by enabling automated literature curation, language translation, and personalized knowledge dissemination.

Emphasis on inclusivity and equity ensures that underrepresented voices are amplified, fostering a more diverse scientific ecosystem. This shift also addresses the ethical imperative to combat misinformation by promoting transparency, peer accountability, and public engagement.

Despite its promise, the transformation of scientific communication faces challenges, including information overload, cybersecurity risks, and the need for universal digital literacy. Addressing these barriers requires a global, multidisciplinary effort to establish robust frameworks that prioritize innovation while maintaining scientific rigour.

In conclusion, transforming scientific communication for the 21st century is essential for advancing knowledge, fostering collaboration, and addressing global challenges, ultimately democratizing access to scientific progress.

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RETHINKING EDUCATION FOR THE 21ST CENTURY.

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The Education and Management Division or EMD is responsible for most of the educational activities of the IFCC. Through a variety of committees and working groups, the EMD contributes to the educational mission of the IFCC through lectures, webinars, workshops, educational materials and peer-reviewed publications. In addition, the EMD has two successful activities, the IFCC-Abbott Visiting Lecturer Programme and the Professional Exchange Programme, which facilitate interaction among scientists. Although these activities are impactful and appreciated by the laboratory medicine community, they are traditional in nature and do not take advantage of evolving technologies. Furthermore, the limitations of some of these activities were realized during the pandemic crisis. The EMD promotes an IFCC-sponsored AI-driven adaptive learning program called the Learning Lab for Laboratory Medicine. At the present, that is the only AI-driven project under EMD and an example of contemporary education.

As we gain more experience with AI and realize its potential, we will better understand its power in shaping our means of not only presenting and disseminating information but also in generating the actual information. In a federation with a global audience such as IFCC, AI can facilitate learning by making the educational materials available in the learner's native language. The transition from traditional preparation and delivery of educational materials to AI-generated information however should be done thoughtfully to avoid pitfalls. Adequate verification of newly created or translated materials by experts can accomplish this task. It is becoming increasingly apparent that the EMD should reduce its reliance on traditional means and start experimenting and developing expertise in AI tools to create educational materials. Any delay in adoption of AI in our community would be to our detriment. The EMD should harness this tool and start interweaving it in all its activities and functions. Furthermore, the IFCC and EMD must take a leadership role in training our community in the available AI tools and developing a guiding document about how to implement AI in our educational activities and what is considered an acceptable practice.

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IFCC 2050: PIONEERING THE FUTURE OF LABORATORY MEDICINE

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As clinical chemistry and laboratory medicine evolve, the IFCC must redefine its leadership to address 21st-century challenges. This round table explores how IFCC leadership beyond 2025 should be shaped by historical foundations, the exponential growth of laboratory sciences, the transformative power of AI, emerging biotechnologies, and a new global healthcare ecosystem.

By 2050, laboratory medicine will be embedded in a global innovation ecosystem. AI-powered diagnostics, personalized biomarker-driven companion diagnostics, and regenerative medicine will revolutionize patient care. Continuous, real-time health monitoring via biosensors, lab-on-a-chip devices, and smart implants will shift testing from centralized labs to wearable and home-based platforms. Advancements in regenerative medicine, synthetic biology, and AI-powered digital twins will enable precision medicine and personalized treatment. Sustainability will be central, integrating green chemistry, biodegradable diagnostics, and decentralized cloud-based testing to minimize waste and democratize healthcare.

The patient's role will shift from passive recipient to active participant, with real-time health analytics and AI-driven personal health assistants refining treatments for longevity and well-being. Education and workforce development will be revolutionized through immersive AI learning, continuous skill adaptation, decentralized scientific publishing, and open-access knowledge-sharing platforms. Traditional dissemination models will give way to real-time, AI-assisted knowledge-sharing and holographic conferences, fostering unprecedented collaboration.

To lead this transformation, IFCC leadership must embrace ethical AI integration and equitable access to cutting-edge diagnostics. By fostering innovation and leveraging disruptive technologies, IFCC can ensure laboratory medicine remains at the forefront of global healthcare. The IFCC of 2050 will not just oversee laboratory medicine, it will engineer the future of human biology.

The challenge is not whether these transformations will happen, but how quickly we will adapt.

Are we ready to embrace the future before it embraces us?