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At the Interface of Materials Science and Clinical Care

Transforming Treatments and Procedures in Health

Luiz Fernando Cotica, PhD[1,2]

[1] Deputy Editor-in-Chief, Journal of Digital Health and Advanced Biomaterials (JDHAB), Maringá, Paraná, Brazil.
[2] Department of Physics, State University of Maringá, Maringá, Brazil.

lfcotica@uem.br • ORCID 0000-0003-2634-447X

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ABSTRACT

The convergence of materials science, digital health, and computational technologies is progressively transforming the way healthcare treatments and procedures are developed, evaluated, delivered, and monitored. Building on the scientific foundations established by contributions already published by JDHAB, this editorial advances the discussion from technological validation toward clinical translation. Advanced biomaterials, biosensors, artificial intelligence, computational modeling, and digital traceability are creating new possibilities for integrating material performance, biological response, and clinical decision-making. The central premise remains unchanged: technological innovation acquires scientific and clinical value only when supported by methodological rigor, transparent measurement, reproducibility, and meaningful applicability to patient care.

KEYWORDS advanced biomaterials; digital health; artificial intelligence; translational research

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When we launched the *Journal of Digital Health and Advanced Biomaterials* (JDHAB), our premise was deliberately conservative: before celebrating innovation, we needed to consolidate the foundations on which credible innovation depends: methodological rigor, transparent measurement, and accountable reporting.

The contributions published to date have confirmed that this premise resonates. Studies addressing reproducible clinical measurement, injectable biomaterials, material properties and clinical application, digital outcome assessment, physiological measurement, and patient-specific digital workflows have begun to establish the scientific territory that JDHAB was created to explore: the rigorous convergence of the digital and the material[1–6].

With our ISSN registered, systematic DOI assignment through Crossref in place, and an established editorial workflow under continuous publication, JDHAB is building a traceable and trustworthy scholarly record for translational science.

Foundations, however, are meant to support what comes next. If our opening premise was concerned with how we know that an innovation is real, the discussion now takes us from the bench to the bedside:

How does this integrated science change, in practice, the treatments and procedures patients actually receive?

Biomaterials as active therapeutic agents

Materials science should no longer be understood solely as a laboratory discipline that supplies the clinic with passive hardware. Implants and scaffolds are increasingly moving beyond inert mechanical support to become bioactive and responsive interfaces capable of interacting with host biology, modulating biological responses, supporting healing, and contributing to tissue regeneration[7,8].

Responsive hydrogels, nanostructured carriers, and controlled-release systems are likewise expanding the possibilities of therapeutic delivery, enabling greater spatial and temporal control over drugs, cells, and other therapeutic agents and supporting increasingly sophisticated approaches to regenerative and personalized treatment[9].

Yet this promise carries a methodological obligation that remains central to this journal: performance must ultimately be demonstrated under biologically and clinically relevant conditions. A biomaterial that performs favorably under controlled conditions must also demonstrate safety, biocompatibility, functional stability, and meaningful performance within the heterogeneity of living systems and, ultimately, real patients. JDHAB welcomes work that embraces, rather than circumvents, this complexity.

Intelligence, continuity, and decision support

Parallel to this material transformation, digital health is converting biological responses, physiological signals, and the performance of materials and devices into increasingly actionable clinical data. Wearable and sensor-based technologies are shifting portions of health assessment from episodic snapshots toward longitudinal and, in some settings, real-time physiological monitoring[10].

Artificial intelligence and computational modeling increasingly support image interpretation, diagnostic assistance, risk assessment, procedural planning, and clinical decision-making. Their translational value, however, depends not simply on computational performance, but on their ability to support clinical reasoning and integrate meaningfully into real healthcare environments[11].

Telehealth and remote patient monitoring further extend this continuum of care. Structured data collected beyond traditional clinical settings can support follow-up and continuity between patients and healthcare professionals. Evidence from care-transition settings is encouraging for several outcomes, while also demonstrating substantial heterogeneity and the continuing need for careful evaluation of clinical effectiveness, implementation, and context[12].

Digital tools, in short, give materials a voice and give healthcare professionals the means to listen. That voice, however, is scientifically meaningful only when the data supporting it are reliable, traceable, interpretable, and properly validated.

The confluence: where data and matter transform care

It is at the interface of these two domains, a central scientific territory for JDHAB, that some of the most consequential changes are taking place. When digital instrumentation is incorporated into biomaterial development and preclinical evaluation, testing can become more data-rich, traceable, and potentially predictive, helping promising technologies move from experimental development toward clinical application with greater scientific confidence.

When advanced materials are combined with image-guided navigation, digital planning, and AI-assisted decision support, procedures may become more precise and better adapted to individual anatomical and biological conditions. And when traceability accompanies a medical device or biomaterial throughout its life cycle, post-market surveillance can become part of a continuing process of performance evaluation, transparency, and patient safety.

This is what we mean by transforming treatments and procedures in health: not isolated technological novelties, but an emerging model of care in which matter is engineered with data, and data remain grounded in biological and clinical reality.

As JDHAB continues to develop under continuous publication, we invite manuscripts that embody this integrated vision: studies that combine technical innovation in materials, digital validation, methodological rigor, and evidence of real clinical applicability or translational potential.

We particularly welcome work born of genuine transdisciplinary dialogue: materials engineers, data scientists, physicists, chemists, biologists, healthcare professionals, and other researchers working at this interface, reasoning together around the same scientific problem and, ultimately, around the same patient.

JDHAB reaffirms its commitment: we do not seek to publish technological novelty for its own sake, but transformations that are scientifically defensible, reproducible, sustainable, and meaningful in their impact on patient care.

The convergence of materials science and digital technologies offers extraordinary possibilities. Yet technological sophistication alone does not constitute scientific progress. The value of innovation ultimately depends on the quality of the evidence that supports it and on its capacity to contribute to safer, more precise, consistent, and effective healthcare.

To the authors, reviewers, and readers who have contributed to the scientific development of JDHAB, our sincere gratitude. To those working at the interface of materials science, digital technologies, and clinical care, this scientific space is yours. We look forward to your contributions.

Luiz Fernando Cotica, PhD
Deputy Editor-in-Chief, JDHAB
Maringá, Paraná, Brazil
ORCID iD: 0000-0003-2634-447X
lfcotica@uem.br

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Assessment Editorial assessment