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EDITORIAL

Editorial: Biomedical Informatics and Smart Healthcare - Shaping the Future of Health

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Abstract

Biomedical Informatics and Smart Healthcare are helping to enhance and improve modern medicine and healthcare facilities by promoting technology-enhanced care and patient-centric approaches. This editorial primarily discusses the latest advancements in the fields of artificial intelligence, big data analytics, and IoT-enabled medical devices that are redefining medical workflows, diagnostics, and healthcare delivery. As the field evolves, biomedical informatics has enabled personalized patient treatment, real-time health tracking, and data-driven decision-making. The editorial also addresses ethical and regulatory concerns associated with this medical transformation, including issues related to patient data privacy. Through interdisciplinary collaboration, the journal Biomedical Informatics and Smart Healthcare aims to serve as a global platform for sharing cutting-edge research and innovations that enhance precision in the medical industry. This editorial encourages researchers, clinicians, scientists, and policymakers to actively contribute to this domain to build a more effective and intelligent healthcare ecosystem.

Keywords: biomedical informatics, smart healthcare, artificial intelligence in medicine, precision medicine, digital health.

1 Introduction

A smart healthcare and biomedical informatics can be considered as one of the most competent in the sphere of modern medicine industry. With the global healthcare sector under increasing pressure due to an influx of patients, increasing burden of chronic diseases and limited resources, incorporating smart data-driven technology has become not only desirable but necessary [1]. Biomedical informatics is the sphere of knowledge on which the acquisition, storage, retrieval, and thoughtful use of biomedical information lies, whereas smart healthcare has a more wide-ranging perspective on applying these opportunities to provide proactive, personal, and efficient medical care. It is the intention of this editorial to discuss the growth, influence, and trends of these two potentially overlapping disciplines and describe both the vision and structures of the journal Biomedical Informatics and Smart Healthcare

as a community space in the field of knowledge development, cross-disciplinary collaboration, and translational innovations [2].

Over the last few decades, biomedical informatics has gone through a tremendous transformation as it has evolved over a wide field that bridges with artificial intelligence and systems biology and digital health technologies to clinical coding and management of databases. In it, there is a variety of subfields that include clinical informatics, bioinformatics, imaging informatics, and public health informatics. This field largely concerns itself with the problem of connecting and interpreting the heterogeneous biomedical data whether electronic health records (EHRs), genomic sequences, radiological images or physiological signals. The objective is not only to take care of the data, but to gain knowledge that can be put into practice to benefit the patient, guide and influence policy and prompt scientific discoveries [3].

Biomedical informatics has grown by leaps and bounds with the emerging applications of machine learning and high throughput computing. Recent models can learn nonlinear and complex patterns in multimodal data and are finding more and more applications to real time decision support, risk prediction, disease classification and treatment recommendations systems. Thus, biomedical informatics is not just a background infrastructure anymore but a propelling force in the reimagining of the modern healthcare systems [4].

2 Understanding Smart Healthcare

Smart healthcare is an application of connected technologies, intelligent systems, and data streams in real-time to enhance the quality of medical services, their access, and their effectiveness. In contrast to the conventional, reactive, and facility-based models, smart healthcare is the proactive approach to monitoring, interventions that can be carried out at a distance, and the customized regimen of interventions [5]. These factors enhance harmonious and patient-focused care throughout the sphere of care- preventable care and early diagnosis, long-term illnesses management and rehabilitation care [6].

Smart healthcare in its essence is the concept of making healthcare delivery responsive and adaptive. Continuous evaluation of the vitals and behavioral data can be carried out using the remote patient monitoring tools, which can be utilized to set up early warning signals, identify anomalies, and real-time

alert to caregivers. In the same way, teleconsultation systems in the cloud remove the physical distance, allowing patients in rural regions to get the assistance of specialists on time. Mobile health apps will help manage medications, check on mental health, and leave patients with agency over managing their lives. These tools facilitate a complete and smart health management system when combined with the biomedical informatics frameworks, which is capable of learning, changing, and growing in accordance with the individual needs of patients [7].

3 Ethical, Legal, and Governance Considerations

Although the advantages of biomedical informatics and smart healthcare are enormous, they, at the same time, bring about considerable ethical, legal, and governance issues that should not be neglected. The issue of patient data privacy is also one of the more controversial ones, particularly, due to the contents of the data being freely transported to multiple platforms, devices, and organizational borders. Important safeguards against these threats are afforded by regulations, like HIPAA, GDPR, and India Digital Personal Data Protection Act, but there is no consistent enforcement of compliance worldwide [8].

The other issue is that quite a lot of AI systems lack transparency. In cases where the clinical recommendations are based on algorithms, clinicians must have the awareness of the reasons underlying such decisions. This has given rise to the new area of research known as explainable AI (XAI), in which the objective is to engineer "hygienic" models that deliver transparent and human-interpretable reasons why an output is produced. The other extremely problematic issue is algorithmic bias, especially in a case where training data does not adequately represent some demographical groups. Without their address, these biases may result in an unsymmetrical care or, perhaps, injury [9].

Moreover, the structures that are going to be established to clarify the accountability level in the case when the negative outcomes are caused by AI-assisted decision-making must be implemented. Issues of responsibility, malpractice and the importance of human control are still subject to discussion in levels of regulation and professional associations. These dialogues should be dynamic, open, and progressive as the smart technologies penetrate deeper into the clinical practice [10]. The approach discussed in [11] aims to enhance resource allocation and patient care,

emphasizing the importance of model interpretability for clinical adoption. This research discussed in [12] presents Healthcare Decision Support Framework (HDSF), a web-based application designed to enhance healthcare delivery through integrated services like virtual consultations, symptom detection, and prescription management. The study in [13] presents a novel analytical framework combining functional connectivity, entropy, time-lag, and causality analysis to investigate amygdala–vmPFC interactions during emotional processing using iEEG data.

4 Conclusion

The combination of biomedical informatics and smart healthcare is the future of revolutionary change in the field of medicine. Their incorporation is guaranteed not only to enhance diagnosis and treatment potential, but a more comprehensive, inclusive, and equal health-related ecosystem. Interdisciplinary collaboration, research integrity, and ethical imagination will be important as we make our way forward through challenges and opportunities facing us. Biomedical Informatics and Smart Healthcare, we will be embracing everyone of the world to take part in this vision, to innovate, to challenge and to lead. The sky is the limit when we join our forces to create a healthier and more intelligent future of us all.

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Conflicts of Interest

The authors declare no conflicts of interest.

Ethical Approval and Consent to Participate

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References

[1] Ognjanović, I., Zoulias, E., & Mantas, J. (2024, October). Progress achieved, landmarks, and future concerns in biomedical and health informatics. In *Healthcare* (Vol. 12, No. 20, p. 2041). MDPI. [CrossRef]

[2] Datta, S. P. A. (2016). Future healthcare: Bioinformatics, nano-sensors, and emerging innovations. *Nanosensors: theory and applications in industry, healthcare and defense*, 247.

[3] Tripathi, D., Hajra, K., Mulukutla, A., Shreshtha, R., & Maity, D. (2025). Artificial Intelligence in Biomedical Engineering and Its Influence on Healthcare Structure: Current and Future Prospects. *Bioengineering, 12*(2), 163. [CrossRef]

[4] Shafik, W. (2025). Smart biomedical devices for smart healthcare. In *Machine Learning Models and Architectures for Biomedical Signal Processing* (pp. 421-448). Academic Press. [CrossRef]

[5] Alla, S., Mohanty, J., Sriraman, H., & Chattu, V. K. (2025). Navigating the frontier: Integrating emerging biomedical technologies into modern healthcare. In *Intelligent Biomedical Technologies and Applications for Healthcare 5.0* (pp. 229-243). Academic Press. [CrossRef]

[6] Nasir, W., & Ikhlaq, M. (2025). From Data to Diagnosis: Integrating Machine Learning and IoT in Biomedical Engineering for Next-Generation Healthcare Solutions.

[7] Kalinaki, K., & Kalinaki, A. (2025). Big Data's Impact on Healthcare and Bioinformatics. In *Cyber-Physical Systems Security: A Multi-disciplinary Approach* (pp. 23-51). Singapore: Springer Nature Singapore. [CrossRef]

[8] Panahi, O. (2025). The role of artificial intelligence in shaping future health planning. *International Journal of Health Policy Planning, 4*(1), 01-05.

[9] Tiwari, A., Masilamani, M., Rao, T. S., Zope, S., Deepak, S. A., & Karthick, L. (2025). Shaping the Future: Emerging Trends and Strategic Predictions in Big Data and AI. *AI and the Revival of Big Data*, 125-154. [CrossRef]

[10] Vasanth, R., Paranthaman, M., & Sivaprakash, P. (2025). ML and IoT coupled biomedical applications in healthcare: Smart growth and upcoming challenges. In *Internet of Things enabled Machine Learning for Biomedical Applications* (pp. 1-22). CRC Press.

[11] Ahmed, A., Zengul, F. D., Khan, S., Hearld, K. R., Feldman, S. S., Hall, A. G., ... & Kennedy, K. (2024). Developing a decision model to early predict ICU admission for COVID-19 patients: A machine learning approach. *Intelligence-Based Medicine, 9*, 100136. [CrossRef]

[12] Tan, S. K., Chong, S. C., Wee, K. K., & Chong, L. Y. (2024). Personalized healthcare: A comprehensive approach for symptom diagnosis and hospital recommendations using AI and location services. *Journal of Informatics and Web Engineering, 3*(1), 117-135. [CrossRef]

[13] Sonkusare, S., Qiong, D., Zhao, Y., Liu, W., Yang, R., Mandali, A., ... & Voon, V. (2023). Frequency dependent emotion differentiation and directional coupling in amygdala, orbitofrontal and medial prefrontal cortex network with intracranial recordings. *Molecular Psychiatry, 28*(4), 1636-1646. [CrossRef]

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