SMART REHAB THROUGH BIG DATA

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The future of Physical and Rehabilitation Medicine (PRM) is being transformed through the integration of Big Data and artificial intelligence (AI), driving the emergence of "Smart Rehabilitation." This model emphasizes personalized, data-driven care tailored to maximize function, participation, and quality of life. PRM specialists are strategically positioned to lead this transformation due to their holistic, patient-centered, and function-oriented approach. Smart rehabilitation leverages predictive analytics, machine learning, and real-time data from electronic health records (EHRs), wearables, and IoT sensors to enhance clinical decision-making (Lanotte et al., 2023). AI supports but does not replace clinical judgment; rather, it augments the rehabilitation team's ability to stratify patients, forecast complications, and personalize recovery pathways (Hwang et al., 2024). Functional outcomes remain the compass of intelligent rehabilitation systems. Metrics such as activities of daily living (ADLs), mobility scores, and ICF parameters are increasingly collected through connected devices and digital platforms. This real-world, objective data fuels evidence-based practice, shifting from hypothesis-driven to data-driven research (Cieza et al., 2023). Educational reform is critical, with PRM training needing to incorporate digital literacy, AI ethics, and interdisciplinary collaboration with engineers and data scientists. Academic institutions must pioneer the validation of AI tools and algorithms to ensure clinical relevance and safety (Lanotte et al., 2023). Team-based care is also being reshaped. Smart dashboards and shared visualizations foster collaborative planning among PRM physicians, therapists, nurses, and neuropsychologists. Big Data centralizes information, facilitating more effective communication, resource allocation, and consensus-based decisions (Zhang, 2025). Ultimately, smart rehabilitation is not a threat but an opportunity—it redefines functionality, strengthens clinical leadership, and promotes precision rehabilitation across diverse populations.

Keywords: rehabilitation, Big Data, artificial intelligence

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