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Digital Twins in Pharmacology: Shaping the Future of Personalized Drug Therapy.

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The field of pharmacy is undergoing a remarkable transformation with the integration of advanced digital technologies. One of the most promising innovations is the concept of digital twins virtual models that replicate the structure and function of biological systems. In pharmacology, digital twins can simulate an individual patient's physiology, disease progression, and drug response, offering a new dimension to personalized medicine. Traditional pharmacotherapy often follows a "one-size-fits-all" approach, which may lead to variability in drug efficacy and an increased risk of adverse effects. By contrast, digital twins supported by artificial intelligence (AI), big data analytics, and pharmacogenomics can predict patient-specific outcomes, optimize dosage regimens, and minimize trial-and-error prescribing. This not only enhances therapeutic precision but also improves patient safety and overall healthcare quality. The application of digital twins in pharmacology extends beyond individualized therapy. They also play a significant role in drug discovery, clinical trials, and pharmacovigilance. By creating virtual simulations, researchers can reduce dependence on animal testing, lower research costs, and accelerate the development of innovative therapies. For practicing pharmacists, digital twins can act as powerful decision-support tools, enabling evidence-based and patient-centered care. As pharmacy education embraces technological advancements, future pharmacists must be equipped with the knowledge and skills to harness these tools. Digital twins exemplify the intersection of pharmacology and technology, symbolizing a shift towards smarter, safer, and more personalized drug therapy. This poster emphasizes their transformative role in empowering the next generation of pharmacists in the era of precision medicine.

Keywords: Digital Twins, Pharmacology, Personalized Therapy, Artificial Intelligence, Pharmacogenomics, Precision Medicine.