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The Impact of Nanorobotics on Enhancing Therapeutic Strategies and Disease Management in Medicine

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Abstract: *Nanorobotics has emerged as a groundbreaking medical field, offering innovative solutions to longstanding challenges in disease management and therapeutic strategies. This systematic review explores the fundamentals of nanorobotics, its applications in targeted drug delivery, diagnostics, cancer treatment, and minimally invasive surgery, as well as the associated challenges and future directions. Nanorobots, characterized by their ability to operate at nanoscale dimensions, have demonstrated significant potential in enhancing the precision and efficacy of medical interventions. In oncology, nanorobots enable targeted drug delivery, reducing systemic toxicity while improving treatment outcomes. In minimally invasive surgery, nanorobots facilitate precise interventions, minimizing collateral damage and expediting recovery. Biocompatibility, technical limitations, and ethical concerns remain critical despite these advancements. Issues like immune system interference, long-term toxicity, and difficulties in propulsion and control require innovative solutions. Ethical considerations regarding patient privacy and regulatory frameworks necessitate global collaboration for responsible implementation. The future of nanorobotics lies in its integration with emerging technologies, such as artificial intelligence, which promises to enhance navigation, predictive analytics, and personalized medicine. Advancements in biocompatible materials, scalable manufacturing, and real-time imaging will further drive the clinical translation of nanorobotics. This review underscores nanorobotics' transformative potential to revolutionize healthcare and emphasizes the need for continued interdisciplinary research to overcome existing barriers and optimize its applications.*

Keywords: Nanorobotics, Targeted Drug Delivery, Minimally Invasive Surgery, Cancer Therapy, Diagnostics, Biocompatibility, Precision Medicine, Artificial Intelligence Integration