# Therapiez: A Piezoelectric System in a Wearable Medical Device for Accelerated Wound Healing Therapy

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Amputations from chronic wounds claim a limb every 30 seconds, with half of the patients dying within five years. Despite $50 billion spent annually, ineffective treatments leave millions at risk of infection, sepsis, and premature death, especially among 537 million adults with diabetes. Recent studies highlight the potential of electrostimulation therapy (EST) to accelerate wound healing by promoting blood circulation, oxygenation, and angiogenesis. However, conventional EST systems are expensive, indiscreet, and require stationary power sources, restricting patient mobility, effectiveness, and continuous treatment. To address these challenges, Therapiez: a Piezoelectric Wound Healing System with optimized EST (1.5-10 V, 50-250 μA, 2-10 Hz) is introduced. The device converts mechanical stress into targeted electrical stimulation, amplifying bioelectrical healing signals of the body. Its discreet three-layer design integrates reusable novel piezoelectric materials, temperature and humidity sensors (SHTC3 I2C), and IoT-based wireless communication, enabling real-time wound monitoring. A hybrid power approach, combining motion-induced energy harvesting with wireless charging, sustains operation and provides access for immobile patients. A two-week evaluation study with 28 participants showed 96.4% satisfaction, highlighting comfort and subtlety. Prototype testing demonstrated controlled electrical output within clinically beneficial ranges. The integration of sensors will enable real-time wound monitoring and the collection of a database for AI-driven EST analytics. This research indicates that with applications in sustainable regenerative medicine and smart wearables, the development of Therapiez will initiate energy-efficient, personalized wound healing therapies.

**Awards Won:**