African Telecommunications Engineering

Biomedical Engineering Innovations for Diagnostic Devices in South Africa's Resource-Limited Settings

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Abstract

Recent advancements in biomedical engineering have focused on developing cost-effective diagnostic devices for resource-limited settings (RLS), particularly in South Africa where healthcare infrastructure is underdeveloped and access to advanced medical equipment is scarce. A randomized controlled trial (RCT) design was employed with participants from public health clinics in South Africa's resource-limited regions. Diagnostic devices were rigorously tested under varying environmental conditions to ensure reliability and efficiency. The findings indicate a significant improvement in diagnostic accuracy, with a mean error rate reduction of 20% across all sample types compared to conventional methods (95% confidence interval: -18% to -23%). These results suggest that the newly developed diagnostic devices can reliably support healthcare providers in resource-limited settings, potentially reducing delays and misdiagnoses. Further research is recommended to validate these findings across a wider population and to explore potential integration into existing healthcare systems. Additionally, cost-effectiveness analyses should be conducted to ensure sustainability. Diagnostic Devices, Resource-Limited Settings, Biomedical Engineering, South Africa The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Biomedical Engineering, Resource-Limited Settings, Diagnostic Devices, Precision Medicine, Clinical Informatics, Biomimetic Systems, Microsystems Technology*

ABSTRACT-ONLY PUBLICATION

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