African Renewable Energy Engineering

Innovative Biomedical Engineering Approaches for Diagnostic Device Development in Liberia's Resource-Limited Settings

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Abstract

Liberia faces significant challenges in healthcare delivery due to resource constraints, particularly in diagnostic device development. A mixed-methods approach combining literature review, expert consultations, and prototype testing was employed to identify and validate design parameters for low-cost diagnostic devices. The prototypes were subjected to formative validation through user feedback and preliminary clinical trials. Prototype devices demonstrated a sensitivity of at least 85% in initial clinical trials with a confidence interval around the mean performance measure, indicating consistent reliability under resource-limited conditions. The developed biomedical engineering solutions offer a promising pathway for improving diagnostic capabilities in Liberia's healthcare infrastructure. Further large-scale validation and integration of these devices into routine health care processes should be prioritised to ensure their widespread adoption and effectiveness. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographic, Africa, Mixed-Methods, Liberia, Biomedical, Engineering, Innovation, Development, Resource-Limited*

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