



Methodological Evaluation of Emergency Care Unit Systems in South Africa: Multilevel Regression Analysis for Clinical Outcomes Measurement

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Abstract

Emergency care units (ECUs) in South Africa are underutilized despite high patient demand and limited resources. Multilevel regression analysis was employed to assess the impact of ECU system variables on patient outcomes, accounting for both individual-level (patient characteristics) and unit-level (system design and resource allocation) factors. A significant proportion ($p < 0.05$) of variance in clinical outcomes could be attributed to unit-level factors such as staffing levels and emergency department size. The multilevel regression analysis provides a robust framework for understanding the complex interplay between ECU systems and patient care outcomes, with implications for resource allocation and policy development. Investment in ECU infrastructure and staff training is recommended to enhance clinical outcomes and ensure equitable access to emergency services.

Keywords: *African geography, multilevel modelling, clinical outcomes, resource allocation, hierarchical analysis, regression diagnostics, service utilization*

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