Evaluating a novel, contextually appropriate, non-internet dependent mobile navigation tool for Emergency Medical Dispatch of Lay First Responders to Musculoskeletal Trauma in Sierra Leone: a Comparative Simulation Trial

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INTRODUCTION: Despite disproportionately bearing the global trauma and musculoskeletal burden, low- and middleincome countries often lack robust emergency medical services (EMS) to address injury. Though training lay first responders (LFRs) is recommended as the initial step to develop EMS by the World Health Organization, equipping active LFRs with emergency medical dispatch (EMD) coordination is the recognized next step toward formal EMS development. However, few context-appropriate mobile dispatch solutions are available for LFRs, and feasibility of implementation and impact on response intervals are not well understood. We aimed to evaluate a novel mobile navigation tool for EMD of LFRs to musculoskeletal trauma in Sierra Leone.

METHODS: A comparative simulation-based trial approach was used to assess SnooCODE, a novel EMD tool not reliant upon formal addresses and able to function without cellular connection during subsequent navigation to geographically dispersed emergencies. Two cohorts of 10 highly active non-EMD enabled LFRs trained in 2019 in Sierra Leone were recruited. Ten simulation scenarios matching proportions of injury conditions across 1,850 previous patient encounters were designed, with fracture having presented in 55.6% of patient encounters (1,029/1,850) (Table 1). 100 total simulations were launched in randomized order over 6 months (equally divided among 10 scenarios), with Cohort 1 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed along 10 km of Sierra Leone highway, and Cohort 2 responding to 50 simulations randomly distributed across 24 square kilometers of an urban setting, with both sharing the same midpoint (Figure 1). LFR on-scene first aid skill performance was assessed under direct observation with a standardized patient actor using a skill checklist (Table 2). Participants were blinded to randomized dispatch timing/scenario to assess response intervals and to replicate real-world conditions, compared with two sample t-tests. Six months post-launch, LFR participants completed follow-up qualitative surveys on dispatch tool ease-of-use and appropriateness, confidence, and ranked relative dispatch variable importance.

RESULTS: Median total response interval (initial notification to LFR arrival on scene) for Cohort 1 for linearly-plotted highway simulations was 6 minutes 33 seconds (IQR: 2m27s; 10m48s), while Cohort 2 was 6m 41s (IQR: 3m59s; 14m47s) for dispersed simulations (p=0.720). Median distance between simulated emergency and LFR at the time of notification acceptance was 1.675 km (IQR: 1.13km; 2.47km) for Cohort 1 and 1.73 km (IQR: 0.82km; 2.28km) for Cohort 2. Mean completion percentage of all discrete first aid steps across all 10 simulation scenario types for Cohorts 1 and 2 were 89.8% (IQR: 80%; 100%) and 94.9% (IQR: 88.89%; 100%) (p=0.017), respectively, with fracture immobilization scenarios demonstrating the greatest range (77.8%- 97.1%) across scenarios (Table 3). Cohort mean confidence was 9.4/10(median=10) and 9.5/10 (median=10) (p=0.889). 75% of LFRs (15/20) used the compass feature for navigation while 25% used turn-by-turn directions(5/20). 70% of LFRs (14/20) reported no unexpected data costs. Emergency location was ranked as the most important dispatch variable factor, followed by nature/severity of injury, and time of emergency. 80% of LFRs (16/20) desired refresher trainings.

DISCUSSION AND CONCLUSION: A novel mobile navigation tool for EMD accurately and efficiently coordinates and dispatches LFRs to simulated emergency incidents across a linear highway and a dispersed urban setting without significant difference in response interval. Equipping non-centralized LFRs with EMD tools may facilitate efficient future dispatch in resource-limited settings to trauma while expanding access to musculoskeletal emergency care.

