

# Phone-based Intervention under Nurse Guidance after Stroke: Concept for Lowering Blood Pressure after Stroke in Sub-Saharan Africa

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Over the last 4 decades, rates of stroke occurrence in low- and middle-income countries (LMIC) have roughly doubled, whereas they have substantively decreased in high-income countries. Most of these LMIC are in Sub-Saharan Africa (SSA) where the burden of stroke will probably continue to rise over the next few decades because of an ongoing epidemiologic transition. Moreover, SSA is circumstantially distinct: socioeconomic obstacles, cultural barriers, underdiagnosis, uncoordinated care, and shortage of physicians impede the ability of SSA countries to implement cardiovascular disease prevention among people with diabetes mellitus in a timely and sustainable manner. Reducing the burden of stroke in SSA may necessitate an initial emphasis on high-risk individuals motivated to improve their health, multidisciplinary care coordination initiatives with clinical decision support, evidence-based interventions tailored for cultural relevance, task shifting from physicians to nurses and other health providers, use of novel patient-accessible tools, and a multilevel approach that incorporates individual- and system-level components. This article proposes a theory-based integrated blood pressure (BP) self-management intervention called Phone-based Intervention under Nurse Guidance after Stroke (PINGS) that could be tested among hospitalized stroke patients with poorly controlled hypertension encountered in SSA. PINGS would comprise the implementation of nurse-run BP control clinics and administration of health technology (personalized phone text messaging and home telemonitoring), aimed at boosting patient self-efficacy and intrinsic motivation for sustained adherence to antihypertensive medications. **Key Words:** Secondary prevention—stroke—Africa—hypertension—mobile health—task shifting.

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## Introduction

Hypertension is a major risk factor for cardiovascular disease.<sup>1</sup> Of all cardiovascular disease clinical entities, none is more strongly linked to hypertension than stroke.<sup>1</sup> Fortunately, with control of hypertension,<sup>2</sup> incidence of and mortality from stroke can be greatly reduced,<sup>3</sup> as seen recently in several high-income countries (HIC).<sup>4-7</sup> However, for low- and middle-income countries that disproportionately bear the global burden of stroke (death from stroke in low- and middle-income countries accounted for 85.5% of stroke deaths worldwide, and

the disability adjusted life years lost in these countries was almost 7 times those lost in HIC),<sup>8</sup> these gains have not materialized.<sup>9</sup> Moreover, given the health care transition from primarily infectious conditions to chronic non-communicable diseases,<sup>10</sup> the burden of stroke in Sub-Saharan Africa (SSA),<sup>11</sup> is likely to increase substantially over the next several decades,<sup>8</sup> a situation likely to be compounded by the low prevalence of awareness, treatment, and control of hypertension (HTN) in SSA.<sup>12,13</sup>

Achieving and sustaining blood pressure (BP) control is a particular challenge in SSA.<sup>9,11</sup> Key factors responsible for uncontrolled HTN are medication, nonadherence, and failure to intensify therapy in a timely manner (ie, therapeutic inertia).<sup>14-17</sup> Systematic reviews of randomized controlled trials (RCTs) involving uncontrolled hypertensives indicate that BP self-monitoring, medication reminder tactics, and use of case managers each improve adherence, therapeutic inertia and BP levels.<sup>18-21</sup> However, no medication adherence/BP self-monitoring RCTs have been designed specifically for people in SSA, especially those at high risk for future stroke. Occurrence of prior stroke is the strongest predictor of future stroke, and risk is greatest during first 3 months after stroke.<sup>3</sup> Initiation of prevention strategies are most effective when implemented early, monitored frequently, and maintained long-term after an index stroke.<sup>22,23</sup> As such, culturally sensitive, efficacious BP control programs, which are acceptable, feasible, timely, and sustainable are needed, especially among hypertensive stroke survivors, the group at highest risk for future stroke.<sup>24</sup> Mobile health (mHealth) technology offers a promising approach to address this need.<sup>25-32</sup> Most adults in SSA own a cell phone (~73%),<sup>33,34</sup> smart phone ownership is burgeoning (~25%),<sup>35</sup> and mHealth has produced promising results in chronic disease management (eg, human immunodeficiency virus) in SSA.<sup>36-38</sup> This article proposes a theory-based framework for conceptualizing an integrated protocol-driven BP management strategy that could be adapted into an intervention for future study testing among hospitalized stroke patients encountered in SSA.

### Stroke Burden in Sub-Saharan Africa

Stroke is a leading cause of death, disability, dementia, and depression in SSA.<sup>8,11</sup> Among stroke survivors, recurrent vascular events including secondary stroke and myocardial infarction lead to functional decline and subsequent mortality,<sup>39-43</sup> which has led to the formation of multidisciplinary partnerships to explore ways to mitigate this immense burden in SSA.<sup>44,45</sup> It is increasingly clear that the greatest opportunity for enhanced stroke outcomes is through prevention.<sup>3</sup> Aggressive efforts in reducing stroke risk factors will be crucial in preventing an impending stroke epidemic in SSA,<sup>46</sup> and because the greatest risk of recurrent stroke

or myocardial infarction is within 3 months of an index stroke, timeliness is also crucial.<sup>47</sup> The most powerful modifiable stroke risk factor is HTN,<sup>48,49</sup> and uncontrolled HTN at the time of discharge from the hospital is a major predictor of recurrent stroke.<sup>50</sup> Therefore, optimal BP reduction needs to be at the center of any serious effort to lessen the burden of stroke in SSA.

### Hypertension Control in Sub-Saharan Africa

Hypertension is increasingly becoming a major public health issue in SSA.<sup>51-54</sup> A survey of 47,443 adults in 6 middle-income countries showed rates of hypertensives not receiving treatment ranged from 35% (Russia) to as high as 87% (Ghana).<sup>55</sup> Moreover, various surveys have demonstrated very low control (BP <140/90 mm Hg) in SSA:

- (1) Among patients with HTN, 18% were treated and only 4% were controlled.<sup>56</sup>
- (2) HTN treatment and control rates were low in both genders (men 7.8% and 4.4%; women 13.6% and 1.7%) and among elderly persons.<sup>57-59</sup>

Although cost of drugs is a contributor to inadequate treatment rates, even in settings where antihypertensive drugs are provided free of charge, BP control rates are low.<sup>60</sup> Sustained adherence to HTN medications can control HTN and reduce stroke events,<sup>61-64</sup> but is actually the leading modifiable barrier to BP control.<sup>14,15,17,65</sup> Indeed, suboptimal HTN control poses a serious challenge to stroke prevention in SSA.<sup>66-68</sup> A survey of HTN patients in SSA found only 5% had BP control (<140/90 mm Hg), 25% of respondents reported HTN had no long-term effects, and 58% indicated it was curable.<sup>69</sup> The latter misconception of HTN being an acute condition and curable is a major barrier to long-term treatment adherence. Patients whose beliefs are discordant with conventional biomedical concepts of HTN tend to have poorer BP control than those with concordant beliefs.<sup>70-74</sup> A survey of Nigerians with HTN found 40% could not define HTN, 65% indicated no longer requiring use of antihypertensive drugs once they achieved initial BP control, and 21% opined they would achieve a permanent cure only from alternative medical practitioners and intended to solely utilize them in the future.<sup>13</sup> Given all of the aforementioned, any strategy to improve adherence to antihypertensive drugs in SSA must address patients' beliefs, and more information from SSA is needed about the role of poor planning/forgetfulness to fill scripts/take meds, language barriers, as well as other intentional contributors to low medication adherence.

Therapeutic Inertia plays a significant role among adherent patients whose BP remains uncontrolled.<sup>75-77</sup> A study in Nigeria found a major reason for nonadherence to antihypertensive drugs was that

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