

Scale-up of a novel vital signs alert device to improve maternity care in Sierra Leone: a mixed methods evaluation of device repair and maintenance

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Background

Sierra Leone (SL) has one of the highest rates of maternal mortality globally.

The CRADLE VSA is a vital signs monitoring device with a traffic-light warning system and an associated training package designed to enable early recognition and management of unwell pregnant women.

Following a successful trial in SL which showed a reduction in maternal mortality of 60%, the CRADLE device was rolled out across 8 (of 16) health districts in May 2020 - March 2021.

Anecdotally there have been some reports amongst users of broken devices, and this needs further evaluation to ensure sustainability of the intervention.

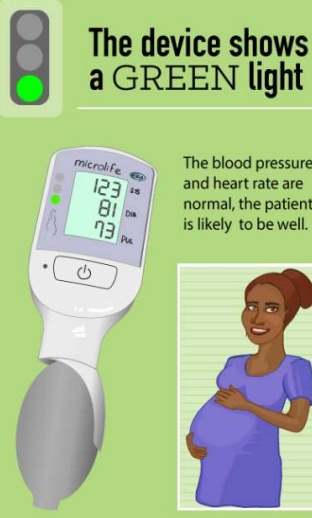


Figure 1. An excerpt from the CRADLE VSA training poster showing the device and an example of the traffic light system

Aim (1) Results

During the national scale up, 1257 devices were distributed amongst the 5 districts. Of these 20.8% (n = 261) were reported as 'broken'.

Allowing for devices that were found to be working when tested or damaged in storage (n = 26), the commonest problems were cuff, 75% (n= 176), bulb, 43%(n= 100) and machine, 18% (n=43).

Table 1. shows the percentage of total devices that were distributed with each type of problem.

Problem	Percentage (%) of devices distributed
Cuff	14.3
Bulb	8.1
Machine	3.5
Tubing	0.4

Table 1.

Aims

1) To establish the proportion of CRADLE VSA devices reported as 'broken' and to systematically identify causes

2) To explore existing 'maintenance and repair' pathways to inform development of a robust maintenance strategy that can be applied at national level

Methods

Data was collected from five districts (Western Area Urban, Western Area Rural, Port Loko, Bo and Bombali) in SL between January-March 2023.

'Broken' devices were collected and categorized by problem.

A selection (n = 20) of members of the district health team, medical technicians and clinical staff were interviewed to explore barriers to maintenance and sustainability.

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Aim (2) Results

Below are the highlights from the hugely informative recorded interviews:

- 100% of people who use the device regularly were aware of the specific problem.
 - "When you are puffing up the bulb you can hear the whizzing where the wind is escaping from the cuff"
- Spare parts are required.
 - "The device is good but because we don't have the spares, that's why we couldn't fix the device. But all of us know, the device is good"
- The 'maintenance and replacement' system introduced at the start of the rollout involved a medical technician per district. Users were trained to contact this medical technician via a district WhatsApp group who would then arrange for repair or replacement of the device.

In reality, all users in all districts reported a broken device to their district health sister who would allow them to go the medical store to exchange their broken one for a replacement.

Medical technicians received very few devices. Without spare parts the medical technicians were not able to repair most devices so users stopped sending them. Devices from rural areas can only be transported to the district hospital when staff need to travel for another reason (e.g. meetings, picking up supplies). Therefore, transporting to a technician delays or prevents exchanging for a new one.

"...he cannot be always able to repair these things in the time that people want ...to take it to Connaught from Western Area Urban, take up the transport to go to Connaught to leave these machines there and then to go and take it. But if within the DHMT there is someone there who can repair, or even at the PHUs then it will be very easy"

Conclusions and Actions

80.1% of initial devices rolled out were still functioning. The commonest problems were related to the cuff and bulb. These are cheap and easily replaced at the healthcare facility by local staff. Based on our findings we implemented the following:

- Empowering users and medical store staff to identify problems and repair devices via training face to face training of store staff and creating a training video in English and Krio.
- Supplying district medical stores with spare cuffs and bulbs.
- These changes supported the local chosen system of replacement to work more effectively.

Lessons can be applied to future global health projects: the environmental impact on materials - cuffs and bulbs were affected by the extreme heat and humidity in SL, and local cultural and logistical differences – this project initially underestimated transport challenges and the importance of the district health sister as the principal coordinator.