



LEVERAGING MEDICAL DRONES FOR LAST-MILE DELIVERY OF ANTI RETROVIRAL THERAPY (ART) IN AN ISLAND POPULATION IN UGANDA

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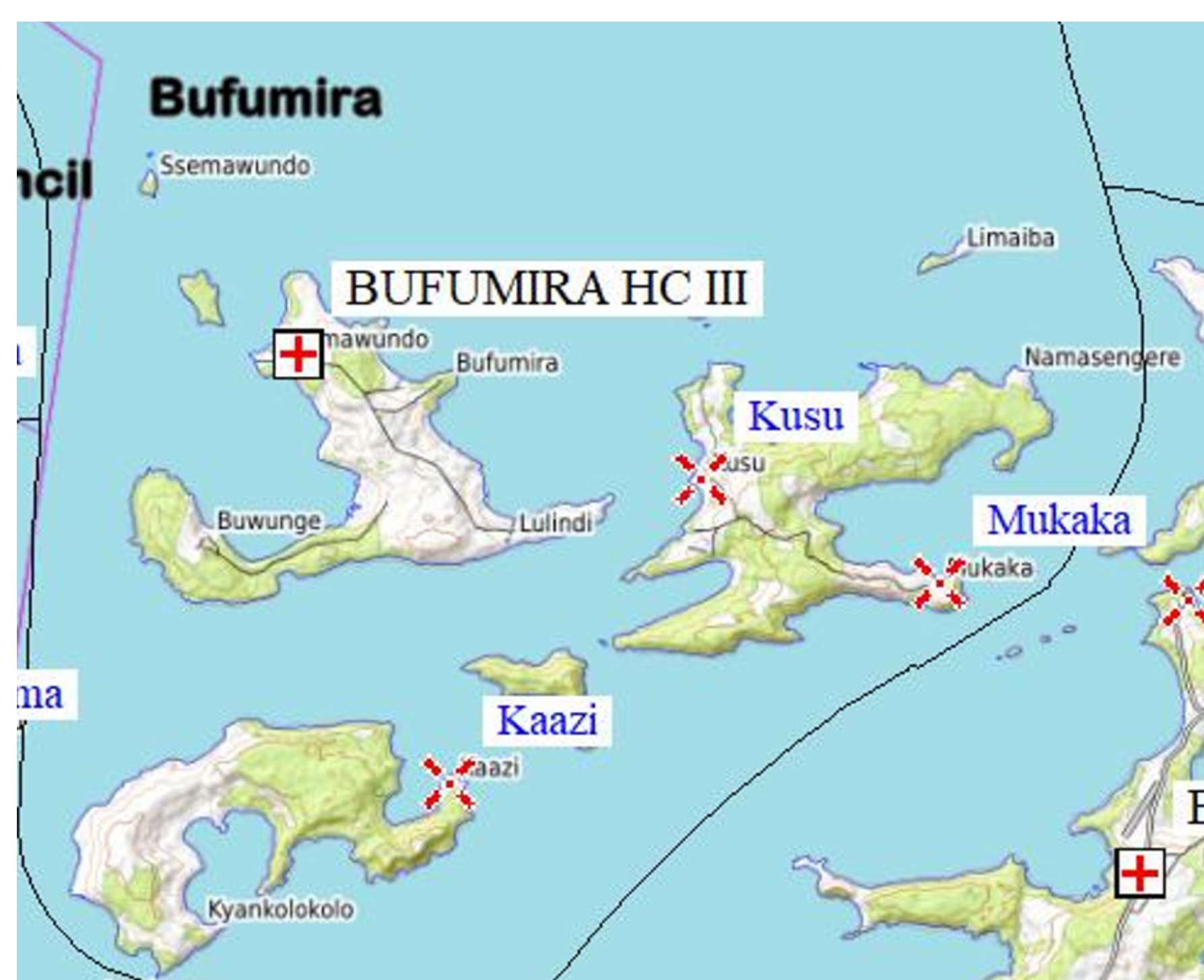
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BACKGROUND

- Kalangala District, located in the archipelago of Lake Victoria, comprises of 84 islands, 64 of which are inhabited.
- The population is primarily composed of fisherfolk, with the highest HIV prevalence in Uganda at 18% (1).
- Access to Antiretroviral therapy (ART) is vital for managing HIV/AIDS.
- Delivering these life-saving medications to remote, geographically isolated populations poses significant logistical challenges (2).
- Boat travels to health facilities from these islands is both costly and hazardous. (See fig 1)

Figure 1 – Map of Bufumira showing landing sites and drone landing zones



METHODS

We undertook a quasi-experimental pilot study to:

- Evaluate the impact of medical drones on delivery of ART directly to patients using Differentiated Service Delivery Models (DSDM) particularly Community Client Led ART Delivery (CCLAD)
- Three weather stations were constructed to enhance safety of operations.

METHODS

- From September 2021 to February 2024, two DJI M300 drones were modified with 3D printed cargo boxes and precision landing capabilities to deliver ART medication directly to patients. (see Fig 2)
- ART patients (n=103) on 6 islands under Bufumira HC III (BHC III) were grouped with Peer leaders (delivery observers) trained to manage drone landing at their respective sites.
- Flight time and distance was recorded and compared to traditional boat delivery.
- Completed a survey at start of drone deliveries to 24 months of follow up.
- Patient retention and adherence was recorded and compared with a control facility, Mazinga HC III (MHC III).

Figure 2 – Peer support leader unloading the medicine from the drones



RESULTS

- ART deliveries were made to 6 islands with 443 flights recorded. (See fig 1)
- The average flight time was 9.3 minutes compared to 35 minutes by boat. (see table 1)
- Average flight distance was 6.8 km with max distance 10.1 km.

RESULTS

- Retention in HIV care was at 100% for BHC III compared to 62% at MHC III.
- Of those that were bled for viral load at BHC II (98), adherence was at 94%, compared to MHC III (57) at 86%.

Other drugs delivered

- Co-trimoxazole
- Isoniazid
- Metformin
- Mebendazole oral
- Paracetamol
- Pyridoxine
- Ketoconazole
- Ciprofloxacin
- Metronidazole
- Emergency refills

Table 1 - Summary of flights

Analysis of flights from September 2021 - February 2024	Total
Number of PLHIV received at least one delivery	103
Number of PLHIV with 24 months of follow up	100
Number of emergency ART deliveries	22
Number of STI samples	37
Total number of flights	443
Average flight time drone	9.3 min
Average boat delivery time	35 min
Average distance	6.6 km

CONCLUSIONS

- This proof of concept shows an increase in retention and ART adherence at BHC III receiving drugs by drones compared to the control MHC III.
- This was the first medical drone delivery project doing last-mile delivery directly.
- Results from this pilot research project have shown drone resilience in breaking geographical barriers for delivery of medical supplies highlighting the potential for scaling.
- Challenges such as regulatory hurdles, drone maintenance and weather disruptions need to be addressed for broader implementation.
- We plan to conduct a cost effectiveness analysis and budget impact analysis on use of drones.

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- Kalangala District Local Government.
- Bufumira HC III staff.
- The community of Kalangala

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