New technology for an old disease: unmanned aerial vehicles for tuberculosis sample transport in Papua New Guinea

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**Background**

Gulf Province is a remote, hard-to-access, swampy region of Papua New Guinea (PNG). For the MSF and Ministry of Health (MoH) Gulf Province tuberculosis programme, transport of diagnostic sputum samples to laboratories is challenging since most peripheral health centres lack road access. Travel is by boat (if the weather permits) or on foot. The current MSF recommendations are that sputum samples must be processed within 3 hours (microscopy) or 3 days (Gene-Xpert) if no cool chain is used. We conducted a feasibility trial on the use of unmanned aerial vehicles (UAVs) to transport samples.

**Methods**

Trials were conducted over 2 weeks in September 2014, of UAVs (equipment and technicians supplied by Matternet, a UAV company) loaded with containers filled with water, which were flown between two accessible peripheral health facilities and the main laboratory in Kerema General Hospital. MSF staff were trained to receive, load, and unload the UAVs. This feasibility test was authorized and supported by the PNG MoH and Aviation authorities.

**Results**

Successful unmanned flights were conducted between three sites. The most successful flight transported the containers in under 1 hour compared with 4 hours by car. The UAVs were sufficiently robust for the environment. Acceptance by the authorities and local population was good, including the community successfully returning a UAV that had fallen in the jungle. No cost-effectiveness comparison with other forms of sample transport was conducted as we were focusing on technology feasibility; this will form part of future trials since the technology requires a large investment for implementation.

**Conclusions**

UAV technology has the potential to support health-care, but needs further development and analysis before deployment. Next steps involve taking the lessons learned from this trial to increase the workload capacity, range, and robustness of the UAV and mapping suitable conditions for use of this technology in MSF projects. Legal hurdles, public health and ethical concerns over the carriage of biological samples would also require further exploration, as does use of UAVS in conflict zones, where they might be associated with military use. We see UAVs being used in: mapping/visualizing refugee camps and disaster areas (already being done); transporting samples and medications to hard-to-reach areas; and transporting essential life-saving emergency medications in remote medevac situations.

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