

FIELD REPORT

Drone Technology to Enhance Healthcare Delivery Access in Uttarakhand

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ABSTRACT

Uttarakhand, a northern state in India is known for its rugged and mountainous terrain. This challenging landscape makes it difficult to deliver medical supplies, especially to the remote and hilly districts. Drones also referred to as unmanned aerial vehicles (UAVs) are increasingly being adopted in healthcare systems worldwide significantly improving access to medical services in remote and underserved areas. All India Institute of Medical Sciences, Rishikesh, Uttarakhand Rishikesh has implemented drone technology in medical practice and organized a capacity-building program for medical officers and other healthcare professionals to integrate drones into healthcare. Training health authorities to utilize drones in the healthcare system in challenging landscapes could enhance clinical and diagnostic services across the state.

KEYWORDS

Healthcare Delivery; Medical Officers; Unmanned Aerial Vehicles; Drone; Hilly Terrain.

INTRODUCTION

In developing countries, the last-mile delivery of medical products poses a significant challenge particularly in hilly and rural areas lacking road connectivity.

The use of Unmanned Aerial Vehicles (UAVs), or drones has surged in recent years especially in healthcare due to their ability to navigate challenging terrains, reduce operational costs, and replace traditional transport vehicles (1). Initially deployed for surveillance and

humanitarian aid, they are now being adapted for transporting medical samples and supplies (2,3). The timely delivery of these supplies is crucial in healthcare but is often delayed by inadequate infrastructure, traffic congestion and harsh environmental conditions. Drones have been used in many parts of the world during the COVID-19 pandemic for carrying out aerial disinfection, delivering COVID-19 vaccines and enabling the transportation of medical samples (2,4).

India has undertaken initiatives across various states to harness drone technology for enhancing healthcare delivery (5). Connecting primary health care centers (PHC) of hilly landscapes with tertiary care centers is a revolutionary approach to improving healthcare accessibility. Scientific research underscores the need for effective training of health authorities to address these challenges. Proper training ensures that healthcare professionals can utilize advanced technologies and implement efficient systems, ultimately enhancing the continuity of care and improving patient outcomes.

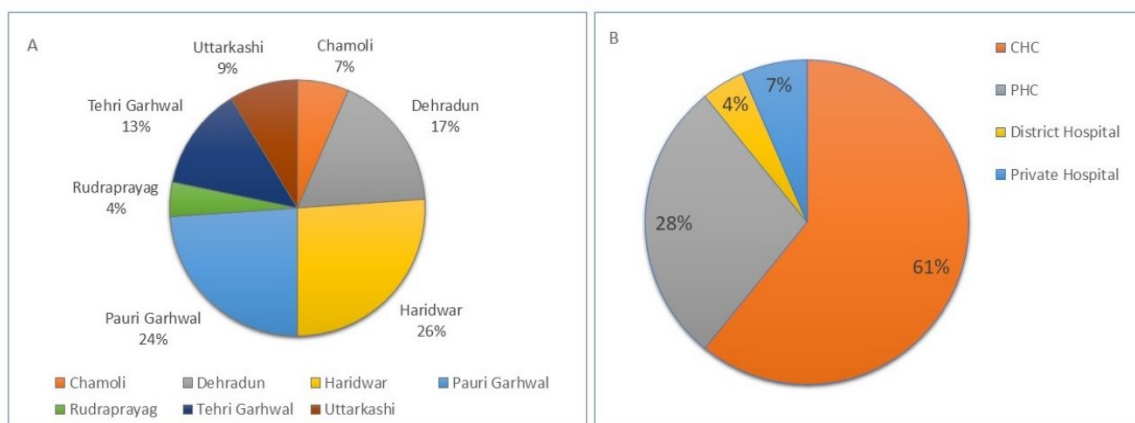
Capacity Building Program for Medical Officers and Healthcare Authorities

AIIMS Rishikesh has conducted trials on drone technology and launched integrated drone services to enhance healthcare access in

challenging terrains. Following directives from the Ministry of Health and Family Welfare, meetings are organized with state officials and training sessions has been conducted for Medical Officers.

These sessions are focused on demonstrating how drones can enhance emergency responses by delivering medical supplies to remote areas. A capacity-building training program for medical officers and other healthcare professionals on integrating drones into medical services was held on April 6, 2024. A total of 46 medical officers from 11 PHCs, 27 CHCs, and 2 district hospitals across seven districts in Uttarakhand—Haridwar, Dehradun, Pauri Garhwal, Tehri Garhwal, Rudraprayag, Chamoli, and Uttarkashi—participated in this training program (Figure 1 & 2).

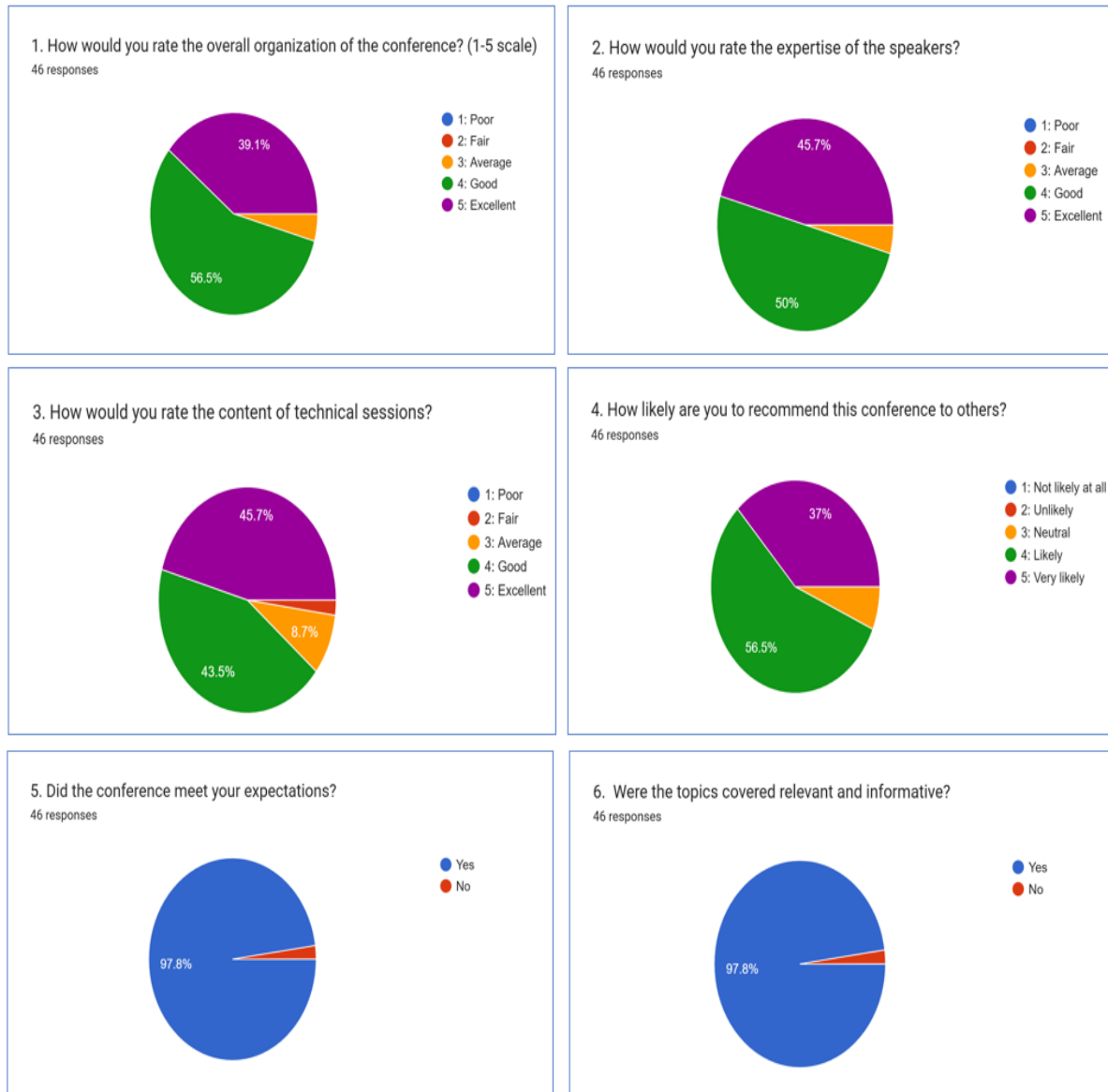
Figure 1 (A&B) shows the participation of medical officers from different districts and locations of health centers in Uttarakhand



The technical training sessions delved into the introductory session followed by a session on generating use cases for drone based areial transportation, hands-on session and an expert panel discussion on planning strategies for use of drone in healthcare. These sessions emphasized drones’s role in expediting emergency response, delivering medical supplies to remote areas, and enhancing patient care accessibility. Experts from cardiology, trauma surgery, emergency medicine, transfusion medicine, and

telemedicine emphasize that drone technology and telemedicine services work particularly well together in emergency scenarios where rapid medical intervention is crucial. Detailed deliberations focused on employing drones for transporting medical supplies and managing emergencies. The discussions emphasized the importance of a collective and collaborative approach to effectively integrate drone technology into healthcare.

Figure 2 shows suggestions and the inputs received from Medical Officers (The pie chart was generated from a Google Forms(<https://forms.gle/JFGPexMCSLjUJciW9>)). A low percentage value (%) inside or outside the pie chart is not displaying in the response output file.



During the panel discussion, various use case scenarios were explored, demonstrating how drones have the potential to transform the distribution of vital medications for conditions such as tuberculosis (TB), stroke, myocardial infarction, and other emergencies. The discussion also highlighted the use of drones to deliver treatments such as acetazolamide and dexamethasone to patients (pilgrims and tourists) suffering from high altitude sickness. This underscores the valuable role of drone technology in improving patient care during emergencies. From a cardiology perspective, deploying drones could greatly help close the

gaps in the availability of heart-related medications and emergency treatments in remote areas. Notwithstanding the positive applications, several challenging factors need to be taken into consideration, including identifying suitable operational sites for drone deployment and landing, training of technical personnel, and coordination with state health authorities and district administration.

CONCLUSION

Integrating drone transport into healthcare represents a transformative approach to addressing logistical challenges associated

with the medical supply chain, particularly in hard-to-reach and difficult environments.

RECOMMENDATION

The global drone market has experienced significant growth in recent years as their applications are evolving rapidly in medicine and other areas. However, in the Indian scenario, advancements in drone technology, establishment of national regulatory framework, and training of healthcare personnel are essential for successful implementation of UAVs based aeromedical transportation.

RELEVANCE OF THE STUDY

Healthcare accessibility in the hilly areas of the Himalayas is a significant challenge. Beyond visual line of sight (BVLOS) drones are emerging as a solution to navigate these terrains effectively. This training program empowers healthcare officials to effectively integrate drone technology in health care for improving clinical and diagnostic services in remote areas.

AUTHORS CONTRIBUTION

All authors have contributed equally

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Nil

CONFLICT OF INTEREST

There are no conflicts of interest.

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DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The assistance of ChatGPT and Grammarly was utilized for grammatical corrections.

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