

A study on the role of Unmanned Aerial Vehicle in healthcare services

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Abstract: Unmanned aerial vehicle (UAV) commonly known as drones have seen increased development in the recent decade. The purpose of this secondary analysis is to understand the current and future application of emerging drone technology in public healthcare services and explore the challenges in using the Unmanned Aerial Vehicle. The larger importance of the drones has been exposed by the COVID-19, they are being used for surveillance, broadcasting, and disinfecting the affected area. In rural areas the delay in diagnosing diseases due to lack of laboratory facilities can be overcome by delivering blood sample, anti-venom for snake bite via drones in a short time. Apart from being deployed for the healthcare, drones are widely used in defense, agriculture, etc.. The organ transportation can have a new form with the advent of drone technology. However, the Indian drone industry is not fully utilized. There is a need for more incentive and technological changes to cater to the growing demand

Keywords: Unmanned Aerial Vehicle, Healthcare, COVID -19, Delivery.

1. INTRODUCTION

Unmanned Aerial Vehicle (UAV) commonly called drones have undergone enormous growth over the past. In this day and age, we are all surrounded by every kind of technological developments that make our life smooth, effortless and economical. The sort of indigenous growth required to steer the following era of aerospace will result from economic innovation and India has the correct element needed to stimulate this.

The pandemic has demonstrated the technological viability of drones in the healthcare sector [11]. The ability of UAV to cut back the value of compliance and price of technology, while also enhancing the worth of the knowledge gathered through these systems has been the key drivers for increased adoption of UAV in India and around the world. The usage of drones predominantly was in warfare by the military until the top of the 20th century. Except for these, drones are used for a myriad of things including film making, commercial surveillance, construction, fishing, mining, agriculture, and medical field. Drone application incorporated with other synergetic technologies like 3D modelling, Artificial intelligence, has opened a world of possibilities for the organisation to leverage the employment of UAV operations[4].

Currently, the transportation of medical goods in times of critical need is prescribed to road transport and manned aircraft, these options often end up in heavy cost and ineffective means during emergencies. Providing aid to people who are in need through the assistance of drones can save the lives of individuals.

2. LITERATURE REVIEW

Unmanned Aerial Vehicles(drones)in public healthcare: A SWOT analysis-Karthik Balajee Laksham(2019)“Unmanned aerial vehicles also known as drones is an aircraft without a human pilot on board. The study is on the strengths, weakness, opportunities and the threats to drones and its usage in public healthcare. These are assessed so that they can be utilised and avoided accordingly”

A role for drones in healthcare-jeremy tucker (2017) “Healthcare organizations already are deploying mobile technology to solve some of the problems in the industry today. Likely in the foreseeable future, drones, robots and artificial intelligence will assume many tasks in healthcare that are performed by humans, to reduce variability, cost and error.”

Using the unmanned Aerial vehicle delivery decision tool to consider transporting medical supplies via drones-Margaret Eichleay , Emily Evens, Kayla Stankevitz and caleb Parker(2019) “describes challenges for integrating UAVs into complex health systems and presents a tool for considering whether UAVs could help address medical transport challenges and how they can be integrated into health systems. If a decision to implement UAV delivery is made, gathering evidence on those activities will enable sustainable and careful integration of this new technology that is likely to revolutionize the transport sector in the next decade.”

Use of unmanned aerial vehicle for medical product transport-Cornelius Thiels, Johnathon Aho, Scott P .Zietlow, Donald H. Jenkins(2015) “This article explores the demand for, feasibility of, and risks associated with the use of UAVs to deliver medical products, including blood derivatives and pharmaceuticals, to hospitals, mass casualty scenes, and offshore vessels in times of critical demand. The role of using UAV for medical support is promising, but further research to access the feasibility, demand and safety of UAV is restricted.”

Drones in medicines-The rise of machines-Manohari balasingam FRCP (2017)”Drones are rapidly developing technology with increasing worldwide applications. They have developed into a valuable tool in medicine. Drones are showing significant potential for transforming healthcare and medicine in the 21st century.”

3. OBJECTIVES OF THE STUDY

The objective of the study is to analyse the current and future applications of Unmanned Aerial Vehicles(drones) in the public healthcare services and aims at exploring the usage and challenges in Unmanned Aerial Vehicles.

4. RESEARCH METHODOLOGY

Research Design

The Study used descriptive research design. Descriptive research is a fact-finding approach generating across a sectional study of the present situation. It ascertains and describes the prevailing conditions of facts in groups .It is used when the purpose of the study is to inquire about the prevailing conditions of events, objects or people.

Tools for data collection

Secondary method:

The secondary data used for conducting the study was collected from various sources such as articles journals, magazines, newspapers etc.

5. APPLICATIONS

Drones in the medical transport system

One recurring problem that global health organizations run into is the people’s inability to access basic medical aid. Hospitals and clinics are miles away, some cannot make the walk while others simply cannot afford the journey. Access to the right medical care at an appropriate time has been a struggle in rural areas. Drones are an alternative for the transportation of medicines to rural areas, including blood products and medicines. This greatly improves access to medicines at the right time for the population living in areas that are difficult to reach.

In developing countries, such as India, there is a shortage of safe blood, to reach many places .For rural areas which lack access to nearby clinics, or infrastructure for collecting blood products, drones provide better access. Drones are used in transporting the blood from blood banks in towns and cities to a remote health centre [10]. In tehri district, Uttarakhand, drones were used for the first time to transport blood unit from primary health center to state hospital covering 32 km in 18 minutes was the small step towards exploring its viable uses in India.

Drones are accustomed to deliver essential medicines like anti-venom, which can prevent death in rural areas[10]. In India, Meghalaya has started an initiative to delivering lifesaving anti-snake venom to remote areas of Meghalaya via drones [8].

Drones in disaster management

The paramount importance during an occurrence of disaster is that the time taken to retort to the situation. The rescue team must be able to reach in time, any delay may cost a life. In such a situation, drones are exceptionally useful as they supply a bird's-eye view of the whole affected area in an exceedingly short period. Drones send real-time video to the rescue teams to know the state of damages inflicted on the region and spotting trapped survivors. The Disaster management team then can effectively plan a rescue mission and assist in directing stranded people to safe locations and providing first aid medical support. Drones were widely used during the Nepal earthquake, Uttarakhand floods, Pune landslides, Kerala floods, etc.

During the Uttarakhand flood, the National Disaster Management Authority (NDMA) deployed 4 drones to scan areas where search and rescue teams could not access. Further 10 more drones were used for rescue operations by State Disaster Management Authority [16]. Similarly, drones were used in Himachal Pradesh to trace 24 engineering students who were swept away by the Beas river [7]. The National Disaster Relief Force has also deployed drones to survey landslides at Malin, Ambegaon, in Pune and also used for spotting stranded people in the forest and isolated areas in Badrinath during Uttarakhand floods [16]. Similarly, UAV's played a significant role in searching and rescuing operations during Nepal earthquake [9].

Recently, drones have quickly emerged as a significant technology for public safety agencies during the COVID-19 crisis, as they will safely monitor public places and make sure that people are practising social distancing. Drones are getting used in many places for broadcasting vital information's and providing awareness messages over loudspeakers about the notified disaster. Drones also are used for spraying disinfectants within the affected areas, UAV thus provides advantages over traditional methods of operations. It performs the task 50 times faster than humans, and the method covers both air and ground without posing risk to human operators. It also helps in supplying emergency medical deliveries [11]. Moreover, the police department in some places like Bangalore, New Delhi, etc are using drones with thermal scanners to check and record the body temperature of people [12]. Thus drones are now turning into an essential service to fight against the COVID-19 pandemic.

Medicine from the sky

The World Economic Forum center for the fourth historic period network and Apollo hospital unitedly with the Telangana government have set to launch an innovative project to deliver emergency medical supplies like blood, organs, and vaccines via drones [13].

The project called medicine from the sky run in partnership with the government and Healthnet global limited.

The project is anticipated to enable growth in healthcare supply chains and effectively pander to last-mile deliveries to reinforce national health care programmes.

The WEF has also worked with other countries around the world to experiment with drones for the delivery for the past five years. One in all the key samples of this in Rwanda, where the experiments matured into national implementations.

Through drones, Rwanda had reportedly cut the delivery time of medical goods from four hours to fifteen minutes, in some cases, and saved thousands of lives through this process. This has gathered international attention. It has led to international bodies, government and healthcare system now getting down to consider the impact of drone delivery. This can immensely benefit remote regions in Telangana and the other states [13].

6. FUTURE OF DRONES IN INDIA

Every year, nearly 4 lakh people in India die, waiting for an organ. India's rate of organ transplants is one of the lowest in the world, at a rate of 0.8 per million population. The demand for organs far exceeds their supply [15]. One of the substantial challenges in organ transplantation is in moving the donated organ from the donor to the recipient admitted in another distant hospital within the shortest possible time [10]. So, for someone in need for an organ transplant, when it involves transportation of donated organ, every second count. To avoid the delay in transporting, the traffic police departments usually block the traffic and make way for the ambulances carrying the organs. In our society there is a mass wastage of donated organs. The reason is, that it is not feasible to transport the organ to a recipient with a given time. To help save more lives, India must decide to take a lead and make use of drones for transporting organs. With the

employ of Unmanned Aerial Vehicles (drones), organs can be transported from one hospital to other within a very short period. .

Many of the rural places lack proper laboratory facilities, Drones can be used to tackle this issue by delivering medical support including diagnosing diseases or perhaps tools like portable ultrasound to remote areas [1]. This can help to reduce the time consumed for diagnosing diseases. Moreover, Drones even have the potential to transport defibrillators to patients in cardiac arrest, this reduces the crucial intervention time after a heart attack and lifts the chances of survival of the victim [14].

Even though drones are often related to open-air activities there are practical applications of UAV in indoor locations also. Its main goal is to yield independent healthcare assistance to the elderly at home. Drones can navigate around the house and assist in taking medicines and food for the elderly [3]. Similarly, Drones are means to provide floor-to-floor transport capabilities for specimens and medications i.e. they can be used to transport samples and medicines in hospitals from one floor to a different or from one building to a different one [3].

7. CHALLENGES

Safety concerns.

- Transporting medicines through drones need to be carefully monitored. The temperature of storage, vibration, duration of transportation can affect drug efficacy and specimen's data results [1]. There is also a possibility of an accident when there is a battery failure, wrong navigation, collisions etc. which can adversely impact the health and survival rate of a person.

Security hazard

- Drones are of immense aid during a natural disaster for surveillance and collecting data. But the chances of sophisticated drone technology getting into the wrong hands increases exponentially. The drones utilized for medical purpose can be mistaken as terrorist drone and vice versa. With the advent of technology, it is easy for hijackers to hack the GPS using jammers and rob the drones or the payload[10].

Regulations

- Drones in healthcare were vague till the pandemic, there were either highly sophisticated drones in defense or those widely used in photography. Pandemic has changed the situation and India's drone industry was not prepared for this. All drone manufacture in India are going through a tiresome regulation before getting a manufacturing license. As of now, India is depending more on imports because of the expensive domestic drones. And many of these imported drones do not even comply with the DGCA requirements.

8. CURRENT REGULATIONS OF GOVERNMENT OF INDIA

In 2014, India enacted a sudden ban on the employ of civil drones. This came after a Mumbai based pizzeria tried to use an unmanned aerial vehicle to airdrop pizzas in its vicinity .This has impacted the emerging drone industry in India .It took about four years for the government agencies to understand the importance and unexplored opportunities in drones.

India's Directorate General of Civil Aviation (DGCA) announced the country's first Civil Aviation Requirements (CAR) for drones on August 27, 2018 to go into effect December 1, 2018[6], [2].

DRONE CLASSIFICATIONS

The policy classifies drone based on the total weight with cargo and battery and these include

- Nano less than or equal to 250 grams
- Micro drone from 250 gram to 2 kg
- Small drone from 2kg to 25 kg
- Medium from 25 kg to 150 kg
- Large - Greater than 150 kg[2]

OPERATIONAL REQUIREMENTS

- All drone except those in nano category is mandatory to register and get a unique identification number.
- The policy proposes that for operations at or above 200ft Above Ground Level (AGL) in uncontrolled airspace, to get necessary clearances from concerned Air Traffic Services (ATS) unit.
- The mandatory equipment required for operation except nano category are (a) GPS, (b) Return-To-Home (RTH), (c) Anti-collision light, (d) ID-Plate, (e) Flight controller with flight data logging capability, and (f) No-Permission No Takeoff (NPNT)[2].

REGISTRATION

- Digital sky platform is that digital platform that implements No permission –No takeoff (NPNT). Users are required to seek a one-time registration of their drones, pilots and owners[2]. For each flight (exempted for the nano category), users are required to ask to raise permission to wing a mobile app and an automatic process permits or denies the request instantly. To forestall unauthorized flights and to confirm public safety, any drone without a digital permit to fly will simply not be ready to takeoff.
- The civil aviation ministry and the Directorate General of Civil Aviation(DGCA) has introduced an online portal, GARUD (Government authorisation for relief using drones) to just accept applications from government agencies to allow usage of the drone. GARUD was developed by the National informatics centre within eight days. The target of the portal is to assist government entities in seeking fast-track exemptions to COVID-19 related drone operations[5]. Any government department can apply for these exemptions on the GARUD platforms.
- Digital sky platform has divided the airspace into three categories red, yellow, and green. Red means “no fly zone” and includes airspace near international borders, near airports and other strategic locations. Yellow is “restricted zone” which incorporates airspaces which require an Air Defense Clearance/ Flight Information Centre (FIC) number from Air Traffic Control. Green is “unrestricted zone”.

DGCA has also set forth a group of regulations which require to be complied by all the drone pilots of the country. A Unique Identification Number (UIN) just like the number plate of a car must be issued for all drones (except for nano category) from DGCA 2].

9. FINDINGS AND SUGGESTIONS

- Medicine from the sky, the first step by Telangana government can turn as an evidence-based approach, that can inspire all the other states to implement drones in healthcare to transport medical support.
- The unprecedented situation has explored the capability of drones in healthcare and has brought in new investment in drone startups, changing regulations, even new business opportunities. Reckon with post-pandemic period separate research and development must be initiated in healthcare to implement the drone technology in rural and urban areas. It has the potential to transform public healthcare services. The future of drone technology puts forward vast opportunity and fully utilized can aid in improving the standard of living of people
- We recommend geofencing technology be inbuilt in domestic drones. Geofencing technology will keep the drones outside the restrictive areas which include airports, defense area and other strategic location. Malicious drone induced collusion or risk can be prevented altogether by this technology, better than relying on a drone pilot completely.
- The drone is now being increasingly utilized for delivering medicines and surveillance, possess public security and privacy threats. Anti-drone technology can be developed to address the threats posed by Unmanned Aerial Vehicle.
- Domestic drone industry is still evolving and manufactures must go through a tiresome procedure to be complied before getting a license. We recommend that regulatory and fiscal incentive can be provided to make drones commercially viable and ensuring all drone components are manufactured in India. The drone industry has exponential growth capability, and this must be timely utilized by Indian industry.

- Pandemic has created a surge in demand for drones in healthcare. It has created an urgent need to set up a framework and tools to ensure appropriate handling and reliance in using drones for delivering medical products. Storage temperature, vibration, and duration, while transporting medical product should be taken into consideration and required adaptation be made in conventional stability testing.

10. CONCLUSION

The unmanned aerial vehicle is a rapidly developing technology with vast applications. They are supposed to revolutionize the short-range delivery and logistics in healthcare services. Major drone applications in medicine include providing disaster assessments when other means of access are severely restricted. Drones are utilized for delivering blood and anti-venom to hospitals in remote areas. During the pandemic period drone have been widely used for surveillance, broadcasting, medical supply, spraying disinfectants, and curbing Covid-19 spread .UAV is showing exponential growth in transforming healthcare and medicine.

Since the pandemic has exposed drone industries potential in healthcare, it is bound to grow. This developing and innovative industry needs regulatory and fiscal incentives to boost indigenous production. Adequate research and development and resources reckoning with the post-pandemic period is essential. It is vital to reshape the conventional methods and inbuild new technological changes to cater to the growing demand

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