Innovative application of drone in monitoring the ICU patients avoiding personal visits

Introduction

Hand transplant is a rare and complex surgery, and only eight transplants have been performed in India till date. Monitoring of a hand transplant patient involves monitoring for saturation in the transplanted limb, which can be visualized from the monitor, and the vitals of patient. This requires either constant presence of a doctor or repeated visits to the isolation intensive care unit (ICU). Repeated visits can increase the risk of cross infection as well as the waste of consumables such as cap, mask, and gown, which are being used every time a doctor/health-care professional enters the room. Using a drone circumvents these issues and helps us in monitoring the patient remotely, without any direct patient contact.

Materials and Methods

A 36-year-old man, a bilateral upper limb amputee, underwent bilateral cadaveric upper limb transplantation in our hospital. The patient was on immunosuppressants preoperatively and postoperatively. Hence, he was kept in an isolated transplant ICU, where only limited personnel were allowed to enter to monitor the patient.

Instead of the conventional method of monitoring the patient, we used a drone to monitor the patient.

Materials used: Drone: IZI JX 1601HW RTF Mini WiFi FPV with 720P Camera Altitude Mode Foldable Arm RC Drone Quadcopter: 2.0 MP White with a weight of 191 g was used. It operated with the National Knowledge Network (NKN) in Jawaharlal Institute of Postgraduate Medical Education Research, Puducherry, India.

The drone's camera was 2 megapixel High Definition, which could be adjusted manually.

It also had a console, which could be used to control the drone, as well as a rechargeable battery. The phone/monitor could be attached to the console. The flight range of the drone was 30 m [Figure 1].

The doctor who wanted to monitor the patient used the console to direct the drone into the patient's room to view the patient's vitals in the monitor, and only if required, the doctor went inside to intervene [Figure 2-4].

This helped in significantly reducing the rate of infection in the patient.

Feedback was taken from the person using the drone, and it was found to be satisfied [Figure 5].

Discussion

The term "unmanned aerial vehicle" was first coined in the 1980s to describe autonomous, or remotely controlled, multiuse aerial vehicles that are driven by aerodynamic forces and are capable of carrying a payload.[1]

According to the Directorate General of Civil Aviation, drones have been classified into the following five categories:[2]

1. Nano: Less than or equal to 250 g.
2. Micro: From 250 g to 2 kg.
3. Small: From 2–25 kg.
4. Medium: From 25–150 kg.
5. Large: Greater than 150 kg.

One of the most promising uses of drones is in the emerging field of telemedicine—the remote diagnosis and treatment of patients by means of telecommunications technology.[3] Hence, we extended the application of drone in surveillance in monitoring the patients who have been isolated, where cross infections can happen due to repeated visits, such as bilateral upper limb cadaveric transplant.

The main disadvantage of drone is that it requires a skilled operator to guide the drone using the console or else it could lead to injury to the patient or damage to the equipment.

Figure 1: Nanodrone with the operating console

Figure 2: Doctor monitoring the patient via picture through the drone

Figure 3: Doctor monitoring the patient via picture through the drone

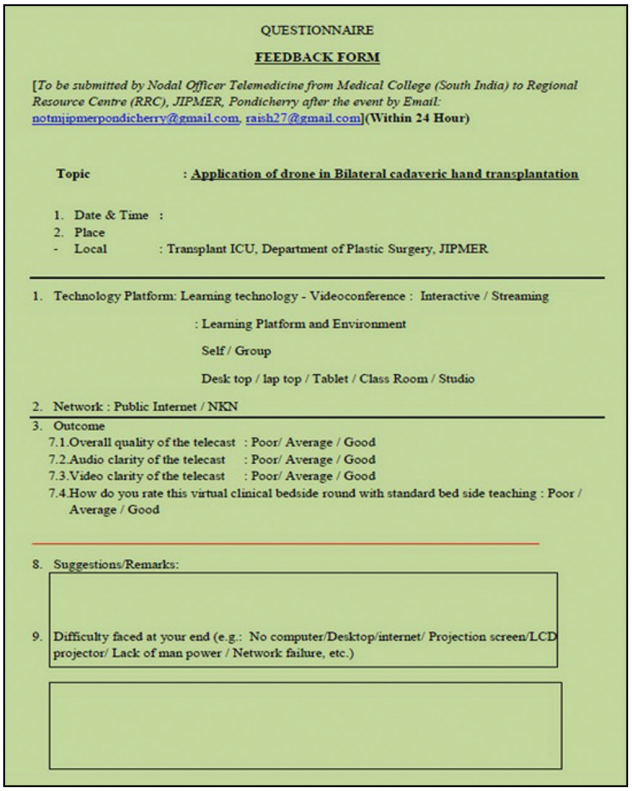
Conclusion

Drones have a promising feature in the field of medicine. Initially invented for military, this can be used as a surveillance tool to increase the accessibility of care to patients who have been isolated. But the main obstacles of these are security and privacy of patient information, Federal Aviation Administration regulations, computing errors, cost, and requirement of skilled personnel. Hence, further research into this topic is essential to tackle these obstacles.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Figure 4: Drone monitoring the patient



QUESTIONNAIRE

FEEDBACK FORM

[To be submitted by Nodal Officer Telemedicine from Medical College (South India) to Regional Resource Centre (RRC), JIPMER, Pondicherry after the event by Email: notmjipmerpondicherry@gmail.com, raish27@gmail.com](Within 24 Hour)

Topic : Application of drone in Bilateral cadaveric hand transplantation

1. Date & Time :
2. Place
- Local : Transplant ICU, Department of Plastic Surgery, JIPMER

1. Technology Platform: Learning technology - Videoconference : Interactive / Streaming
: Learning Platform and Environment
Self / Group
Desk top / lap top / Tablet / Class Room / Studio
2. Network : Public Internet / NKN
3. Outcome
7.1.Overall quality of the telecast : Poor/ Average / Good
7.2.Audio clarity of the telecast : Poor/ Average / Good
7.3.Video clarity of the telecast : Poor/ Average / Good
7.4.How do you rate this virtual clinical bedside round with standard bed side teaching : Poor / Average / Good

8. Suggestions/Remarks:

9. Difficulty faced at your end (e.g.: No computer/Desktop/internet/ Projection screen/LCD projector/ Lack of man power / Network failure, etc.)

Figure 5: Feedback form

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Newcome LR. Unmanned aviation: A brief history of unmanned aerial vehicles. Reston, VA: American Institute of Aeronautics and Astronautics; 2004.
2. Tyagi N. The Drone Policy 2018. 2019. [cited 9 January 2019]. Available from: http://www.khuranaandkhurana.com/2018/09/20/the-drone-policy-2018/. [Last accessed on 9 January 2019].
3. Breen GM, Matusitz J. An evolutionary examination of telemedicine: A health and computer-mediated communication perspective. Soc Work Public Health 2010;25:59-71.

Padmalakshmi Bharathi Mohan, Ravikumar Chittoria, Vinayak Chavan, Abhinav Aggarwal, Saurabh Gupta, Chirra Likhitha Reddy, Imran Pathan, Mohamed Ishaq

Department of Plastic surgery, JIPMER, Pondicherry, India

Address for correspondence: Dr. Ravikumar Chittoria, Professor, Department of Plastic Surgery, JIPMER, Pondicherry, India.
E-mail: drchittoria@yahoo.com

Access this article online

Quick Response Code:

Website: www.jcasonline.com

DOI: 10.4103/JCAS.JCAS_6_19

How to cite this article: Bharathi Mohan P, Chittoria R, Chavan K V, Aggarwal A, Gupta S, Reddy CL, *et al*. Innovative application of drone in monitoring the ICU patients avoiding personal visits. J Cutan Aesthet Surg 2019;12:149-51.