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Drone "A sky ambulance": The future of medicine and safe road to health

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Abstract
Time is crucial in healing, no matter whether it's about a natural disaster, heart attack or an organ transplant. In future medical emergencies, where urgent response will be necessary, drones will mean the fastest answer. They will fly the extra mile in delivering drugs, vaccines, blood or organs.

Keywords: UNICEF, detonate, telemedicine, postpartum hemorrhage

Introduction

Growing Acceptance: While drones have only recently been more widely accepted in the medical community, they were previously used to deliver small aid packages following the Haitian earthquake in 2012.

Doctors without Borders also used them to transport TB test samples from a remote village in Papua New Guinea. Furthermore, drones have successfully delivered condoms and birth control to women throughout Ghana. Delivery of medical supplies and blood products is just the tip of the iceberg. Amazon Prime Air is pioneering drone delivery of other goods. The unmanned aerial vehicles are able to transport items as heavy as five pounds to locations up to 30 minutes away.

Private trials have been run in the United Kingdom and there are multiple development centers in the United States, Israel, the United Kingdom, and Austria. According to any times interview in December 2016, the first Amazon drone successfully delivered goods to a home in Cambridgeshire, England.

The implications of drone delivery systems are vast and truly unknown. Drones have the potential to revolutionize medical care, and this is only the beginning.

Drones are the future of delivery

According to my geek calendar, 2017 will be the year of the drone. These advanced versions of model airplanes or unmanned aerial vehicles are everywhere on the rise. According to the estimates of the Consumer Technology Association, 9.4 million units were projected to be sold in 2016 worldwide; and the number will soar in 2017.

Fig 1

Drones eagerly respond to disasters

One of the earliest medical utilization of these unmanned aerial vehicles was in catastrophes. Various drones successfully delivered small aid packages after the Haitian earthquake in 2012. They were also able to help in humanitarian operations for collecting data and imagery where infrastructure was destroyed or already lacking; including in the Philippines after Typhoon Haiyan in 2013. This year, after the Obama administration somewhat eased the use of small drones by real estate agents, farmers, filmmakers and countless other commercial operators, experts tested drones in New Jersey for disaster response. In December, two disaster drones delivered telemedical packages to victims and rescue personnel in a simulated mass casualty event at an airport in Mississippi. I believe that within the next 3-5 years, technology and regulation will allow for the development of a more effective disaster response with the help of these small and agile helpers be a steady scaling up of impact."

Drones that have been tested in the U.S. have shown promise for improving the nation's rural healthcare. July 15, 2015, marked the first time medicine was delivered and received by drone in a rural area, during the Wise Expedition—one of the largest annual medical outreach events in the country

"There's so much healthcare disparity here in the mountains," Dr. Teresa Gardner Tyson, executive director of Health Wagon, which operates a mobile clinic in southwest Virginia, told The Rural Monitor. "So anything that we can put in our armor to address healthcare disparities, any resource that we can bring to the region, it's all welcomed."

After a massive EF4 tornado ripped through Hattiesburg, Miss., in 2013, researchers at William Carey University College of Osteopathic Medicine began rethinking how to respond to medical emergencies during disasters, the Healthcare Integrated Rescue Operations project, known as HIRO, which uses a modified drone capable of carrying a 20-pound medical kit.

"Embedded inside the kit is a Smartphone, which enables a live video chat between the injured party and the physician," said Dr. Italo Subbarao, an associate dean at Carey who led the team

The possibilities for drones in healthcare are vast. They can

help deliver lab tests to diagnose patients faster, distribute contraceptives, help disaster victims with necessities and more. The sky's the limit.

Few technologies have undergone as radical a change as drones. Where five years ago, unmanned aerial vehicles, UAVs, or drones, were mainly seen as an instrument of war, today they are far more likely to be flown by a wedding photographer than an airman. Earlier this year, the Consumer Technology Association estimated that globally 9.4 million civilian UAVs will be sold in 2016.

Increased reliability, ease of use and much lower prices have also made drones a viable technology for humanitarian responders. Rarely a week goes by without a new idea for how UAVs can revolutionize humanitarian aid: from drones that promise to detonate landmines to edible drones.

However, this hardware centric view often neglects drawing on humanitarian best practice, respecting legal frameworks, or considering ethical aspects of humanitarian innovation.

At the core of the research were 14 case studies from 10 countries that looked at the impact of drones in situations ranging from search and rescue, to damage assessments and camp management to transporting medical samples.

The technology is mature so that skilled users can quickly produce information products that are of immediate use for humanitarian programmes: drones can take photos that have 10 times as much detail as satellite images.

In addition, they can fly underneath cloud cover that often blocks the view from space. The results are especially useful in countries that experience recurring disasters such as floods, storms or landslides, where precise maps can help empower communities to increase their own resilience to natural hazards or reduce risks to lives and livelihoods.

Drone in Action

Drones have been successfully used in Rwanda, Taiwan, Nepal, and other countries to reach remote villages and hospitals. Most recently, California-based Zipline will bring its drone delivery program to rural communities in Maryland, Nevada, and Washington, including some Native American reservations.

Fig 2

Before the use of medical drones, it would take an average of four hours to make an emergency delivery to a hospital. Drones are able to make the same deliveries in approximately 15 minutes.

Hospitals using this technology order the medicine or blood via text message, and the product is delivered via a disposable parachute launched from the drone.

The unmanned planes are navigated using cellular networks and GPS, and can make deliveries within 30 minutes.

Another project uses drone delivery of medications in conjunction with telemedicine appointments in rural Maryland. Finally, Zipline and their drones would link large healthcare centers to hospitals and tribal clinics near Reno, Nevada.

Malawi, Drones, and HIV

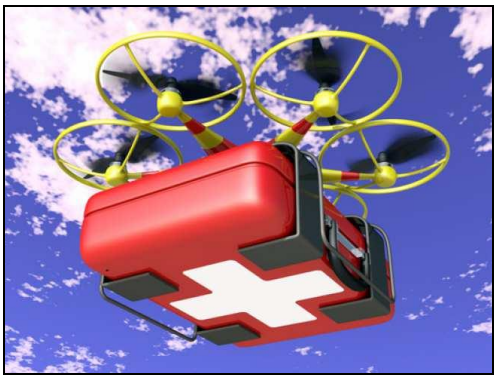

Fig 3

Matternet, another US-based tech company, partnered with UNICEF to deliver HIV testing kits to clinics and hospitals throughout Malawi. According to UNICEF, approximately 10% of Malawians have HIV, which is currently one of the highest rates of infection in the world.

Drones, capable of carrying 250 tests, pick up testing kits from clinics throughout Malawi and then make laboratory deliveries. Despite an overwhelming percentage of HIV+ patients, there are currently only eight labs able to run these tests.

In Malawi, HIV medications are not provided until there is a positive test result. Without the use of drones, it can take almost two months for results to be returned – this time frame delays medical treatment in newborns as well as newly infected adults.

UNICEF predicts that drones will be more cost-effective than the current mode of transportation and will speed the delivery of life-saving medications.

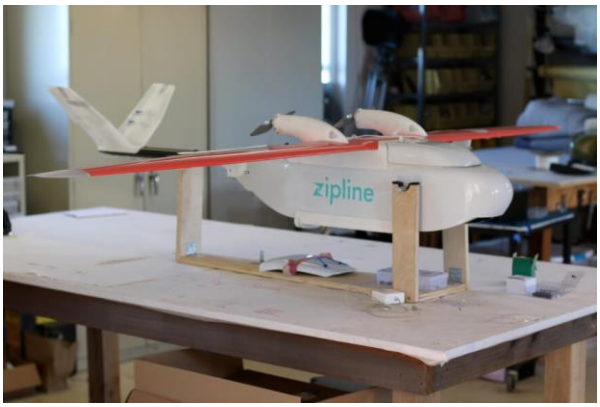

Fig 4

The future use of drones in healthcare also is very thought provoking.

The rapid delivery of vaccines, medications and supplies right to the source could quash outbreaks of life-threatening

communicable diseases. Communication equipment, mobile technology, portable shelter comprises the vast list of what could be delivered in a rapid fashion to areas where critical infrastructure damage would prevent ground or typical air transport.

This technology may allow more people in nursing homes to receive care at home for a longer period of time, which would increase the independence of the growing boomer population as they age. A drone could keep tabs on a patient living at home with dementia or deliver a meal to someone who cannot prepare his or her own meals. I can envision drone automated external defibrillators (AED) that would fly to the patient in a public space to provide rapid defibrillation for ventricular fibrillation. No longer would a person have obtained AEDs from a specific location that may be challenging to find in a rapid fashion. Simply summon the AED with the push of a button or smart phone app.

Healthcare organizations already are deploying mobile technology to solve some of the problems in the industry today. Mobile devices, wearable tech, remote monitoring, telemedicine and information sharing platforms all are transforming healthcare. 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.

FAA approved drone fields are dotted around the United States -- open fields where you can legally indulge your drone hobby. This special white drone is made of Styrofoam, weighs just four pounds, and costs less than $100. This hobby-grade drone could represent the future of medical delivery.

Fig 5

If access to labs and transporting samples for medical testing were some of the biggest hurdles because of traffic, poor roads and lack of accessibility, why not remove those factors altogether? Why not fly the samples in a drone?

"The idea for using drones first came from the problems of moving samples internationally,", "There's a need in places that are really poor that don't have roads. And then in places like here in the United States, we have issues with traffic."

Future

As more innovations are made and users continue to become more proficient, a whole other world of opportunity and potential applications will open up. The industry is eager to fly beyond visual line of sight, and many hope that is addressed more specifically in the next set of rules. For now most seem happy with the guidance they finally have from the FAA and are looking forward to seeing this industry continue to grow.

In the future, small indoor drones could deliver medicine to the bedside of a patient from the pharmacy, thus eliminating some human steps. This would lead to more rapid and less error prone administration of medications. Nurses and pharmacists can work more efficiently as supplies can be summoned to the bedside instead of the time consuming task of gathering necessary items.

Drones could deliver medications and supplies to patients being cared for in the home instead of a hospital-based setting. The future will see more outpatient care and even home-based care that used to be delivered in the hospital. For many conditions, drone technology may make it easier and safer to provide this home-based care. When a provider rounds on a home patient, blood can be drawn and immediately sent by drone to the lab to be tested. Medications, antibiotics and treatments ordered by the provider may be delivered to the home by drone.

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Conclusion

Healthcare organizations already are deploying mobile technology to solve some of the problems in the industry today. Mobile devices, wearable tech, remote monitoring, telemedicine and information sharing platforms all are transforming healthcare. 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.

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