Does Success Of 1st Organ Delivery Flight Make Drones A Realized Medical Moonshot?

By Jamie Wells, M.D. — May 6, 2019

With the goal of reducing transport inefficiencies that contribute to wasted organs for transplant, a multidisciplinary team from the University of Maryland’s Schools of Medicine and Engineering has much cause to celebrate their recent creation. Their specially crafted drone was just triumphant in delivering the first donor kidney for transplant. The organ was ultimately implanted into a patient with longstanding renal failure. With the recipient already discharged from the hospital, they now have the proof-of-concept necessary to proceed further in this latest innovative medical application for the use of unmanned aircraft.

Successful organ transplantation requires that a logistically complex series of events take place well beyond the scope of an ideally-matched donor and recipient. As time lags worsen ischemia and damage, maintaining the suitability of the organ in transit can pose quite a challenge including but not limited to the following: reliance on commercial travel, enduring staffing or scheduling and regulatory hurdles, costly couriers, inclement weather, and remote geographical access.
In an act of true collaboration, these researchers, surgeons, aviation experts and more designed a novel inflight real-time organ monitoring system as well as a carrier that prevailed in its maiden voyage after extensive trials and testing (review journal articles [here][3] and [here][4]). The exhaustive rigor required to achieve this task met the precious nature of its cargo. Innumerable redundancies and extensive optimizing of the process over a long period of time cemented the foundation for the flight. Such dedication and comprehensive considerations were vital to preserving the safety of the organ for transplant - and will be essential to evolving the concept.

**The possibilities keep expanding**

Big risk, big reward “moonshots” seem to be the rage these days. Especially in marketing within the cancer research realm. Though those pursuits are incredibly important, in reality such “dramatic” advancements manifest through years and years of cumulative incremental research.

I would argue we are witnessing a realized moonshot with these ever expanding transportation innovations occurring in the healthcare space. Not only are the applications wide-ranging, thereby improving access and reducing barriers, their development is actually happening at warp speed. The technology is progressing and the refinements needed are not decades into the future.

It wasn’t that long ago that I included unmanned aerial systems, aka drones, in my Top 8 Med, Tech Advances of 2017 [5]. Their capacity to deliver life-saving equipment or medications to remote areas is replete with fascinating, even unlimited potential. A research letter published in the *Journal of the American Medical Association (JAMA)* by a Swedish team explored the possibilities with out-of-hospital cardiac arrests (OHCA) in Time to Delivery of an Automated External Defibrillator (AED) Using a Drone for Simulated Out-of-Hospital Cardiac Arrests vs Emergency Medical Services [6]. Their findings [6] after comparing data of GPS-enabled drones to actual ambulance response times to areas without medical access demonstrated a median reduction in response time of 16 minutes and 39 seconds.

Granted, these were not real-time scenarios. But, what if, after more thorough and comprehensive investigations, they could be?

OHCA has a very poor prognosis, time to treatment is literally a matter of life or death and permanent disability. Early and swift intervention with an automated external defibrillator (AED) amidst sudden OHCA during bystander cardiopulmonary resuscitation (CPR) saves lives—in fact, doubles the likelihood of survival. But there are problems including: cost, availability and high variability of place and time of OHCA occurrence, and the presence and willingness of bystander intervention.

Given this is all computer generated data [6], much more needs to be studied in terms of weather challenges, ability to integrate with 911 dispatch centers and survival with EMS versus bystander intervention, to name a few. But, this along with possible drug delivery of EpiPens or on the battlefield for supplies like wound care, for example, could be a whole new avenue for reducing barriers to access. When done responsibly and in a targeted manner, perfecting the apparent issues could hold great promise.
Drone delivery routes are underway

In March, I wrote about the United Parcel Service Inc (UPS) teaming up with Matternet to launch the first U.S. routine commercial drone delivery service in an effort to take a bite out of the healthcare market and distinguish itself further from online retail giant Amazon, whose recent partnership with Berkshire Hathaway and JPMorgan Chase & Co threatens to dominate the space (see here). The inaugural flight carried lab specimens from clinics across the WakeMed Hospital campus to a central laboratory for analysis in Raleigh, N.C. What normally takes a half hour by courier was expected to be a three minute journey by drone. If all goes well with the WakeMed project, then this will be a leap forward toward achieving the ultimate goal of becoming the top contender for national medical delivery services.

Right now the prospect is in its early stages and being pitched as a way to reduce healthcare costs through potentially faster delivery and turnaround of urgent testing and inevitable consolidation of laboratory sites (to learn more, read here). The current test route requires a visual pathway, the aim down the line once the process is perfected would be a fully independent, automated, remotely supervised system - the same holds true for the latest organ-carrying drone. Matternet and UPS hope to get a waiver from the U.S. Federal Aviation Administration that would permit longer flights that don’t require a pilot on-site or a route entirely within his or her line of sight.

UPS has a number of home health projects underway as well. Their vaccine project, set to go later this year, intends on dispatching nurses to patient homes for vaccine administration. The company has invested wisely and has the necessary infrastructure to perform logistically. You see, transport of medical materials - albeit medications to lab samples - requires proper and varying temperatures in controlled environments, avoidance of sun exposure in some cases to tight regulatory compliance for quality control measures. The litany is long in ensuring blood specimen accuracy without contamination during transport or not degrading medical contents, for example, and currently even Amazon is using UPS or FedEx for medical deliveries of its recently billion dollar purchase PillPack.

To sum up

Delivery-focused technology is a boon for healthcare. As long as the critical elements are in place and pristinely executed to guarantee the integrity of specimens and medications, drones as an adjunct to care can enhance its quality.

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