A Novel Pre-Hospital Indoor Rescue Drone System for Cardiac Arrest Patient Emergency Assistance and Medication Delivery Through Remote EMS Surveillance

Du, Max (School: Western Canada High School)

Survival chances of out-of-hospital cardiac arrest patients are near zero after 10 minutes, but EMS response rates are on average 9 minutes or longer. This project developed the first indoor rescue drone system to assist saving cardiac arrest patients using an emergency medication auto-injection delivery system under remote EMS team surveillance before EMS arrives. The current prototype has six subsystems: consumer quadcopter, surveillance, medication delivery, door-opening, drone homebase, and electronics controls. The drone system was tested in a residential setting to simulate an emergency scenario. A custom programmed interface was developed to accelerate rescue by enabling EMS to remotely activate and control the drone hosted on a designed 24/7 homebase. Patient location details are provided to EMS to locate and approach patients using the quadcopter's built-in "Return to Home" function. Experimental testing showed that the drone system was capable of locating and approaching patients across a two-storey residential building in an average of 55 seconds, and delivering emergency medication to patients under remote EMS surveillance. The drone can deliver an emergency pill box and an innovative intramuscular needleless autoinjector at a proximity of 3-4 cm from the patient. The drone can facilitate live video surveillance and phone calls with EMS through a screen mirroring application. Furthermore, an innovative door-mounted gripper system was developed for EMS to remotely open room doors if necessary. This novel indoor rescue drone system can be affordably integrated into existing EMS rescue practices to improve survival chances, shorten recovery time, and reduce healthcare costs.