HOPE: A Novel Automated Device for Hemorrhage Control in Pediatric Firearm Emergencies

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Three-hundred and eighty three children have died in school shootings since the devastating Columbine high school tragedy. Exsanguinating hemorrhage is the main cause of death from gunshot wounds. Current hemostatic methods cannot control bleeding efficiently, effectively, or easily. This engineering project aimed to create a novel device, HOPE (Hemorrhage cOntrol for Pediatric firearm Emergencies), that rapidly controls exsanguinating hemorrhage more effectively than current methods, and is user-friendly for bystanders to stabilize any gunshot wound in the body. The device comprises of three components: (1) A control box housing a microcontroller, air pumps, pressure sensors, and audio-visual elements; (2) A multi-use patch, that applies negative, direct, or internal pressure via tubing and balloons; and (3) A machine vision camera that recognizes a specific type of gunshot wound and activates the appropriate component of the patch. The device was tested across three different EMT wound simulators. The time-efficiency of the device to stabilize the wound and the ability of the device to apply uniform pressure was tested in comparison to that of current hemostatic methods using the Mann-Whitney U-test. Additionally, the Wilcoxon-signed rank test measured ease-of-use based on survey results from participants that tested HOPE and current methods over the three wound models. Data from the trials conducted above strongly suggests that HOPE is a significantly more efficient, effective, and easy-to-use alternative to current hemostatic methods.

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