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Rewriting the future of healthcare

DEVELOPMENT OF A NOVEL PORTABLE HEMO/PNEUMOTHORAX DETECTING DEVICE

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Background: Tension pneumothorax and hemothorax are leading causes of preventable battlefield deaths. Current methods present difficulties in diagnosis and are not applicable under warfare conditions, i.e. under fire, in darkness, and surrounded by intense noise. **Objective:** A feasibility study to develop a medical device able to collect, analyze, and classify the unique acoustic signature for pneumothorax and hemothorax. **Methods:** Using a pig animal model, we utilized a device consisting of two sensitive modified microphones to sample 12 seconds recordings over the pig's thorax. The thoracic cavity was injected with increasing volumes of 200, 400, 600, 800, and 1000ml of air/saline to simulate pneumothorax and hemothorax, respectively. The data was analyzed using a dedicated algorithm that collected the acoustic signals unique to each pathology, filtered the background noises, and distinguished the signals according to their distinctive characteristics. **Results:** The algorithm was able to significantly identify and classify ($p < 0.01$) the difference between normal lung tissue and the presence of pneumothorax and hemothorax, starting from 200ml and regardless of the presence of background noise. **Conclusions:** The study deals with the development of a medical device that enables an objective and rapid identification of pneumothorax and hemothorax, independently of external factors that can delay diagnosis and treatment. The feasibility of distinguishing pneumothorax, hemothorax and normal lung tissue has been achieved through the use of a dedicated algorithm. Additional studies are required to increase sample size, to upgrade the algorithm's real-time detection ability against a predetermined dataset, and to assemble the device in an operational manner.