Device helps ICU patients by filtering out noise from medical alarms

June 21 2017

A team of investigators at Vanderbilt University Medical Center wants to improve patient outcomes in Intensive Care Unit (ICU) settings by silencing audible medical alarms in hospital rooms.

Auditory medical alarms have created hazards for patient recovery, said Joseph J. Schlesinger, M.D., assistant professor of Anesthesia, Division of Critical Care Medicine at Vanderbilt. His team has created a device that removes the alarm sounds while preserving the patient's ability to hear human and environmental stimuli, notably speech.

The findings, "Frequency-Selective Silencing Device for Digital Filtering of Audible Medical Alarm Sounds to Enhance ICU Patient Recovery," were presented at the International Community for Auditory Display (ICAD) at Penn State this week. The paper highlights how loud noises produced by clinical alarms contribute to psychological problems like delirium and PTSD and provides innovative solutions to enhance the patient experience.

"The shrill and quantity of audible medical alarms are responsible for many negative consequences for patients," said Schlesinger. "The noise of the alarm combined with its frequency often disturbs patients' sleep patterns, which can be very disorienting.

"We wanted to create a way that clinicians would still be alerted to necessary patient alarms, while providing a better environment for the patient's healing process," he said. "The question became - how do we

filter out the alarms from the patient experience without harming the patient's ability to hear and comprehend speech as well as be in tune to other environmental sounds?"

Schlesinger collaborated with students from Vanderbilt University Department of Biomedical Engineering to develop a device worn by the patient that eliminates alarm sounds from the patient perspective by digitally subtracting sound waves while preserving and improving speech comprehension.

The team tested the in-ear device in a simulated ICU environment. The results showed clinical and statistical improvement in alarm filtering.

Schlesinger hopes his team's findings will spark collaborations across the country to further develop devices that are medical grade, affordable and reusable.

"This will need further study in large patient populations to look at patient outcomes, benefits and safety," he said. "I anticipate we will have some interest from multiple sites to investigate use in patients.

"Future directions also include a device for clinicians that would transmit the alarm signals directly to the nurse and physician caring for a particular patient."

Schlesinger holds adjunct faculty appointments in Vanderbilt's School of Nursing, Department of Hearing and Speech Sciences, and the Division of Biomedical Engineering within the School of Engineering.

In addition to his faculty appointment at Vanderbilt, he is a research member of the Centre for Interdisciplinary Research in Music Media and Technology, and an Adjunct Professor of Electrical and Computer Engineering at McGill University in Montreal, Canada.

Provided by Vanderbilt University Medical Center