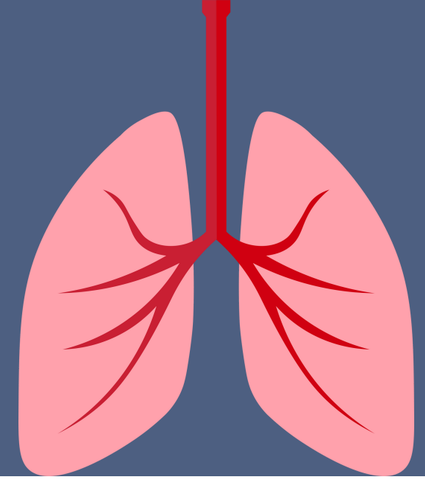
DETECTION OF BREATHING PATTERN FOR OPIOID ADMINISTRATION



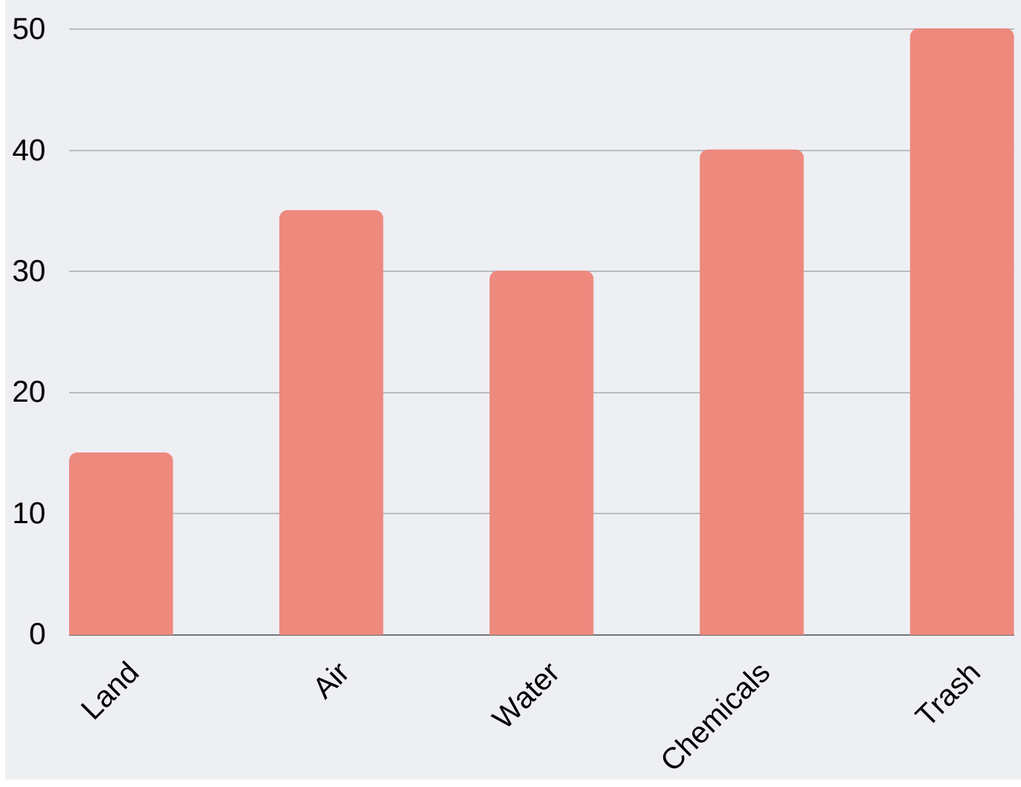
INTRODUCTION

Opioids are beginning to affect a large part of the population in recent times and opioid overdoses have been at an all-time high with the COVID-19 pandemic. In most cases, an overdose needs to be detected almost immediately for an individual to have naloxone administered. Naloxone counteracts the life-threatening depression of the central nervous system and respiratory system, thus allowing an overdose victim to breathe normally [1].

In order for naloxone to be administered, a low breathing rate needs to be detected. This brings us to the main mission of this project, which is to fabricate a breathing rate detection device. This device will detect if breathing rate drops below four breaths per minute and alert the user to administer naloxone. This simple device can have a huge impact on the opioid epidemic as it can lower overdose numbers significantly.

PROJECT GOAL

The goal of the project is to develop a device that detects the breathing pattern of a user in order to diagnose opioid overdose and administer Naloxone accordingly.



REFERENCES

[1] "Understanding Naloxone," National Harm Reduction Coalition, 08-Sep-2020.[Online].Available:https://harmreduction.org/issues/overdose-prevention/overview/overdose-basics/understanding-naloxone/. [Accessed: 8-Jun-2021].

DESIGN & METHODOLOGY

The main operational principle of the device is the detection of the number of breaths in a minute (breathing rate) and alerting the user if the breathing rate falls below the minimum threshold (4 breaths/min).

The device's circuitry is fitted inside in a black box that is sealed with an acrylic (transparent) lid. The device is worn on the body via harness that goes around the diaphragm area horizontally as well as around the shoulders for stable support.

After intensive research and analysis, a pressure sensor was chosen as an appropriate sensor for the detection to measure the force of expansion and contraction of the breathing area. The force measurements were used to identify the maximum and minimum forces of a single breath and program the device to detect the number of breaths in a minute by setting the corresponding ranges accordingly.

The sensor is placed under the box directly on the diaphragm such that there is an even contact with the body to obtain the maximum expansion and contraction measurements of the lungs. After each minute, the device is programmed to check if the breathing rate is normal or insufficient with respect to the 4 breaths/min threshold. In the event that the breathing rate is below the threshold, the device rings a buzzer to alert the user to intake the naloxone drug immediately. If the breathing rate is normal, the program continues to reset the breath count for the next minute, and this process continues until the user stops the device or the breathing rate is below the threshold.

RESULT & DISCUSSION

The results obtained from the device are reliable data. There is a distinct difference in force for an inhalation as well as an exhalation with a distinct difference in the minimum and maximum forces which enables the accurate counting of the number of breaths in a minute, resulting in the device working properly and alerting when necessary.

In order to enhance the device, a more precise pressure sensor should be used which can produce more accurate results in the force measurements and make it more stable to operate.

CONCLUSION

The device successfully detects the breathing rate of the user per minute and alerts them if the breath rate is lower than the stated threshold. We hope this device can be used to alert users when opioid overdose happen as most deaths from opioid occur due to not recognizing the symptoms of opioid overdose (breath rate lowers)