

Recent studies have demonstrated associations between maternal supine sleep (on the back) during pregnancy and an increase in the risk of stillbirth. There exists a need to create a simple system that alerts pregnant women when they are sleeping in a supine position so that they can adjust their sleeping position to the side.

A device that accomplishes this should be functional, be comfortable, last through pregnancy, last through an entire night, be easy to calibrate, be affordable, allow for variable sleeping habits, and adapt to users of different body shapes and sizes. These user specifications were generated based on input from the primary stakeholders, the project sponsor and project advisor, and literary research.

An extensive concept generation process was used to generate a wide range of possible concepts that incorporated three main sub-concepts: the type of sensor, the type of mechanical support housing, and the type of alert. Concept selection was completed with the help of a Pugh chart.

The chosen design consists of a Force Sensitive Resistor mounted in a polypropylene housing. The device will be positioned on a woman's back. As the woman rolls over from her side to a supine sleeping position, her weight will actuate the FSR, which will signal the microcontrollers to send voltage to the vibrating motors. There are four vibrating motors mounted on the device, and the actuation of these motors will occur in a ramping fashion.

The final design is an overall success, passing the majority of the validation tests. There are several specifications which could not be validated thoroughly. The main strengths of the design are that the device allows for user mobility during sleep, allows for variable sleeping habits, and requires absolutely no user calibration during use. The main recommendations for this project are that a memory storage system be integrated into the device to allow for more robust research testing. In addition, a more ergonomic form should be investigated for the housing.