Engineering World Health has identified a need in developing countries for a low-cost, reliable infant respiratory rate monitor that can detect a lapse in breathing for twenty seconds and emit an audible alarm to alert nearby adults.

### What is EWH?

Engineering World Health (EWH) is an independent multidisciplinary organization with the goal of positively impacting the quality of healthcare in disadvantaged areas around the globe. EWH inspires and moves the biomedical engineering community to mobilize and improve healthcare for those around the world. EWH assesses medical instrumentation needs of developing communities and helps work towards making them affordable and practical for those locations.

### What is SIDS?

Sudden Infant Death Syndrome (SIDS) is responsible for thousands of deaths each year in developing countries. SIDS is the unexpected, sudden death of a child under the age of one in which the autopsy does not show an explainable cause of death. While there is no known cause for SIDS certain factors seem to increase the risk of a SIDS related death, including sleeping on the stomach or sleeping in soft bedding.

### Design Concepts

**Design Process:**

The solutions that were considered all utilized circuitry that will sound if it detects twenty second lapse in movement. To increase the cost-to-benefit ratio and to reduce complexity, an analog, as opposed to a digital, approach was considered.

1. **Snuza Go! Mobile Baby Movement Monitor**

   The product depicted was purchased in order to study and reverse engineer an approach that’s already on the market. Snuza, the manufacturer, relies on a piezoelectric strain gauge transducer to measure movement of the infant’s abdomen which is assumed to be motion from breathing. It’s able to detect varying lengths of lapse in movement and will sound an alarm at the first detected incident. This model will be reverse-engineered to reduce cost and still maintain necessary functions.

2. **RC Circuit Alarm System**

   A preliminary circuit design that utilizes capacitors and resistors in parallel branches, A and B, which exploits the mechanical movement of the baby’s chest was considered. The concept was to utilize the charging characteristic, if a lack of movement was detected and one side of the branch becomes charged, it would activate the alarm. This idea was ultimately discarded because we couldn’t figure out a working circuit that utilized this property.

3. **Circuit with an Integrated Chip (IC)**

   Circuit utilizes an IC and resistors to control the current through a LED light. By selecting proper components, the circuit can light the LED every 20 seconds. This circuit can be applied to monitoring baby respiratory motion by including relay switches and a reset method.

**Design Inputs**

- Low cost
- Adaptable
  - Growth of Baby
  - Environment
- Detects 20-sec lapse in breathing
- User-friendly
  - Any uneducated, non-trained adult can use it
- Non-invasive
- Back-up power source
- Emit audible signal
- Indicate power level
- Minimize restriction
- Safety
  - Physical
  - Electrical
  - Structural
  - Baby safe
  - Nothing poisonous
- Reliable
  - Structure
  - Function
  - Power
  - Electronically reliable
- Easily maintained