

## ***Arterial Actuator: Product Design Specifications***

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### Problem Statement

Cardiovascular disease is one of the top killers in today's society. Blood pressure and arterial stiffness are indicators of cardiovascular health. Currently, blood pressure is measured via sphygmomanometry and arterial stiffness via arterial tonometry. Although effective, the speed and accuracy of these methods can be improved. The goal is to design a system, comprised of a piezoelectric pressure sensor, an actuator, and a stabilizing structure, that can quantitatively measure blood pressure and arterial stiffness on a single artery.

### Client Requirements

- Effectively and continually measure blood pressure using a pressure sensor on a single artery
- Measure arterial stiffness by applying an impulse force on the artery using an actuator
- Measurements should be taken non-invasively
- Should increase speed of measurement from current methods
- System should incorporate pressure sensor, actuator, and stabilizing structure
- System must be comfortable for subject
- System should be easy to operate

### Design Requirements

1. Physical and Operational Characteristics
  - a. *Performance requirements:* Measures blood pressure and arterial stiffness non-invasively on a single artery; must acquire data more quickly than current methods
  - b. *Safety:* Cannot cause pain to patient, contain hazardous or sharp materials, or cause health problems
  - c. *Accuracy and reliability:* Blood pressure and arterial stiffness data must be as accurate as data obtained from current methods; data must be reproducible and consistent between trials
  - d. *Life in Service/Shelf Life:* The device should last at least 10 years
  - e. *Operating Environment:* Indoor clinic, hospital, or laboratory
  - f. *Ergonomics:* The system is modified to place the user in the most comfortable position
  - g. *Size:* Should be able to fit in a cupboard or on a bedside table
  - h. *Weight:* Must be light enough to be handled by an average person
  - i. *Materials:* Piezoelectric sensor, push/pull solenoid, PVC pipe, wood base, light fixture whip, blood pressure cuff, aluminum block, circuitry

- j. *Aesthetics, appearance, and finish*: Should be presentable in a hospital setting
2. Production Characteristics
- a. *Quantity*: One prototype
  - b. *Target Product Cost*: System less than \$100
3. Miscellaneous
- a. *Standards and Specifications*: Meets FDA standards for a Class II medical device
  - b. *Customer*: Hospitals, clinics, and laboratories
  - c. *Patient-related concerns*: Cannot pose health or safety risks
  - d. *Competition*: Standard sphygmomanometry and arterial tonometry devices, ambulatory blood pressure monitoring devices, pulse wave velocity blood pressure sensors