People who fall victim to leg and ankle fractures, knee and hip replacements, and foot complications have no method of determining the amount of weight they are bearing on their injured leg. This device needs to translate weight bearing to patients either visibly, audibly or through a vibration mechanism. The goal for this device is to accurately calculate the percentage of weight the user bears on their leg and alert the user when their weight bearing has exceeded the desired threshold.

### The healing process:
1.) No weight bearing
2.) Toe-touch weight bearing (10% >)
3.) Limited weight bearing (50% > 10%)
4.) Weight bearing as tolerated (50% <)
5.) Full weight bearing

### Background

**Design Specifications**

- Device that accurately calculates the percentage of weight the leg bears
- Includes an alert mechanism notifying the user
- Active for 16 continuous hours per day for at least 3 consecutive months
- Primarily used in a home setting
- Compatible with users weighing under 300 lbs
- Affordable at under $600
- Does not interfere with daily activities or users medical condition
- Follow FDA standards for safety
- Patient will be responsible for use
- Device will be marketed towards patients whose history includes, but not limited to hip replacement, hip fractures, knee surgery, and lower leg fractures

**Prototype**

Our prototype is a working prototype. Therefore, it will accurately measure a users weight and alerts the user through a buzzer if the weight exceeds the set value.

1.) The Shoe Insert
   - Neoprene shoe insert
   - Houses A401 FlexiForce sensors

2.) The Box
   - FlexiForce Quickstart Board converts sensor output to voltage
   - Arduino Board receives input from FlexiForce Quickstart Board
   - Arduino program controls buzzer and calculates weight bearing (%)
   - All circuitry held in 3D printed console

### Financial Breakdown:

<table>
<thead>
<tr>
<th>Description</th>
<th>Projected Cost</th>
<th>Actual Cost</th>
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<tbody>
<tr>
<td>FlexiForce Quickstart Board</td>
<td>$150.00</td>
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<td>TekScan A401 Sensors- 4 Pack</td>
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<td>Spenco Shoe Insert</td>
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<td>Arduino Board UNO REV 3</td>
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<td>Misc (wire, shrink tube, electrical tape)</td>
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<td>Battery clips, breadboard</td>
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### Future Work

- Clinical testing of current prototype
- Wireless technology (Bluetooth)
- Microchip condensing all circuitry
- Implementation of 3 sensors for accurate readings
- App development

### Acknowledgements

A special thank you to the National Institutes of Health (NIBIB), Life Beyond Barriers, and Prem Sivakum for project support.