Elbow Contracture Treatment Device

BMEN 3151 *Medical Device Practicum*

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Clinical Problem

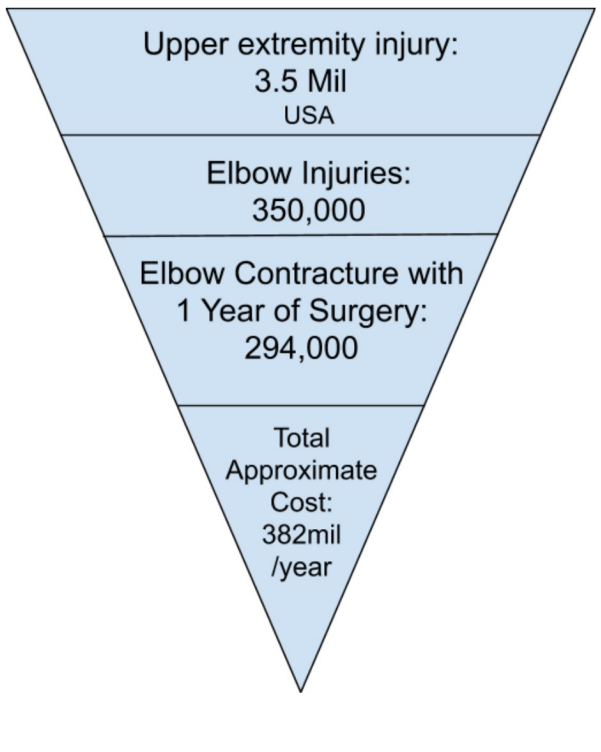
According to the National Center for Biotechnology Information, roughly 350,000 patients suffer from complications due to elbow contracture every year. Elbow contracture for elderly and postoperative patients requires extensive physical therapy, and the medical devices available to patients fail to take meaningful measurements that guide their recovery. We would aim to provide a restorative therapy device that provides a method for increasing patient and caregiver recovery awareness, so that caregivers can more accurately provide treatment to the patient and the patient can understand their physical limitations.

Needs Statement

Patients suffering from elbow contracture need a restorative therapy device that accurately captures progress and assists in motion in order to aid in the restoration of movement within the elbow joint.

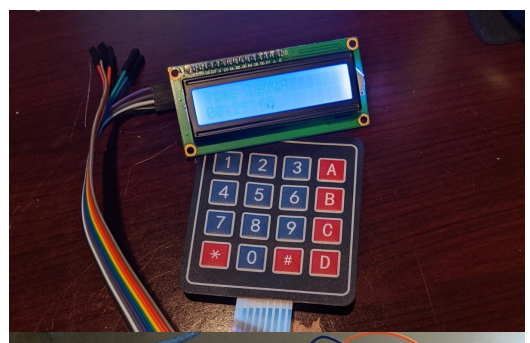
Market Analysis

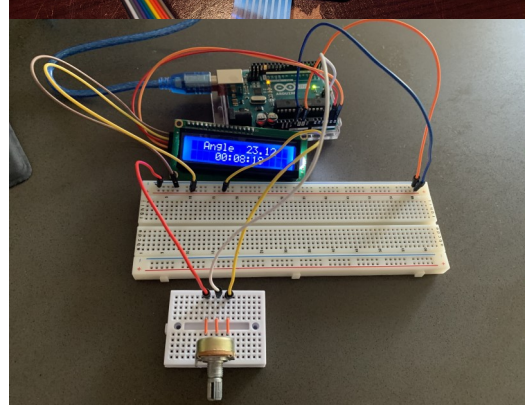
According to the NCBI, roughly 3.5 million patients receive emergency treatment per year in the USA. 10.5% of these treatments pertain to elbow injuries (~350,000 patients). 8.4% of patients (~29400 patients) developed subsequent elbow contracture within 1 year of surgery. Without insurance, elbow surgery and treatment costs $10k+ with therapy costing from $1-3k. The total approximate cost is thus $382 million per year. Assuming the teams device captures 30% of the market, the maximum value is ~$115mil/year.

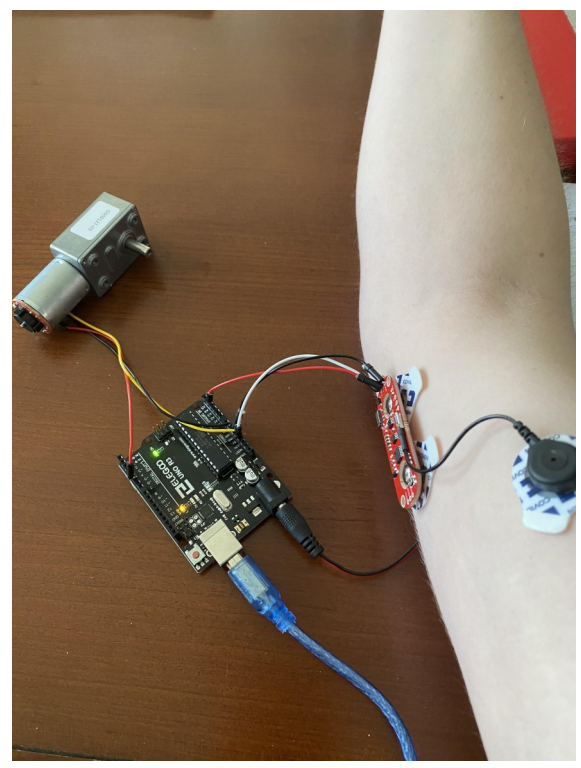


Medical Device Solution

The concept behind our device is that a myoelectric sensor attached to the triceps would send a signal to a DC motor fixed to the system that would help the user rotate their arm further. Upon exhaustion, the user would relax their arms to their rest position and the motor would return to rest position. Attached to the pin on the opposite side of the system is a potentiometer that will be used to measure angular displacement. This would work by fixing the potentiometer to one half of the joint and then fixing the cap of the potentiometer to the other half of the joint. This signal would then be sent to an Arduino that would convert the changing resistance to an angular displacement. It would then display your progress and your improvement based on previous data. In addition to a system which can calculate an angle based on the resistance from a potentiometer, the team also included a timer with which users could set their therapy time.







Team Photo