A Pilot Study of a Mobile Application to Assess Neurogenic Pain

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Background

- Neurogenic pain can be debilitating and result in low quality of life.
- Targeted muscle reinnervation (TMR) is a technique developed by the senior author to prevent and treat neurogenic pain caused by painful neuromas.[1]
- We developed and launched mobile application to monitor pre- and post-operative pain, medication use, and quality of life among patients with neurogenic pain.[2]
- We hypothesize that mobile application use to monitor pre- and post-operative pain can provide granular data that can allow providers to assess pain outcomes.

Methods

- Subjects were recruited from the clinics of the senior authors.
- Patients were asked to complete weekly surveys and medication logs via the mobile application.
- Survey questions were selected based on the biopsychosocial approach to pain assessment.[3]
- Data was collected from August 1, 2020 to June 1, 2021.
- Exploratory data analysis was performed to assess retention rate and fitness data.
- A subset of patients who met the following criteria was evaluated: at least one pre-op survey, underwent surgical treatment, and at least one post-operative survey.

Methods

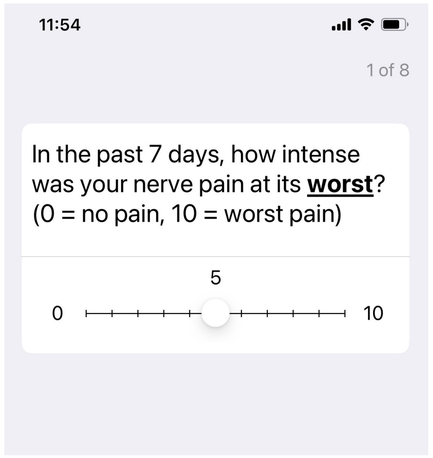


Figure #1. Screen capture of Zing PainApp assessment tool.

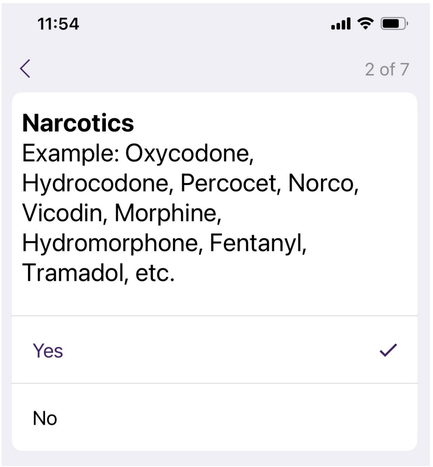


Figure #2. Screen capture querying 7-day recall of medication use.

Results

- A total of 97 patients were recruited.
- The retention rate at the end of the study period was 30.7%, demonstrating a decrease over time.
- 28 surgical patients completed a pre-op survey and a post-op survey.
  - In this group, median (IQR) age was 46.9 (39.0, 55.5), 25 (89.3%) participants were white, and 15 (53.6%) were never smokers.
  - Most patients suffered from anxiety (n = 11, 39.3%) and depression (n = 7, 25.0%).
  - 10 patients had amputation-related pain, 4 occipital nerve pain, 4 trunk nerve pain, 3 groin nerve pain, and 7 non-amp limb pain.
- Mean number of survey entries per patient was 11.3, with a mean response time of 23.5 days between surveys per patient.
- **Pain increased in the immediate post-operative period, with a steady downtrend thereafter. A similar trend was demonstrated with post-operative medication use.**
- Depression and anxiety scores were low and did not demonstrate a transient effect with surgery.

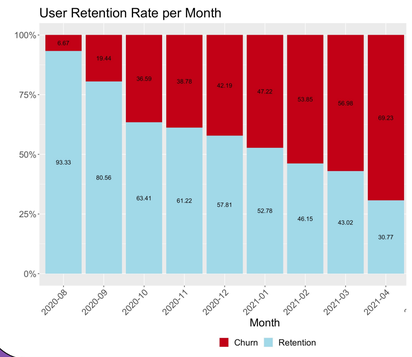
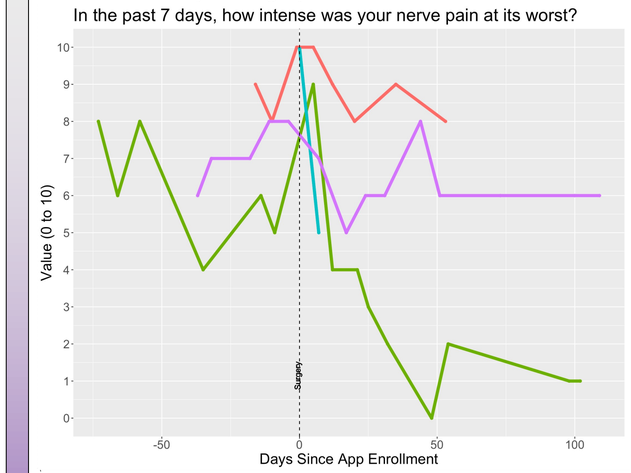


Figure #3. App retention (blue) during study period.

Conclusions

- This study utilizes a mobile application to assess neurogenic pain.
- User retention can be improved with personalized alerts and gamification.
- Granular pain data can provide important information regarding patients' post-operative courses and guide appropriate post-operative counseling.
- Additional recruitment to increase sample sizes in subgroups is needed for future studies.

Figure #4. Responses of occipital nerve patients regarding nerve pain at its worst. Dashed line indicates day of surgery.



References

1. Dumanian GA, Potter BK, Mioton LM, et al. Targeted muscle reinnervation treats neuroma and phantom pain in major limb amputees: a randomized clinical trial. *Ann Surg*. 2019;270(2):238-246.
2. Sood R, Stoehr JR, Janes LE, Ko JH, Dumanian GA, Jordan SW. Cell phone application to monitor pain and quality of life in neurogenic pain patients. *Plast Reconstr Surg Glob Open*. 2020;8(4):e2732.
3. Cella D, Riley W, Stone A, et al. PROMIS Cooperative Group ; PROMIS Cooperative Group The patient-reported outcomes measurement information system (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005-2008. J Clin Epidemiol. 2010;63:1179–1194.