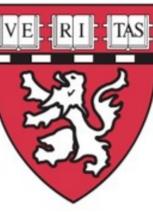




A mobile application for real-time assessment of fatigue and related symptoms in patients with multiple sclerosis



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1. Background:

Fatigue is a disabling symptom that has been reported in 65-97% of patients with multiple sclerosis (MS). The use of mobile applications as a replacement for handwritten questionnaires has gained popularity in recent years, since they improve both access to and the quality of data acquisition for research and health care services. While several applications have been developed to track symptoms, or to monitor clinical status, there is a need to perform a detailed, real-time assessment of fatigue and related symptoms in patients with MS.

2. Specific Aim:

To develop a mobile application that 1) combines common handwritten questionnaires that assess fatigue and related symptoms, 2) assesses symptoms multiple times a day, and 3) enables real-time symptom monitoring in MS patients.

3. Methods/Results:

We created a mobile application for Android devices using the Mobilengine platform (<https://mobilengine.com/>).

There are 3 components of the application:

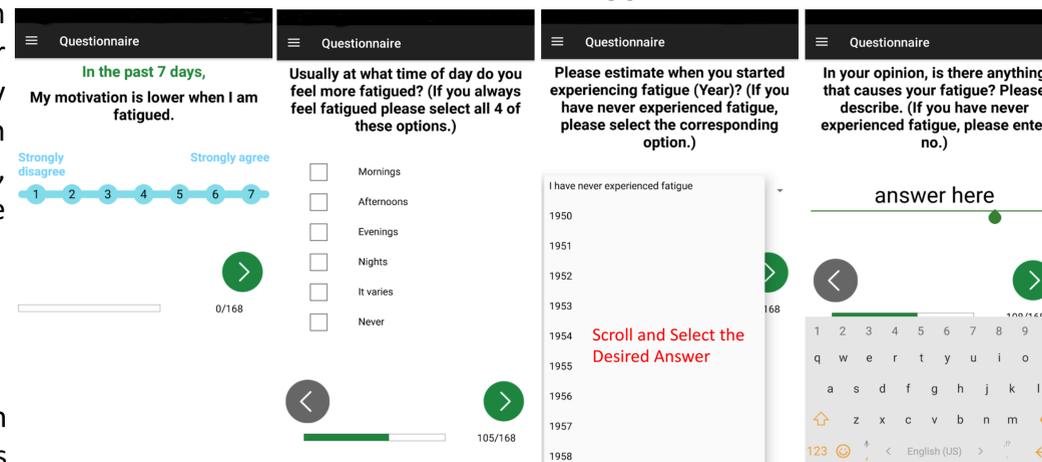
1) One-Time Questionnaire including 10 commonly used questionnaires that assess fatigue and most potential confounders:

- 1) Modified Fatigue Impact Scale
- 2) Fatigue Severity Scale
- 3) Fatigue Questionnaire of Neuro-QOL
- 4) Depression Questionnaire of Neuro-QOL
- 5) Anxiety Questionnaire of Neuro-QOL
- 6) Sleep Disturbance Questionnaire of Neuro-QOL
- 7) 7 questions from the Symptoms of Depression Questionnaire aimed at the vegetative symptoms of depression
- 8) Epworth Sleepiness Scale
- 9) Godin Leisure-Time Exercise Questionnaire
- 10) Behavioral Avoidance/Inhibition System Scale

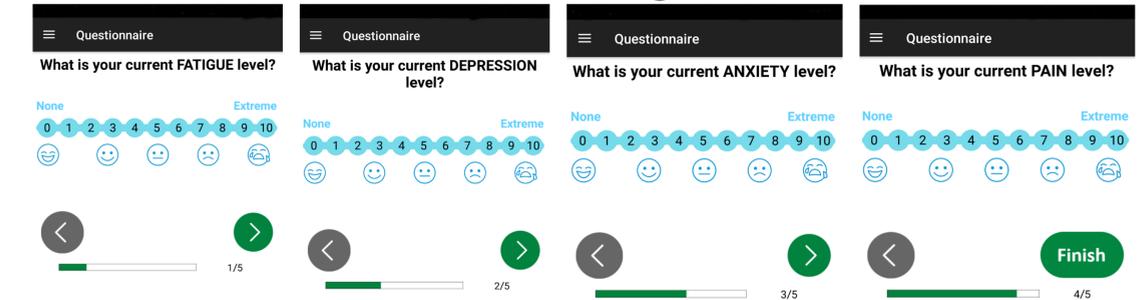
2) Visual Analog Scale (VAS) that tracks patients' fatigue, anxiety, depression, and pain levels every 4 hours,

3) Sleep Diary which assesses sleep habits, including daily sleep time, wake time, and perceived sleep quality.

Question Types

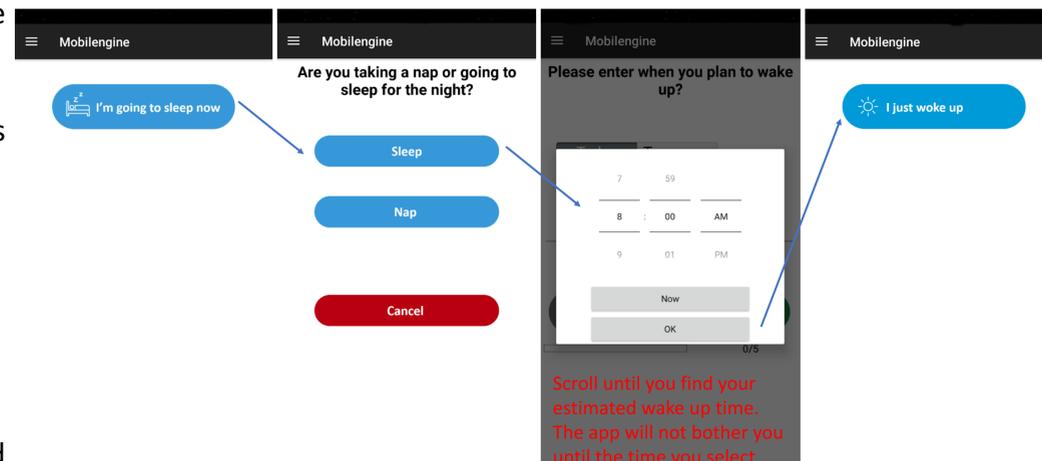


Visual Analog Scales



Additionally, we have created a database that is updated in real time with patient responses from the mobile phones. The investigators are notified every evening on which subjects have fallen behind on completing the One-Time questionnaire or on the VAS. Therefore, we are able to reach out to these subjects while they are still in our study and hopefully encourage them to complete our study.

Sleep Diary



Conclusion:

We have developed a mobile application which aims to assess fatigue and its confounders in MS patients, both as a battery of commonly used questionnaires, as well as real-time tracking of common MS symptoms, in the belief that it will facilitate remote monitoring of symptoms and adverse events; and may allow more timely intervention than is possible with scheduled face-to-face visits.

Conflict of Interests:

The authors have received support from Mobilengine (free use of platform and programming by Mobilengine Engineers).

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Dr. Palotai reports no disclosures.
Mr. Kujbus is the Director of Mobilengine.
Mr. Wallack reports no disclosures.
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