Social Needs Analysis of a Transcranial Magnetic Stimulation Patient Cohort

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Short Report

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Abstract

Purpose

Little research exists on how a depressed patient’s social wealth affects their access and clinical benefit from Transcranial Magnetic Stimulation (TMS) therapy.

Methods

We performed a retrospective analysis of patients who underwent TMS therapy for MDD. To assess social assets, we implemented a modified version of the AHC-HRSN Screening Tool.

Results

We found that generally, the n = 74 patients had minimal deficits regarding basic needs. A majority reported social isolation and disabling symptom burden.

Conclusion

This cohort had elevated levels of social assets, though symptoms may contribute to social disengagement. There is potential to connect patients with higher social burdens to TMS.

INTRODUCTION

Health practitioners are increasingly recognizing the crucial role of social determinants of health on patients’ mental health outcomes. The risk of developing mental illness is increased in patients with poor social determinants of health \([1]\). Patients facing social inequalities are at higher risk of worse health outcomes and less likely to engage with care at the same rates as patients with higher social supports and assets.

Little research exists into the impact of a patient’s social wealth profile on access to, and benefit from, TMS therapy. Given the effective treatment modality that TMS represents for a subset of patients with MDD and the potential vulnerability of these, it is important to understand the social dynamics surrounding this therapy. An analysis of this cohort’s social needs and assets could better inform holistic mental health care, aid in the identification of barriers to TMS therapy, and clarify the effect of social needs on patient response to TMS treatment.

METHODS

This is a retrospective analysis of data obtained from patients aged 18 + who underwent an acute series of TMS therapy at a single site between 2019 and 2021. Data was collected at the beginning of their course of TMS as a routine part of clinical care.
Treatment was naturalistic and determined by standard-of-care TMS clinical practice. All treatments were delivered using the NeuroStar TMS Therapy system (Neuronetics, Inc., Malvern, PA). Motor threshold (MT) was determined over the left hemisphere primary motor cortex at the initial treatment session and used for determination of treatment intensity. An iterative, automatic software-based mathematical algorithm (MT Assist, Neuronetics) is integrated with this system for use in MT determination. Head measurements were used to identify a scalp location corresponding with the left dorsolateral prefrontal cortex (DLPFC), over which the coil was placed at each session. The protocol described in the product user manual specifies stimulation at 120% intensity relative to the MT value. The standard on-label stimulation protocol was comprised of a frequency of 10 pulses per second; and a cycle of 4 seconds active stimulation followed by up to 26 seconds of rest (no stimulation) for a total of 3000 pulses per session. Patients started their course of TMS therapy with left-sided 10 Hz stimulation, though modifications to the stimulation protocol were made according to standard clinical routine to manage side effects or to optimize treatment outcome.

Inventory of Depressive Symptomatology-Self Report (IDS-SR) and Patient Health Questionnaire, 9-item (PHQ-9) total scores were used to measure depressive symptom severity, and to define response and remission [2–3]. Response was defined by a reduction of ≥ 50% from pre-treatment to post-treatment IDS-SR/PHQ-9 score, and remission was defined by an endpoint score of ≤ 14 for IDS-SR and ≤ 4 for PHQ-9. Percent change was calculated as (((baseline score - endpoint score)/(baseline score))x100%).

To assess social assets, we implemented a modified version of The Accountable Health Communities Health-Related Social Needs (AHC-HRSN) Screening Tool as a self-report measure, with questions added to explore level of community engagement [4]. Specific social need variables were created from items on the questionnaire and coded for hypothesis testing as described below. Demographics and past medical history were abstracted from patients’ charts. ArcGIS (Esri, Redlands, Calif) was used to identify patients’ United States Census block group.

**Statistical Analysis**

A score was created to summarize baseline level of need, referred to as “AHC-HRSN Screening Tool Total Score”. This was defined by the sum of responses to items 1 through 26, resulting in a score with a range of 0–79. See **Table 1** for descriptions and scoring method of individual items. To analyze the differences between two treatment outcome groups (remitters vs. non-remitters), chi-square tests were used for categorical variables and a series of Independent-samples t-tests were performed to compare the mean AHC-HRSN screening tool total score between two outcome groups (responders vs non-responders and remitters vs. non-remitters). All statistical analyses were performed using SPSS, version 24 (IBM Inc).

While correction of p-value significance thresholds (i.e., with a bonferroni factor) was considered for avoiding type I errors, we wanted this analysis to be exploratory in nature and detect potential signals that could be further explored in a larger and more representative sample. We report uncorrected p-values here.
RESULTS

Patient Sample

From September 2019 to August 2021 a total of 82 patients began a series of TMS treatments. Of these 82 patients, 81 completed the baseline social needs screening, and 74 had clinical outcome data (IDS-SR, PHQ-9) available for analysis. The summarized demographic and clinical characteristics, and treatment outcomes of the study population can be found in Table 2.

Reported Social Needs at Pre-Treatment Baseline

Patients’ pretreatment responses to the modified AHC-HRSN Screening Tool are summarized in Table 3, where the number and percent endorsing each social need are reported for the patient sample (n = 74). The domains most often reported by the patients were Feeling Isolated or Lonely and Feeling Stressed Lately – both endorsed by 94.6% of the sample.

Comparison of Response Groups

Independent-samples t-tests compared TMS responders versus non-responders on the AHC-HRSN Screening tool total score; this was done with response groups defined by both depression scales. There was not a significant difference between the groups in the baseline social needs scores (Responders IDS-SR 16.21 ± 5.72 vs. Non-Responders IDS-SR 15.14 ± 7.55; t(59) = -6.29, p = .532). Similarly, the response groups defined by PHQ-9 criteria were equivalent regarding baseline social needs (Responders PHQ-9: 15.88 ± 5.69 versus Non-Responders PHQ-9: 15.43 ± 8.17; t(59) = -2.50, p = .804).

When AHC-HRSN Screening tool total score were compared in Remitters and Non-Remitters, again there were no significant differences between groups at baseline using remission criteria defined by either scale. 15.46 ± 5.49 versus 15.91 ± SD = 7.37 t(59) = .264, p = 0.793 for IDS-SR, and 15.44 ± 7.18 versus 15.92 ± 5.75; t(59) = .276, p = 0.784 for PHQ-9.

The difference in the percentage of the patients endorsing specific domains of social needs between IDS-SR remitters and non-remitters were analyzed using a series of chi-square tests. Our analysis did not find significant differences between these two groups in the examined domains, which can be found in Table 4 below.

DISCUSSION

The purpose of this study was to define a TMS treatment cohort's social needs. Notably, the cohort was categorized by a disproportionate percentage of patients that identified as white, English speaking, and non-Hispanic/Latino. The TMS patient sample is not representative of the greater population of race and ethnicity, reflecting structural barriers that lead to disparity in access to TMS treatment [5]. This trend in under-representation of minority group patients in mental health care is not unique to TMS care. Individuals identifying as members of racial and/or ethnic minorities have less access to necessary
mental health care and receive worse quality care with higher rates of care discontinuation and lower satisfaction [6–10]. The data from this study may serve as added evidence of the need for continued outreach and support for historically underserved patient populations.

Across many of the social determinants of health examined in these patients receiving a course of TMS therapy, we found most patients reported at least basic assets and minimal needs. Notably, only one patient out of 74 endorsed having needs on questions regarding housing insecurity, lack of reliable transportation, and difficulty affording utilities. However, there were notable categories where most patients reported social needs. These included: Feeling Isolated or Lonely, Feeling Stressed Lately, Serious Difficulty with Concentration/Memory/Decision-Making, Moderate Exercise (outside of work) Less Than 3 Days per Week, Difficulty Completing Errands Alone (due to mental/physical conditions), No Volunteer Activity (past 3 months), and Low or No Connection with Community. These reported areas of deficits may be explained by the cohort's shared diagnosis of MDD. Depression can manifest including difficulty with concentration and psychomotor retardation presenting as lack of exercise. Symptoms may be disabling and promote isolation and disengagement with others and the community [11].

Contrary to our hypothesis, in this cohort, baseline social needs (represented as a total modified AHC-HRSN Screening Tool score) did not differ between patients whose illness responds to TMS therapy and those whose illness persists. It is possible our study has a treatment access selection bias, and this cohort is not representative of all patients eligible for TMS therapy. As previously mentioned, the sample of patients receiving TMS is not representative of the larger community of depressed patients in Rhode Island and surrounding areas. It is possible that our sample size was too small for sufficient power and suffers from a type II error. Finally, it is possible that this modified scale was not psychometrically sufficient to produce a valid total score for comparisons across patient groups.

Strengths of this study include its naturalistic design. By allowing patients to receive medication therapy during the study, our results are more practically applicable to the average patient receiving TMS. There were limitations in this study. Participants in this study received treatment at a single care site. This may lower the external validity of our results. Additionally, while the AHC-HRSN Screening Tool supplies a model for collecting social determinants data from patients, certain details such as time frames and score scales may be adjusted for ease and clarity in future studies.

Declarations

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Statements and Declarations:

- The authors have no competing interests. The funders had no role in the study's conduct, manuscript preparation, or the decision to submit for publication. The views expressed in this article are those of the authors and do not necessarily reflect the position or policy the funders.
• This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the institutional review board of Butler Hospital.
• Informed consent was obtained from all individual participants included in the study.
• The authors affirm that human research participants provided informed consent for publication

References


Tables
Tables 1 to 3 are available in the Supplementary Files section.

Table 4 is not available with this version.

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.

- LSTable1A1B.pdf
- LSES M2.pdf
- LSES M1.pdf