Washington State Health Care Authority

FINAL Key Questions and Background

Transcranial Magnetic Stimulation for Treatment Resistant Obsessive-Compulsive Disorder and Major Depressive Disorder

Background

Many Americans experience behavioral health disorders that affect mood, thinking, and behavior. These disorders are associated with substantial impairment in quality of life and physical, social, and occupational functioning. Major depressive disorder (MDD) is associated with an increased burden of chronic medical conditions, reduced workplace functioning, and elevated mortality.[1-5] Obsessive-Compulsive Disorder (OCD) is a chronic disorder that can cause substantial distress and impairment in daily, social, and occupational functioning.[6,7]

Current treatment approaches for MDD and OCD often begin with psychotherapy, pharmacotherapy, or both. However, many people do not achieve adequate clinical responses after the initial treatment attempt, and second and third-line medications or procedures (e.g., electroconvulsive therapy (ECT)) carry risk of adverse side effects that many individuals do not tolerate. Transcranial magnetic stimulation (TMS) is a non-invasive procedure that has been FDA approved for some behavioral health and neurologic conditions. Recently, accelerated TMS protocols have been used to reduce treatment length and improve response time.[8] However, the durability of effect and safety of such protocols is less established than standard TMS protocols.

This health technology assessment (HTA) will review the evidence for the efficacy, safety, and cost-effectiveness of TMS in adults to assist the State of Washington's Health Technology Clinical Committee (HTCC) in updating its coverage decision related to TMS. This HTA is an targeted update to an HTA completed in 2023.[9] In 2023, the State of Washington's Health Technology Clinical Committee (HTCC) determined that there was sufficient evidence to conditionally cover TMS for treatment-resistant MDD in adults (age 18 years or older). The committee found that there was insufficient evidence to cover TMS for the treatment of OCD, generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), smoking cessation, and substance use disorder (SUD).[10] This targeted update will focus on the evidence for accelerated protocols for MDD and evidence for standard or accelerated protocols for OCD.

Policy context

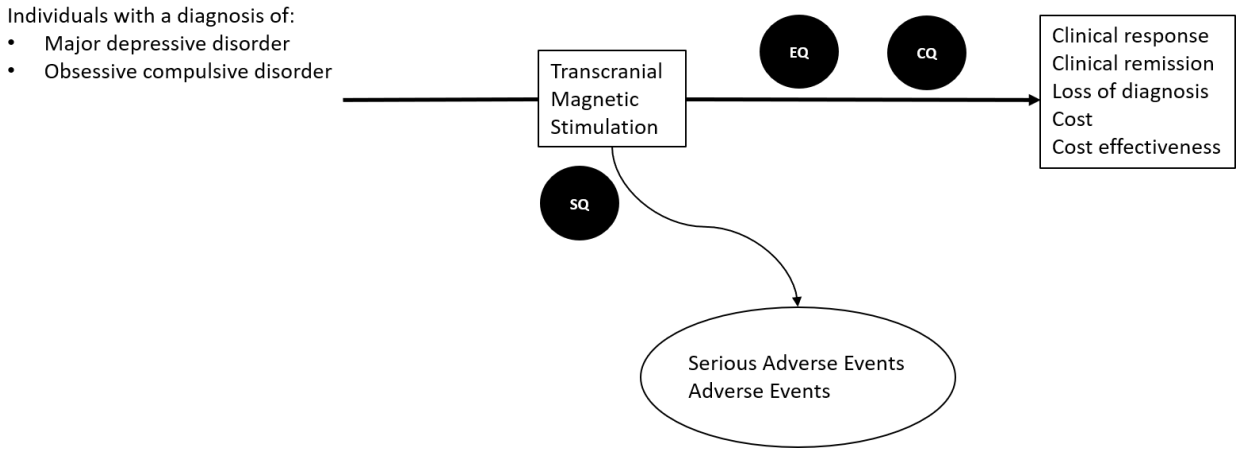
The State of Washington Health Care Authority selected TMS for selected behavioral health conditions for a health technology assessment (HTA) because of low concerns of safety and medium/high concerns for efficacy and cost.

Washington State Health Care Authority

Scope of this HTA

The analytic framework (**Figure 1**), research questions, and key study selection criteria (**Table 1**) are listed in this section.

Figure 1. Analytic Framework Depicting Scope of this Health Technology Assessment



Abbreviations: SQ = safety question, CQ = cost question; EQ = efficacy question

Research Questions

Efficacy Question (EQ 1). What is the efficacy of transcranial magnetic stimulation for treatment-resistant OCD in adults?

Efficacy Question (EQ 2). What is the efficacy of accelerated transcranial magnetic stimulation protocols for treatment-resistant MDD in adults?

Safety Question (SQ1). What are the harms associated with transcranial magnetic stimulation for treatment-resistant OCD in adults?

Safety Question (SQ2). What are the harms associated with accelerated transcranial magnetic stimulation protocols for treatment-resistant MDD in adults?

Cost Question (CQ 1). What are the costs and cost-effectiveness of transcranial magnetic stimulation for treatment-resistant OCD in adults?

Cost Question (CQ 2). What are the costs and cost-effectiveness of accelerated transcranial magnetic stimulation for treatment-resistant MDD in adults?

Study Selection Criteria

Table 1 provides the study selection criteria we will use to include studies in the HTA and are organized by population, intervention, comparator, outcomes, timing, setting, and study design (PICOTS) criteria.

Washington State Health Care Authority

Table 1. Proposed Population, Intervention, Comparator, Outcome, Timing, and Setting for Health Technology Assessment

PICOTS	Include	Exclude

Population	• Adults with eligible clinical diagnosis of:
	  ○ OCD that is considered treatment-resistant (EQ1, SQ1, CQ1)
	  ○ MDD that is considered treatment-resistant (EQ2, SQ2, CQ2)
	• Studies that include at least 50% of patients aged 18 years and over or that report results separately for the adult population are eligible
		• Children or adolescents aged less than 18 years
		• New diagnosis of MDD or OCD without prior treatment
		• Populations defined by suicidal ideation/ suicidal behavior without MDD or OCD diagnosis
		• Individuals with ineligible mental health diagnoses, including mixed populations of eligible and ineligible diagnoses for which results are not stratified
		• Individuals with no mental health diagnosis (e.g., healthy controls)
		• Individuals with a primary medical (i.e., nonpsychiatric) diagnosis as the TMS indication
		• Studies conducted in animals, in vitro, or in silico

Intervention	• For EQ1, SQ1, CQ 1 on OCD:
	  ○ Standard or accelerated protocols of repetitive TMS, deep TMS, or continuous or intermittent TBS
	• For EQ2, SQ2, CQ2 on MDD:
	  ○ Accelerated protocols of repetitive TMS, deep TMS, or continuous or intermittent TBS
		• Single-session TMS
		• Other noninvasive neuromodulation procedures (e.g., transcranial direct current stimulation, neurofeedback, transcutaneous vagus nerve stimulation)
		• Invasive neuromodulation therapies (e.g., implanted vagus nerve stimulation, deep brain stimulation, brain surface implants)
		• Experimental therapies (e.g., synchronized TMS)

Comparator	• For EQ1 and SQ1 on OCD:
	  ○ Standard active TMS vs. standard sham TMS
	  ○ Accelerated active TMS vs. accelerated sham TMS
	  ○ Accelerated active TMS vs. standard active TMS
	  ○ All of the above with or without concurrent pharmaco- or psychotherapy
	• For EQ2 and SQ2 on MDD:
	  ○ Accelerated active TMS vs. accelerated sham TMS
	  ○ Accelerated active TMS vs. standard active TMS
	  ○ All of the above with or without concurrent pharmaco- or psychotherapy
		• EQ1 and SQ1 on OCD:
		  ○ No comparator
		  ○ Wait-list control
		  ○ Active TMS comparisons to medication, therapy, or between TMS protocols other than accelerated vs standard
		• For EQ2 and SQ2 on MDD:
		  ○ Standard active TMS vs sham TMS
		  ○ No comparator
		  ○ Wait-list control
		  ○ Active TMS comparisons to medication, therapy, or between TMS protocols other than accelerated vs standard

PICOTS	Include	Exclude
	• For CQs: Sham TMS, medication, ECT, or other standard-of-care therapies	
Outcomes	• EQs: Clinical outcomes: response (e.g., symptom scales or indices), time to response, remission, or loss of diagnosis as measured by validated instruments or clinical evaluation. In addition, the primary study outcome or outcome used for determining power or sample size must be a clinical outcome. • SQs: AE, SAE, specific AEs (e.g., seizures) • CQs: Cost, cost-effectiveness	• Nonvalidated measures of clinical response or remission • Individual symptom response outside of a validated scale (e.g., guilt, hopelessness) • Clinical outcomes that do not measure the primary indication for TMS (e.g., anxiety measures in MDD population) • Quality-of-life outcomes (e.g., SF-12)
Timing and Language	• No timing restrictions • English-language articles	• No timing exclusions • Non-English-language articles
Study Design	• EQs: RCTs • SQs: Same as EQs; plus we will consider prospective non-randomized studies of interventions if there are not enough RCTs to synthesize • CQs: cost-effectiveness, cost-utility, cost-benefit analyses performed from the societal or payor perspective	• Editorials, commentaries, narrative reviews, or letters; conference abstracts; case reports or case series; retrospective controlled cohort studies; case-control studies; other observational study designs without a comparator group not already specified • Relevant systematic reviews will be excluded but will be hand searched to identify potentially eligible primary studies. • Studies with fewer than 10 individuals in any arm will be excluded.
Setting	• For EQs and SQs: Countries categorized as "very high" human development on the United Nations Development Programme's HDI Report[11] [a] • For CQs: Studies conducted based on U.S. cost data	• For EQs and SQs: Countries not categorized as "very high" human development according to the United Nations Development Programme's Human Development Report[11] • For CQ: Studies conducted using non-U.S.-based cost data • No exclusions based on care setting

Abbreviations: AE = adverse event; CQ = cost question; ECT = electroconvulsive therapy; EQ = efficacy question; HDI = Human Development Index; HTA = health technology assessment; MDD = major depressive disorder; OCD = obsessive-compulsive disorder; PICOTS = population, intervention, comparator, outcomes, timing, and setting; RCT = randomized controlled trial; SAE = serious adverse event; SF-12 = 12-Item Short Form Health Survey; SQ = safety question; TBS = theta-burst stimulation; TMS = transcranial magnetic stimulation; U.S. = United States.

[a]Albania, Andorra, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Bahamas, Bahrain, Barbados, Belarus, Belgium, Bosnia and Herzegovina, Brunei Darussalam, Bulgaria, Canada, Chile, Costa Rica, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hong Kong, China (SAR), Hungary, Iceland, Ireland, Israel, Italy, Japan, Kazakhstan, Korea (Republic of), Kuwait, Latvia, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malta, Mauritius, Montenegro, Netherlands, New Zealand, North Macedonia, Norway, Oman, Panama, Poland, Portugal, Qatar, Romania, Russian Federation, Saint Kitts and Nevis, San Marino, Saudi Arabia, Serbia, Seychelles, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, Türkiye, United Arab Emirates, United Kingdom, United States, Uruguay.

Washington State Health Care Authority

References

1. IsHak WW, Mirocha J, Dang J, et al. Quality of Life and Functioning Impairments Across Psychiatric Disorders in Adults Presenting for Outpatient Psychiatric Evaluation and Treatment. *Psychiatr Res Clin Pract.* 2024;6(3):68-77. PMID: https://www.ncbi.nlm.nih.gov/pubmed/39568501. doi: 10.1176/appi.prcp.20230064
2. Berk M, Köhler-Forsberg O, Turner M, et al. Comorbidity between major depressive disorder and physical diseases: a comprehensive review of epidemiology, mechanisms and management. *World Psychiatry.* 2023;22(3):366-387. PMID: https://www.ncbi.nlm.nih.gov/pubmed/37713568. doi: 10.1002/wps.21110
3. Arnaud AM, Brister TS, Duckworth K, et al. Impact of Major Depressive Disorder on Comorbidities: A Systematic Literature Review. *J Clin Psychiatry.* 2022;83(6). PMID: https://www.ncbi.nlm.nih.gov/pubmed/36264099. doi: 10.4088/JCP.21r14328
4. Wicke FS, Ernst M, Otten D, et al. The association of depression and all-cause mortality: Explanatory factors and the influence of gender. *J Affect Disord.* 2022;303:315-322. PMID: https://www.ncbi.nlm.nih.gov/pubmed/35176339. doi: 10.1016/j.jad.2022.02.034
5. de Oliveira C, Saka M, Bone L, Jacobs R. The Role of Mental Health on Workplace Productivity: A Critical Review of the Literature. *Appl Health Econ Health Policy.* 2023;21(2):167-193. PMID: https://www.ncbi.nlm.nih.gov/pubmed/36376610. doi: 10.1007/s40258-022-00761-w
6. Melkonian M, McDonald S, Scott A, Karin E, Dear BF, Wootton BM. Symptom improvement and remission in untreated adults seeking treatment for obsessive-compulsive disorder: A systematic review and meta-analysis. *J Affect Disord.* 2022;318:175-184. PMID: https://www.ncbi.nlm.nih.gov/pubmed/36030999. doi: 10.1016/j.jad.2022.08.037
7. Dos Santos-Ribeiro S, de Menezes GB, Moreira-de-Oliveira ME, Hühne V, Fortes PP, Fontenelle LF. The effect of treatment on the quality of life of patients with obsessive-compulsive disorder: systematic review and meta-analysis. *J Psychiatr Res.* 2025;188:19-28. PMID: https://www.ncbi.nlm.nih.gov/pubmed/40424682. doi: 10.1016/j.jpsychires.2025.05.036
8. van Rooij SJH, Arulpragasam AR, McDonald WM, Philip NS. Accelerated TMS - moving quickly into the future of depression treatment. *Neuropsychopharmacology.* 2024;49(1):128-137. PMID: https://www.ncbi.nlm.nih.gov/pubmed/37217771. doi: 10.1038/s41386-023-01599-z
9. Washington State Health Care Authority. Transcranial magnetic stimulation for treatment of selected conditions. https://www.hca.wa.gov/about-hca/programs-and-initiatives/health-technology-assessment/transcranial-magnetic-stimulation-treatment-selected-conditions. Published n.d. Accessed 14 Dec, 2022.
10. Washington State Health Care Authority. Health Technology Clinical Committee Final Findings and Decision: Transcranial Magnetic Stimulation (TMS). https://www.hca.wa.gov/assets/program/TMS-final-findings-and-decision.pdf. Published 2023. Accessed June 5, 2026.
11. United Nations. Human Development Report 2025. https://hdr.undp.org/system/files/documents/global-report-document/hdr2025reporten.pdf. Published 2025. Accessed September 30, 2026.