

REWIRING the Depressed BRAIN & more

What Psychiatrists
Need to Know About Available Clinical
TMS

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"The Brain Electrician"

Disclosures

- Co-founder and equity in a health & wellness device (zendomeditation.com) — not discussed today
- No speaker fees from device manufacturers for this talk
- Content reflects peer-reviewed evidence and clinical experience

Outline for talk

- Major Depressive Disorder current state
- Expanded Paradigm and the Neurocircuit view within it
- Brain Stimulation Techniques & TMS FDA Clearance History
- Review Clinical TMS- mechanisms of action, protocol, predictor of response, treatment staging
- Review Status of Conventional TMS , SAINT, SWIFT, & AINT for Major Depression
- Mention other available clinical neuromodulation options for Major Depression
- TMS for OCD and smoking cessation

Depression is the leading driver of workforce disability and economic burden

\$210B

Annual US economic burden of depression.

30%

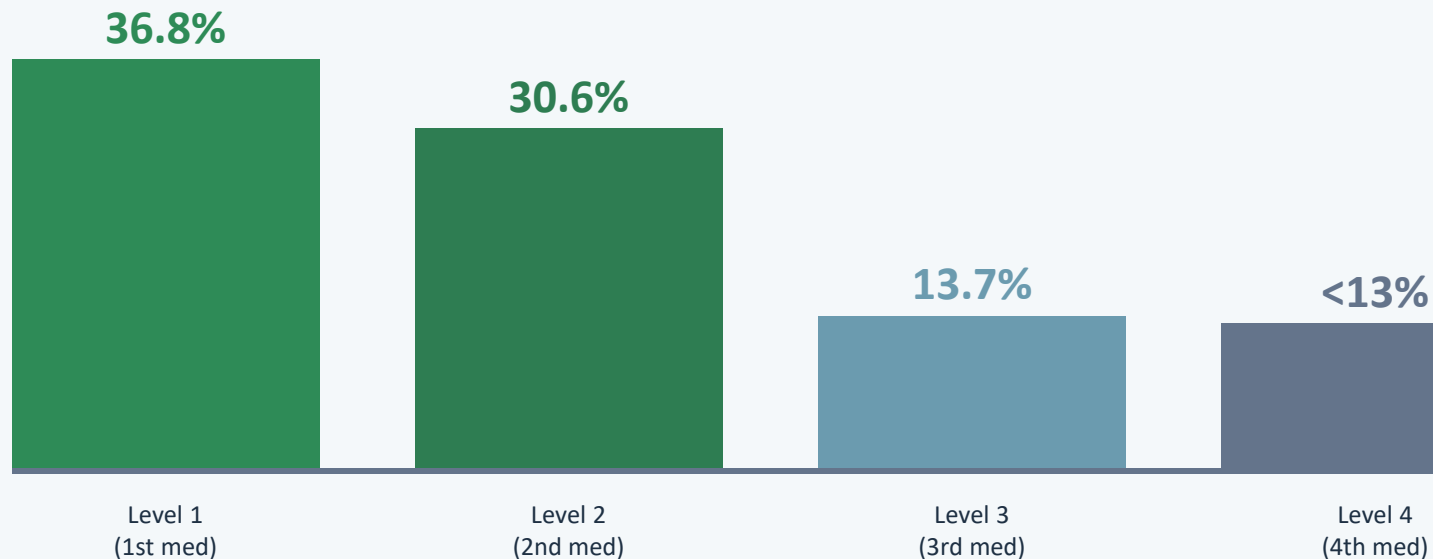
Patients who do not improve on standard treatment pathways.

1 in 2

Treatment-resistant patients who cycle repeatedly through high-cost ER and inpatient care.

For EAP and Behavioral Health leaders, these are not just clinical statistics—these are your primary disability drivers and highest-cost covered lives.

The Medication Ladder Has a Ceiling



By the
4th medication

only 1 in 8
patients
achieves
Remission

67% remission rates
challenged in
reanalysis to 35%
remission rates
(Pigott, 2023, BMJ)

A Multi-Level Disorder Requires an Expanded Paradigm

BIOLOGICAL

- Brain circuits
- Genetics
- Sleep & metabolism

PSYCHOLOGICAL

- Rumination
- Shame & hopelessness
- Neurotic loops

Depression is not one thing. Which level is primary, and which must be addressed for durable recovery?

SOCIAL

- Isolation
- Relational trauma
- Poverty & exclusion

SPIRITUAL

- Meaning collapse
- Estrangement
- Guilt & despair

The Biological Foundation: Depression as a Disordered Circuit



“Some patients cannot ‘think’ or ‘relate’ their way out of a severely disordered brain state. Biological treatment is often what reopens the door.”

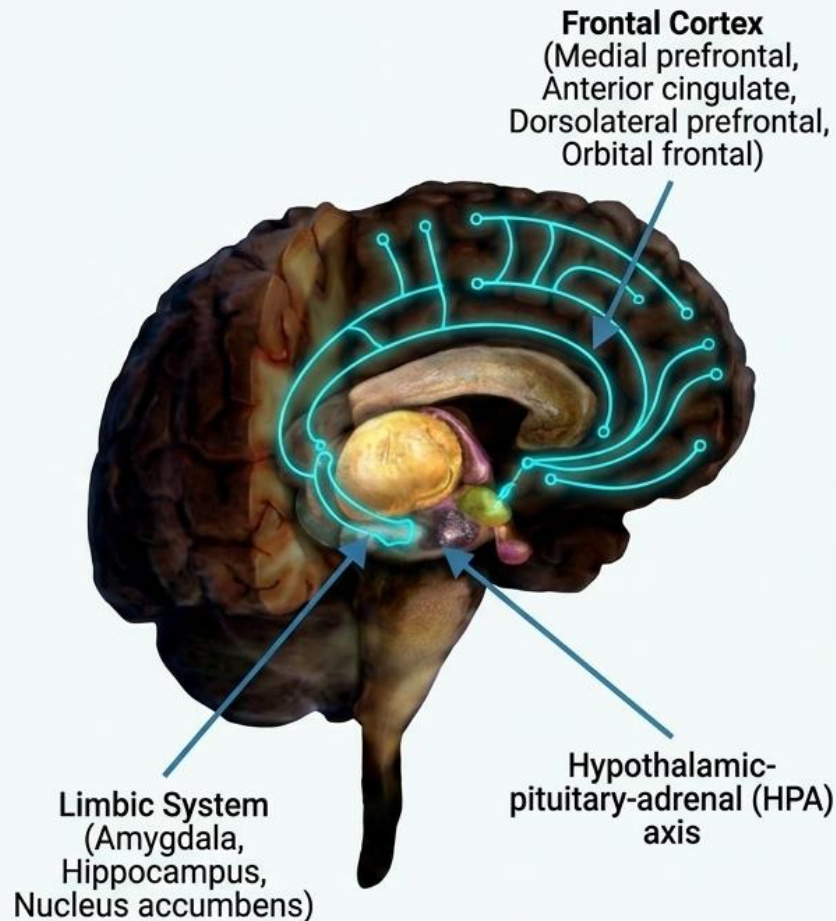
Electricity is the Native Currency of the Human Brain

The Systemic Detour: All of pharmacology simply serves to eventually transmit electrical signals to the next neuron.

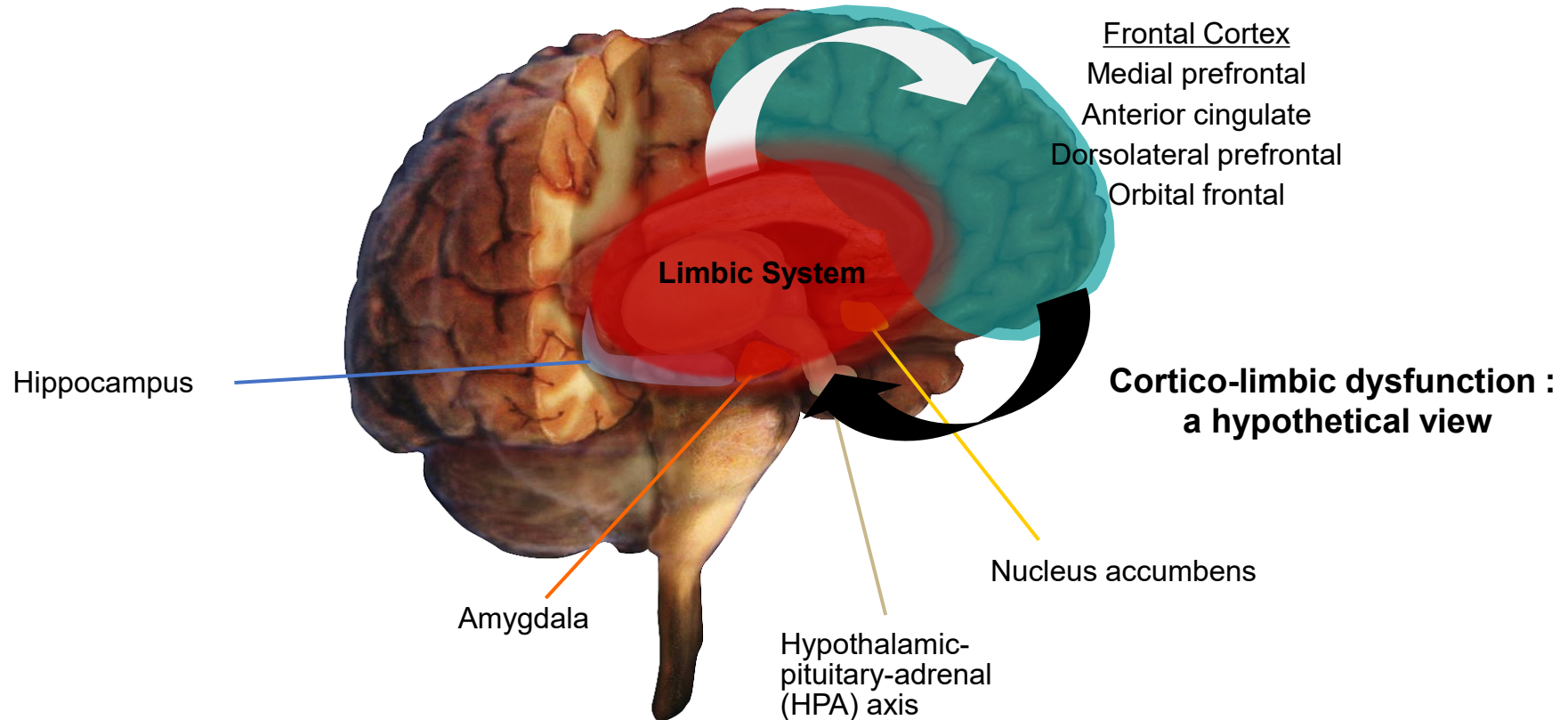
The Direct Pathway: Brain stimulation bypasses this systemic detour. It speaks directly to the brain in its native, electrical language.

A Circuit Disorder: Depression is driven by cortico-limbic network dysfunction, not just chemical deficits.

"Some patients cannot 'think' or 'relate' their way out of a severely disordered brain state. Biological treatment is often what reopens the door."

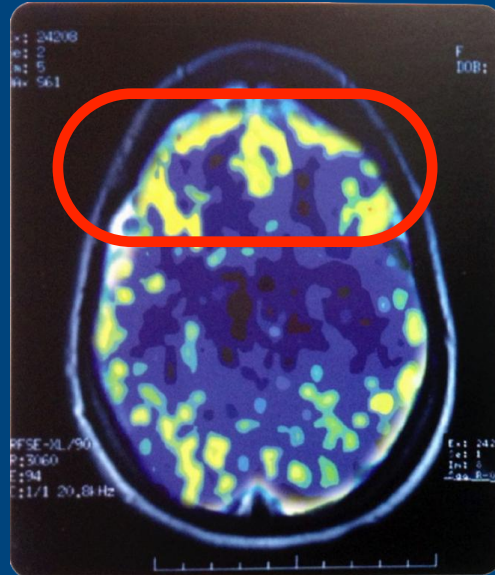


The depressed brain: major areas of dysfunction



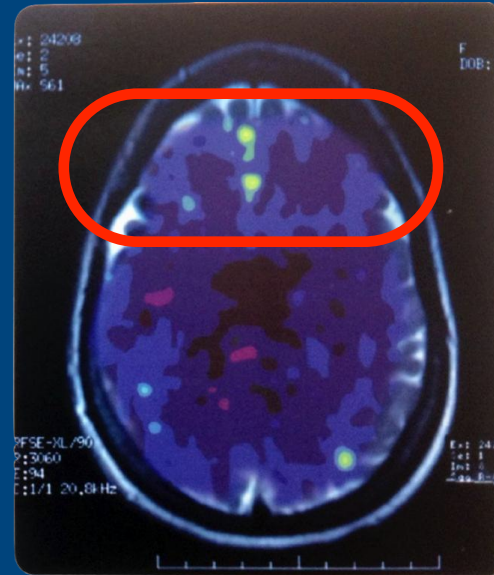
Brain Function

Non-Depressed



Active

Depressed



Underactive

PET scan measuring differences in oxygen use and glucose metabolism

Brain Stimulation Techniques

✓ FDA Approved

ECT

Electroconvulsive Therapy — gold standard for severe MDD

rTMS

Repetitive Transcranial Magnetic Stimulation (Neuronetics, BrainsWay, Magnus)

DBS

Deep Brain Stimulation — approved for PD, dystonia, OCD

VNS

Vagus Nerve Stimulation — epilepsy & treatment-resistant depression

tDCS (FL-100)

Flow Neuroscience home device — FDA approved Dec 2025

eCOT-AS

Neurolief Proliv Rx — FDA approved Jan 2026



Research / Emerging

FEAST

Focal Administered Seizure Therapy — direct-current ECT variant

MST

Magnetic Seizure Therapy — seizure with TMS coil

Epidural CS

Epidural Cortical Stimulation — less invasive than DBS

tDCS

Transcranial Direct Current Stimulation (low-intensity)

CES

Cranial Electrical Stimulation — Alpha-Stim

Ultrasound

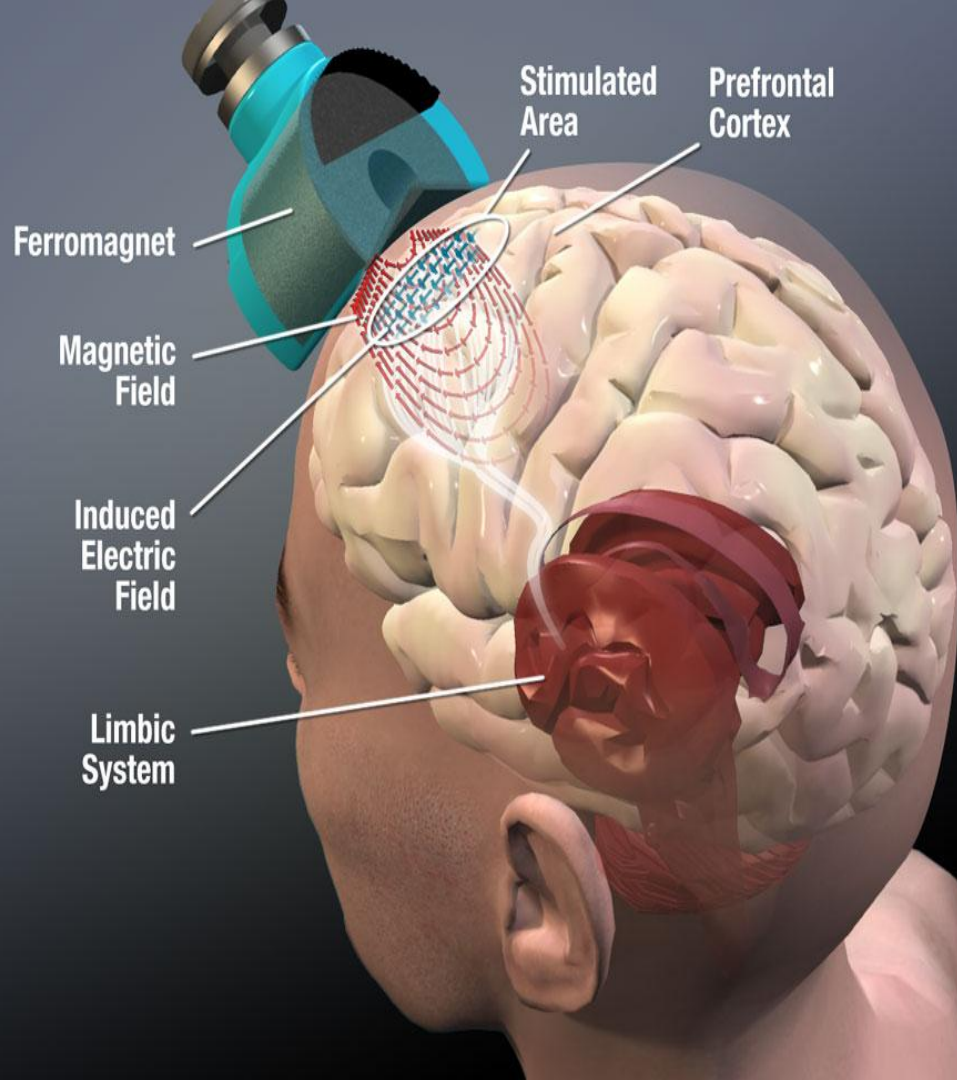
Transcranial Pulsed Ultrasound — neuromodulation frontier

Historical Studies that Moved the Field of TMS Forward

- 1985: Anthony Barker, PhD makes use of the first TMS device
- 1995: Mark George, MD shows potential therapeutic utility in depression
- 2008: First TMS device FDA cleared for use in TRD
- 2013: First dTMS device FDA cleared for use in TRD
- 2018: FDA clearance of first TMS device for OCD
- 2018: First FDA clearance of device with iTBS capability
- 2022: FDA clearance of the SAINT protocol and system
- 2024: BrainsWay gets first FDA clearance for “late life depression”
- 2024: Neuronetics gets first FDA clearance for “adolescent depression”
- 2025: BrainsWay gets clearance for accelerated TMS (SWIFT) protocol



[http://www.scholarpedia.org/
article/
Transcranial_magnetic_stimulati
on](http://www.scholarpedia.org/article/Transcranial_magnetic_stimulation)



Overview of TMS

- 1) Electrical energy in insulated coil on the scalp induces
- 2) Pulsed magnetic field of about 1.5 Tesla in strength
- 3) Passes unimpeded through the cranium for 2-3 cm
- 4) In turn induces a focal electrical current in the brain
- 5) Get desired local and distal effects on the target neural circuitry
- 6) Delivered as single pulses or repeated trains (rTMS)

Mechanism of Action

Electromagnetic Induction

Rapidly alternating magnetic field (1.5–4 Tesla) induces electrical currents in cortical neurons, depolarizing targeted circuits at ~2–3 cm depth

DLPFC Targeting

Standard placement at left dorsolateral prefrontal cortex (5-cm rule or neuronavigation); modulates cortico-limbic networks implicated in MDD

Frequency-Dependent Effects

High-freq (≥ 5 Hz) excitatory $\rightarrow$ LTP-like potentiation. Low-freq (1 Hz) inhibitory $\rightarrow$ LTD-like suppression. Both used clinically

Neuroplasticity

Repeated sessions produce lasting synaptic remodeling, normalization of prefrontal hypoactivity, and downstream modulation of amygdala/subgenual ACC

Why Patients Prefer TMS: The Side Effect Comparison

ANTIDEPRESSANT MEDICATIONS

- ✗ Weight gain
- ✗ Sexual dysfunction
- ✗ GI distress / nausea
- ✗ Insomnia or sedation
- ✗ Withdrawal syndrome
- ✗ Tremor / sweating
- ✗ Blurred vision
- ✗ Emotional blunting

TMS THERAPY

- ~ Scalp discomfort (mild, fades)
- ~ Headache (initial sessions)
- ✓ No systemic effects
- ✓ No weight change
- ✓ No sexual effects
- ✓ No cognitive impairment
- ✓ No sedation
- ✓ No withdrawal

Standard TMS: What to Expect

SESSIONS

30–36 sessions
typically

SCHEDULE

5 days/week
over 6–9 weeks

DURATION

20–40 min per
session

EXPERIENCE

Awake, alert
can drive home
and work

FINDING A SKILLED PROVIDER

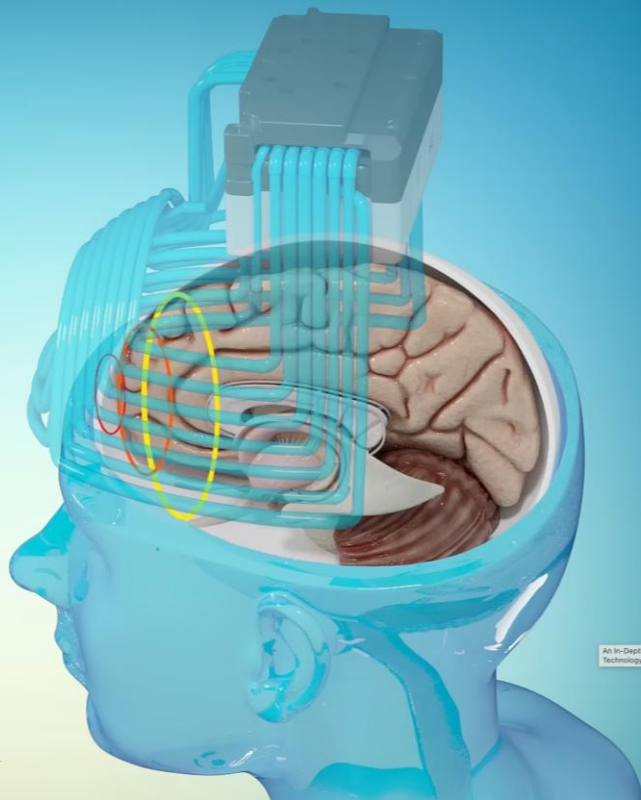
- Board-certified psychiatrist with dedicated brain stimulation training
- Residency or CME-based TMS certification (Clinical TMS Society)
- Program volume: active program, not occasional use
- Multiple device familiarity and accelerated protocol capability

Transcranial Magnetic Stimulation (1st Gen)





et al. Deep TMS in a resistant major depressive disorder: a brief report. *Depress Anxiety*. 27:465-9 (2010).



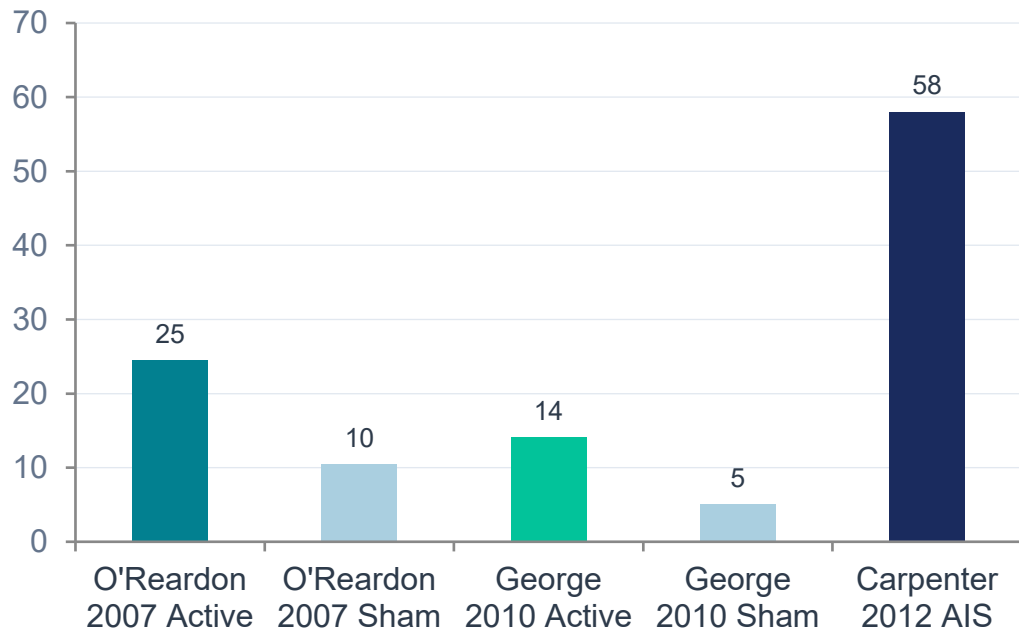
An In-Depth Look At BrainWay Technology For Brain Disorders



Deep rTMS

Early Sham-Controlled Evidence & Meta-Analyses

Remission Rates: Active vs. Sham Across Key Studies



Sources: O'Reardon 2007; George 2010; Carpenter 2012; Berlin 2014; Slotema 2010

Meta-Analytic Findings

Lam et al. 2008
(JAMA)

NNT ~6 for response; active sig. superior to sham ($p < 0.001$)

Slotema et al. 2010
(J Clin Psychiatry)

Effect size $d = 0.55$ for response; supports clinical benefit

Berlin et al. 2014
(Psychol Med)

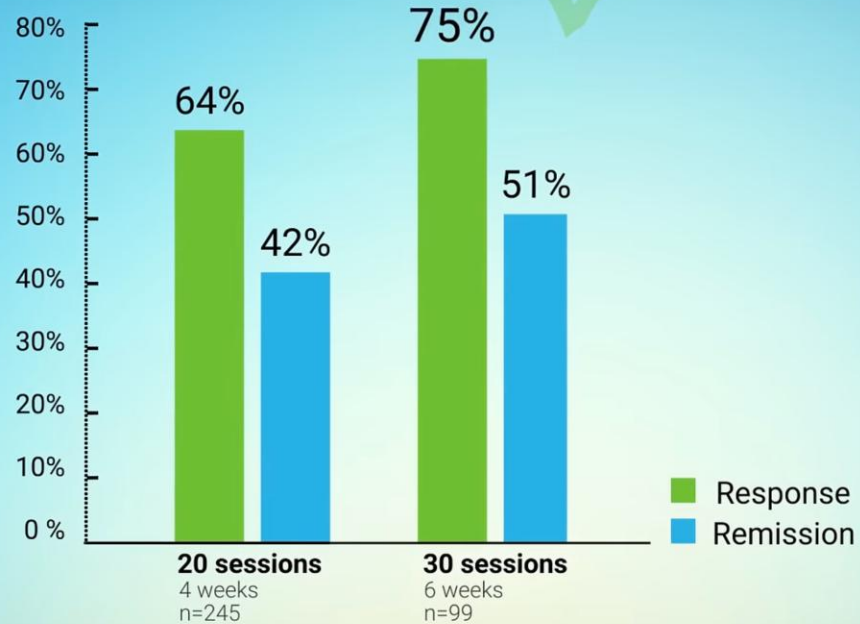
ORR 29% vs 11% sham across 29 RCTs ($N = 1,371$)

Health Qual. 2015
(AHRQ Evidence)

Strong A-level evidence for ≥ 1 ADM failure population

Brainsway

CLINICAL PRACTICE



*In the multicenter trial that led to Brainsway's FDA clearance for MDD, 1 in 3 medication-resistant patients achieved full remission and 38.4% achieved a positive response. Real life settings have shown significantly better results.

More TMS = Better Outcomes

Extending the acute course beyond 30 sessions converts non-responders into responders

52.5%

Conversion Rate

*Non-responders at session 30
who responded after extension*

~53%

Replicated Finding

*Confirmed by Razafsha et al. 2023
in independent naturalistic study*

77.5%

Prediction Accuracy

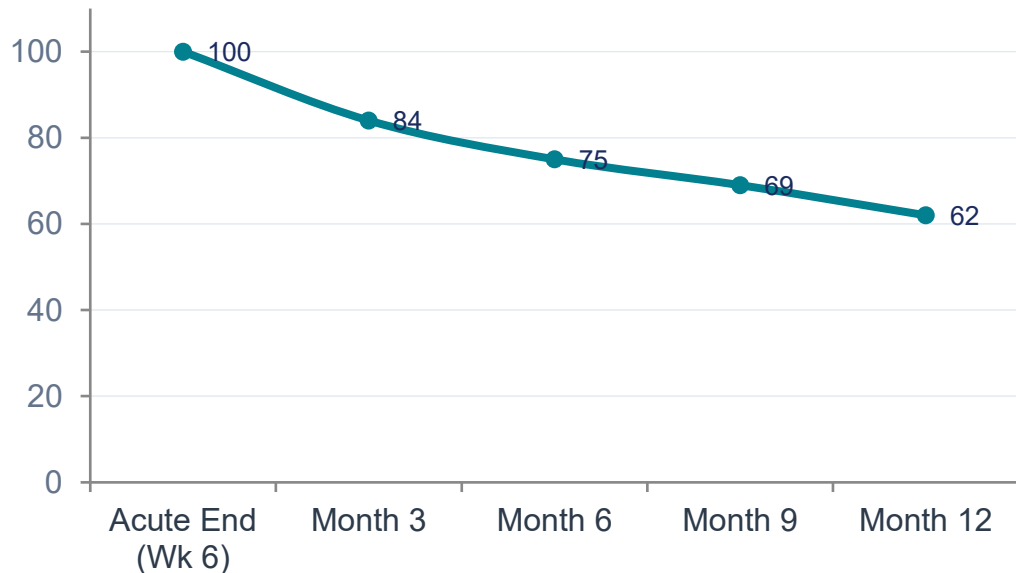
*≥26% IDS-SR improvement by
session 30 predicts conversion*

Response & Remission: Session 30 vs. Post-Extension

Outcome	At Session 30 (Standard Endpoint)	After Extension (37–41+ Sessions)	Benefit
Response Rate	46%	62%	+16 pts
Remission Rate	15%	30%	2× higher
IDS-SR Improvement (Converters vs. Non)	20.2% avg (non-converters)	33.8% avg (converters)	<i>Steeper trajectory = better odds</i>

Durability & Relapse Prevention

Durability of Response Post-TMS (Dunner et al., 2014)



Dunner et al. 2014

(J Clin Psychiatry): 257 acute responders followed 52 wks. ~62% maintained response at 1 year; median time to relapse 194 days.

Retreatment Works

Carpenter 2012 & Cohen 2009: >50% of relapsers responded to retreatment course; TMS can be repeated safely.

Combined Pharmacotherapy

Isserles & Zangen 2011; Blumberger 2018: Concurrent antidepressant maintenance extends durability and reduces relapse vs TMS alone.

Maintenance TMS

Emerging evidence for scheduled maintenance sessions (weekly or monthly) post-acute to extend remission; standard of care at many centers.

People can be treated again and 1/3 need it in less than 6 months

TMS Works — And It's Covered

**4 Large
RCTs**

Supporting TMS for
treatment-resistant
depression

37%

Remission in
double-blind phase
(real-world: up to 50–62%)

**Up to
83%**

Response rates in
latest real-world
Multisite RCT 2023

60-70%

Durability of
response at
12 months

✓ FDA cleared since 2008 ✓ All major commercial insurers ✓ VA & Medicare coverage ✓ NOT experimental

George et al. Arch Gen Psychiatry 2010 | O'Reardon et al. Biol Psychiatry 2007 | Tendler et al. Psychiatry Res 2023

Theta Burst Stimulation: 3-Minute Sessions, Same Results

STANDARD TMS (10 Hz)

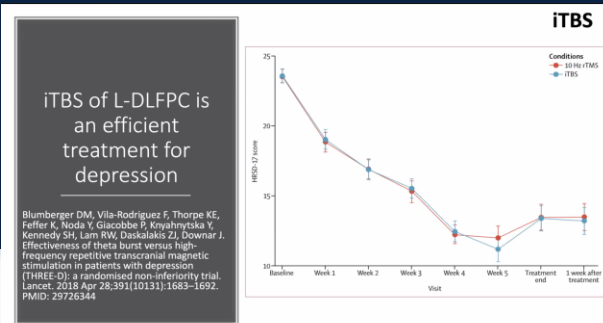
- 20-40 minutes per session
- 1,980 pulses delivered
- 5 days/week × 6 weeks
- 36 total sessions



Blumberger et al., Lancet 2018: THREE-D trial, N=414 — iTBS non-inferior to 10Hz rTMS for depression

THETA BURST (iTBS)

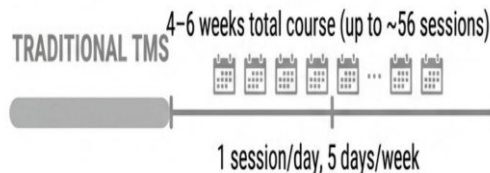
- 3-9 minutes per session
- 600–1,800 pulses
- Same 5-day schedule
- Non-inferior efficacy (THREE-D trial, Lancet 2018)
- Improves clinic throughput
- Enables accelerated protocols



Background: What Is Accelerated TMS?

Traditional TMS

- 1 session/day, 5 days/week
- 4–6 week total course
- ~30–36 total sessions, with extensions ~56
- Response rate: ~50–60%
- Remission rate: ~30–35%
- Burden: high (travel, time)
- Onset of benefit: slow



Accelerated TMS



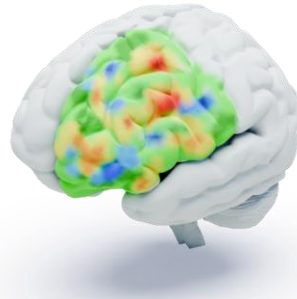
- Compressed into days to weeks
- Same or more total pulses
- Response rates comparable or higher
- Reduced patient travel burden (VS time burden?)
- Faster onset of clinical benefit
- Emerging for urgent need/stabilization

SAINT is the **only form of TMS** that is personalized, rapid-acting therapy, combining functional MRI (fMRI)-based treatment guidance with an accelerated 5-day TMS treatment protocol



Pre-SAINT Imaging: Functional & Structural MRI

Approximately 45-minute scan to map the brain using our proprietary sequences (existing MRI codes apply)



SAINT STEP 1

Individual Target Identification (code 0889T)

Proprietary algorithm identifies optimal spot in your brain for precise, individualized stimulation



SAINT STEP 2

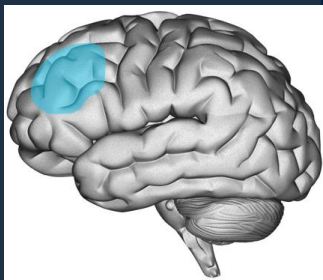
Intensive 5-day TMS Therapy Protocol (codes 0890T, 0891T, or 0892T)

Unique theta burst stimulation, targeted with real-time image guidance, delivered 10x per day (10-12 hr day) over 5 days

SAINT: The 5-Day Breakthrough- 3rd Generation TMS

Precision Targeting

fMRI identifies the exact subregion of DLPFC most negatively connected to the subgenual cingulate (depression's 'hub')



Accelerated Dosing

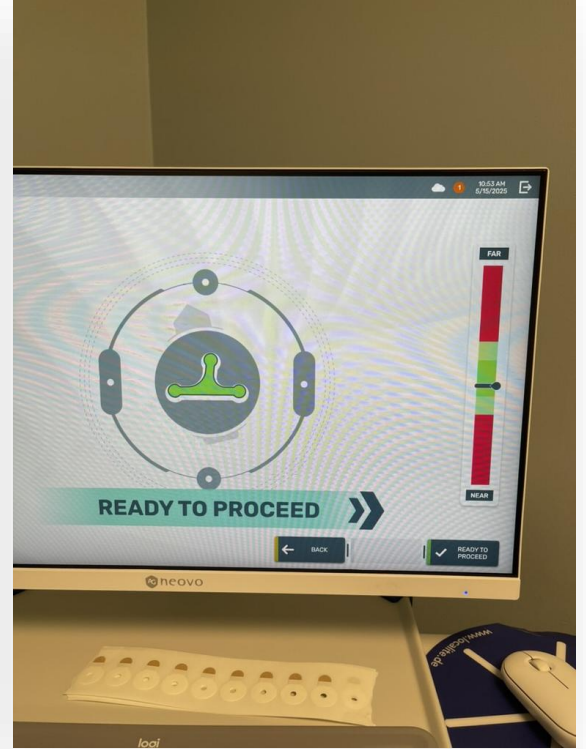
10 sessions per day
50 min apart
for 5 consecutive days
= entire course in 1 week

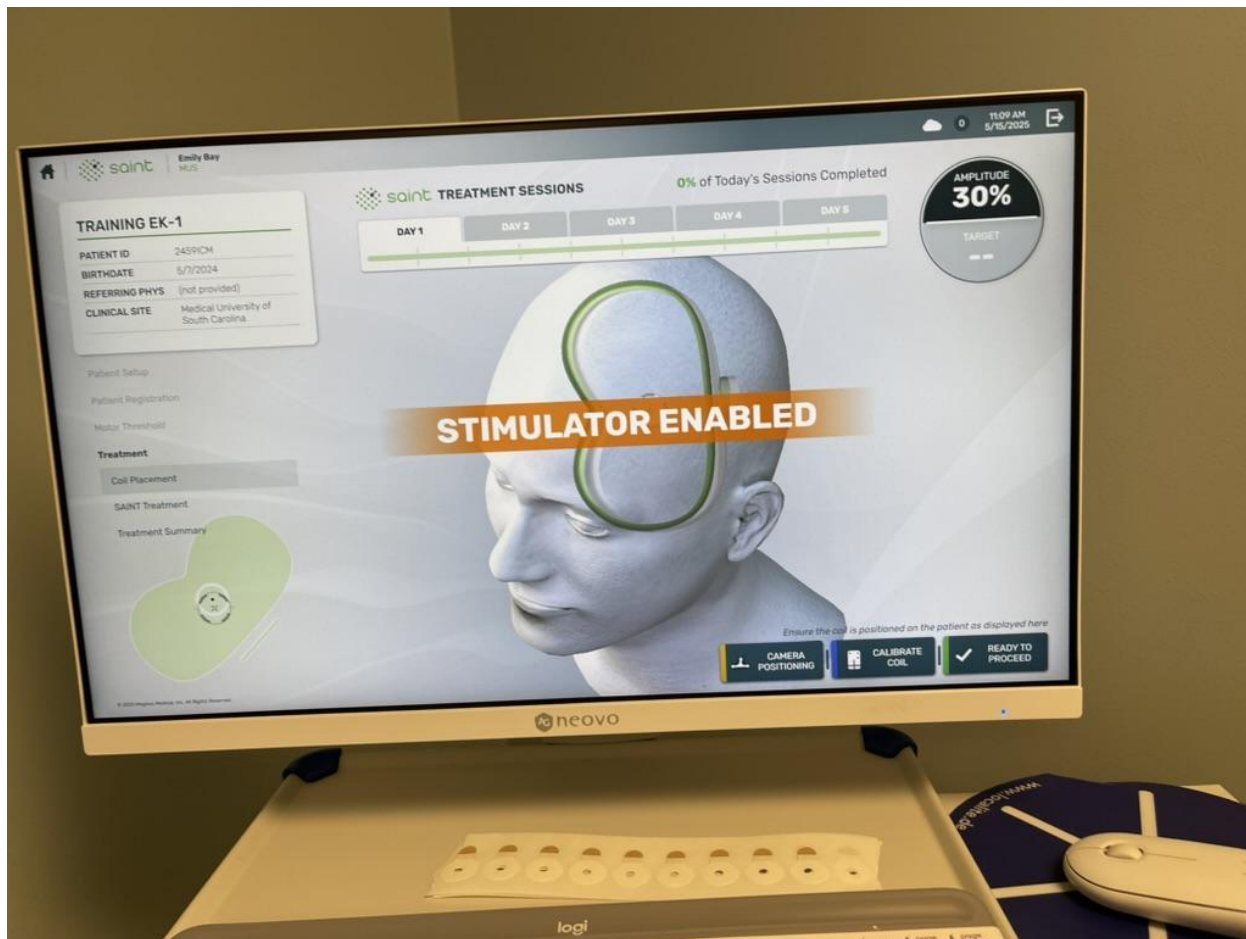
Day 1	Day 2	Day 3	Day 4	Day 5
1785 1800	1785 1800	1785 1800	1785 1800	1785 1800
50 minute	50 minute	50 minute	50 minute	50 minute
IS	IS	IS	IS	IS
1785 1800	1785 1800	1785 1800	1785 1800	1785 1800
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High Pulse Density

1,800 pulses/session
18,000 pulses/day
90,000 pulses total
(vs ~2,000 standard)





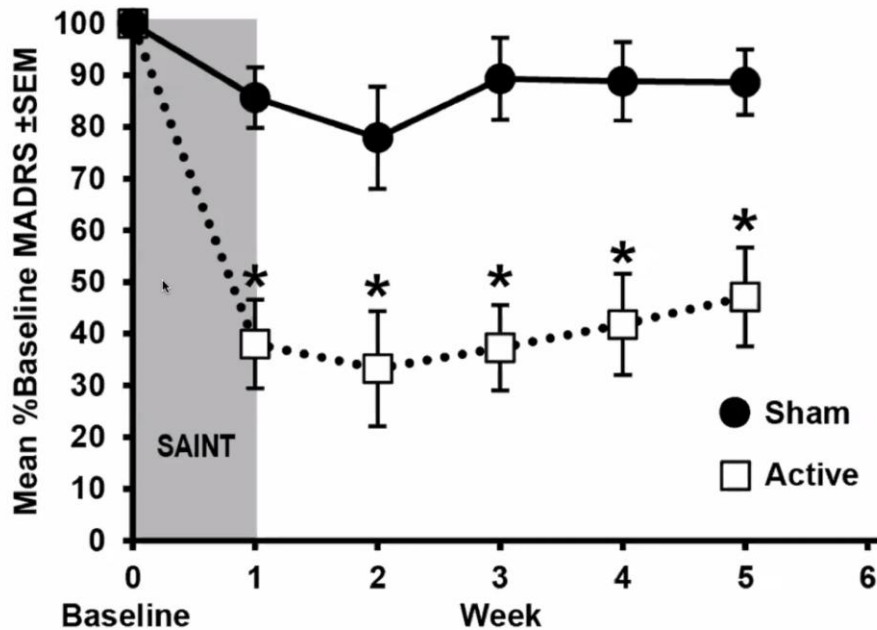


SAINT RESULTS

The American Journal of
Psychiatry

Cole et al., 2021
PMID: 34711062

Primary
Outcome



SAINT Results: What the Data Show

79%

Remission Rate

(vs. 13% sham)
in the pivotal RCT

*Cole et al.,
Am J Psychiatry 2022*

5 days

Complete acute treatment course —
patient returns to function quickly

Remission onset

Many patients report improvement
within 2–3 days of treatment

MUSC first

Dr. Short led first national clinical
implementation of SAINT in 2024

Biomarkers

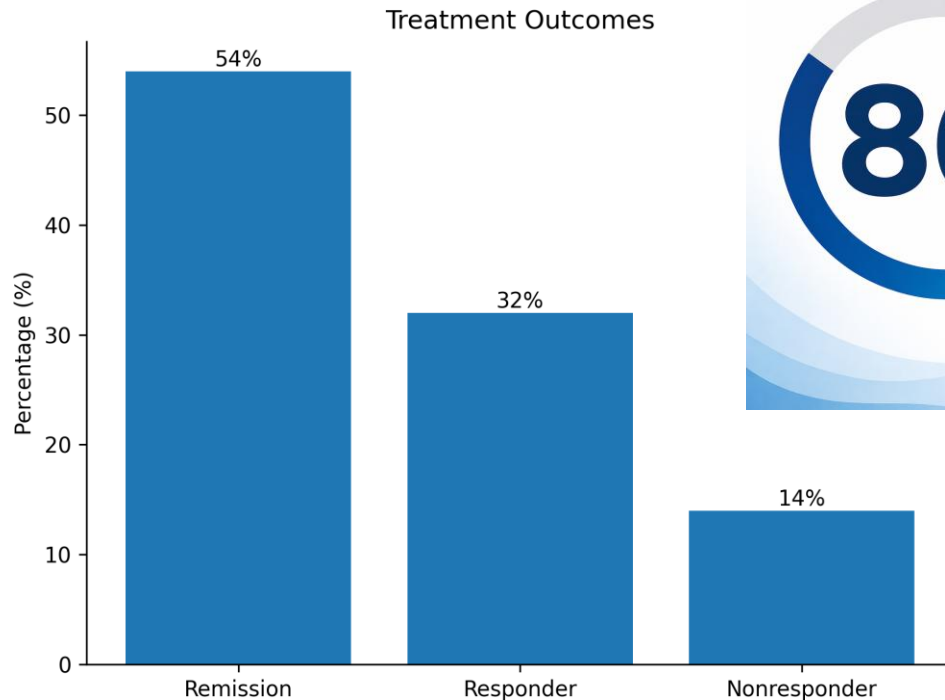
fMRI targeting also reveals
predictors of response

Stanford RCT Replication: New 2026 Study

- **Design:** Double-blind, sham-controlled RCT replication study evaluating SAINT in a larger randomized sample of subjects (n=48) with treatment-resistant, moderate-to-severe depression
 - **Primary Endpoint:** Depression remission at 1 mo. (MADRS ≤ 10)
 - **Secondary:** Response rate per MADRS reduction; analysis of EEG activity
- **Patients:** Diagnosis of moderate-to-severe depression (≥ 20 MADRS), treatment resistant (4.5 ± 1.8 lifetime failed treatments), with current depressive episode 4.9 ± 5.2 yrs
- **Outcomes:** Remission of 50% in SAINT tx arm vs. 20.8% in sham arm (p=0.035)
 - No SAEs, and longitudinal analysis showed clinically significant improvement in treatment arm at all time points
 - EEG changes in L-ACC beta power correlated with greater MADRS reduction in treatment arm, but not in sham group

MUSC SAINT 2025 data

N=38



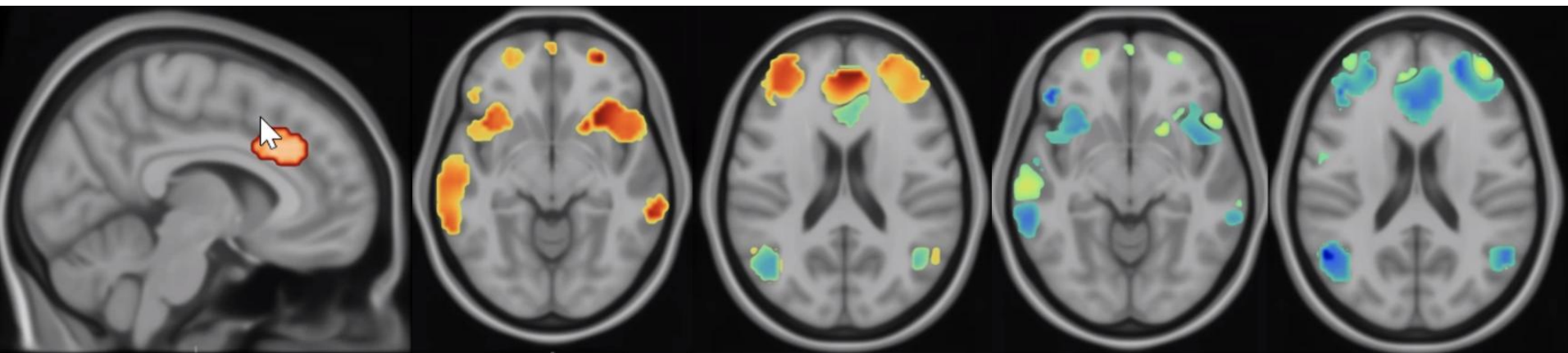
Insight Ribbon: Translation to the Clinic: While real-world remission rates (54%) adjust downward from highly controlled pilots, they remain significantly higher than standard TMS.

ACC- ant insula connectivity signaling reverses with SAINT TMS antidepressant response

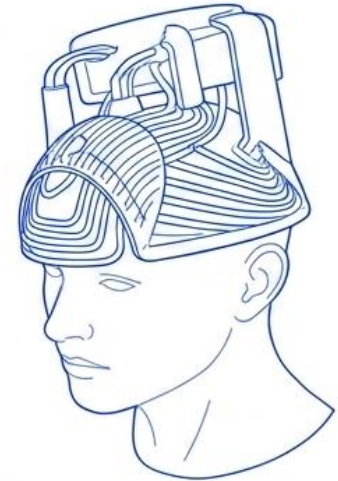
Seed

Baseline

Posttreatment



A Multisite Randomized Non-Inferiority Trial of Accelerated TMS



Protocol Investigated

Accelerated (ACC-iTBS) vs.
Standard (SOC-HF)
H1-coil TMS

Cohort

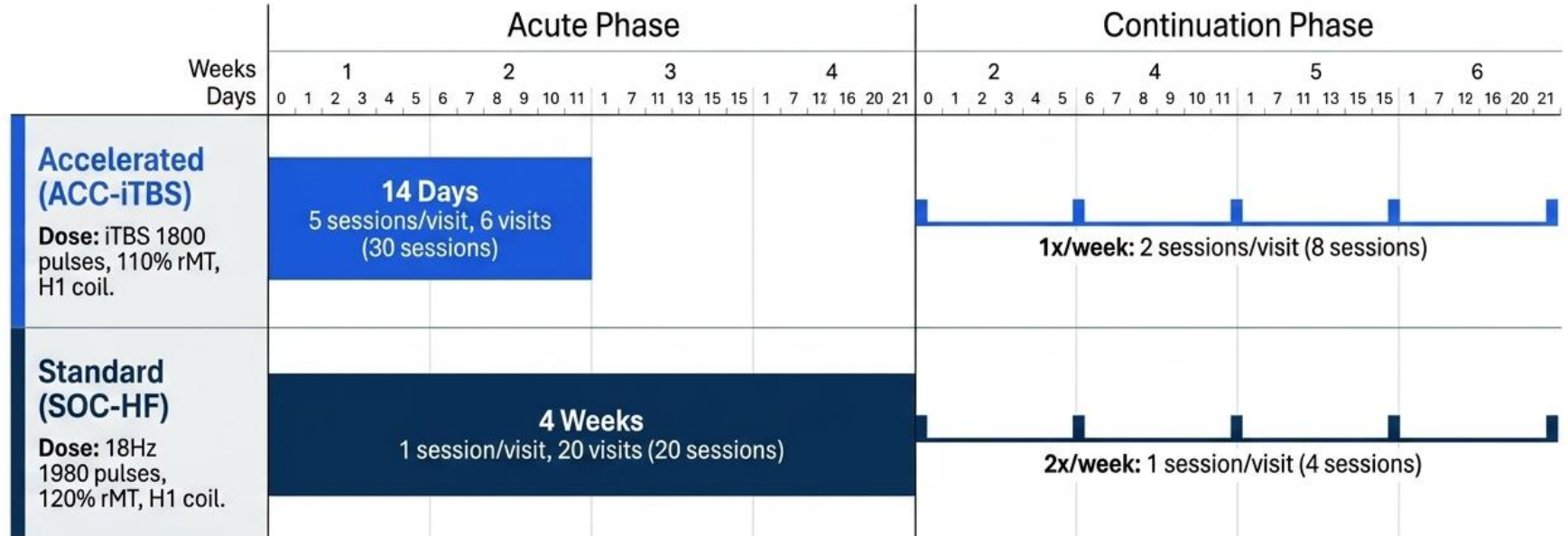
104 patients with Major
Depressive Disorder (MDD)

Clinical Goal

Establishing non-inferiority
while radically compressing
the treatment timeline

Compressing the Treatment Timeline

Comparative Gantt Matrix



38 total sessions condensed vs. 24 standard sessions spread—measuring the impact of high-density delivery.

Uncompromised Efficacy at the 6-Week Timepoint

Clinical Response



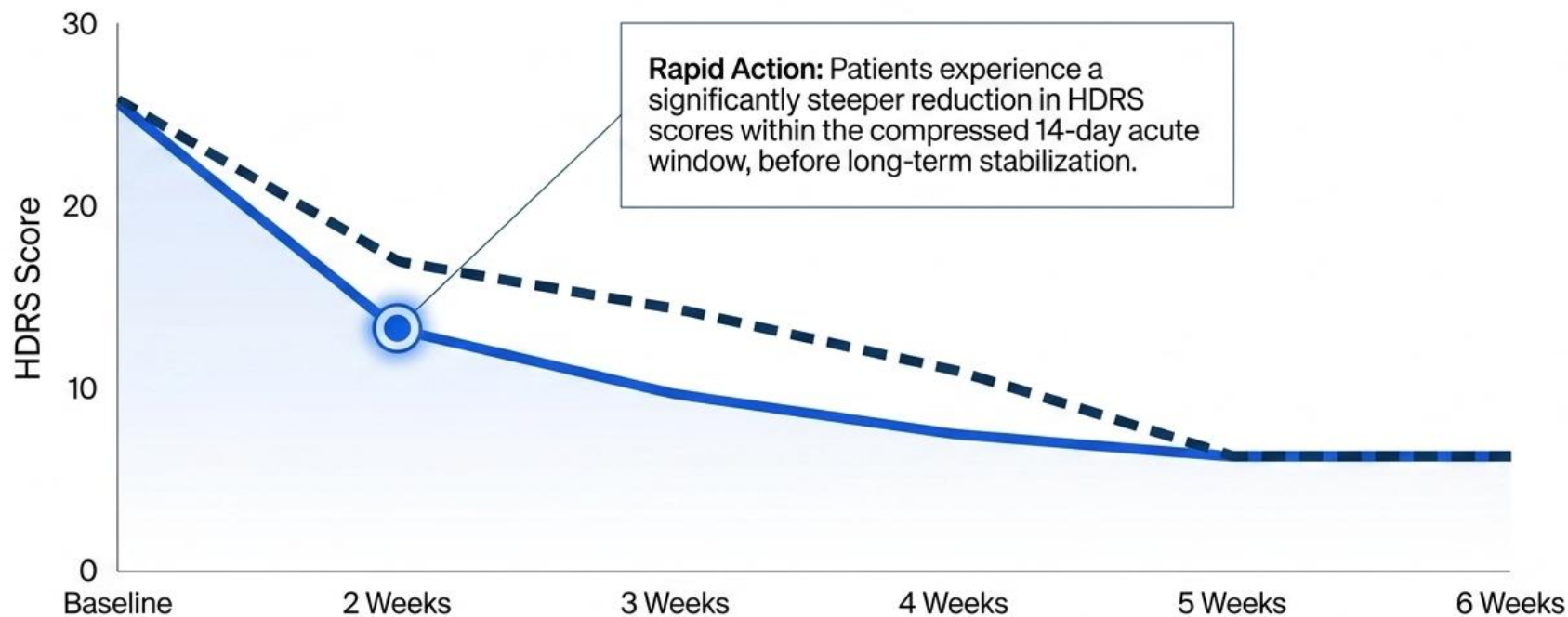
Clinical Remission



Despite the severely truncated acute phase, Accelerated iTBS delivers statistically non-inferior response and remission rates for MDD patients compared to the standard 4-week protocol.

Accelerated Trajectory of Symptom Relief

Activation Curve



SWIFT offers a highly flexible, outpatient accelerated option

SWIFT Timeline (10 Visits Total)

Days 1-6:

- 5 sessions/day.
- Flexible scheduling (patients choose their days).
- Minimum 50 mins between sessions.

Weeks 3-6:

2 continuation sessions per week.

Clinical Outcomes (Multi-site RCT, N=104)

78% Remission | 87.8% Response

21 Days: Median time to remission (significantly faster than standard 28 days).

Patient Impact: Dramatically improves **Quality of Life** metrics:
Work (65% improvement) **Social** (54-75%) **Family** (62-69%)



What Patients Experience with Accelerated TMS

Day 1

5 sessions

Baseline assessment
First 5 sessions
~5 hours in clinic

Days 2–6

5×/day

Flexible scheduling
≥50 min between
All within 2 weeks

Weeks 3–6

2×/week

Continuation phase
1 day per week
Outpatient, brief

Week 6

~88% response

Primary outcome
Back to normal
quality of life

Quality of Life (Q-LES-Q): 85–100% of patients had SEVERE impairment at baseline → only 15–17% at 6 weeks

Work (65% improvement) | Social relationships (54–75%) | Family (62–69%) | Overall satisfaction (65–78%)

Why Accelerated TMS Protocols=Workforce Game-Changer



Removes the Burden of Daily Clinic Visits

Standard TMS = 30+ visits over 6 weeks.
Accelerated = 5 (SAINT) – 10 (SWIFT) visits total.
Patients can complete treatment from 1 week (SNT) to 2 weeks + taper 1 visit a week for 4 weeks(SWIFT).

Shortens Disability Duration

Faster remission 5 days (SAINT) to 21 (SWIFT) means earlier return to work and function.
Direct impact on short-term disability claims and productivity losses.

Expands Access for Underserved

Rural employees, caregivers, shift workers cannot do daily TMS.
Flexible scheduling addresses the #1 barrier to TMS utilization.

Anxiety Improves Too

ACC-iTBS produced 67.5% remission in anxiety (CUXOS).
Anxious depression — common in workforce — responds strongly to TMS.

The Targeting Debate: Precision vs. Anatomy

Imaging Target (Precision)



Apple to Apple Mapping

fcMRI targets the exact anti-correlated circuit in that specific patient's brain.

Scalp Target (Anatomical)



Apple to Orange Mapping

Anatomical targeting maps a standardized model onto an individual's unique brain topology.

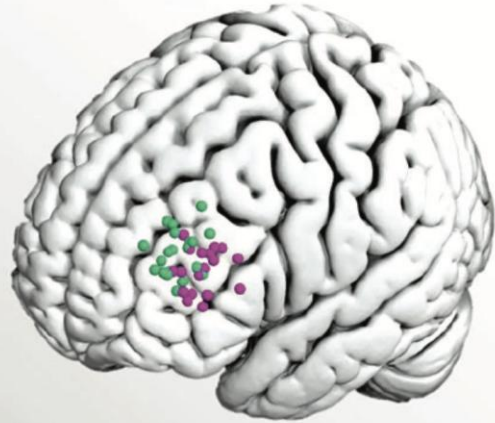
The AINT Trial Insight

AIN T Trial abstr. (IMAGE 2): Blinded interim analysis (n=21) shows 69.8% MADRS reduction for imaging-based vs. 52.9% for scalp-based accelerated TMS.

Precision matters, but anatomical targeting is still highly effective.

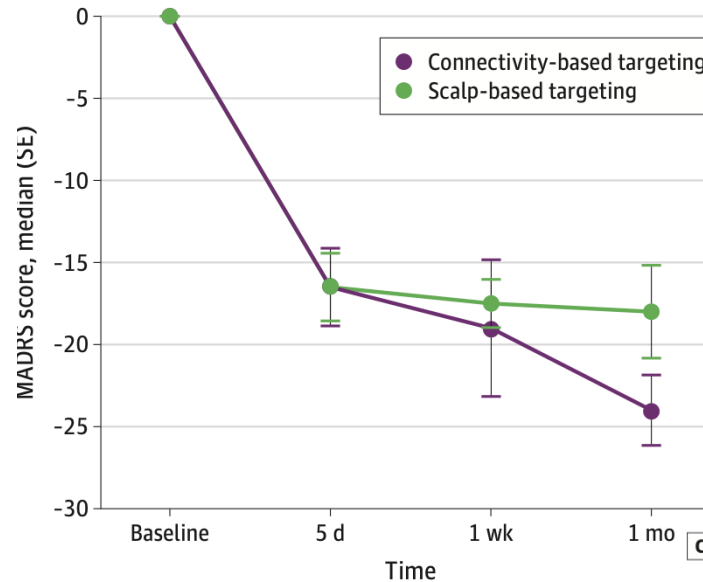
Connectivity Targets Matter!

Targeting method



- Connectivity-based targets
- Scalp-based targets

Change in MADRS scores relative to baseline



Median MADRS reduction: 24
(IQR=9) connectivity vs. 18 scalp
(IQR=13) scalp (p=0.01)

Cohen's d analog: 0.8 (95% CI
[0.26-1.54])

Number Needed to Scan: 5 for 1-month responder

C Clinical outcome by targeting method

Metric	Targeting method, %	
	Connectivity based	Scalp based
Response rate	80	60
Remission rate	65	50
MADRS score % reduction, median (IQR)	83 (38)	62 (54)

rTMS saves money...Next is SAINT & SWIFT

Observational Study > J Comp Eff Res. 2025 Jul;14(7):e250019.

doi: 10.57264/ceer-2025-0019. Epub 2025 Jun 10.

Resource utilization and economic outcomes following repetitive transcranial magnetic stimulation for treatment-resistant depression: a retrospective observational analysis

Joseph J Taylor ^{1 2 3}, Andrew J Manett ⁴, Michael Feyder ⁵, Brandon S Bentzley ⁵

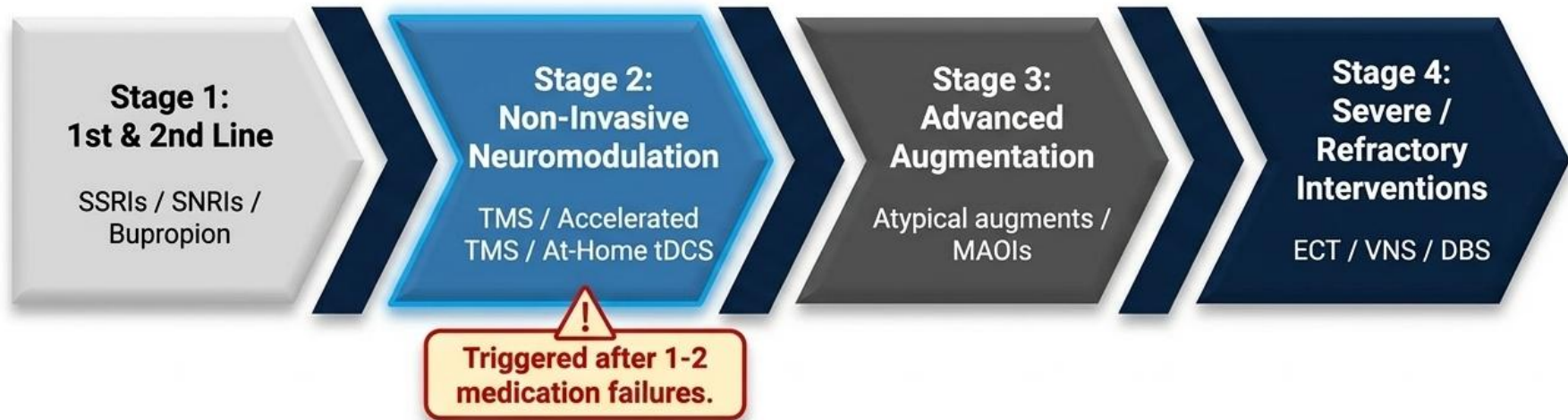
Affiliations + expand

PMID: 40491267 PMCID: [PMC12224075](#) DOI: [10.57264/ceer-2025-0019](#)

Relative to the non-rTMS cohort, the rTMS cohort incurred:

- 37% more hospital outpatient visits with 7% higher outpatient cost
- 24% fewer inpatient admissions
- 19% lower inpatient admission costs
- 48% fewer emergency room visits
- 34% lower emergency room costs, and
- \$893 less in episode of care costs.

Treatment-resistant depression requires a clinical staging model



Takeaway: Brain stimulation is not a fringe last resort—it is a precision intervention mapped precisely to the patient's level of treatment resistance.

ECT in 2026: Not Your Grandfather's Electroshock

ECT is the most effective treatment for severe, treatment-resistant depression — and it has been transformed.

THEN

- X Bilateral electrode placement
- X Sinewave pulse width
- X 30–40% memory impairment
- X Cultural stigma
- X One-size protocol

NOW

- ✓ Right unilateral (RUL) placement
- ✓ Ultrabrief pulse — same efficacy
- ✓ Memory side effects dramatically reduced
- ✓ Response: 65–80% even in severe TRD
- ✓ FEAST (focal ECT): MUSC innovation

ECT is broadly covered, cost-effective in severe cases, and prevents far more expensive hospitalizations.

Electroconvulsive Therapy (ECT)

During ECT — Protocol

Anesthesia

Propofol 1mg/kg · Methohexital 1mg/kg · Etomidate 0.15mg/kg

Muscle Relaxant

Succinylcholine 1mg/kg · Atracurium 400-500mcg/kg

Anticholinergic

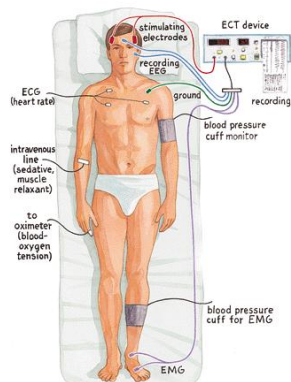
Glycopyrrolate 0.2mg · Atropine 0.4mg

Monitoring

Continuous cardiac (ECG) + EEG throughout

Dosing Strategy

Find seizure threshold → treat above threshold → adjust by seizure duration/morphology



Electrode Placement & Outcomes

Bitemporal (BL)

65%

Original standard; higher cognitive fx

Right Unilateral

65% (high dose)

6× seizure threshold = equal to BL with fewer cognitive effects

Bifrontal (BF)

~60%

Intermediate option; fewer side effects than BL

FEAST or RAFT

Similar to RUL

Focal direct-current ECT; 5.5 min mean recovery time (MUSC)



Still no driving, No working
10-14 sessions
3x week for a month

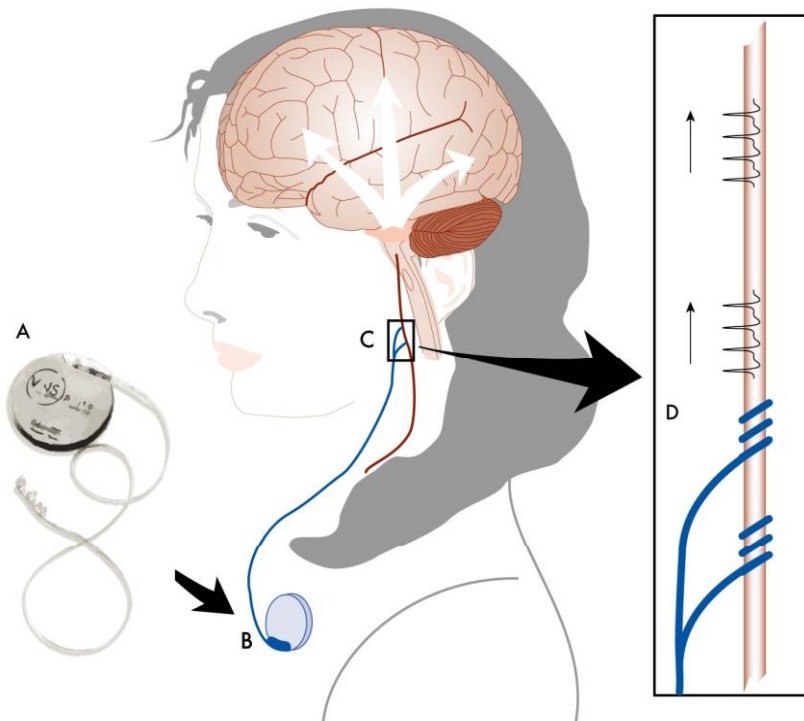
The Neuromodulation Performance Matrix

Intervention	Remission Rate	Mean Time to Remission	Treatment Duration	Targeting
Standard Meds	14%	6+ weeks	Ongoing	Systemic
Standard TMS	17-32%	3.5 weeks	6 weeks (36 visits)	Scalp Measurement
ECT	48%	2.5 weeks	3-4 weeks	Diffuse/Regional
SWIFT (Accelerated)	78%	3 weeks	2 weeks (10 visits)	Deep Brain H1 Coil
SAINT (Accelerated)	Up to 90%	2.6 days	5 days	Individualized fMRI

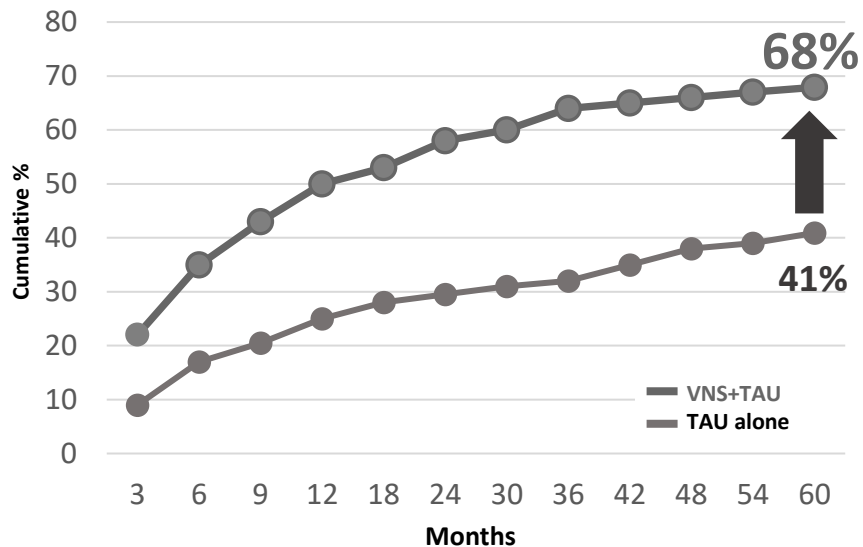
Accelerated protocols (SAINT/SWIFT) deliver ECT-level (or better) remission rates in a fraction of the time, dramatically reducing logistical barriers for rural populations.

What is Vagus Nerve Stimulation (VNS)

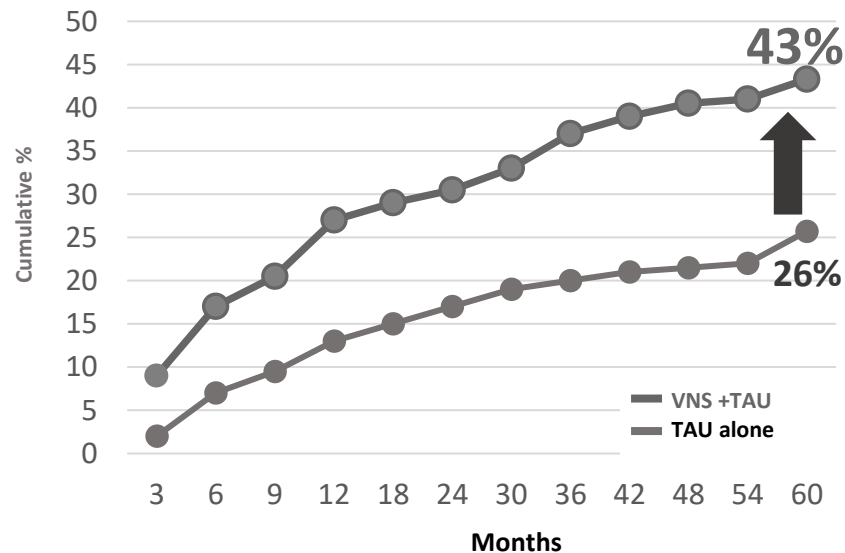
- Mild pulses applied to the left vagus nerve in the neck send signals to the brain
- Automatic intermittent stimulation
- Simple in-office dose adjustment
- Assured treatment adherence
- ^{FDA} Approved for Epilepsy, Class I evidence



Significantly higher 5-year cumulative response rate* ($p < 0.001$)¹



Significantly higher 5-year cumulative remission rate ($p < 0.001$)¹**



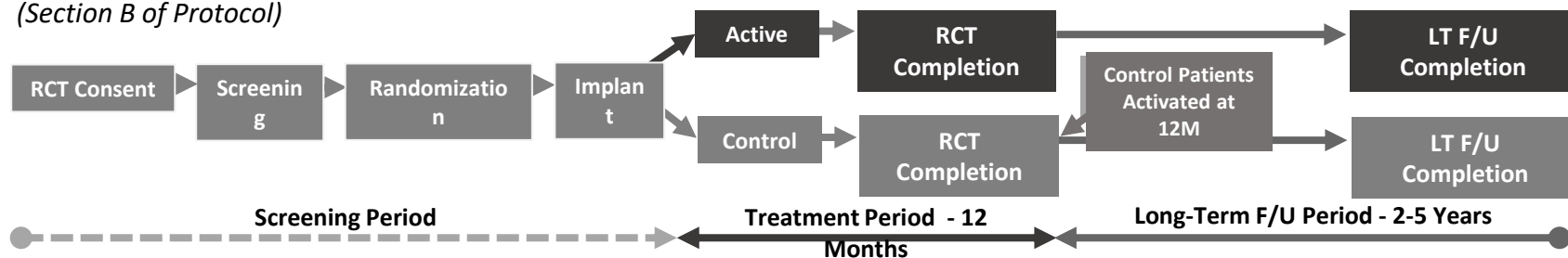
Efficacy analysis conducted on intent-to-treat population. *Response rate defined as decrease of $\geq 50\%$ from baseline in MADRS score at any post-baseline visit during the study. **Remission based on MADRS score ≤ 9 at a post-baseline visit, a QIDS-SR score ≤ 5 at a post-baseline visit, and a CGI-I score of 1 at a postbaseline visit. ITT population was used for efficacy analysis.

1. Aaronson ST, Sears P, Ruvana F, et al. Am J Psychiatry. 2017;174:640-48.

RECOVER Trial

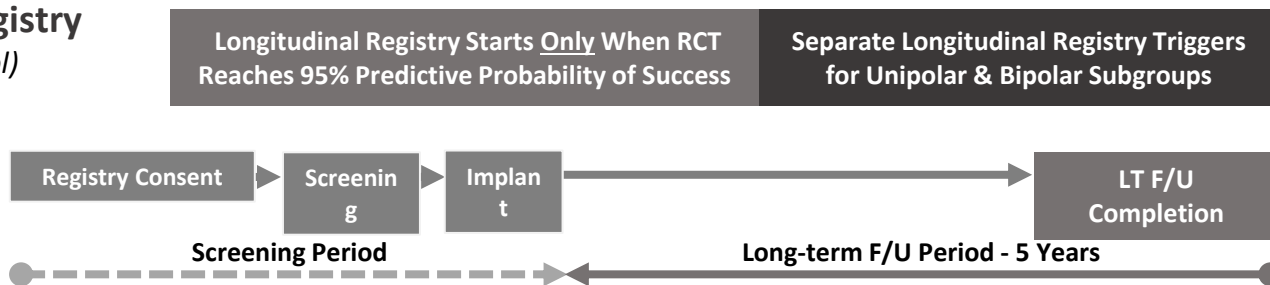
RCT + Follow-up Study

(Section B of Protocol)



Longitudinal Registry

(Section C of Protocol)

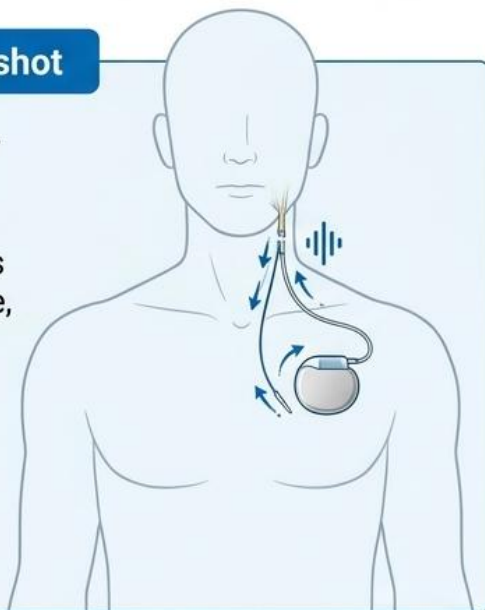


Active VNS demonstrated significantly more percent time in response on the CGI-I ($P=0.004$) and QIDS-SR ($P=0.049$), and significantly more percent time in partial response (PR; symptom improvement $\geq 30\%$) on the CGI-I ($P<0.001$) and QIDS-C ($P=0.006$) versus sham VNS. Active VNS exceeded sham VNS in rate of dyspnea ($P=0.035$), a known side effect of VNS.

Vagus Nerve Stimulation provides exceptionally durable maintenance

Mechanism Snapshot

Small pulse generator implanted in chest sends continuous, automatic mild pulses to the left vagus nerve, increasing NE and 5-HT firing rates progressively over months.



The RECOVER Trial Data (24-Month Follow-Up)

~80%

Benefit Retained:

Participants who found benefit at 12 months maintained it at 24 months.

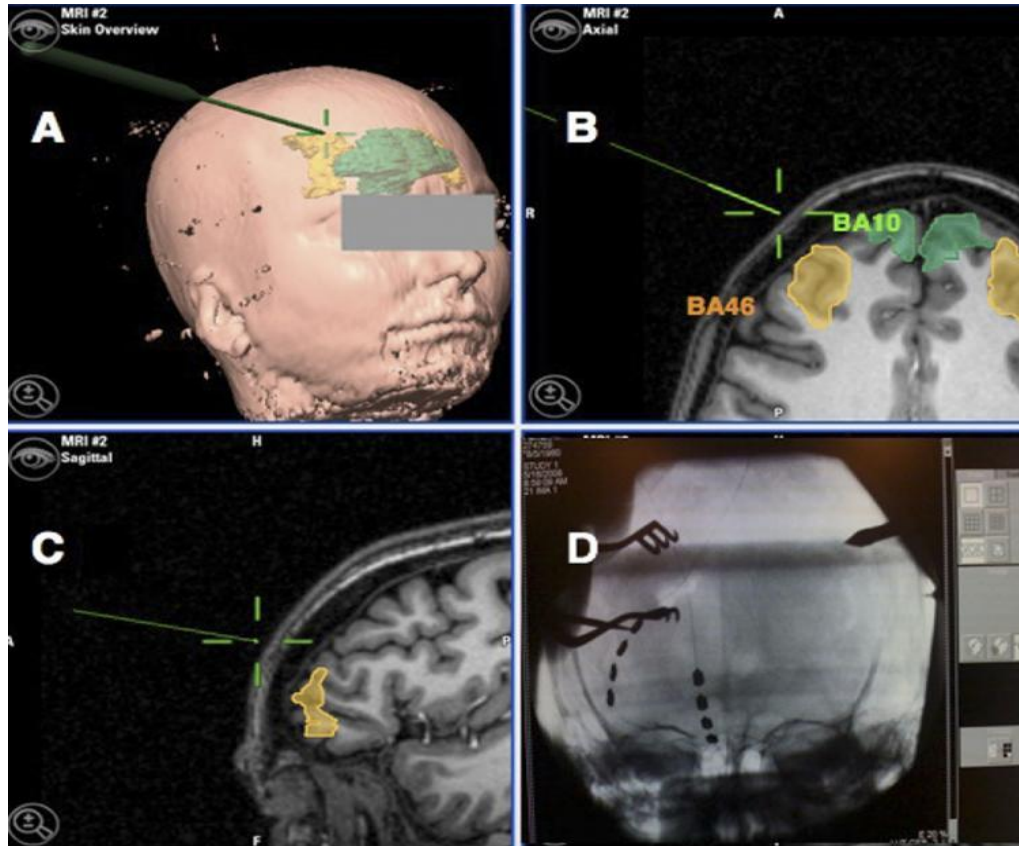
~38%

Late Responders:

Patients with no meaningful benefit at 12 months achieved it by 24 months.

Insight: VNS is FDA-approved for TRD as a long-term adjunctive maintenance tool, ensuring treatment adherence and preventing regression in highly refractory patients.

Intermittent Epidural Cortical



- Strips of electrodes on the brain's surface
- Less invasive
- All 5 patients continued to tolerate the therapy.
- Three of 5 (60%) subjects continued to be in remission at 5 years.
- This study was initiated at MUSC and work continues in Minnesota

The Door Openers: Precision Neuromodulation for TRD

TMS Transcranial Magnetic Stimulation	SAINT Accelerated, Precision-Guided TMS	ECT Electroconvulsive Therapy	VNS Vagus Nerve Stimulation
First-Line TRD	Rapid Response	Severe / Urgent	Chronic TRD
Noninvasive, outpatient targeting of dysfunctional circuits.	Precision-guided via fMRI. Up to 79% remission in one week (Cole et al., 2022). Critical for urgent symptom burden.	Most effective acute treatment. Essential for psychotic depression, catatonia, and severe suicidality. Humane and lifesaving.	Longer-arc pathway. Durable benefit over months to years for highly recurrent illness.

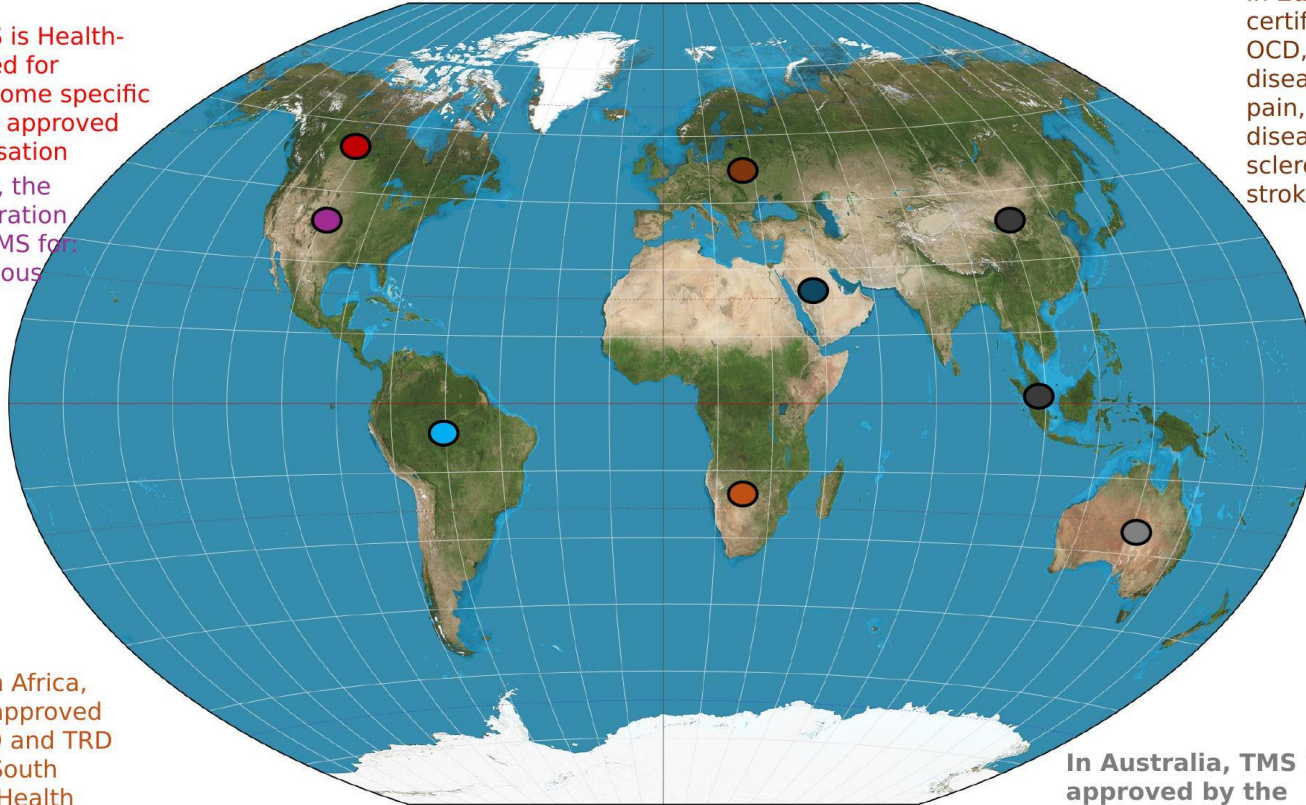
International Regulatory Agencies for TMS Approval

In **Canada**, TMS is Health-Canada-approved for TRD and OCD. Some specific devices are also approved for smoking cessation

In the **United States**, the Food & Drug Administration (FDA) has approved TMS for: depression, OCD, anxious depression, smoking cessation

In South America, various regulatory agencies approved TMS for MDD, TRD. Approvals for other conditions vary by country.

In South Africa, TMS is approved for MDD and TRD by the South African Health Products Regulatory Authority



In **Europe**, TMS has CE certification for: MDD, OCD, Alzheimer's disease, PTSD, chronic pain, Parkinson's disease, multiple sclerosis, and post-stroke rehabilitation.

In Saudi Arabia, TMS is approved for TRD by the Saudi Food and Drug Authority (SFDA)

Asia: In China, TMS is approved by the National Medicine Products Administration (NMPA) for MDD. In Singapore, TMS is approved for MDD and OCD by the Health Sciences Authority.

In Australia, TMS is approved by the Therapeutic Goods Agency (TGA) and the Royal Academy College of Physicians (RACP)

Defining Obsessive-Compulsive Disorder (OCD)

OCD is a psychiatric disorder defined by:

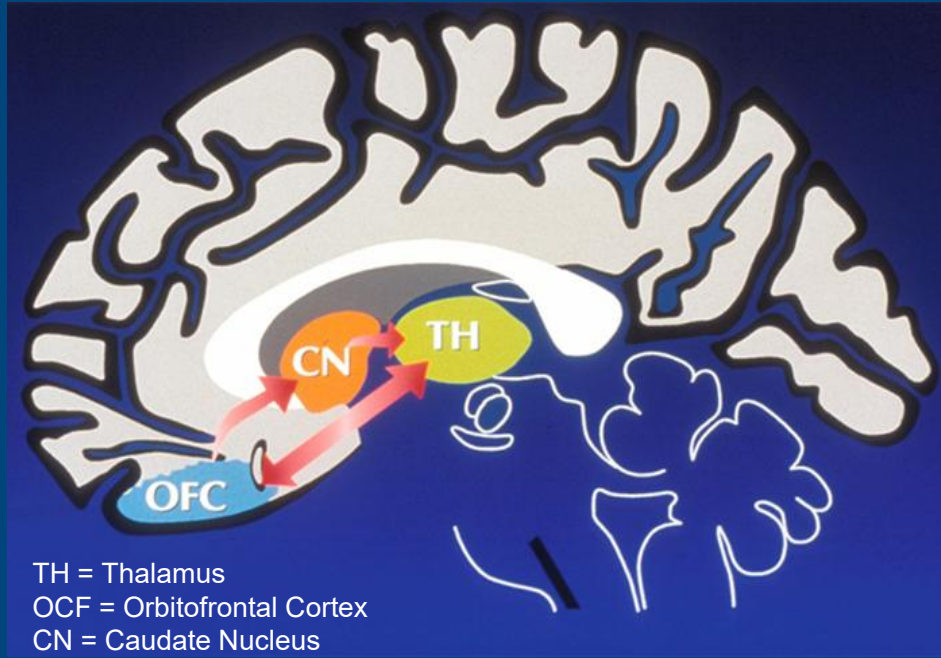
Obsessions: recurrent, unwelcome thoughts

- Fear of dirt, germs, contamination
- Fear of acting on violent or aggressive impulses
- Feeling overly responsible for the safety of others
- Abhorrent religious and sexual thoughts
- Inordinate concern with order, arrangement and symmetry

Compulsions: repetitive behaviors

- Performed in response to obsessions
- Excessive washing (hands/bathing), cleaning, checking, touching, counting, arranging, ordering, or hoarding
- These ritualistic behaviors seem to lessen the distress from obsessions (but is short term at the long-term cost of frequent repetition)

Fronto-Striato-Thalamo-Frontal Circuit



Deep TMS for OCD

Carmi, et al 2019

FIGURE 3. Rates of full response and individual distribution of responders and nonresponders according to YBOCS score at week 6 in the active and sham dTMS treatment groups^a

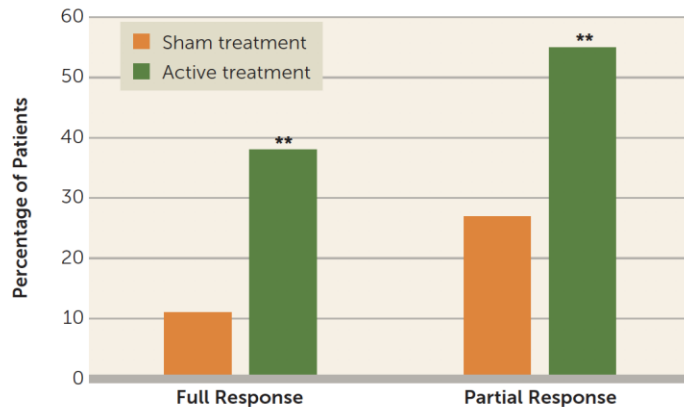
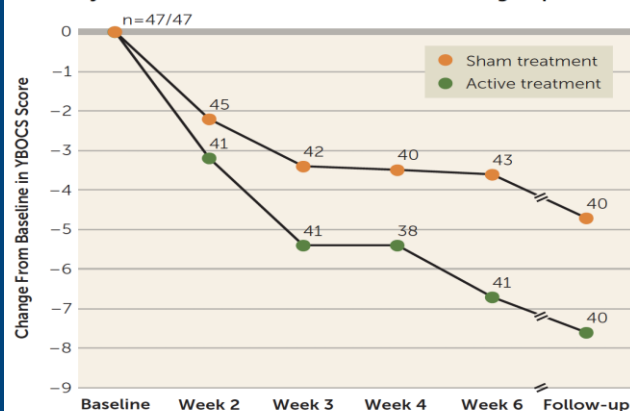
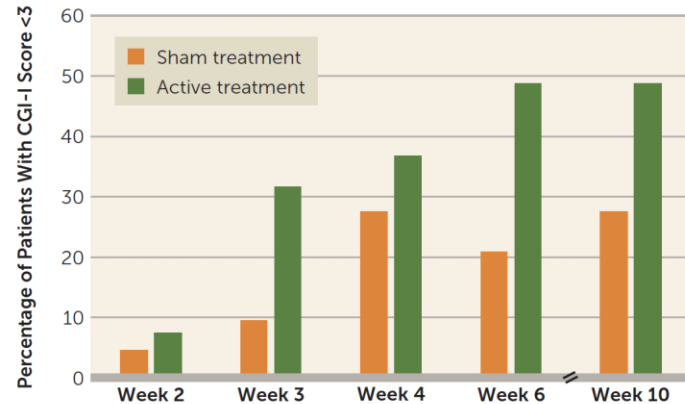


FIGURE 2. Change from baseline in mean YBOCS score through the study for the active and sham dTMS treatment groups^a



^a dTMS=deep repetitive transcranial magnetic stimulation; YBOCS=Yale-Brown Obsessive Compulsive Scale. Each data point includes the patients with recorded YBOCS scores at that time point.

FIGURE 4. Rates of patients reported as “moderate” to “very much improved” in the active and sham dTMS treatment groups across time^a



^a CGI-I=Clinical Global Impressions improvement scale; dTMS=deep

Registry Trial - Real World Evidence: majority of OCD patients achieved response*



Post-market study conditions

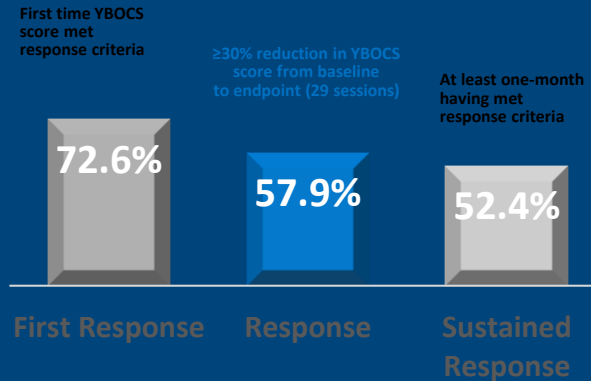
- 22 medical centers worldwide
- 219 OCD patients analyzed
- 121 OCD patients received 29 sessions

Examined clinically relevant endpoints

More treatment sessions = improved outcomes

Average YBOCS scores demonstrated continuous reduction with increased numbers of Deep TMS sessions. (29-40)

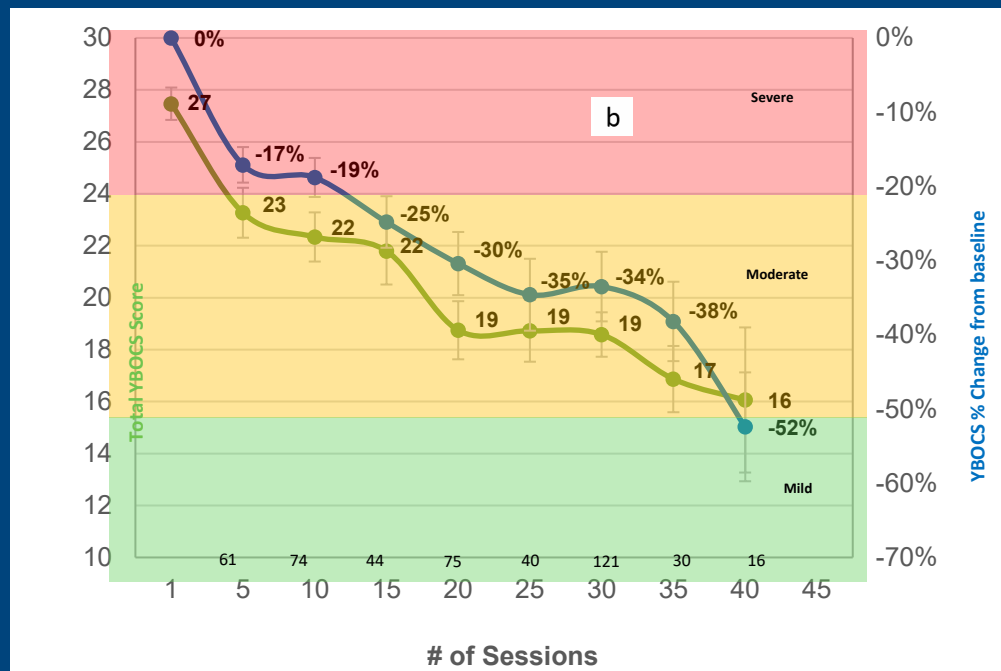
Among patients who completed a treatment course of 29 sessions
>1 in 2 achieved Response



*Response: ≥30% reduction in YBOCS score from baseline

Roth Y. et al. Real-world efficacy of deep TMS for obsessive-compulsive disorder: Post-marketing data collected from twenty-two clinical sites. *J. Psychiatric Research*. 4 Nov 2020

Extending treatment courses improves outcomes

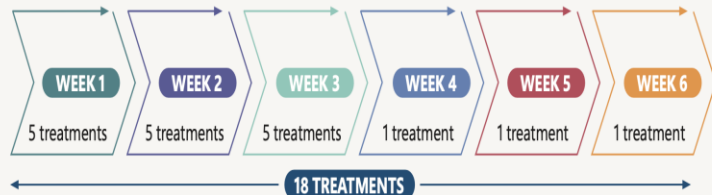


Roth Y. et al. Real-world efficacy of deep TMS for obsessive-compulsive disorder: Post-marketing data collected from twenty-two clinical sites. *J. Psychiatric Research*. 4 Nov 2020

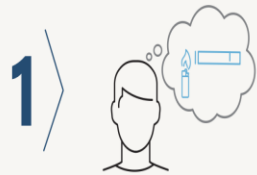
Short Treatment Sessions in Your Healthcare Provider's Office

Easily fitting into your daily routine

Deep TMS for Smoking Addiction consists of 18 sessions across a 6-week period.



Each session typically takes 25-30 minutes and includes 3 steps



1 Induce Craving to Smoke

Desire to smoke is provoked in order to activate the areas of the brain that control cravings, using a variety of visual and audio cues personalized to your smoking triggers.



2 Stimulate Brain Targets with Deep TMS

The treatment coil delivers gentle electromagnetic pulses to key areas in your brain involved in addiction behaviors. These pulses feel like mild tapping on your scalp. You'll be comfortably sitting in a chair, awake and alert during the treatment.



3 Conduct Motivational Counseling

Treatment is followed by a brief therapy discussion with the provider, reinforcing motivation to quit smoking and celebrating day-to-day progression.

A large study in 14 centers examined adults who had been long-term heavy smokers, all having failed prior quit attempts using medication, therapy, or other methods.

Of those that completed Deep TMS treatment,

28%

achieved four consecutive weeks without smoking, most of them not smoking for at least three months after treatment.¹

Among all participants in the study,

the average number of cigarettes smoked per week over the course of treatment was reduced by

75%

No Systemic Side Effects Commonly Found with Medication

And well-tolerated with years of safety data supporting Deep TMS

THE BRAIN ELECTRICIAN'S TAKEAWAY

Thank You

shorteb@muscul.edu

We are in the golden age of brain stimulation — the science is strong, the tools are safe, the evidence is clear

TMS is NOT experimental — it is covered, proven, and underutilized in your covered populations

Accelerated TMS (SAINT, SWIFT) compresses treatment from 6 weeks to 5–6 days without sacrificing results

The access gap is awareness — not just authorization.

The lives you collectively serve deserve to know that if medications fail, there are highly effective, well-tolerated alternatives

Contact information

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