

## Expanding the Nurse Practitioner Role in Treatment Resistant Major Depression

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### Abstract

Treatment resistant major depression (TRMD) is a common problem with significant consequences in terms of bio-psycho-social disability and economic impact for the individual, family and community. A 2014 survey of San Francisco bay area community resources confirms that nurse practitioners (NPs) are under represented in the advanced management of TRMD using electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS) and ketamine infusion therapy (KIT). An expansion in the role of the NP in the management of TRMD is indicated. The purpose of this project was to develop and implement an education course that prepares a cohort of NPs to demonstrate mastery of advanced clinical techniques through direct provision of safe, tolerable and efficacious care to TRMD populations using ECT, TMS and KIT. Five NPs participated in a continuing education program that included four hours of didactic and twelve hours of bedside clinical continuing education in the advanced management of TRMD. Implementation of this quality improvement project resulted in a high level of satisfaction among NP participants and patient. Upon completion of the training, a considerable increase was evident in self-efficacy in the management of TRMD (95%), ketamine infusion therapy (90%), electroconvulsive therapy (85%), and transcranial magnetic stimulation (80%), relative to pre-training levels. In the 60-day follow-up period, all five NP participants directly managed an average of 8.6 patients with TRMD using advanced techniques.

**Keywords:** Electroconvulsive therapy; Transcranial magnetic stimulation; Ketamine infusion therapy; Treatment resistant major depression

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## Introduction

### Background

Major depression is associated with a high rate of mortality and morbidity [1] and affects approximately 18 million people at any one time in the United States alone with a lifetime incidence of up to 17% [2]. Psychotherapy or psychopharmacology alone or in combination is the mainstay of treatment for major depression [3]. Psychotherapy alone is commonly provided by psychologists, marriage and family therapists (MFTs), social workers (LCSWs), and licensed professional counselors (LPCs). Psychopharmacology alone is most commonly provided by: primary care physicians, family nurse practitioners (FNPs), and physician assistants (PAs). Combined psychopharmacology and psychotherapy from a single provider is commonly provided by: psychiatrists, psychiatric nurse practitioners (PMH-NPs), and where available prescribing psychiatric clinical nurse specialists (PMH-CNSs) and the less

common prescribing psychologist [4]. It is estimated that 70% to 80% of cases of major depression will respond to an initial course of psychotherapy and/or psychopharmacology alone or in combination [2]. TRMD is the term that loosely describes those cases of major depression that fail to demonstrate an adequate clinical response to a full treatment course (usually considered to be 12 weeks) of an evidence-based psychotherapy (such as cognitive behavioral therapy or psychodynamic psychotherapy) and two full trials of psychopharmacology from two different antidepressant classes in the current episode [5]. ECT, TMS, and KIT are all within the scope of practice for knowledgeable and skilled NPs however the ANCC and other NP certifying bodies do not require exposure to these modalities during training for a career that will inevitably include caring for patients with TRMD. It is generally presumed that NPs will either pursue post-graduate training in these modalities or refer patients with TRMD to colleagues experienced in the advanced management of TRMD [6]. This quality improvement project was developed to improve

the knowledge and skill of a cohort of NPs related to the clinical management of TRMD using the advanced techniques of ECT, TMS, and KIT through participation in a continuing education (CE) format that incorporates both didactic and clinical (experiential) learning opportunities. An additional purpose of this project is to demonstrate that ECT, TMS, and KIT services provided by NPs following this continuing education program was comparable in terms of efficacy, safety, tolerability and patient satisfaction to similar services provided by psychiatrists.

## Treatment Resistant Major Depression

TRMD is the term that loosely describes those cases of major depression that fail to demonstrate an adequate clinical response to a full treatment course (usually considered to be 12 weeks) of an evidence-based psychotherapy (such as cognitive behavioral therapy or psychodynamic psychotherapy) and two full trials of psychopharmacology from two different antidepressant classes in the current episode [5]. An adequate clinical response is generally considered to be a significant reduction (+/-50%) in clinical symptoms or a return to near baseline bio-psycho-social functioning [7]. The commercial insurance industry has typically required documented evidence of TRMD as part of the prior authorization process for ECT or TMS. KIT does not typically require prior authorization as the overhead costs are substantially less than for the other two modalities.

## Electroconvulsive Therapy

ECT is typically considered the “gold-standard” intervention for TRMD [2]. ECT provides rapid relief from the symptoms of major depression in 75% to 85% of cases [7]. Onset of symptom relief begins as early as day 7-10 (4<sup>th</sup> to 5<sup>th</sup> treatment) with relief of most symptoms of depression by the 3<sup>rd</sup> to 4<sup>th</sup> week (8<sup>th</sup> to 12<sup>th</sup> treatment) [8]. ECT has been available since the late 1930s with evolution in the techniques and practice standards reflecting advances in technology. Barriers to use of ECT in the management of TRMD include: cost (+/- \$20,000), anesthesia risks/fears, specific cardiac or intra-cerebral contraindications, availability (rural areas), and real or imagined psychosocial stigma.

## Transcranial Magnetic Stimulation

TMS research began in the late 1990s and the technology was brought to the consumer markets in Western Europe, Canada and Australia in the early 21<sup>st</sup> century. The U.S. Food and Drug Administration (FDA) approved the Neurostar TMS device for use in the management of TRMD in 2008 [9]. TMS costs are typically 30% to 50% less than costs associated with ECT [10]. A course of TMS typically is composed of 20-30 outpatient sessions that last approximately one hour and are scheduled in the outpatient setting five days per week. Symptom relief begins around the 10<sup>th</sup> treatment (2<sup>nd</sup> week) with resolution of most symptoms of depression by the 20<sup>th</sup> session (4<sup>th</sup> week). Side effects for TMS include a small risk of seizure and the potential for headache early in the course of treatment. The response rate for TRMD to a course of TMS is estimated to be around 50%-60% [11].

## Ketamine Infusion Therapy

Ketamine infusion therapy has emerged in the last 10 years as an evidenced based rapid acting intervention for TRMS [12]. KIT provides relief of suicidal thinking as early as three hours following the infusion, with peak antidepressant effects at day 3 post infusion lasting for up to 7 days [13]. Most KIT protocols provide twice per week treatments for 2-4 weeks with the potential to extend into a maintenance protocol similar to maintenance ECT [14]. The costs associated with KIT are typically 1-2 times the cost of a combined session of psychotherapy + psychopharmacology with cost variability reflecting the principles of supply and demand in the community. Potential side effects from KIT include dose dependent hypertension, nausea and psychic-dysphoria. The response rate for TRMD to a course of KIT is estimated to be around 50% [14].

## Theoretical Framework

Successful expansion of the NP role in management of TRMD using ECT, TMS, and KIT involves enhanced knowledge and skill by the individual practitioner, removal of barriers to change, provision of leadership support, and reinforcement by patients, clinical colleagues, supervising and consulting physicians, and the clinical practice and community environment. Concepts from Prochaska and DiClemente's (1984) transtheoretical model (TTM) of change have been successfully applied to quality improvement initiatives to promote individual practice change as well as organization practice change. From a practical perspective, the stages of change dimension has been applied by clinical practice leaders to reduce resistance, increase participation, reduce dropout, and increase change progress among professionals [15]. Core constructs of Prochaska and DiClemente's (1984) TTM include; the processes of change, decisional balance, self-efficacy, and relapse temptation.

## Methods

### Setting

The project took place at two clinics located in Northern California that provide advanced management of TRMD using ECT, TMS, and KIT. Under the supervision of supervising Psychiatrists, with extensive experience administering ECT, TMS, and KIT services on an inpatient and outpatient basis. These two clinics have consented to participate in this project to provide the knowledge and skills training necessary to expand the role of NPs in the management of TRMD using the modalities of ECT, TMS and KIT (Appendix B).

## Planning the Intervention

Expanding the NP role in the management of TRMS for a cohort of five NPs required access to CE training necessary to increase the skills and knowledge for participants beyond that provided in typical pre-licensure training. This project developed a 16-hour CE course of psychiatrist supervised post-graduate training in ECT, TMS, and KIT in the management of TRMD to enrolled NPs. Principles from the TTM were used to design a CE course that facilitates change by observing the learning style of the

participants, allowing for individualized progression through the stages of professional practice change, and the provision of a supportive clinical environment both for training and for subsequent implementation of the new skills and knowledge into the participants daily clinical practice. Evidence of a successful project was to be demonstrated by:

1. Increase in post-test scores upon completion of CEU training by 50% over pre-course performance
2. All NP participants will report enhanced self-efficacy in the direct management of TRMD using the advanced modalities of ECT, TMS, and KIT following completion of this practice improvement project
3. All NP participants will embrace an expanded role in the management of TRMD as evidenced by referral and/or management of >3 clients for ECT, TMS or KIT in the 45 days following this practice improvement intervention
4. Patients will express confidence in the clinical management of ECT, TMS, and/or KIT by project enrolled NPs as evidenced by a patient satisfaction score in the range of "very satisfied" or "fully satisfied" for services provided in the 90 days following completion of this project's training
5. Clinical efficacy for NP management of ECT, TMS and KIT will be demonstrated by a 50% reduction in PHQ9 scores or return to baseline functioning in 50% of patients managed with TMS or KIT and in 75% of those patients managed with ECT.
6. Safety and tolerability of NP managed ECT, TMS and KIT will be demonstrated by the absence of untoward events severe enough to interrupt a course of treatment in the 45 days that follow completion of CEU training.

## Methods of Evaluation

This project captured and analyzed the following data to determine the efficacy if the NP's administration of the treatment:

- Number of NPs enrolled in this practice improvement project
- Number of NPs completing 16 hours of CEU training in the provision of ECT, TMS and KIT in the management of TRMD as part of this practice improvement project
- Pre and Post CEU testing data for enrolled NPs
- Patient satisfaction data for NP management of ECT, TMS and KIT
- Untoward and adverse event data for NP management of ECT, TMS, and KIT
- Clinical efficacy data for NP management of TRMD using ECT, TMS, and KIT evidence by change in PHQ9 scores or report of return to baseline functioning
- Number patients managed by ECT, TMS or KIT by enrolled in NPs in the 90 days following completion of CEU training

## Analysis

Evidence of a successful practice improvement project towards a

goal of expanding the role of the NP in care of TRMD using ECT, TMS and/or KIT is provided by the following:

- Completion of 16 hours of CEU training by 2-6 NPs
- 50% improvement in post-CEU testing of NPs compared to pre-CEU test scores
- Patient satisfaction with NP managed ECT, TMS or KIT in the "very satisfied" or "fully satisfied" range
- Absence of untoward or adverse events that interrupt a treatment course of ECT< TMS or KIT
- Clinical efficacy demonstrated by PHQ9 score reduction of 50% or return to baseline mood functioning
- 3 or more patients with TRMD referred for or directly management by NPs using ECT, TMS or KIT in the 45 days following completion of project's CEU course

## Results

### Program Evaluation/Outcomes

The goal of this quality improvement project was to produce a change in clinical practice behavior in a small cohort of nurse practitioners using the insights and framework of Prochaska and DiClemente's transtheoretical model. The specific intended change was to increase the NP role in the management of treatment resistant major depression by expanding the clinician's self-efficacy with ECT, TMS and KIT interventions. Pre-contemplation, the first stage of the TTM describes the potential participants as "not ready for change" and involved identification by the project's two psychiatrists of a cohort of nurse practitioners currently practicing in one or more of this project's clinical sites (CTRI, AMSC, MPHS). These three clinical sites represent environments with rich clinical resources available to support the cohort of clinicians that decide to move forward in the project. This first stage involved identification of five NPs professionally active at these three clinical sites who were already providing routine psychopharmacologic and psychotherapeutic management of patients with TRMD. Contemplation, the second stage of the TTM involved introduction by the two project psychiatrists to the cohort of potential NP project participants of the existence of this project, the goals of this project, potential costs to the participants (disruption of usual practice activities, study-time, impact on practice finances, etc.) as well as the potential benefits to the participants (16-hours of CE, acquisition of advanced knowledge and skill in the management of TRMD with ECT, TMS and KIT) and the potential benefits to participant's current and future clients (continuity of care, increased access to services, expanded clinical options, relief of suffering and disability associated with TRMD, etc.). Although participation by the cohort of five NPs was both voluntary and free of charge, it was important for the cohort to recognize the potential costs to the individual participants in terms of study time and temporary disruption to usual practice activities and weigh these against the potential benefits to themselves as clinicians, to their clients and to the community. All five NPs identified as potential participants by the project's two psychiatrists, were eager to move forward and moved quickly through the contemplation phase into the

preparation phase. The preparation stage is marked by readiness for change within the next weeks to month. In this stage of the TTM the five participants cleared space in their professional and personal lives to be actively present for a 16-hour CE experience to include four hours of didactic study focused on evidence based practice with TRMD, ECT, TMS, and KIT. The didactic study was composed of a series of audio-narrated power-point presentation prepared by a board certified psychiatrist experienced with the advanced management of TRMD. The didactic component was followed by 12-hours of clinical mentoring with an experienced psychiatrist providing ECT, TMS, and KIT related services. All five participants moved through the preparation stage of the TTM within 7-10 days.

The action stage of the TTM (making change) was completed in less than one month by all five of the NP participants. Pre-CE testing and post-CE testing (see Appendix C & G) was data was collected for each of the four didactic topics (TRMD, ECT, TMS, and KIT) by all NP participants to assess baseline self-efficacy and percent change in self-efficacy following the didactic component. The data is reported in **Table 1** below and in Appendix F. The average percent increase in self-efficacy for the participants following the didactic component was: TRMD (95%), ECT (90%), TMS (85%), and KIT (80%).

A self-assessment of clinical efficacy in the use of ECT, TMS, and KIT in the management of TRMD was completed by all participants following completion of the 12 hours of clinical mentoring with a project psychiatrist. The clinical mentoring component of this CE activity focused on four specific clinical activities:

- Diagnostic criteria for TRMD, case identification and screening
- Detailed informed consent regarding the potential risks and benefits of the management of TRMD with ECT, TMS or KIT
- Pre-Treatment/Pre-Op clearance for ECT, TMS and KIT

Provision of ECT, TMS, KIT interventions, interval and post-treatment care

The participant's self-assessment of clinician efficacy (Appendix G) was reported on a 5 point Likert scale where a score of 5 represents confident in the provision of safe, evidence based

**Table 1** Group of nurse practitioner involved in different treatments.

**Note:** Electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), ketamine infusion therapy (KIT), treatment resistant major depression (TRMD).

Nurse Practitioner	A	B	C	D	E	NP Cohort Average
Pre-CE TRMD	0	10	10	5	0	5
Post-CE TRMD	100	100	100	100	100	100
% change TRMD	100	90	90	95	100	95%
Pre-CE ECT	10	10	0	5	5	6
Post-CE ECT	90	95	100	95	100	96
% change ECT	80	85	100	90	95	90%
Pre-CE TMS	20	5	15	0	5	9
Post-CE TMS	95	90	95	95	95	94
% change TMS	75	85	80	95	90	85%
Pre-CE KIT	20	20	10	10	5	13
Post-CE KIT	100	95	100	80	90	93

protocol driven independent clinical practice with minimal or no input from supervising or consulting psychiatrist. A score of 4 on the Likert scale represented confidence with the provision of safe, evidence based protocol driven independent clinical practice in the setting of readily available consultation and supervision with a psychiatrist. A score of 3 on the Likert scale represented confidence with protocol driven evidence based clinical practice under the direct (on-site) clinical supervision of a psychiatrist. A score of 2 on the Likert scale represented confidence assisting a psychiatrist in the provision of evidence based protocol driven clinical services. A score of 1 on the Likert scale represented confidence in the role of trainee or observer of psychiatrist provided evidence based clinical interventions. All participants rated their self-efficacy as clinicians providing ECT, TMS and KIT services at 4 or higher on this Likert scale with an average of 4.6 for the participant cohort at the end of the CE training. Maintenance is the last stage of Prochaska and DiClemente's TTM. In the stage the cohort of NPs resumed their usual practice activities prepared to offer ECT, TMS, and KIT services to patients with TRMD. In this last stage, the participants provided ECT, TMS, and KIT consultation and treatment services to an average of 8.6 patient encounters (with a range of 4 to 14, for a total of 43 clinical encounters) (**Table 2 and Appendix F**) in the 60 days following completion of the CE training. Chart review of these patient encounters revealed no untoward or adverse events associated ECT, TMS, or KIT services provided by the NP cohort. Patient satisfaction with each ECT, TMS, or KIT encounter provided by the project participants in the 60-day maintenance stage was assessed using a 5-point Likert scales (5 being fully satisfied and 1 being entirely dissatisfied) (see Appendix H) and documented in the medical record. NP participant scores ranged from 4.2 to 4.8 out of 5, with the cohort average at 4.6 (**Table 3 and Appendix F**). A course of treatment with ECT, TMS or KIT was deemed efficacious when the PHQ -9 scores were reduced by 50% or more at the end of a course of treatment or the patient reported a return to baseline functioning and remained at that level on routine follow-up in 2-4 weeks following the last treatment. Individual participant data is reported in **Table 1 and Appendix F**. Clinical efficacy outcomes data for this cohort were reported at 90% for ECT, 70% for TMS, and 80% for KIT.

## Discussion

### Summary

This quality improvement project identified five NPs at three clinical sites and MPHS currently working with depressed patients and offered this cohort the opportunity to voluntarily participate in a free 16-hour CE project. All five NP participants who began the CE project completed the 16-hours of training and remained active at the three clinical sites in the following 60 days. All participants demonstrated a significant increase in clinical efficacy with the use of ECT, TMS, and KIT in the management of TRMD as evidenced by improvement in post-CE test scores over pre-CE baseline testing. On completion of the CE training, all participants provided a self-assessment of their professional comfort

**Table 2** Participant’s self-assessment of clinician efficacy.

Nurse Practitioner	A	B	C	D	E	NP Cohort Average
% change KIT	80	75	90	70	85	80%
Self-Efficacy Assessment Post-CE	4	5	4	5	5	4.6
ECT/TMS/KIT in 45 days post CE training	5	4	14	8	12	8.6
Patient Satisfaction	4.3	4.8	4.7	4.2	4.8	4.56
Untoward/Adverse Events	0	0	0	0	0	0
Efficacy/Outcomes ECT	100%	95%	80%	90%	85%	90%
Efficacy/Outcomes TMS	0	60%	80%	0	0	70%
Efficacy/Outcomes KIT	80%	90%	70%	75%	85%	80%

providing ECT, TMS, and KIT related services. All participants reported confidence in their professional self-efficacy with these procedures to independently provide protocol driven services with minimal ongoing supervision with a consulting psychiatrist experienced with these procedures. Following completion of the CE training, this cohort of NP participants participated in 43 patient encounters involving the provision of ECT, TMS and KIT related services over a 60-day follow-up period. This 60-day follow-up period was noted for the absence of adverse and untoward events, patient satisfaction was routinely in the ‘satisfied’ to ‘fully satisfied’ range, and clinical outcomes for those patients completing a course of treatment were reported as efficacious for 90% of ECT cases, 80% of KIT cases and 70% of TMS cases. These results are consistent with typical outcomes for psychiatrist provided services at these three clinical sites.

## Relation to Other Evidence

The safe provision of ECT, TMS, and KIT services has been well established in a variety of clinical settings across the America. This quality improvement project was undertaken in part because nurse practitioners in the San Francisco bay area are under-represented in the management of TRMD with ECT, TMS and KIT despite the fact that management of depression is a routine part of daily practice for many primary care and mental health based NPs. The clinical outcome for patients followed by the NP cohort in the 60-days following completion of the CE training was consistent with national outcomes data for ECT, TMS and KIT (Table 4).

## Barriers to Implementation/Limitations

Potential barriers to the implementation and completion of this quality improvement project were considered in the planning phase of this project. Potential barriers can be summarized as resistance to an expanded NP role at the clinical sites (CTRI, AMSC, MPHS), resistance to completion of the formal CE training by the NP cohort, resistance to incorporating new skills and knowledge into daily practice by the NP cohort in the 60-day follow-up phase, and/or an unexpected drop in referral of TRMD patients to the three clinical sites. None of these potential barriers impacted this project. This initial small scale, local quality improvement project supports an expanded role for NPs in the management of TRMD involving ECT, TMS, and KIT services at the three clinical

sites involved in this project. This project demonstrates that NPs at these three clinical sites, following completion of a 16-hour CE training can provide safe, well tolerated clinically efficacious TRMD treatment involving ECT, TMS, and KIT. Practice protocols for the NPs at CTRI and AMSC will be updated to reflect this expanded NP role in the management of TRMD

## Interpretation

The small size of this project in terms of number of NPs enrolled, number of clinical sites involved, and number of patients involved, limit the clinical interpretation of the data on a larger scale. This quality improvement project is only able to speak to improvements in quality patient care at the three sites involved in the project. Despite the small size and scope of this quality improvement project, the initial data confirms the effectiveness of this 16-hour CE program at raising the clinical self-efficacy of enrolled NPs. It also confirms that following completion of this 16-hour CE training, NP participants provided safe, well-tolerated

**Table 3** Data of nurse practitioner involved in different depression treatments

**Note:** Electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), ketamine infusion therapy (KIT), treatment resistant major depression (TRMD)

Nurse Practitioner	NP Cohort Average
Pre-CE TRMD	5
Post-CE TRMD	100
% change TRMD	95%
Pre-CE ECT	6
Post-CE ECT	96
% change ECT	90%
Pre-CE TMS	9
Post-CE TMS	94
% change TMS	85%
Pre-CE KIT	13
Post-CE KIT	93
% change KIT	80%
Self-Efficacy Assessment Post-CE	4.6
ECT/TMS/KIT in 45 days post CE training	8.6
Patient Satisfaction	4.56
Untoward/Adverse Events	0
Efficacy/Outcomes ECT	90%
Efficacy/Outcomes TMS	70%
Efficacy/Outcomes KIT	80%

**Table 4** Outcomes Data of nurse practitioners involved in different treatments.

**Note:** Electroconvulsive therapy (ECT), transcranial magnetic stimulation (TMS), ketamine infusion therapy (KIT), treatment resistant major depression (TRMD)

	ECT	TMS	KIT
Efficacy Data commonly reported in the psychiatric literature	75-85%	50-60%	50%
Efficacy Data in the 60-day study follow-up period	90%	70%	80%

and clinically efficacious ECT, TMS, and KIT services at least in the initial 60-day follow-up period.

## Conclusions

Prochaska and DiClemente's transtheoretical model of change (1984) was originally presented with five stages (pre-contemplation, contemplation, preparation, action, and maintenance). This quality improvement project was organized and implemented following the original TTM. In the years since the TTM was introduced, a sixth stage titled 'relapse' has often been described in the clinical literature. The final stage of relapse is most often referenced as part of the process of changing health related behaviors such as diet in the setting of diabetes and heart disease or substance use in the setting of tobacco, alcohol and other substances of abuse. This project demonstrates a successful expansion in the role of a cohort of nurse practitioners in the management of TRMD using ECT, TMS, and KIT at three clinical sites through the initial maintenance stage. This project cohort of NPs remain at risk for relapse to prior practice behaviors marked by failure to recognize TRMD and continued efforts to manage TRMD with psychotherapy and traditional psychopharmacology

despite the patient's repeated failure to respond on this and prior episodes of TRMD. Potential triggers for entry into a relapse stage for this cohort include:

1. Loss of access to consulting/supervising psychiatrist with ECT, TMS and/or KIT experience at current clinical practice site
2. Change in clinical population served (low incidence of TRMD in pediatric population)
3. Financial incentives (high volume psychopharmacology practice may be more financially lucrative than more labor intensive activities such as ECT, TMS and KIT)
4. Failure to maintain clinical knowledge and skills as the state of the art care for
5. TRMD evolves over time
6. Despite the potential for relapse, this quality improvement project successfully demonstrated that the NP role in the management of TRMD using ECT, TMS and KIT services can be successfully expanded without risking patient safety, patient satisfaction, or clinical efficacy.

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