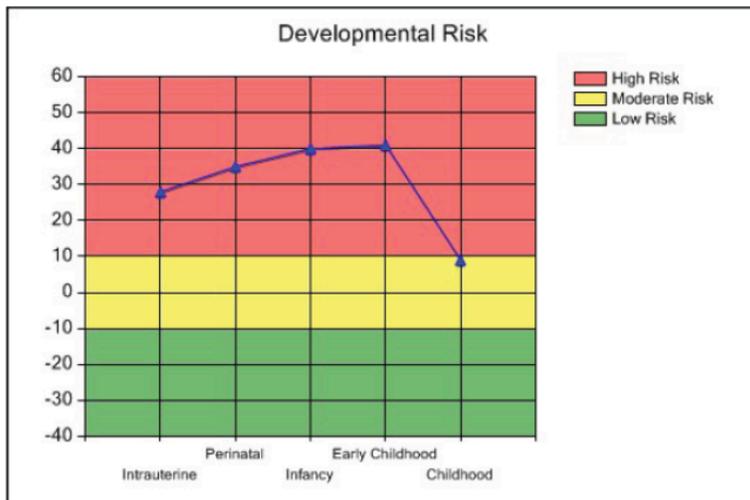
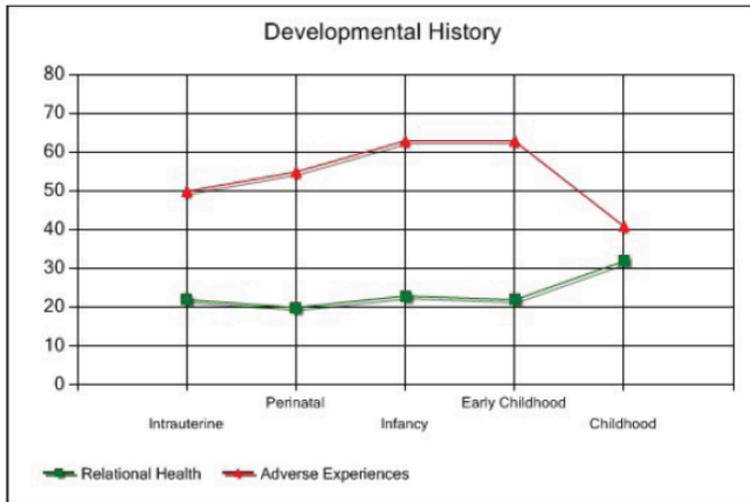


## The Neurosequential Model of Therapeutics® as Evidence-based Practice

The Neurosequential Model of Therapeutics (NMT) is a developmentally sensitive, neurobiology-informed approach to clinical problem solving. NMT is not a specific therapeutic technique or intervention. It is an approach that integrates core principles of neurodevelopment and traumatology to inform work with children, families and the communities in which they live. The Neurosequential Approach has three key components – training/capacity building, assessment and then, the specific recommendations for the selection and sequencing of therapeutic, educational and enrichment activities that match the needs and strengths of the individual.

As described by Brandt and colleagues (2012) – *“The Neurosequential Model of Therapeutics (NMT) (Perry, 2006) provides an integrated understanding of the sequencing of neurodevelopment embedded in the experiences of the child, and supports biologically informed practices, programs, and policies. As a global evidence-based practice (EBP) and coupled with the NMT’s brain mapping matrix, the model supports providers in identifying specific areas for therapeutic work and in selecting appropriate therapies, including evidence-based therapies (EBTs), within a comprehensive therapeutic plan. Organized NMT-based intervention models, such as NMT therapeutic child care, can be EBTs.”*



A more detailed overview of the NMT will help articulate why NMT is an EBP. The NMT assessment process examines both past and current experience and functioning. A review of the history of adverse experiences and relational health factors helps create an estimate of the timing and severity of developmental risk that may have influenced brain development (see graph). In the sample graph, both the timing and severity of risk and resilience factors are plotted (top graph) to generate an overall developmental risk estimate (bottom graph). In this case this individual was at high risk for developmental disruptions – with potential significant functional consequences – during the entire first five years of life.

A review of current functioning identifies problems and

strengths in current functioning and helps generate a visual representation of the child’s estimated current functioning organized into a neurobiological fashion; this generates a Functional Brain Map (see below). The NMT “mapping” process helps identify various areas in the brain that appear to have functional or developmental problems; in turn, this helps guide the selection and sequencing of developmentally sensitive interventions. These interventions are designed to replicate the normal sequence of development beginning with the lowest, most abnormally functioning parts of the brain (e.g., brainstem) and moving sequentially up the brain as improvement is seen. The NMT is grounded in an awareness of the sequential development of the brain; cortical organization and functioning depend upon previous healthy organization and functioning of lower neural networks originating in the brainstem and diencephalon. Therefore a dysregulated individual (child, youth or adult) will have a difficult time benefiting from educational, caregiving and therapeutic efforts targeted at, or requiring, “higher” cortical networks. This sequential approach is respectful of the normal developmental sequence of both brain development and functional development. Healthy development depends upon a sequential mastery of functions; and a dysregulated individual will be inefficient in mastering any task that requires relational abilities (limbic) and will have a difficult time engaging in more verbal/insight oriented (cortical) therapeutic and educational efforts.

<b>Client (14 years, 3 months)</b>			<b>Report Date: 12/4/2010</b>		
4	8	7	2	2	9
11	10	7	2	6	10
3	3	8	1	8	8
	10	5	2	3	
	11	6	4	3	
		4	4		
		8	10		
		9	6		

<b>Age Typical - 14 to 16</b>					
10	10	10	10	10	10
12	12	12	10	10	11
11	11	12	11	10	12
	11	11	11	12	
	12	12	12	11	
		12	12		
		12	12		
		12	12		

The NMT Web-based Clinical Practice Tools (aka, NMT Metrics) help provide a structured assessment of developmental history of adverse experiences, relational health and current brain-mediated functioning. These NMT Metrics are designed to complement, not replace, existing assessment tools (e.g., CANS, CAFAS) and psychometrics (e.g., CBCL, IES, WISC, WRAT). They are designed to allow use across multiple systems using multiple assessment packages. The primary goal of

the NMT Metrics and assessment is to ensure that the clinical team is organizing the client and family's data (and planning) in a developmentally sensitive and neurobiology-informed manner.

Above is an example of a functional brain "map" produced by the web-based NMT Clinical Practice Application. The top image (with the red squares) corresponds to a client (each box corresponds to brain functions mediated by a region/system in the brain. The map is color coded with red indicating significant problems; yellow indicates moderate compromise and green, fully organized and functionally capable). The bottom map is a comparative map for a "typical" same-aged child. The graphic representations allow a clinician, teacher, or parent to quickly visualize important aspects of a child's history and current status. The information is key in designing developmentally appropriate educational, enrichment and therapeutic experiences to help the child.

This clinical approach helps professionals determine the strengths and vulnerabilities of the child and create an individualized intervention, enrichment and educational plan matched to his/her unique needs. The goal is to find a set of therapeutic activities that meet the child's current needs in various domains of functioning (i.e., social, emotional, cognitive and physical). An individual demonstrating significant problems in brainstem and diencephalic functions may end up with recommended activities that are primarily rhythmic, repetitive and somatosensory in nature such as music, dance, yoga, drumming, various sports, therapeutic massage or more traditional play therapy, sand tray or other art therapies. Later in the treatment process, with improved somatosensory processing and self-regulation, the treatment recommendations would shift to more relational and cognitive-behavioral focused interventions including a range of EBTs such as PCIT or TF-CBT.

#### NMT Training and Certification

The NMT training and capacity building component (NMT Certification) is a manualized yet flexible process that involves a minimum of 90 hours. Certification incorporates didactic teaching with web-based sessions using clinical cases presented by participating clinicians. It also incorporates multimedia and reading materials that focus on child development, neurobiology, traumatology, attachment theory and a host of related areas relevant to understanding the impact of maltreatment and other developmental insults on the developing child. The CTA has developed an NMT training certification process for individual clinicians and organizations. This training process provides the necessary exposure to the core concepts, practical application and use of the web-based NMT Metrics to establish and maintain fidelity required for examining clinical outcomes and conducting research using the NMT Metrics as part of the evaluation package. Certified clinicians from across the world demonstrate high fidelity and inter-rater reliability when "evaluating" and scoring the same client data.

The NMT is widely applicable to a variety of clinical and educational environments and has been integrated into a variety of settings across the full life cycle – infants through adults - including therapeutic preschools, early head start programs, infant mental health, ECI programs, residential treatment centers, schools and in numerous private and outpatient clinical practices working with young children, youth and adults. Several large public child protective services and child mental health settings have become certified and routinely use the NMT to help guide clinical decision-making.

#### Evidence-based Practice and the NMT

Over the past decade there has been a movement toward practice accountability from federal, state and foundation funding sources demanding proof of the effectiveness for specific interventions (Austin & Roberts, 2002). This increased interest in accountability has led toward more "evidence-

based” work throughout various disciplines. Similarly, evidence-based medicine (EBM) refers to aspects of medical care in which the scientific method is applied to certain parts of medical practice. It seeks to assess the quality of evidence relevant to the risks and benefits of treatments (including lack of treatment). Evidence-based medicine is the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients (Sackett, 1996). The NMT adheres to these principles and as this relatively “young” approach to clinical work is disseminated, an impressive body of evidence is accumulating (see references below); some of this has been published, and much of it is in the process of being prepared for publication.

There are various levels of “evidence” which are to be considered when making the designation of “evidence-based.” For example the U.S. Preventive Services Task Force uses the following to ranking evidence about the effectiveness of treatments:

*Level I: Evidence obtained from at least one properly designed randomized controlled trial.*

*Level II-1: Evidence obtained from well-designed controlled trials without randomization.*

*Level II-2: Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one center or research group.*

*Level II-3: Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled trials might also be regarded as this type of evidence.*

*Level III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.*

The Neurosequential Model of Therapeutics currently meets criteria for Level III, Level II-3, Level II-2 and Level II-1. Several of the NMT Certification Sites have plans for studies that are randomized, controlled trials.

The NMT has the following EBP elements:

- 1.) Multiple sites participating in NMT Training Certification gather data that is used to determine efficacy of the model. The NMT model in these sites is employed in therapeutic preschools, residential treatment facilities, out-patient clinical settings, and large state child welfare systems. There are several cross-validation projects underway to compare NMT Metrics with a variety of other common metrics (e.g., CAFAS, CBCL, TSC).
- 2.) There are several reports from independent groups using the NMT that have demonstrated positive outcomes.
- 3.) All NMT-certified sites have demonstrated improved outcomes (using both NMT and non-NMT metrics such as incident reports, restraints, changes in CAFAS). In cases where the data were collected in systematic fashion these outcomes are statistically significant when compared to previous “treatment as usual” at the same site or organization.
- 4.) NMT metrics have been shown to be valid (both face valid and cross-validity have been examined) and reliable. There is a network wide inter-rater reliability process and ongoing “ratings meeting” to allow ongoing correction and supervision.
- 5.) The Certification and training process are manualized.

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