Evidence-Based, Best Practices in Diagnosing and Managing Attention Deficit Hyperactivity Disorder (ADHD) in Children and Adults

Steven J. Hughes, PhD, LP, ABpDn
The TOVA Company, Los Alamitos, CA

ABSTRACT

Incorrect and missed diagnoses, overuse of medication, and symptom exaggeration or malingering are frequently overlooked problems in the diagnosis and treatment of Attention-deficit Hyperactivity Disorder (ADHD). All of these problems can be addressed through use of objective measures such as the Test of Variables of Attention (T.O.V.A.) and a set of diagnostic procedures collectively known as Evidence Based Assessment (EBA).

This poster presents information about EBA, and shows how use of the EBA in the diagnosis and treatment of ADHD can:

1. Improve diagnostic accuracy. The primary application of EBA is in combining the power of multiple diagnostic tools with known sensitivity and specificity to obtain a degree of diagnostic resolution not possible with any single measure.
2. Confirm veracity of reported symptoms. EBA methods are increasingly used to detect false or exaggerated symptom reporting and frank malingering. Recent research with the T.O.V.A. has lead to the creation of a Symptom Validity Index (SVI) that flags the presence of characteristic signs of symptom exaggeration (“faking bad”) during the test, which can serve to strengthen the validity of subjective symptoms.
3. Document response to treatment. When used in conjunction with behavior checklists, EBA procedures that incorporate cognitive measures allow the clinician to identify medication dosing levels that optimize cognitive (e.g., academic fluency) performance or in addition to behavioral improvement.

Clinicians who utilize EBA methods can provide easily interpreted, unbiased evidence to help caregivers understand the nature of the patient’s problem, and which documents response to treatment.

BACKGROUND

Attention deficit hyperactivity disorder affects 3-5% of the world’s population (Polanczyk et al., 2007). Characteristic features include symptoms of hyperactivity, impulsivity, and inattention (American Psychiatric Association, 1994). The “symptom complex” represented by this diagnostic criterion is generally understood to represent the final common behavioral pathway of a range of heterogeneous childhood multi-faceted disabilities (Armstrong, 2008).

Accurate diagnosis of ADHD cannot be based simply on behavioral presentation and reported history of problems, as a wide range of disorders can present with symptoms of hyperactivity, impulsivity and inattention, including vision or hearing problems, learning disabilities, or emotional disorders (Reif & Tippins, 2004). Failure to adopt an evidence-based approach to diagnosis and treatment management of ADHD increases the probability that a patient has ADHD of .90.

EBA IMPROVES DIAGNOSTIC ACCURACY

As described by Frazier & Youngstrom (2004), multiple measures with established sensitivity and specificity can be used in combination to obtain diagnostic precision unavailable with the use of any single measure.

With a known base rate of ADHD (either a population estimation of 3-5% or a practice specific base rate calculated through an internal census), a range of objective tests and diagnostic checklists can be applied in a sequential manner by multiplying the pre-test odds (or initial base rate) of having ADHD by the likelihood ratio of the diagnostic measure. The result is the post-test odds of having ADHD, which itself can be multiplied by the likelihood ratio of a second diagnostic measure to yield an even more precise estimation of the odds of having ADHD. This sequence can be continued across a series of diagnostic tools to achieve a high degree of diagnostic certainty.

Illustration:

Step 1: Assuming a (previously established) local base rate of 35% of patients referred for “ADHD evaluation” receiving the diagnosis, the pre-test probability of ADHD for a child entering your clinic can probably be assumed to be .35 (Frazier & Youngstrom, 2004).

Step 2: Presence of a first-degree family member with a confirmed diagnosis of ADHD confers a 4x or greater increase in the probability of the index case having ADHD (Frazier & Youngstrom, 2004). Multiplying the pre-test odds by the likelihood ratio associated with having a first-degree relative with ADHD yields adjusted post-test odds:

\[
\text{posttest odds} = \text{pretest odds} \times LR = 0.35 \times 4 = 1.4
\]

Step 3: We can multiply the current odds by a likelihood ratio calculated for any given T-score obtained on the Conners Parent Rating Scale-Revised: Long Form (CPRS; Conners, 1997). This is done by calculating the sensitivity and specificity of that score relative to average T-scores in a known-ADHD group (from the manual: T-score = 73) and a group of children with emotional problems (from the manual: T-score = 66). This procedure yields an estimated likelihood ratio of 1.85.

\[
\begin{align*}
\text{posttest probability} & = \text{posttest odds} / (1 + \text{posttest odds}) = 0.90 \\
\end{align*}
\]

A T-score of 70 on the CPRSLL increases the probability that your patient has ADHD from .68 to .80.

Step 4: A similar calculation based on a T-score of 70 on the Conners Teacher Rating Scale-Revised: Long Form (CTRS; Conners, 1997) yields a likelihood ratio of 2.18.

\[
\begin{align*}
\text{posttest probability} & = \text{posttest odds} / (1 + \text{posttest odds}) = 0.90 \\
\end{align*}
\]

A positive family history, parent, and teacher ratings yield a new probability that the patient has ADHD of .90.

Step 5: Your patient obtains a score in the ADHD range on the Test of Variables of Attention. The T.O.V.A. has a likelihood ratio of 4 (Leark et al., 2007). New post-test odds are calculated by multiplying the current odds by the LR of 4.

\[
\begin{align*}
\text{posttest odds} & = \text{pretest odds} \times LR = 0.90 \times 4 = 3.6 \\
\end{align*}
\]

A positive family history, parent, and teacher ratings, and a score in the ADHD range on the T.O.V.A. increases the probability that your patient has ADHD to the level of .97.

EBA AIDS DETECTION OF “FAKING BAD”

Malingering of ADHD symptoms has been shown to occur in as many as 48% of some treatment-seeking populations (Sullivan et al., 2007). Fear of stimulant medication abuse or diversion can be a barrier to appropriate treatment of individuals with genuine attention problems. Incorporation of the T.O.V.A. into an EBA model provides a means of confirming the veracity of reported symptoms. In an analysis of data previously collected in a “fake bad” simulation study (Leark et al., 2002), and partial data from a study of personal injury litigants seen for neuropsychological evaluations (Henry, 2005), Hughes et al. (2006) identified response patterns on the T.O.V.A. that correctly classified 95% of simulated malingering and malingerers, and did not erroneously classify any of the “good effort” cases. Through consideration of extreme error scores and obligatory within-subject differences in reaction time across three response types, the T.O.V.A. Symptom Validity Index (SVI) is likely resistant to the effects of performance from the T.O.V.A program SVI can confirm the veracity of self-reported symptoms of attention impairment, and can assist the clinician in determining whether or not to treat patients from groups at increased risk for medication abuse or diversion.

REFERENCES


Sprague, R.L., Sleator, E.K. (1994). Methylphenidate in hyperkinetic children: Differences in dose effects across a wider of range of outcomes that is possible with current, less formalized approaches to ADHD diagnosis and treatment management.

The author is Director of Education and Research for The TOVA Company and Assistant Professor of Pediatrics and Neurology at the University of Minnesota Medical School. Contact the author at steve@theaboutowaco.com, or visit www.towatest.com.