



CNS Vital Signs Advancing Attention Deficit Care

**Adding Value to Your Practice by Providing Solutions for Measuring,
Monitoring and Managing Neurocognitive and Behavioral Health...**

CNS
Vital Signs®

www.CNSVS.com

Contents

■ Why CNS Vital Signs?	3
■ Why CNS Vital Signs in AD/HD?	4
■ AD/HD Guidelines and CNS Vital Signs	7
■ About CNS Vital Signs Assessment Platforms	10
■ CNS Vital Signs ADD – AD/HD Case Studies	14
■ Optimized for AD/HD Guidelines	18
■ About CNS Vital Signs Clinical Domains in AD/HD	28
■ CNS Vital Signs Assessment Platform Implementation	31
■ AD/HD Reimbursement Information	35
■ Next Steps	36

The following pages have been assembled from various sources and publications and is meant to be a reference or roadmap guide to assist and inform how CNS Vital Signs can be used to improve clinical insight and care management, enable current guidelines, be integrated into a clinic or practice, and help improved practice revenues and performance.



Why CNS Vital Signs?

CNS Vital Signs strives to provide clinicians a valid, reliable, and affordable, 'research quality' assessment platform. The CNS Vital Signs assessment platforms helps to support a practices comprehensive, state-of-the-art clinical assessment, and evidence-based treatment services for children, adolescents, and adults across the lifespan by:

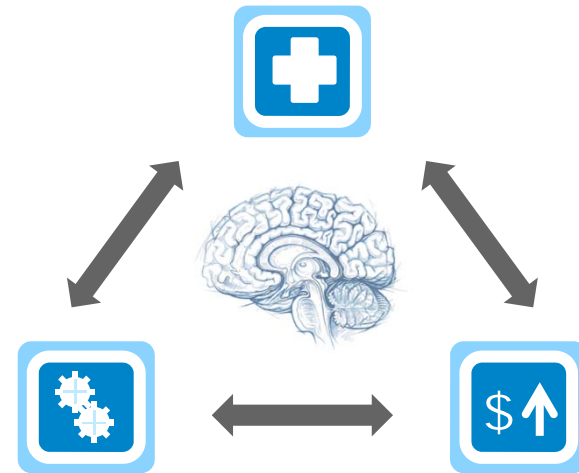
- Accurately measuring and characterizing a patient's neurocognitive function based on his or her status or effort
- Facilitating the thinking about the patient's condition (50+ well known medical and health rating scales) and helping to explain the patient's current difficulties
- Optimizing serial administration which helps to monitor and guide effective intervention and enables evidence-based medicine and outcomes

CNS Vital Signs offers multiple assessment platform options that can be easily configured and deployed depending on each practices goals and needs.



Enhanced Patient Insight and Care Management

OBJECTIVE, PRECISE, and STANDARDIZED Assessments that Supports many NeuroPsych Clinical Guidelines



Extend Practice Efficiency

Objective and Evidence-Based Assessment Data Collected, Auto-Scored and Systematically Documented.

Develop Enhanced Revenue Streams

Well Established Billing Codes to Improve Practice Performance



Introduction: CNS Vital Signs in AD/HD

CNS Vital Signs provides clinicians and researchers with leading edge neurocognitive and behavioral health assessment technologies that efficiently collect valid and reliable brain & behavioral clinical endpoints for a more objective view of a patient's functional status, disease progression, and outcomes. Attention-deficit/hyperactivity disorder (ADHD) is a common neurobehavioral condition that impairs functioning throughout childhood, adolescence, and adulthood. Evidence-based guidelines for the treatment of ADHD recommend recognizing ADHD as a chronic condition across the lifespan. The CNS Vital Signs Assessment platform supports a lifespan chronic care model and helps enable productive interactions between the family, teachers, and a specialist practice team. Key parent and youth screening tools, parent-teacher-physician assessment (rating scales), and neurocognitive testing assessments can be used to efficiently evaluate and manage AD/HD, medication titration and ongoing monitoring. Barriers in primary care settings can impede the delivery of high-quality AD/HD care and a collaborative (specialist), systems-based approach can help support the current guidelines and advance AD/HD care.

CNS Vital Signs computerized neuropsychological tests can enhance efficiency and insight in assessing cognitive status and the difference between "normal performance" and a patient's current status and provides the clinician with a normative comparison that can be paired with an interview, exam, and other valid test(s) e.g. BRIEF, Conners, Brown, Barkley, etc. to help add validity to the evaluation and management of attentional and executive deficits or dysfunction. Re-evaluation or serial testing with CNS Vital Signs supports the effective management and tailoring of medications and assessment of outcomes. A very detailed assessment of abilities is auto-scored, and the pattern of strengths and weaknesses can be used in treatment planning and measuring progress.

CNS Vital Signs VSX BRIEF-CORE assessment platform contains seven tests of neurocognitive function which are auto-scored into nine clinical domains, the VSNP battery adds three additional normed tests. The CNS Vital Signs AD/HD toolbox also contains FREE evidence-based rating scales such as the Vanderbilt ADHD Diagnostic Parent & Teacher Rating Scales, Vanderbilt Assessment Follow-up Parent & Teacher Rating Scales, Adult ADHD Self-Report Scale, Pediatric Symptom Checklist PSC-35 Youth Self Report Y-PSC-35 & PSC-17, NeuroPsych Questionnaire NPQ-207 & NPQ-45 both Adolescent & Adult, SCARED Child Anxiety Rating Scale, Child OCD Inventory, and the Epworth and Pittsburgh Sleep Scales. The CNS Vital Signs ADD – AD/HD Toolbox automatically scores and systematically documents the resulting clinical endpoints. The resulting reports can help inform (rule-in or rule-out), confirm status (level of impairment) and longitudinally track a condition (outcomes).

If you have a question or would like to register for a free in-service webinar go to www.CNSVS.com or email support@cnsvs.com or call 1.888.750.6941.



Why Use CNS Vital Signs to Assess AD/HD?

The CNS Vital Signs VSX Assessment Platform represents a legacy of innovation and a commitment to advancing neurocognitive and behavioral clinical assessment tools that help support a TEAM MANAGEMENT concept between primary care and specialists.

FREE Screening

Practice Efficiency

Assess and Determine Possibility of IMPAIRMENT...

*CNS Vital Signs **FREE** computerized screening tools allows clinicians to **SCREEN** for possible NeuroPsych, Mental, and Behavioral Health Issues that can effect educational or vocational productivity and performance.*

Three Versions of the Pediatric Symptom Checklist, many other rating scales.

Clinical Pathology

Measure and Monitor

Assess BRAIN FUNCTION, to help Rule-In or Rule-Out...

CNS Vital Signs computerized neurocognitive testing allows clinicians to **assess abnormal cognitive impairment** by comparing patients to our 'PEER REVIEWED' normative data set from **ages 8 to 90** across the lifespan e.g. level of disability.

Certain DOMAIN Scores can be **informative in confirming a possible clinical condition e.g., frontal lobe tests.**

Comorbid Status

Measure and Monitor

CNS Vital Signs enables the recently updated AAP and past AACP AD/HD guidelines.

Evidence-based rating scales and neurocognitive testing can help clinicians **sort out symptom, behavioral, and comorbid issues** and help better understand possible brain and behavior relationships.

50+ free rating scales: Vanderbilt AD/HD (Parent & Teacher), NeuroPsych Questionnaires 207 & 45, SCARED, Etc.

"Diseases of the brain commonly produce changes in behavior, including impairment of cognitive abilities and production of neuropsychiatric symptoms. Knowledge of the presence and characteristics of these changes can aid in the evaluation, management, and longitudinal care of patients with neurologic and psychiatric diseases." Adapted from: Neurology 1996;47:592-599.



Solutions for Measuring , Monitoring, and Managing Neurocognitive and Behavioral Health



MANAGEMENT TEAM



Why Use CNS Vital Signs to Assess AD/HD?



Frontal Lobe Objective Measure of Clinical Pathology

The CNS Vital Signs tests can compliment other "Executive Function" assessments e.g., Brown AD/HD, BRIEF, CONNERS, Barkley, etc. to help identify and effectively address neurocognitive challenges that can have dramatic impact on academic and vocational performance.

Frontal Lobe Tests

Symbol Digit Coding (SDC)

Approx. 4 Minutes



- Information Processing Speed
- Complex Attention
- Visual-Perceptual Speed
- Information Processing Speed

Stroop Test (ST)

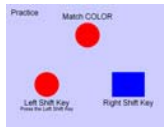
Approx. 4 - 5 Minutes



- Executive Function
- Simple and Complex Reaction Time
- Speed-Accuracy Trade-Off
- Information Processing Speed
- Inhibition / Disinhibition

Shifting Attention (SAT)

Approx. 2.5 Minutes



- Executive Function: Shifting Sets
- Reaction Time
- Information Processing Speed
- Speed-Accuracy Trade-off

Continuous Performance (CPT)

Approx. 5 Minutes



- Sustained Attention
- Choice Reaction Time
- Impulsivity

4-Part Continuous Performance (4PCPT)

Approx. 7 Minutes



- Sustained Attention
- Working Memory

Neurocognitive Function

Clinical Domains

Processing Speed

Measure: How well a subject recognizes and processes information i.e., perceiving, attending/responding to incoming information, motor speed, fine motor coordination, and visual-perceptual ability. **Relevance:** Ability to recognize and respond/react i.e., fitness-to-drive, occupation issues, possible danger/risk signs or issues with accuracy and detail.

Executive Function

Measure: How well a subject recognizes rules, categories, and manages or navigates rapid decision making. **Relevance:** Ability to sequence tasks and manage multiple tasks simultaneously as well as tracking and responding to a set of instructions.

Complex Attention

Measure: Ability to track and respond to information over lengthy periods of time and/or perform mental tasks requiring vigilance quickly and accurately. **Relevance:** Self-regulation and behavioral control.

Cognitive Flexibility

Measure: How well subject is able to adapt to rapidly changing and increasingly complex set of directions and/or to manipulate the information. **Relevance:** Reasoning, switching tasks, decision-making, impulse control, strategy formation, attending to conversation.

Working Memory

Measure: How well a subject can perceive and attend to symbols using short-term memory processes (4PCPT). **Relevance:** Ability to carry out short-term memory tasks that support decision making, problem solving, planning, and execution. Enables "right-now" responses.

Sustained Attention

Measure: How well a subject can direct and focus cognitive activity on specific stimuli. **Relevance:** How well a subject can focus and complete task or activity, sequence action, and focus during complex thought.

Auto-scored

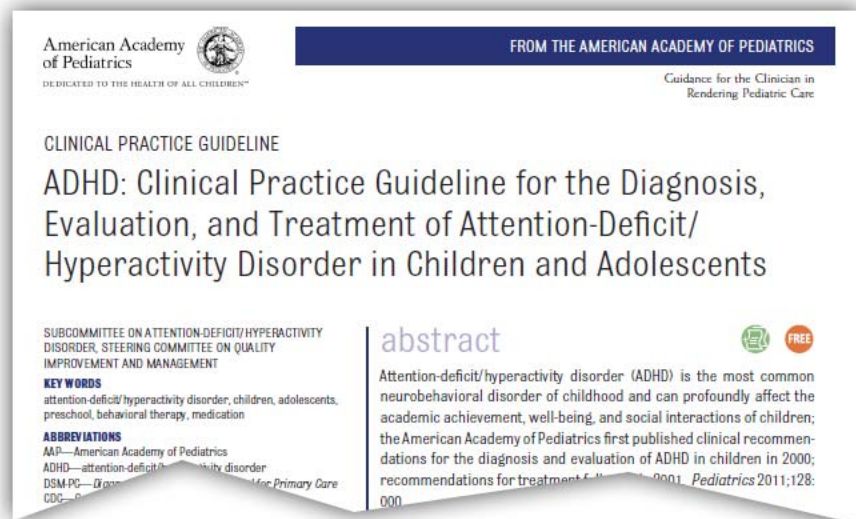
CNS Vital Signs is used throughout the world as a clinical tool to evaluate and manage ADHD. Executive Functioning, sometimes called executive control system, is generally considered a frontal lobe (see orange section of the brain) neurocognitive system that controls and manages other cognitive processes. It is considered a higher-order brain function, which include attention, behavioral planning and response inhibition, and the manipulation of information in problem-solving tasks. Sometimes referred to as the "command and control" or the "conductor" of many cognitive skills.



Solutions for Measuring, Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized to Support NEW AAP Guidelines



Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood and can profoundly affect the academic achievement, well-being, and social interactions of children; the American Academy of Pediatrics first published clinical recommendations for the diagnosis and evaluation of ADHD in children in 2000; recommendations for treatment followed in 2001. *Pediatrics* 2011;128: 000

 = How CNS Vital Signs Can HELP

Summary of key action statements:

1. **The primary care clinician should initiate an evaluation for ADHD for any child 4 through 18 years of age who presents with academic or behavioral problems and symptoms of inattention, hyperactivity, or impulsivity** (quality of evidence B/strong recommendation).
2. To make a diagnosis of ADHD, the primary care clinician should determine that *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria have been met (**including documentation of impairment in more than 1 major setting**); **information should be obtained primarily from reports from parents or guardians, teachers, and other school and mental health clinicians involved in the child's care**. The primary care clinician should also rule out any alternative cause (quality of evidence B/strong recommendation).
3. **In the evaluation of a child for ADHD, the primary care clinician should include assessment for other conditions that might coexist with ADHD**, including emotional or behavioral (e.g., anxiety, depressive, oppositional defiant, and conduct disorders), developmental (e.g., learning and language disorders or other neurodevelopmental disorders), and physical (e.g., tics, sleep apnea) conditions (quality of evidence B/strong recommendation).
4. **The primary care clinician should recognize ADHD as a chronic condition** and, therefore, consider children and adolescents with ADHD as children and youth with special health care needs. Management of children and youth with special health care needs should follow the principles of the chronic care model and the medical home (quality of evidence B/strong recommendation).
5. Recommendations for treatment of children and youth with ADHD vary depending on the patient's age...
6. **The primary care clinician should titrate doses of medication for ADHD to achieve maximum benefit with minimum adverse effects** (quality of evidence B/strong recommendation).



Solutions for Measuring , Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized to Support AACAP Guidelines

American Academy of Child and Adolescent Psychiatry (AACAP)

Guidlines.gov

Pliszka S, AACAP Work Group on Quality Issues. Practice parameter for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 2007 Jul;46(7):894-921.

Diagnosis / Evaluation / Screening

- **Screening patients for attention-deficit/hyperactivity disorder (ADHD) as part of mental health assessment**
- **Patient evaluation including interviews with parent and patient, obtaining information about patient's school or day care functioning**, review of the patient's medical, social, and family histories
- **Psychological and neuropsychological tests if the patient's history suggests low cognitive ability or low academic achievements**
- **Evaluation for comorbid psychiatric disorders**

■ = How CNS Vital Signs Can HELP

Management / Treatment

- Development of comprehensive treatment plan
- Parent and child psychoeducation about ADHD and its various treatment options
- Psychopharmacological intervention including stimulants, atomoxetine, bupropion, tricyclic antidepressants, and alpha-agonists
- Monitoring for treatment side effects
- Psychosocial intervention (including behavior therapy) if indicated, in conjunction with medication treatment
- **Follow-up including assessment of the continued need for treatment** and monitoring patient's height and weight



Solutions for Measuring, Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized to Support AACAP Guidelines

American Academy of Child and Adolescent Psychiatry (AACAP)

Guidlines.gov

Pliszka S, AACAP Work Group on Quality Issues. Practice parameter for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 2007 Jul;46(7):894-921.

Major Outcomes Considered

- **Incidence of comorbid disorders**
- **Effectiveness of treatment**
- Adverse effects of medication

Major Recommendations

Recommendation 1. *Screening for Attention-Deficit/Hyperactivity Disorder (ADHD) Should Be Part of Every Patient's Mental Health Assessment.*

Recommendation 2. Evaluation of the Preschooler, Child, or Adolescent for ADHD Should Consist of Clinical Interviews with the Parent and Patient, Obtaining Information about the Patient's School or Day Care Functioning, *Evaluation for Comorbid Psychiatric Disorders*, and Review of the Patient's Medical, Social, and Family Histories.

Recommendation 3. If the Patient's Medical History Is Unremarkable, Laboratory or Neurological

Recommendation 4. *Psychological and Neuropsychological Tests* Are Not Mandatory for the Diagnosis for ADHD, but Should Be Performed if the Patient's History Suggests Low General Cognitive Ability or Low Achievement in Language or Mathematics Relative to the Patient's Intellectual Ability Testing Is Not Indicated

Recommendation 5. *The Clinician Must Evaluate the Patient with ADHD for the Presence of Comorbid Psychiatric Disorders*

Recommendation 6. A Well-Thought-Out and Comprehensive Treatment Plan Should Be Developed for the Patient with ADHD

Recommendation 7. *The Initial Psychopharmacological Treatment of ADHD Should Be a Trial* with an Agent Approved by the Food and Drug Administration (FDA) for the Treatment of ADHD

Recommendation 8. If None of the Above Agents Result in Satisfactory Treatment of the Patient with ADHD, the Clinician Should Undertake a Careful Review of the Diagnosis and Then Consider Behavior Therapy and/or the Use of Medications Not Approved by the FDA for the Treatment of ADHD

Recommendation 9. During a Psychopharmacological Intervention for ADHD, the Patient Should Be Monitored for Treatment-Emergent Side Effects

Recommendation 10. If a Patient With ADHD Has a Robust Response to Psychopharmacological Treatment and Subsequently Shows *Normative Functioning* in Academic, Family, and Social Functioning, Then Psychopharmacological Treatment of the ADHD Alone Is Satisfactory

Recommendation 11. If a Patient with ADHD Has a Less Than Optimal Response to Medication, Has a Comorbid Disorder, or Experiences Stressors in Family Life, Then Psychosocial Treatment in Conjunction with Medication Treatment Is Often Beneficial

Recommendation 12. *Patients Should Be Assessed Periodically to Determine Whether There Is Continued Need for Treatment or If Symptoms Have Remitted. Treatment of ADHD Should Continue as Long as Symptoms Remain Present and Cause Impairment*

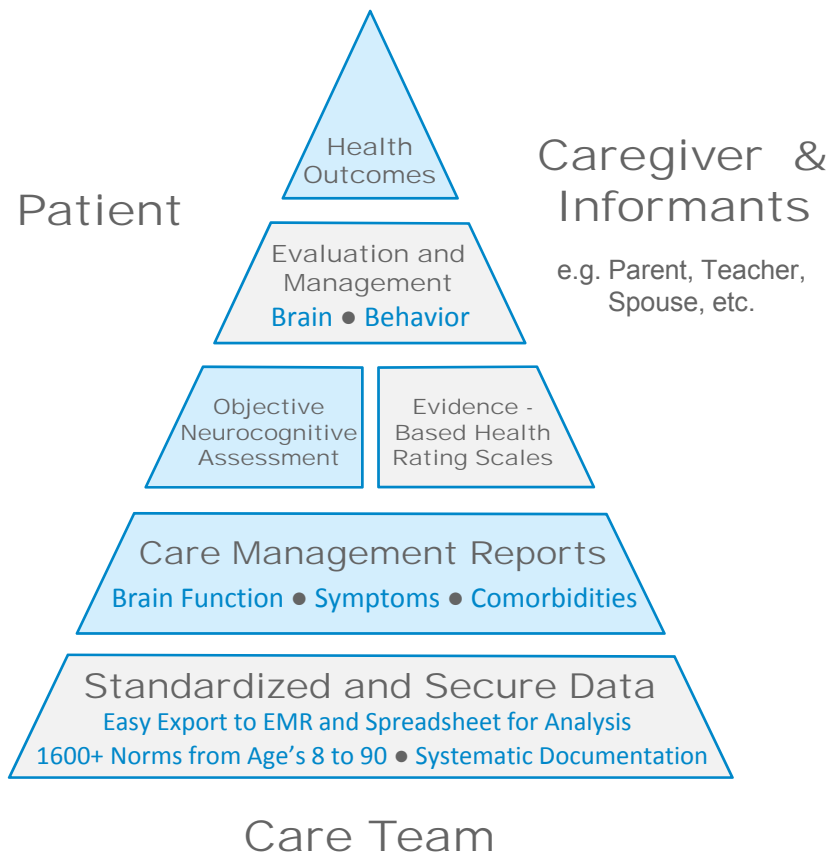
Recommendation 13. Patients Treated With Medication for ADHD Should Have Their Height and Weight Monitored Throughout Treatment



Solutions for Measuring, Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized for ADD AD/HD Assessments



CNS Vital Signs Neurocognitive Battery in AD/HD

“The neuropsychological problems associated with ADHD have been well documented, and typically are characterized as core deficits in attention and executive functioning. Computerized neuropsychological batteries, like CNS Vital Signs, are becoming more popular in ADHD clinical research and practice. The method for simultaneously interpreting the domain scores from this battery constitutes a unique approach that appears to identify the subset of patients with ADHD who present with neurocognitive deficits prior to receiving treatment.”

Adapted from: Clinical Usefulness of CNS Vital Signs for Assessing Neurocognition in ADHD; APA 2007

The CNS Vital Signs AD/HD Toolbox helps clinicians systematically collect AD/HD brain function, symptoms, and comorbidities data, automatically scoring and systematically documenting the resulting clinical endpoints.



A Systems Based Approach

AD/HD Neurocognitive Tests

CNS Vital Signs is a computerized neurocognitive health assessment platform that enables the **OBJECTIVE EVALUATION of COGNITION...**

WEB &
COMPUTER
Based Testing

AD/HD Rating Scales

...identifying **symptoms, possible comorbidities, behavioral issues**, and other important clinical information.

Patient In-Take /
Early Detection

Multi-Modal Professional
Assessment

Measure Progress
and Performance

Screening

Evidence-Based Rating Scales

Neurocognitive Testing

Follow-up and Outcomes

Identify

- Possible Behavioral or Comorbid Issues
- Cognitive Status - Baseline
- NeuroPsych, Mental, and Behavioral Health Issues (symptoms that can effect educational or vocational productivity and performance)

Behavioral

- Neuropsychiatric Symptoms & Comorbidities
- Attentional Issues
- Internalizing (anxiety – depression – PTSD) Issues
- Externalizing (behavioral – conduct) issues
- ...and many more.

Brain

- Memory
- Attentional
- Executive Control
- Processing Speed
- Cognitive Flexibility
- Social Acuity
- Reasoning
- Working Memory
- ...and many more

Monitor

- Assess Medication Effect
- Measure Progress or Changes
- Document for Outcomes and/or Research
- Conduct Web Based Mental and Behavioral Health Surveillance
- Improve Compliance

SOPHISTICATED... **yet...** SIMPLE Systems-Based approach to Screening, Assessment, & Surveillance...



Advancing Attention Deficit Care

CNS Vital Signs ADD-AD/HD Neurobehavioral Toolbox



Clinician Expertise

Brain Function: Attentional,
Executive Functions, and
Working Memory

Behaviors,
Symptoms, and
Comorbidities

Computerized Neurocognitive Testing

- Nine Neurocognitive Domains Measured
- Three Executive Control Tests
- Two Attentional Tests
- Working Memory – Nback Test
- Immediate Auto – Scored Reports
- Rapid Assessment - 30 Minute Initial Assessment/Baseline, 15 Minute Follow-up for Treatment Effect
- Easy to Interpret
- Systematic & Standardized Documentation for Patient Registry/Research
- HIPAA Compliant

Computerized Medical and Health Rating Scales*

- Vanderbilt ADHD Diagnostic Parent & Teacher Rating Scales
- Vanderbilt Assessment Follow-up Parent & Teacher Rating Scales
- Adult ADHD Self-Report Scale
- Pediatric Symptom Checklist PSC-35 Youth Self Report Y-PSC-35 & PSC-17
- NeuroPsych Questionnaire NPQ-207 & NPQ-45 both Adolescent & Adult
- SCARED Child Anxiety Rating Scale
- Child OCD Inventory
- Epworth and Pittsburgh Sleep Scales

* *Used with permission... Free use of rating scales*



How can CNS Vital Signs HELP?

Unique Cognitive Profile

Over the past century, the syndrome currently referred to as attention-deficit/hyperactivity disorder (ADHD) has been conceptualized in relation to varying cognitive problems including attention, reward response, executive functioning, and other cognitive processes. More recently, it has become clear that whereas ADHD is associated at the group level with a range of cognitive impairments, no single cognitive dysfunction characterizes all children with ADHD. In other words, ADHD is not a one-size-fits-all phenomenon. Patients with this syndrome do not fit into any one category and present with widely differing co-occurring disorders—including varying cognitive profiles.

Source: Cognitive Impairments With ADHD, by Joel T. Nigg, PhD; Psychiatric Times. Vol. 26 No. 3, 2009

Medication Management

Clinical Tailoring of Medications for Impairments of Executive Function in ADHD

...careful fine-tuning is required for stimulant medications for ADHD; these agents tend not to follow mg/ kg guidelines for many patients. Effective dosing of stimulants is not related consistently to age, weight, or symptom severity; the critical variable is sensitivity of the individual patient's body chemistry to the particular medication used.

SOURCE: Thomas E. Brown, PhD

<http://www.drthomasebrown.com/pdfs/cmarticle.pdf>



Every patient with ATTENTION DEFICIT has a Unique PROFILE.



Johnny, a twelve year old boy struggling in school was given CNS Vital Signs VSX BRIEF-CORE Clinical Battery... he scored below average in 5 of 9 cognitive domains (pre-dose).

After examining the H&P, the test results, and the PCS - pediatric symptom checklist & Vanderbilt AD/HD rating scales; Johnny was given a prescription medication. Four weeks later he was administered the test again (post-dose).

The CNS Vital Signs report is available seconds after the testing session ends and is a useful tool for assessing academic and vocational accommodations as well as *measuring medication effect and helping clinicians tailor medications to get the minimum dose vs. maximum neurocognitive effect.*

Pre Dose

Patient Profile:	Percentile Range				> 74	25 - 74	9 - 24	2 - 8	< 2
	Standard Score Range				> 109	90 - 109	80 - 89	70 - 79	< 70
Domain Scores	Subject Score	Standard Score	Percentile	VI**	Above	Average	Low Average	Low	Very Low
Neurocognition Index (NCI)	NA	66	1	Yes					x
Composite Memory	101	100	51	Yes		x			
Verbal Memory	52	102	49	Yes		x			
Visual Memory	49	98	19	Yes			x		
Processing Speed	34	73	4	Yes				x	
Executive Function	21	68	2	Yes					x
Psychomotor Speed	148	81	10	Yes			x		
Reaction Time*	896	64	1	Yes					x
Complex Attention*	24	48	1	Yes					x
Cognitive Flexibility	22	69	2	Yes					x
Total Test Time (min: secs)	29:24				Total time taken to complete the tests shown.				

Post Dose

Domains most sensitive to attention deficit conditions.

Patient Profile:	Percentile Range				> 74	25 - 74	9 - 24	2 - 8	< 2
	Standard Score Range				> 109	90 - 109	80 - 89	70 - 79	< 70
Domain Scores	Subject Score	Standard Score	Percentile	VI**	Above	Average	Low Average	Low	Very Low
Neurocognition Index (NCI)	NA	105	63	Yes		x			
Composite Memory	104	106	50	Yes		x			
Verbal Memory	53	105	50	Yes		x			
Visual Memory	51	101	50	Yes		x			
Processing Speed	45	90	26	Yes		x			
Executive Function	49	111	75	Yes		x			
Psychomotor Speed	194	109	74	Yes		x			
Reaction Time*	731	78	7	Yes				x	
Complex Attention*	4	118	88	Yes	x				
Cognitive Flexibility	46	109	74	Yes		x			
Total Test Time (min: secs)	26:03				Total time taken to complete the tests shown.				

"For the first time I am able to show my son that his mind functions better when he is on his medication than when he is not..." Johnny's Mother

"Our relatives are always giving us a hard time about giving our boys AD/HD medicine. For the first time I have proof that they need their medicine." Johnny's Father



College Student Attention Deficit Case Study

① PRE: Part of AD/HD Assessment Protocol ○ = Low Frontal Lobe Domain Scores

Patient Profile:	Percentile Range				> 74	25 - 74	9 - 24	2 - 8	< 2
	Standard Score Range				> 109	90 - 109	80 - 89	70 - 79	< 70
Domain Scores	Subject Score	Standard Score	Percentile	VI**	Above	Average	Low Average	Low	Very Low
Neurocognition Index (NCI)	NA	88	21	Yes			x		
Composite Memory	107	113	58	Yes	x				
Verbal Memory	58	118	88	Yes	x				
Visual Memory	49	105	63	Yes		x			
Processing Speed	86	125	95	Yes	x				
Executive Function	40	84	14	Yes			x		
Psychomotor Speed	208	115	84	Yes	x				
Reaction Time*	641	92	30	Yes		x			
Complex Attention*	28	35	1	Yes					x
Cognitive Flexibility	39	83	13	Yes			x		
Working Memory	13	109	73	Yes		x			
Sustained Attention	26	106	66	Yes		x			
Total Test Time (min: secs)	36:12				Total time taken to complete the tests shown.				

Patient History:

James K. a 21 year old college student on a Presidential scholarship for his piano playing ability. James is gifted musically, has played with symphony orchestras, and can watch someone play a musical piece then repeat from memory the piece. James' high school academic performance was average and he was a popular student. At college James has struggled, he reports he has a problem concentrating in the library compared to his peers. He has struggled with a number of courses and has dropped at least one course per semester. A peer in his dorm told James he should "get some Adderall". James was referred for clinical evaluation.

Clinical Findings:

As part of the patient in-take he was administered the Adult ADHD Self-Report Scale in which he scored a 40 overall and a 25 in the 'inattentive' category (24 or greater = Highly likely to have ADHD). James was also administered the CNS Vital Signs neurocognitive ① assessment and was identified as having possible frontal lobe deficits. Based on this information James was given the Brown ADD Scales which confirmed possible executive and attentional dysfunction. Reviewing James' initial Domain Dashboard confirms James has above average skills in Memory, Processing Speed, and Psychomotor Speed which would be expected given his considerable piano playing skills.



College Student Attention Deficit Case Study

1 PRE: Part of AD/HD Assessment Protocol

James K. 21 Year Old College Student: Adult ADHD Self-Report Scale (ASRS-v1.1)

1	How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?	3 - Often
2	How often do you have difficulty getting things in order when you have to do a task that requires organization?	3 - Often
3	How often do you have problems remembering appointments or obligations?	2 - Sometimes
4	When you have a task that requires a lot of thought, how often do you avoid or delay getting started?	4 - Very Often
5	How often do you fidget or squirm with your hands or feet when you have to sit down for a long time?	1 - Rarely
6	How often do you feel overly active and compelled to do things, like you were driven by a motor?	2 - Sometimes
7	How often do you make careless mistakes when you have to work on a boring or difficult project?	4 - Very Often
8	How often do you have difficulty keeping your attention when you are doing boring or repetitive work?	4 - Very Often
9	How often do you have difficulty concentrating on what people say to you, even when they are speaking to you directly?	2 - Sometimes
Part A (Inattentive)		25
10	How often do you misplace or have difficulty finding things at home or work?	4 - Very Often
11	How often are you distracted by activity or noise around you?	3 - Often
12	How often do you leave your seat in meetings or other situations in which you are expected to remain seated?	1 - Rarely
13	How often do you feel restless or fidgety?	0 - Never
14	How often do you have difficulty unwinding and relaxing when you have time to yourself?	2 - Sometimes
15	How often do you find yourself talking too much when you are in social situations?	2 - Sometimes
16	When you're in a conversation, how often do you find yourself finishing the sentences of the people you are talking to, before they can finish them themselves?	2 - Sometimes
17	How often do you have difficulty waiting your turn in situations when turn taking is required?	0 - Never
18	How often do you interrupt others when they are busy?	1 - Rarely
Part B (Hyperactive/Impulsive)		15
ASRS Total Score		40



College Student Attention Deficit Case Study

2 POST: Part of AD/HD Assessment Follow-up

Patient Profile:	Percentile Range				> 74	25 - 74	9 - 24	2 - 8	< 2
	Standard Score Range				> 109	90 - 109	80 - 89	70 - 79	< 70
Domain Scores	Subject Score	Standard Score	Percentile	VI**	Above	Average	Low Average	Low	Very Low
Neurocognition Index (NCI)	NA	108	70	Yes		x			
Composite Memory	107	113	81	Yes	x				
Verbal Memory	55	108	70	Yes		x			
Visual Memory	52	113	81	Yes	x				
Processing Speed	82	121	92	Yes	x				
Executive Function	55	107	68	Yes		x			
Psychomotor Speed	206	114	82	Yes	x				
Reaction Time*	618	96	40	Yes		x			
Complex Attention*	3	110	75	Yes		x			
Cognitive Flexibility	55	108	70	Yes		x			
Working Memory	10	98	45	Yes		x			
Sustained Attention	32	105	63	Yes		x			
Total Test Time (min: secs)	33:22				Total time taken to complete the tests shown.				

The Results:

James was prescribed 20mg of Vyvanse™ and returned for a follow-up to measure the impact of Vyvanse™ on neurocognitive function. The Domain Dashboard test scores, 2 POST-MEDICATION, reveals a beneficial or positive shift in his neurocognitive function. No side-effects were experienced or observed by the student. The college health center provided James with copies of his tests which he was able to share with his family. The family was impressed that the CNS Vital Signs test was able to quantify and illuminate the various neurocognitive functions and help them better understand their son's status and see the impact medication had on their son's cognition. Vyvanse™ is a product of Shire Pharmaceuticals.

CNS Vital Signs neurocognitive tests are psychometrically sound and include measures of the most common complaints of AD/HD: **inattention** (Complex Attention Domain), **impulsive responding** (Complex Attention and Executive Function Domain), **executive control** (Executive Function, Cognitive Function), and **speed of processing** (Processing Speed Domain), and **working memory** (four-part CPT). Clinicians can now easily and objectively measure executive control, attention, and other important domains as part of their evaluation and management activities. CNS Vital Signs helps contribute to an efficient, systematic continuity between evaluation and treatment (medication management).



NEW AAP AD/HD Process-of-Care Algorithm

HOW CNS Vital Signs CAN HELP! *TFOMH indicates Task Force on Mental Health; CYSHCN, child/youth with special health care needs*

4 to 18 year-old patient identified with signs or symptoms suggesting ADHD. Symptoms can come from parents' direct concerns or the **mental health screen** recommended by the TFOMH

Perform Diagnostic Evaluation for ADHD and Evaluate or Screen for Other/Coexisting Conditions

Family (parents, guardian, other frequent caregivers):

- Chief concerns
- **History of symptoms** (e.g., age of onset and course over time)
- Family, Past Medical, & Psychosocial History
- Review of systems
- **Validated ADHD instrument**
- **Evaluation of coexisting conditions**
- **Report of function, both strengths and weaknesses**

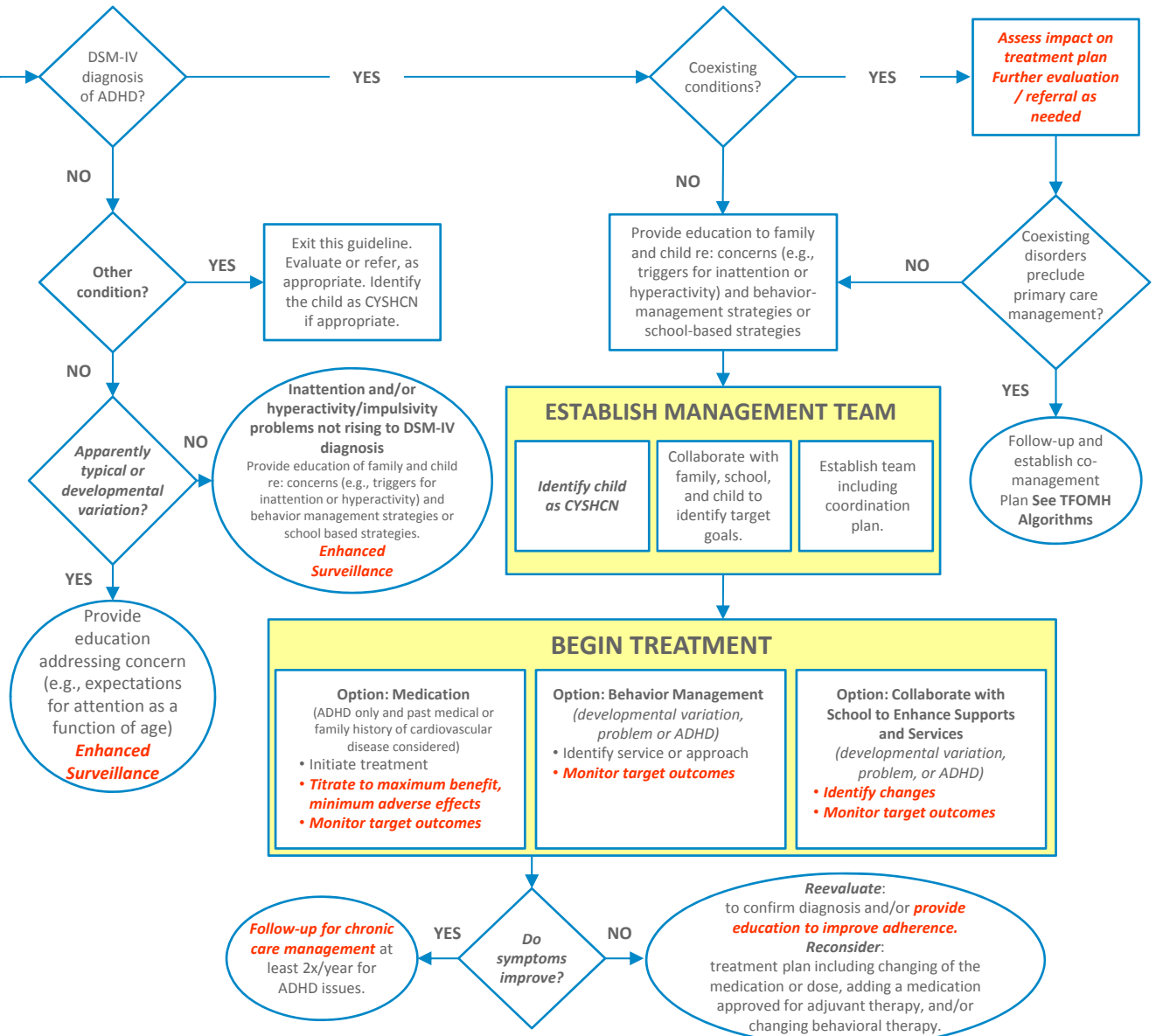
School (and important community informants):

- Concerns
- **Validated ADHD instrument**
- **Evaluation of coexisting conditions**
- Report on how well patients function in academic, work, and social interactions
- Academic records (e.g., report cards, **standardized testing, psychoeducational evaluations**)
- Administrative reports (e.g., disciplinary actions)

Child/Adolescent (as appropriate for child's age and developmental status):

- Interview, including concerns regarding behavior, family relationships, peers, school
- **For adolescents: validated self-report instrument of ADHD and coexisting conditions**
- Report of child's self-identified impression of function, both strengths and weaknesses
- Clinician's observations of child's behavior
- Physical and neurologic examination

- Legend**
- = CNS Vital Signs can support team
 - = Start
 - = Action / Process
 - = Decision
 - = Continued Care
- = CNS Vital Signs Can Help Enable Guidelines*

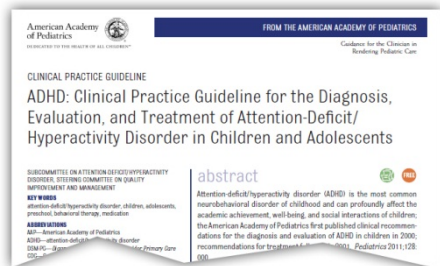


Adapted From: ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents SUBCOMMITTEE ON ATTENTION-DEFICIT/HYPERACTIVITY DISORDER, STEERING COMMITTEE ON QUALITY IMPROVEMENT AND MANAGEMENT; *Pediatrics* 2011; peds.2011-2654



Optimized to Enable Guidelines

FREE Screening



Action Statement 1:
The primary care clinician should initiate an evaluation for ADHD for any child 4 through 18 years of age who presents with academic or behavioral problems and symptoms of inattention, hyperactivity, or impulsivity (quality of evidence B/strong recommendation).

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™



AAP Committee on Children with Disabilities
recommends routine standardized developmental and behavioral screening

...reaffirm the mandate for child health professionals to provide early identification of, and intervention for, children with developmental disabilities through community-based collaborative systems.

SOURCE: Council on Children With Disabilities, et al. Pediatrics 2006;118:405-420

Pediatric Symptom Checklist

Validated and widely used screening instrument: Murphy et al., 1992, 1996; Gall et al., 2000; Pagano et al., 2000

http://www2.massgeneral.org/allpsych/psc/psc_home.htm

Pediatric Symptom Checklist (PSC) LF-35	
Subject Reference/ID: qatest	Test Date: July 7, 2009 11:37:08
Age: 1	Administrator: Department of Human Services
Total Test Time: 0:36 (min:secs) for all tests in this report	Language: English (United States)
This scale was administered using CNS Vital Signs	
Completed by: mother	
4 Fidgety, unable to sit still	Sometimes
7 Acts as if driven by a motor	Never
8 Daydreams too much	Sometimes
9 Distracted easily	Never
14 Has trouble concentrating	Never
Attention Problem Subscale	
11 Feels sad, unhappy	Never
13 Feels hopeless	Often
19 Down on him or herself	Sometimes
22 Worries a lot	Often
27 Seems to be having less fun	Sometimes
Anxiety/Depression Subscale	
16 Fights with other children	Often
29 Does not listen to rules	Sometimes
31 Does not understand other people's feelings	Often
32 Teases others	Often
33 Blames others for his or her troubles	Often
34 Takes things that do not belong to him or her	Sometimes
35 Refuses to share	Sometimes
Conduct Problem Subscale	
1 Complains of aches or pains	Never
2 Spends more time alone	Sometimes
3 Tires easily, little energy	Never
5 Has trouble with teacher	
6 Less interested in school	
10 Is afraid of new situations	Sometimes
12 Is irritable, angry	Never
15 Less interested in friends	Often
17 Absent from school	
18 School grades dropping	
20 Visits doctor with doctor finding nothing wrong	Often
21 Has trouble sleeping	Sometimes
23 Wants to be with you more than before	Sometimes
24 Feels he or she is bad	Often
25 Takes unnecessary risks	Often
26 Gets hurt frequently	Often
28 Acts younger than children his or her age	Often
30 Does not show feelings	Often
PSC 35 Total Score	
37	

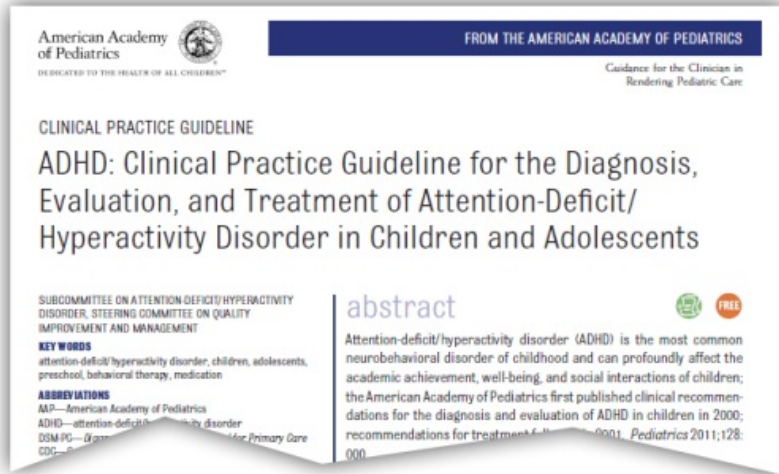


Solutions for Measuring, Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized to Enable Guidelines

FREE AD/HD Scales



Validated and widely used AD/HD Assessment Instruments:

- Vanderbilt ADHD Diagnostic Parent & Teacher Rating Scales
- Vanderbilt Assessment Follow-up Parent & Teacher Rating Scales
- Adult ADHD Self-Report Scale

Vanderbilt ADHD Diagnostic Parent Example

Dashboard

Vanderbilt ADHD Diagnostic Parent Rating Scale (VADPRS LF-53) Page 1 of 2			
Subject Reference ID: ParentObserver		Test Date: March 29, 2009 14:37:22	
Age: 10		Administrator: Neuropsych Solutions	
Total Test Time: 1:44 (min:secs) for all tests in this report		Language: English (United States)	
All questions completed by: Mother This scale was administered using CNS Vital Signs			
Inattentive	7	Hyperactive/Impulsive	5
Oppositional/Defiant	7	Conduct	11
Anxiety/Depression	5	Performance	6
Average Performance Score	4	Total Symptom Score	32
Inattentive Questions			
1 Does not pay attention to details or makes careless mistakes, for example homework			Occasionally
2 Has difficulty attending to what needs to be done			Often
3 Does not seem to listen when spoken to directly			Very Often
4 Does not follow through when given directions and fails to finish things			Occasionally
5 Has difficulty organizing tasks and activities			Often
6 Avoids, dislikes, or does not want to start tasks that require ongoing mental effort			Very Often
7 Loses things needed for tasks or activities (assignments, pencils, books)			Very Often
8 Is easily distracted by noises or other things			Often
9 Is forgetful in daily activities			Very Often
Hyperactive/Impulsive Questions			
10 Fidgets with hands or feet or squirms in seat			Often
11 Leaves seat when he/she is supposed to stay in his/her seat			Very Often
12 Runs about or climbs too much when he/she is supposed to stay seated			Very Often
13 Has difficulty playing or starting quiet games			Never
14 Is "on the go" or often acts as if "driven by a motor"			Often
15 Talks too much			Never
16 Blurs out answers before questions have been completed			Occasionally
17 Has difficulty waiting his/her turn			Never
18 Interrupts or bothers others when they are talking or playing games			Often
Oppositional/Defiant Questions			
19 Argues with adults			Very Often
20 Loses temper			Very Often
21 Actively disobeys or refuses to follow an adult's requests or rules			Often
22 Bothers people on purpose			Often
23 Blames others for his or her mistakes or misbehaviors			Very Often
24 Is touchy or easily annoyed by others			Very Often
25 Is angry or bitter			Often
26 Is hateful and wants to get even			Occasionally
Conduct Questions			
27 Bullies, threatens, or scares others			Often
28 Starts physical fights			Very Often
29 Lies to get out of trouble or to avoid jobs (i.e., "chores" others)			Often
30 Skips school without permission			Very Often
31 Is physically unkind to people			Often
32 Has stolen things that have value			Occasionally
33 Destroys others' property on purpose			Often
34 Is physically mean to animals			Very Often
35 Has set fires on purpose to cause damage			Often
36 Has broken into someone else's home, business, or car			Very Often
37 Has stayed out at night without permission			Often
38 Has run away from home overnight			Very Often
Anxiety/Depression Questions			
39 Is fearful, nervous, or worried			Often
40 Is afraid to try new things for fear of making mistakes			Often
41 Feels useless or inferior			Very Often
42 Blames self for problems, feels at fault			Often
43 Feels lonely, unwanted, or unloved; complains that "no one loves him/her"			Never
44 Is sad or unhappy			Never
45 Feels different and easily embarrassed			Often
Performance Questions			
46 Rate how your child is doing in school overall		Average	
47 How is your child doing in reading?		Somewhat of a Problem	
48 How is your child doing in writing?		Average	
49 How is your child doing in math?		Problematic	
50 How does your child get along with you?		Somewhat of a Problem	
51 How does your child get along with brothers and sisters?		Somewhat of a Problem	
52 How does your child get along with others his/her own age?		Problematic	
53 How does your child do in activities such as games or team play?		Somewhat of a Problem	

Action statement 2:

To make a diagnosis of ADHD, the primary care clinician should determine that *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR)* criteria have been met (including documentation of impairment in more than 1 major setting), **and information should be obtained primarily from reports from parents or guardians, teachers, and other school and mental health clinicians involved in the child's care.** The primary care clinician should also rule out any alternative cause (quality of evidence B/strong recommendation).

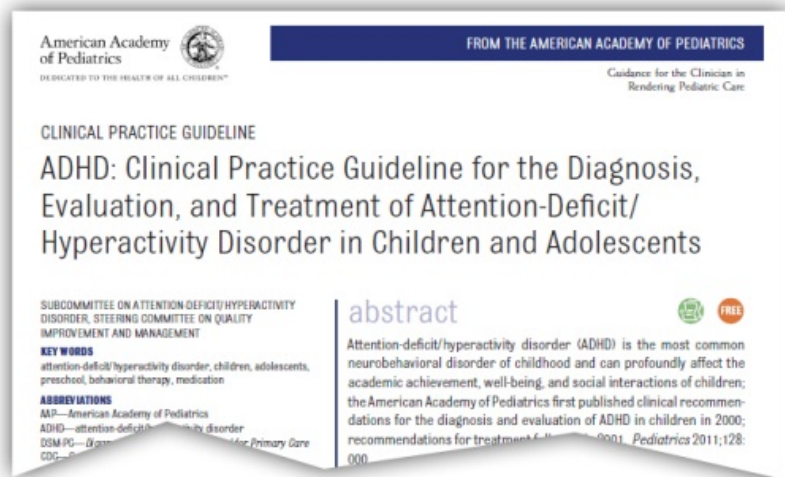


Solutions for Measuring, Monitoring, and Managing Neurocognitive and Behavioral Health



Optimized to Enable Guidelines

Comorbid Assessment



Action statement 3: In the evaluation of a child for ADHD, the primary care clinician **should include assessment for other conditions that might coexist with ADHD, including emotional or behavioral** (eg, anxiety, depressive, oppositional defiant, and conduct disorders), **developmental** (eg, learning and language disorders or other neurodevelopmental disorders), **and physical** (eg, tics, sleep apnea) conditions (quality of evidence B/strong recommendation).

50+ Well Known Symptom, Behavioral, and Comorbid Assessment Instruments

- NeuroPsych Questionnaire NPQ-207 Intake Adolescent & Adult
- NeuroPsych Questionnaire NPQ-45 Follow-up Adolescent & Adult
- Screen for Child Anxiety Related Disorders (SCARED) Child Version LF-41
- Screen for Child Anxiety Related Disorders (SCARED) Parent Version LF-41

Used with permission: Boris Birmaher, M.D., Suneeta Khetarpal, M.D., Marlane Cully, M.Ed., David Brent M.D., and Sandra, McKenzie, Ph.D., Western Psychiatric Institute and Clinic, University of Pgh.

- Child Obsessive-Compulsive Disorder Inventory (OCD-C) SF-20
- Social Anxiety Scale for Children and Adolescents (SASCA) SF-20
- Epworth Sleepiness Scale (ESS) SF-8
- Pittsburgh Sleep Quality Index (PSQI) SF-10;
- Zung Depression and Anxiety Scales
- + Many More...

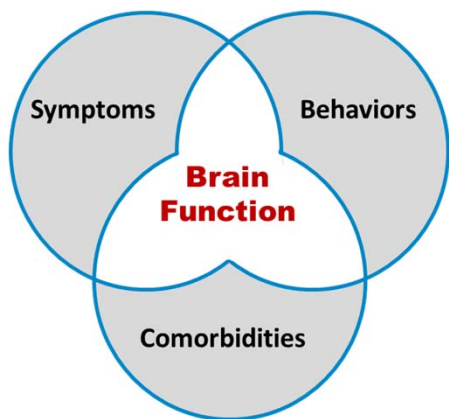


Tools to Help Assess AD/HD and Comorbidities

NPQ – 207

Rapid In-take to Assess the Neuro-Psych Status of a Patient

**Autoscores
Twenty
NeuroPsych
Symptoms and
Eight Possible
Comorbidities**



Reported Symptoms

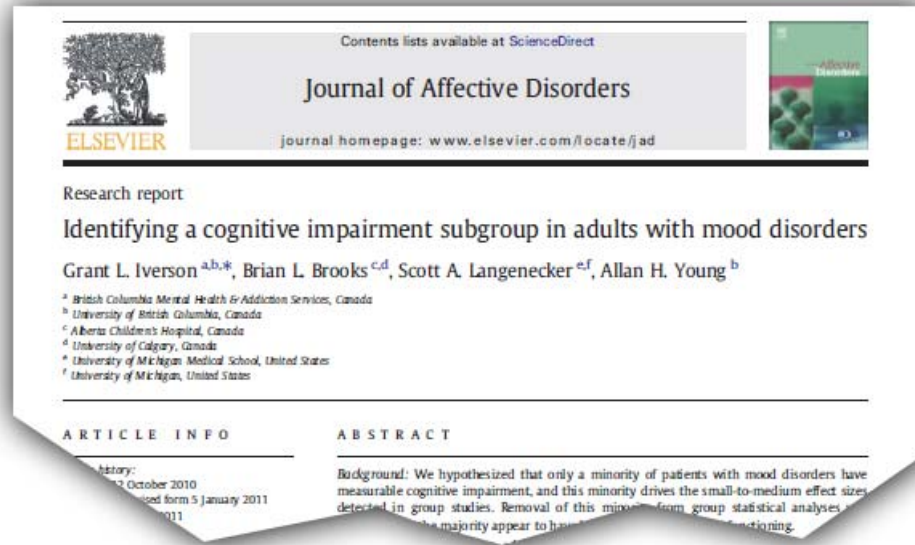
Possible Comorbidities

NeuroPsych Questionnaire (NPQ) LF-207 (Page 1 of 9)			
Subject Reference/ID: John Doe		Test Date: February 11 2009 11:24:43	
Age: 23		Administrator: Med Tech	
Total Test Time: 10:31 (min:secs)		Language: English (United States)	
Domain	Score	Severity	Description
Attention	238	Severe	<p>The Neuropsych Questionnaire asks patients (or an appropriate observer) a series of questions about their clinical state. The questions are about the symptoms of various neuropsychiatric disorders. The terminology is similar to that used in the diagnostic manuals, and in many familiar clinical questionnaires and rating scales; but it has been simplified, and all symptoms are scored on the same metric.</p> <p><i>Scores are reported on a scale of 0 (not a problem) to 300 (severe). As a rule, scores above 225 indicate a severe problem; scores from 150-224 indicate a moderate problem; and scores from 75-149, a mild problem. A high score on the Neuropsych Questionnaire means that the patient is reporting more symptoms of greater intensity.</i></p> <p>It doesn't necessarily mean that the patient has a particular condition; just that he or she (or their spouse, parent or caregiver) are saying that they have a lot of intense symptoms. Conversely, a low score simply means that the patient (or caregiver) is not reporting symptoms associated with a particular condition, at least during the period of time specified. It does not mean that the patient does not have the condition. Just as some people over-state their problems, others tend to under-state their problems. The Neuropsych Questionnaire is not a diagnostic instrument. The results it generates are only meant to be interpreted by an experienced clinician in the course of a clinical examination.</p>
Impulsive	270	Severe	
Learning	209	Moderate	
Memory	171	Moderate	
Anxiety	89	Not a Problem	
Panic	33	Mild	
Agoraphobia	80	Mild	
Obsessions & Compulsions	60	Mild	
Social Anxiety	125	Mild	
Depression	160	Moderate	
Mood Stability	192	Moderate	
Mania	70	Not a Problem	
Aggression	150	Moderate	
Psychotic	70	Not a Problem	
Somatic	78	Mild	
Fatigue	150	Moderate	
Sleep	225	Severe	
Suicide	70	Not a Problem	
Pain	100	Mild	
Substance Abuse	140	Mild	
Average Symptom Score	142	Mild	
PTSD	222	Moderate	
Bipolar	155	Mild	
Autism	158	Mild	
Aspergers	153	Mild	
ADHD	253	Severe	
MCI	108	Mild	
Concussion	172	Moderate	
Anxiety/Depression	150	Moderate	



Helping Assess Comorbidities

Cognition and Depression



“Indeed, there is some suggestion that cognitive or executive functioning deficits may be a trait risk factor for depression (Douglas and Porter, 2009; Frasch et al., 2009; Micco et al., 2009; Reppermund et al., 2009). Furthermore, worse neuropsychological test performance at baseline is associated with poorer response to treatment (Dunkin et al., 2000; Kampf-Sherf et al., 2004; Mohlman and Gorman, 2005), and cognitive deficits are more pronounced in patients who are unemployed (Baune et al., 2010). It is possible that treatment refractory depression is a subtype characterized in part by cognitive impairment.

The accurate identification and quantification of neurocognitive impairment are important for research relating to neurobiological underpinnings, treatment, and functional outcome in patients with mood disorders. It is essential, methodologically, that we have accurate methods for identifying those patients who are objectively cognitively impaired and separate them from patients who have the subjective experience of poor thinking skills or thinking that is easily perturbed by negative affect, but perform normally on cognitive testing in controlled conditions. The treatments and outcomes for these two groups may differ markedly, as well as the prognosis.”

Source: Identifying a cognitive impairment subgroup in adults with mood disorders. *J Affect Disord.* 2011 Aug;132(3):360-7. Epub 2011 Mar 25.

<http://www.ncbi.nlm.nih.gov/pubmed/21439647>



Cognition and Depression

Cognitive Flexibility

Domain scored from two venerable AD/HD tests

- Healthy Control
- Mood Disorder, Normal Cognition
- ◆ *Mood Disorder, Cognitive Impairment*

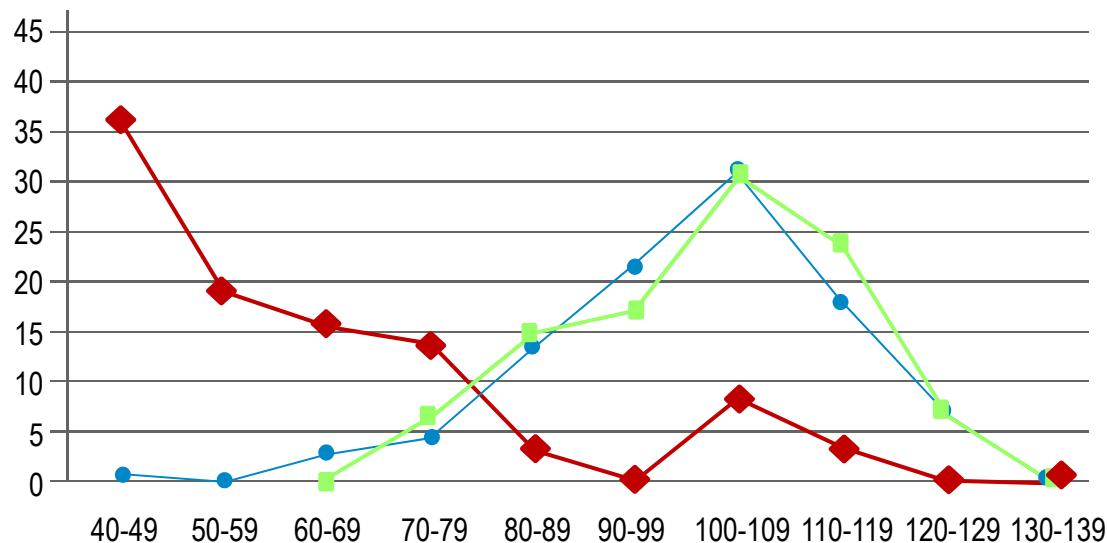


Fig. 3. Distributions of CNS Vital Signs *cognitive flexibility* index score in patients with or without impaired cognition. Figure note: Healthy control, N=660. Mood disorder, normal cognition, n=128. Mood disorder, cognitive impairment, n=58. *Normative scores were truncated at 40. Each value represents the percentage of subjects in that score range.



The Comorbidity of Depression and Attention / Cognitive Deficits are well Known

Tools to Assess Comorbidity and Differential Diagnosis

The clinician needs tools that assist with screening and recording information on symptoms of possible comorbid conditions and that provide the information needed to recognize when further expertise or evaluation is needed to make a differential diagnosis. These tools must be user friendly and free of charge, and need to include both developmental and adult onset ...

Frequent Clinical Dilemmas and Decision Points

Mood Symptoms

Approximately 50% of adults with ADHD have mood symptoms. A common question is which to treat first: the ADHD or the mood symptoms. A treatment strategy should be developed in anticipation of suboptimal response to the first agent. ***ADHD specialists typically see patients who have previously been diagnosed or treated for mild depression or dysthymia. For patients who present with a clear history of ADHD, it is often best to treat the ADHD first, while monitoring the mood symptoms in response to the treatment.***

In a primary care setting or one where the practitioner has not had experience with ADHD, the challenge is to identify someone with previously undiagnosed ADHD. ***Often, ADHD diagnoses are missed because the comorbid disorder is more prominent or is one that the practitioner is more accustomed to screening for based upon their own training (depression).***

Some of the greatest clinical successes are patients who have ADHD and mild mood symptoms or demoralization, where the ADHD has not been previously treated. When the ADHD is treated optimally, the mood symptoms often respond.⁵ Overall, it may be best to select one treatment and then monitor both outcomes rather than combine several medications at once so that treatment response is not obscured by multiple agents (Slide 4).

SLIDE 4

Frequent Clinical Presentations and Key Decision Points

ADHD and mood symptoms

- How to time and sequence treatments

ADHD and substance use disorder

- Which agents to use and how to evaluate compliance and efficacy

ADHD and personality disorders

- Putting ADHD into perspective or even with optimal treatment of ADHD, what are presumed residual symptoms and impairments which require additional intervention

ADHD and learning disorders

- Putting ADHD into perspective
- What other accommodations/interventions are needed

Subthreshold or mild ADHD

- Should medicines be used and if so, how to evaluate

CNS Spectr. 2007;12(8 Suppl 12):1-16



Optimized to Enable Guidelines

Longitudinal Tracking

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS
Guidance for the Clinician in Rendering Pediatric Care

CLINICAL PRACTICE GUIDELINE
ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents

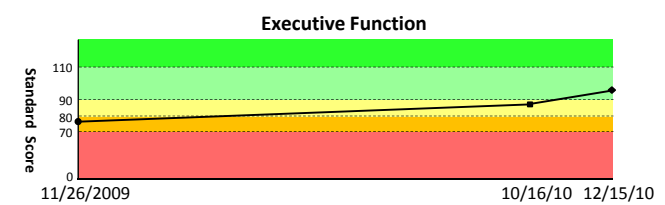
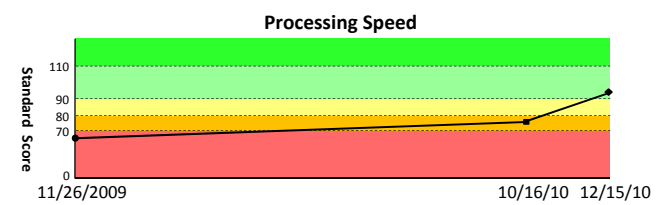
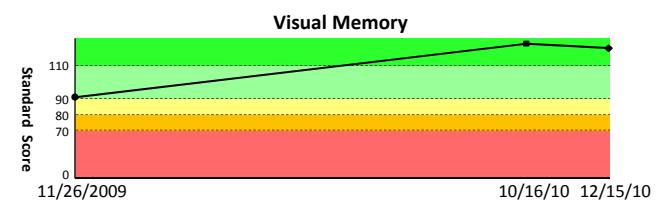
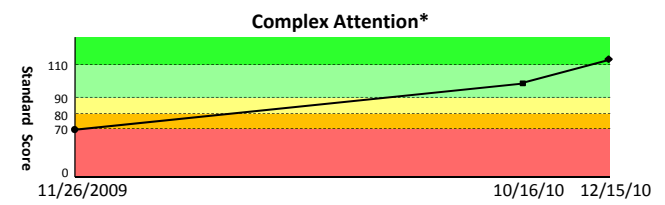
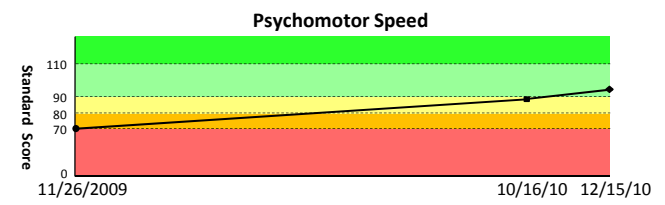
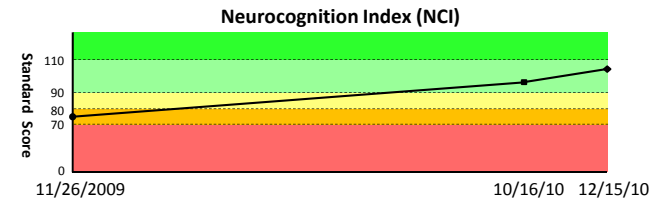
SUBCOMMITTEE ON ATTENTION-DEFICIT/HYPERACTIVITY DISORDER, STEERING COMMITTEE ON QUALITY IMPROVEMENT AND MANAGEMENT

KEY WORDS
attention-deficit/hyperactivity disorder; children, adolescents, preschool, behavioral therapy, medication

ABBREVIATIONS
AAP—American Academy of Pediatrics
ADHD—attention-deficit/hyperactivity disorder
DSM-PC—Diagnostic and Statistical Manual of Mental Disorders for Primary Care
CDC—Centers for Disease Control and Prevention

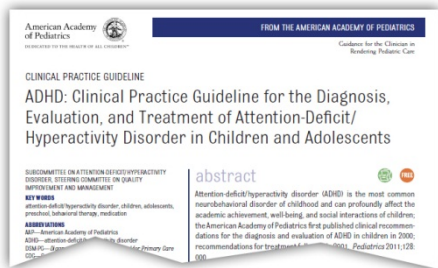
abstract
Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood and can profoundly affect the academic achievement, well-being, and social interactions of children; the American Academy of Pediatrics first published clinical recommendations for the diagnosis and evaluation of ADHD in children in 2000; recommendations for treatment followed in 2001. *Pediatrics* 2011;128:000

Action statement 4: *The primary care clinician should recognize ADHD as a chronic condition and, therefore, consider children and adolescents with ADHD as children and youth with special health care needs. Management of children and youth with special health care needs **should follow the principles of the chronic care model** and the medical home (quality of evidence B/strong recommendation).*



Optimized to Enable Guidelines

Medication Management



Action Statement 6:
Primary care clinicians should titrate doses of medication for ADHD to achieve maximum benefit with minimum adverse effects (quality of evidence B/strong recommendation).

...70% of children and youth with ADHD respond to one of the stimulant medications at an **optimal dose when a systematic trial is used**. Children ...with less frequent monitoring and had less optimal results. Because stimulants might produce positive but suboptimal effects at a low dose in some children and youth, titration to maximum doses that control symptoms without adverse effects is recommended instead of titration strictly on a milligram-per-kilogram basis.

...that the process might require a few months to achieve optimal success, and that medication efficacy should be **systematically monitored at regular intervals**.

Medications Do Not Necessarily Normalize Cognition in ADHD Patients

C. Thomas Gualtieri
Lynda G. Johnson
North Carolina Neuropsychiatry Clinics, Chapel Hill and Charlotte

Objective: Although ADHD medications are effective for the behavioral components of the disorder, little information exists concerning their effects on cognition, especially in community samples. **Method:** A cross-sectional study of ADHD patients treated with three different ADHD doses was conducted. Patients' performance on a computerized neurocognitive

“Even with optimal treatment, based on parents’ and teachers’ opinions, subtle and not-so-subtle neurocognitive impairments persisted in the ADHD patients.”

2008 MHS Keith Conners Award for Scholarly Contribution

JAD is pleased to announce the 2008 winner of the MHS Keith Conners Award for scholarly contribution to the field of attention-deficit hyperactivity disorder (ADHD). ...The winning article titled, *Medications Do Not Necessarily Normalize Cognition in ADHD Patients*, appeared in Volume 11, pages 459-469. The authors, C. Thomas Gualtieri and Lynda G. Johnson, are associated with the North Carolina Neuropsychiatry Clinics. Their article evaluated performance on a computerized, neurocognitive battery for patients taking three different ADHD medications compared to patients with ADHD, absent medication and normal controls. Significant differences were detected between normal persons and untreated patients with ADHD. Treated patients with ADHD performed better than untreated patients but remained significantly impaired compared to normal persons.

Adapted From: 2008 JAD Awards; *J Atten Disord* 2009; 13; 203



About CNS Vital Signs AD/HD Domains

The Executive Function Domain

Executive Functioning referred to as the "command and control" function (frontal lobe); the executive function can be viewed as the "conductor" of many cognitive skills. The Shifting Attention (rules, categories, rapid decision-making) test results are used to calculate this frontal lobe domain. Of all the tests in CNS Vital Signs, it is probably the most sensitive. ADHD patients make fewer correct responses than normals, and more errors. ADHD patients, as a group, have longer reaction times on the SAT. As a group, ADHD patients are slower and less accurate than normals. However, some ADHD patients are much faster than normals on this test, but much less accurate. CNS Vital Signs is used to compliment other assessments of executive function such as the BRIEF (Gioia), Brown AD/HD, Barkley Scales, Etc.

The Complex Attention Domain

The Stroop Test, the Continuous Performance Test, and the Shifting Attention Test contribute to the Complex Attention domain. All three are tests of attention. The complex attention domain is the total number of errors made on the Stroop Test, total number of errors on the Shifting Attention Test and total number of errors on the CPT. The complex attention domain is very, very close to the cognitive flexibility domain so the two are usually correlated. They are not perfectly correlated but they usually move together and they are strongly indicative of AD/HD. If somebody is very low or low on these tests, it can indicate or help rule-in AD/HD. Attention is a higher cognitive function that is largely mediated by the frontal lobes but other parts of the brain including the basal ganglia and the cerebellum. As clinicians know there are many, many different kinds of attention. In the Shifting Attention Test you have to shift your attention from one thing to another, in the Stroop Test you have to inhibit one form of conceptualization and activate another, and the Continuous Performance Test is a venerable test, if you are doing poorly on this test you may well have AD/HD. But all of these three tests participate in the broad cognitive domain known as attention and for that reason they all contribute to the domain on the dashboard that is known as **Complex Attention**.

The Cognitive Flexibility Domain

The Stroop Test (ST) and the Shifting Attention Test (SAT) contribute to the Cognitive Flexibility Domain. The Shifting Attention Test and the Stroop Test is a measure of the patient's ability to inhibit and to disinhibit or perform executive control, cognitive flexibility tasks such as: decision making, multitasking, going quickly and accurately, or choosing an effective strategy and so on. These are very important tests of executive control. ADHD patients also have slower reaction time scores on the Stroop test – for simple RT, complex RT and the Stroop RT. This indicates their relative inefficiency in this complex task. AD/HD Patients also make more mistakes on Part 3 of the ST. So: not only do they take longer, but they make more mistakes. As ADHD patients grow older, they learn to make fewer mistakes on tasks like the ST, but their RT's remain comparatively slower. The SAT is also what is called a "speed-accuracy tradeoff test." That means the subject can choose to go faster on the test, with more correct responses and a shorter reaction time. That strategy, though, will generate more errors. An alternative strategy is to minimize errors by going more slowly; in this case, the subject will get fewer correct responses and will have a longer reaction time.



About CNS Vital Signs AD/HD Domains

The Sustained Attention Domain

One form of attention is sustained attention or vigilance. The sustained Attention domain is scored from the initial CPT portion of the 4-Part Continuous Performance test. Sustained attention or vigilant attention is the patients ability to stay alert through a dull, boring task. Vigilant attention is sustained attention. You have to sustain your attention during a boring task. Sustained Attention is a special skill that is measured by continuous performance testing. The continuous performance type of tests have been traditionally used for the assessment of ADHD. ADHD patients make fewer correct responses and more errors on the CPT, and their CPT reaction time is usually longer than normals'. Normal people over the age of 10 seldom make more than 2 errors on the CPT and rarely, if ever, make more 4 errors. It may be surprising to learn that ADHD patients have reaction times on the CPT that are *slower* than normals. It is, however, in keeping with modern theories of ADHD that refer to a primary deficit in executive control systems, and a relative inefficiency in processing information in effortful tasks.

Working Memory Domain

The N-Back sections of the 4-Part Continuous Performance test is used to score the Working Memory domain. Working memory is the ability to actively hold information in the mind needed to do complex tasks such as reasoning, comprehension and learning. Working memory tasks are those that require the goal-oriented active monitoring or manipulation of information or behaviors in the face of interfering processes and distractions. The cognitive processes involved include the executive and attention control of short-term memory which provide for the interim integration, processing, disposal, and retrieval of information. The N-Back tests are venerable assessments of working memory. The N back appraises the updating function of the central executive as subjects need to remember the shape 1-back, 2-back and 3-back respectively.

The Processing Speed Domain

The Symbol Digit Coding test is used to calculate the Processing Speed domain. Processing speed refers to the rate at which we deal with instructions and information. Impaired or slow processing speed can be an issue with many ADD or ADHD patients. Patients with slower processing speed may have problems academically or vocationally: they may not catch all the instructions for completing a task, they may be slower at copying down information, and they may be slower to retrieve information that they need. Patients with symptoms of inattention sometimes have slow and/or variable processing speeds. Processing speed can be critical for writing essays and working math problems and patients can have difficulty holding ideas in mind, acting upon and organizing ideas, organizing the material in a logical sequence, etc. This is not a matter of intelligence but slowed processing speed can make it hard to demonstrate knowledge.



About CNS Vital Signs AD/HD Domains

The Memory Domains

The first two tests are Verbal and Visual Memory Tests; these are basic ways of testing memory. Verbal and visual memory evaluation is a traditional measure in psychology; done mainly in a verbal (words) and a Visual (figures) format. Verbal memory accesses the language based semantic channel, left hemisphere, and visual memory is kind of a gestalt channel or a right hemisphere channel. CNS Vital Signs measures how many correct responses you make on this test. The Memory tests are presented at the beginning and then repeated at the end of the battery. This presentation is done so clinicians can measure both immediate memory and delayed memory. The two memory tests are highly correlated with the traditionally administered neuropsychological exams. While memory tests are not a traditional test for AD/HD; if clinicians see clients with an isolated low score in memory, it may be that they have a learning disability and that the learning disability was never diagnosed. Patients learn how to accommodate and they learn how to compensate. In any event, an isolated low score in memory is something you will want to investigate and possibly inquire about learning disabilities.

The Psychomotor Speed Domain

Finger Tapping Test and the Symbol Digit Coding-SDC tests generate the “Psychomotor Speed” domain. The Finger Tapping Test is one of the most reliable and valid test in all of Neuropsychology. Another test that contributes to the psychomotor speed domain is the Symbol Digit Coding test where you have to look at the symbol, and connect the symbol to a number and record a correct number response. AD/HD patients tend to perform normal on tests of psychomotor speed. However, patients suffering with a concussion or brain injuries have shown abnormalities in psychomotor speed. Many sports related concussions are frontal lobe in nature and the PS domain might help clinicians determine whether a low score in the frontal lobe domains are related to brain injury or attention deficit. Patient history and physical, however, is generally the best indicator of brain injuries but the FTT can add to the evaluation process.

The Reaction Time Domain

The Stroop Test and the Shifting Attention Test contribute to the Reaction Time domain. Reaction time scores are very interesting because in AD/HD those scores can be low. Clinicians might think that AD/HD kids have a fast reaction time but they usually don't. When AD/HD patients try to perform accurately it is a much more laborious task for them, they have to go much more slowly, they have to take their time. They perform much less efficiently on these complex inhibitions - disinhibition tests like the Stroop Test.



CNS Vital Signs: Complex Assessment Made Easier

ADHD Screening, Neurocognitive Test Procedure, Evidence-Based Rating Scales

The CNS Vital Signs ADHD neurocognitive testing procedure takes 15 to 45 minutes depending on the number of neurocognitive tests that are selected. The assessment platform collects objective data on the patients neurocognitive performance e.g., executive function, complex attention, cognitive flexibility, etc. The testing results are immediately auto-scored and presented in easy to read and interpret reports.

Key Advantage

A key advantage to the VSX assessment platform is the autoscoring of embedded indicators of patient testing effort. As with all psychological and neuropsychological testing neuropsychiatric patients can feign their responses due to incentives such as academic accommodations. When analyzing test data, either in research, or in clinical practice, it is important to know whether a test result is valid or not. Clinicians need to know if testing subjects are generating “dubious results” or a “non-credible response pattern.” CNS Vital Signs has developed “validity indicators” for its tests and domains that indicate whether the patient gave poor effort or generated invalid results. The Validity Indicator alerts the clinician to the possibility of an invalid test allowing the clinician, examiner or testing technician to question the testing subject: Do the testing results reflect an understanding of the test and the instructions? Did the testing subject put forth their best effort? Did they get a good night’s sleep? Does the subject have poor vision and need their glasses?

Should a subject test abnormally low triggering an “invalid” test (NO as displayed in the Validity Indicator section of the report) then that would be a reason for retesting the individual, unless your clinical judgment makes you believe that is the best score the patient can achieve. Like any suspicious lab, the test should be re-administered, and it can be done with CNS Vital Signs through the RETEST function. Before Retesting, the test examiner or technician should reinforce the need for the subject to give a good testing effort and use the “Validity Indicator” as a tool to help with the reinforcement. To RETEST a subject go to MENU > RETEST SUBJECT > and select the appropriate subject and retest the subject. Upon retest, should a subject test abnormally low again triggering yet another “invalid” test (NO as displayed in the Validity Indicator section of the report) and the clinician believes it was the patient’s best effort further evaluation or referrals should be considered.

The clinician generally integrates the VSX ADHD Test report with information from other screening - assessment tools and the clinical evaluation to help guide the discussion on the level of impairment and the possible treatment strategies and plan. Longitudinal assessments can help tailor/optimize medications and track the patients condition and outcomes according to the chronic care model.



CNS Vital Signs: Complex Assessment Made Easier

ADHD Screening, Neurocognitive Test Procedure, Evidence-Based Rating Scales

Screening

The VSX ADHD Toolbox contains three versions of the Pediatric Symptom Checklist (children and adolescents) and the Adult ADHD Self-Report Scale (ASRS-v1.1) which are valid and reliable screening tools to rapidly assess AT-RISK individuals. These instruments can either be done remotely via CNSVS Online web-based assessment platform or in the clinic using a handheld e.g., iPad, Android or laptop computer.

NOTE: Brain and Behavioral Specialists – ***CNS Vital Signs supports the specialist “Team Management” or “Center of Excellence” practice strategy. This is a way for specialist to provide support services to primary care practices. The CNS Vital Signs platform helps enable a seamless continuum of care. From Primary Care to Specialist back to Primary Care. Contact us for more information.***

Neurocognitive Testing & Vanderbilt AD/HD Assessments

The VSX ADHD Toolbox/Test may be administered at the initial visit to help quantify the severity of deficits related to neurocognition. Objective neurocognitive testing data from the VSX report supplements information gathered through the CNS Vital Signs rating scales from parents, teachers and self-reports. The baseline VSX ADHD Test provides a foundation of objective information about the patients neurocognitive status and helps to guide the conversation about an individualized treatment plan, if ADHD is the diagnosis.

Follow-up Testing

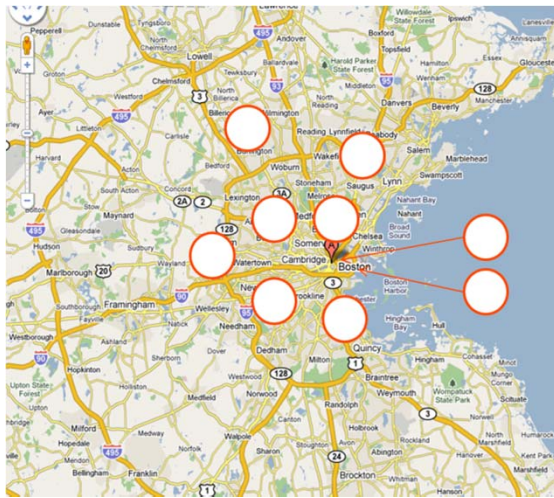
Clinicians can use the CNSVS Online web-based assessment platform to collect follow-up rating scales e.g., Vanderbilt, NPQ-45 to track symptoms and behaviors. Clinicians can also run a series of CNS Vital Signs neurocognitive assessments to help tailor (maximize neurocognition while minimizing dosage) or inform medication management to achieve greater clinical efficacy. The CNS Vital Signs assessment platform is used to evaluate progress toward goals and to help guide treatment planning. As stated earlier the professional guidelines recommends systematic monitoring of dosage and side effects. And the American Academy of Child and Adolescent Psychiatrists (AACAP) recommends an office visit in the first 30 days to monitor medication tolerance, side effects and progress and office visits at least monthly until symptoms have been stabilized. AACAP guidelines state, “The patient with ADHD should have regular follow-up for medication adjustments to ensure that the medication is still effective, the dose is optimal and the side effects are clinically insignificant.”

Clients have expressed that parents find the medication optimization and management to be a valuable clinical service.



Brain and Behavioral “Team Management”

Multiple Practices with Multiple Practitioners using a Single System...



1

Brain and Behavioral specialist or specialty clinic sets-up a WEB Master Account at CNS Vital Signs.

2

Brain and Behavioral specialist or specialty clinic provides each primary care practice a customized LOGIN

3

Brain and Behavioral specialist and primary care practitioner customizes (configures) patient notification process and assessment strategy e.g. referrals

4

Primary care clinic provides patients LOGIN information to complete screening and/or testing

5

Assessment results from screening or testing can be AUTO Emailed or Faxed to each Primary Care Practice or to each Practitioner

6

Brain and Behavioral specialist referral is generated

7

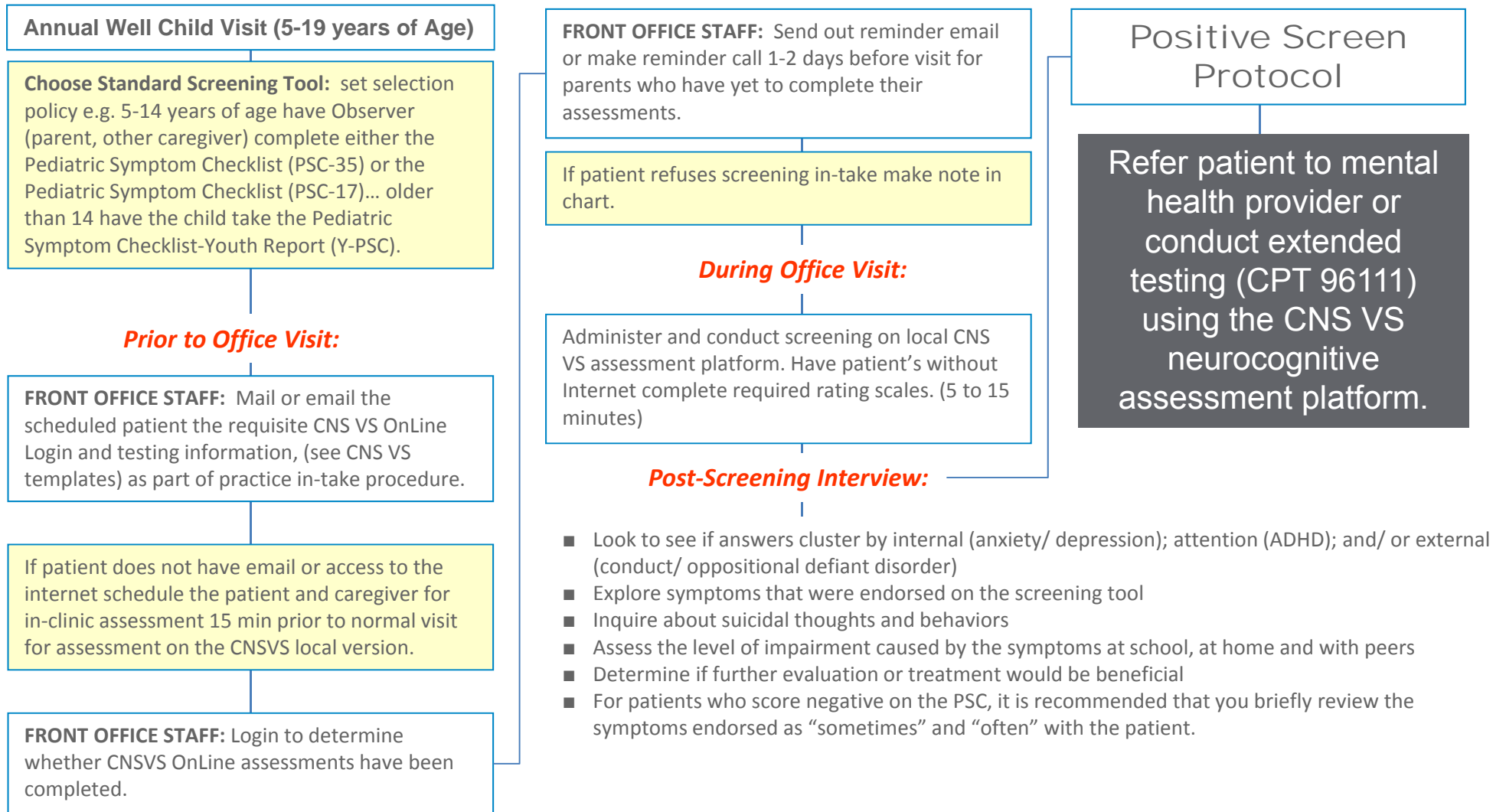
Brain and Behavioral specialist can oversee assessment database and easily export to a spreadsheet or database for outcomes and quality care research.



Implementation Example

Integrating Developmental, Behavioral, and Mental Health Screening, and Assessment into a Practice

Pediatric Symptom Checklist Example (Validated and widely used Murphy et al., 1992, 1996; Gall et al., 2000; Pagano et al., 2000)



AD/HD Reimbursement Information

NOTE: See the reimbursement Webpage at CNSVS.com for additional reimbursement information

Neurocognitive assessments may be deemed medically un-necessary for uncomplicated (primary care, school psychologist) cases of attention deficit disorder with/without hyperactivity (ADHD). If a patient is clearly seeking the testing for educational reasons e.g., special accommodations such as extended time on testing or other special services in school, these services generally, are provided by school systems under applicable state and federal rules and generally are not reimbursed by insurance carriers. Most benefit plans exclude coverage of educational testing. Check the patients benefit plan as payment may need to be paid directly to the practice by the patient for the services.

However, many employer based benefits have special set-aside health accounts that can be used for payment of non-covered benefits such as neurocognitive assessments for AD/HD. Health plans may reimburse and consider the procedure medically necessary for the evaluation and management of complicated cases e.g. executive dysfunction, examining expanded developmental concerns, neurologically complicated cases of ADHD, e.g., post head trauma, seizures, or comprehensive bio-psychosocial treatment for these disorders in collaboration with primary care physicians and other specialists.

Screening, Surveillance, & Assessment

Surveillance, Screening, or Assessment

Surveillance: recognizing children who may be at risk of developmental delays

Screening: is using a brief standardized tool that aids the identification of children at risk of a developmental disorder...

Assessment: to identify the child's strengths and weaknesses, present level of performance, and indicated intervention...

does not result in either a diagnosis or treatment plan but assists the clinicians E&M processes.

Adapted from: Pediatrics, July 2006

CPT Codes for Screening and Assessment

96110 - Developmental Testing, **limited**, with interpretation and report (e.g. CNS Vital Signs medical, behavioral, and health rating scale tools)

96111 - Developmental testing; **extended** (includes assessment of motor, language, social, adaptive and/or cognitive functioning by standardized developmental instruments e.g. CNS Vital Signs neurocognitive assessment tools) with interpretation and report.

96116 - Neurobehavioral status exam with interpretation and report, per hour

99420 - Administration and interpretation of a health risk assessment for children (e.g., mental health screening)

Adapted from: AAP Developmental Screening/Testing Coding Fact Sheet for Primary Care Pediatricians



NEXT STEPS:

Contact Us...

Getting Started

Step One: Register at www.CNSVS.com
After registering download the VSX 'Brief-Core'
Assessment Software with 5 FREE Test Sessions...
Take it for a test drive.

Step Two: *Schedule a FREE One-on-One In-Service Webinar...* Contact CNS Vital Signs Support support@cnsvs.com with dates and times that you will be available.

After the webinar the total CNS Vital Signs Assessment platform (Web & Local) can be configured to meet your practice needs.

Learn More

Contact me to receive report examples, case studies, administration guides etc.

- Website: www.CNSVS.com
- Phone: 888.750.6941
- Email: support@cnsvs.com
- Address:
598 Airport Blvd.
Suite 1400
Morrisville, NC 27560

"The webinar training was terrific... it covered the Validity & Reliability of the platform, the interpretation of results, billing and coding, testing protocol, and the integration of the CNS Vital Signs platform into our practice." Practice Administrator

