

## CHAPTER 2: DIFFERENTIAL DIAGNOSIS AND COMORBID DISORDERS

### Introduction

When making an ADHD diagnosis, it is important to exclude other disorders that might overlap with ADHD or mimic ADHD symptoms. The differential diagnosis for ADHD is lengthy and ADHD is a highly comorbid psychiatric disorder. **Consider a second opinion or referral to an ADHD specialist if the patient has a clinical history that is complex or if you are contemplating medication treatment beyond those recommended in these Guidelines<sup>14</sup>.**

Most individuals with ADHD have co-occurring conditions which may complicate the clinical presentation. Often these comorbid disorders need to be dealt with concomitantly.

- 50-90% of children with ADHD have at least one comorbid condition<sup>10</sup>;
- Approximately half of all children with ADHD have at least two comorbidities<sup>10</sup>;
- 85% per cent of adults with ADHD meet criteria for a comorbid condition<sup>260</sup>.

Comorbidity contributes to the failure to diagnose ADHD in adults and children. Follow-up studies of children with ADHD and comorbidity show they have a poorer outcome than children with ADHD alone, as evidenced by significantly greater social, emotional and psychological difficulties<sup>19</sup>. The most common comorbidities identified in the Multimodal Treatment Study of ADHD<sup>18</sup> and in other comorbidity studies have been remarkably consistent.

High rates of comorbidities with ADHD have been reported in both clinical samples and epidemiological studies. Many authors have indicated that comorbidity is generally higher for ADHD in both children and adults. Several competing hypothesis are proposed to account for this high rate of comorbidity. ADHD with a comorbid condition may be indicative of one disorder being an early manifestation of the other, or that development of one disorder increases the risk for the other. Another possibility is that one disorder is a subtype of the other (conduct disorder and ADHD may be a subtype of ADHD). Comorbid disorders may share common vulnerability factors or genetic and psychosocial factors. Each disorder might be an expression of phenotypic variability or, finally, each disorder is a separate entity. More research is needed to understand the validity of each hypothesis.

### Disorder-based Differentiation

Differential diagnoses are disorders that mimic ADHD while comorbid disorders are disorders that occur together with ADHD (either causally-related or independent and occur concurrent with ADHD). A careful assessment of other possible diagnoses should be undertaken at the time of evaluation.

### **Common Differential Diagnosis for ADHD**

This table is modified from *Clinician's Guide to ADHD* with permission of the author, Dr. Joseph Sadek.

Conditions that Can Mimic ADHD	Symptoms or Signs not Characteristic of ADHD
<b>Psychiatric Disorders</b>	
Generalized Anxiety Disorder	Worry for six months or more that the person cannot control; lack of energy; anxious mood and somatic anxiety symptoms.
Obsessive Compulsive Disorder	Presence of obsessions or compulsions that interfere with level of function.
Major Depression	Episodic decline in mood or depressed mood and/or dysphoria ; suicide-related issues; low energy; psychomotor retardation.

<b>Conditions that Can Mimic ADHD</b>	<b>Symptoms or Signs not Characteristic of ADHD</b>
Bipolar Disorder I or II (manic or hypomanic episode)	Episodic change from baseline; psychotic symptoms; grandiosity; pressured speech; recent decreased need for sleep.
Psychotic Disorder (schizophrenia or schizoaffective disorder)	Psychotic symptoms.
Autism Spectrum Disorder	Qualitative impairment in social interactions, communication or odd eccentric behaviours.
Oppositional Defiant Disorder	Defiant; loses temper; annoys others and is easily annoyed; spiteful or vindictive.
Conduct Disorder	Presence of conduct disorder criteria e.g. aggression to people and animals; destruction of property; deceitfulness or theft; serious violations of rules.
Disruptive Mood Dysregulation Disorder	Severe recurrent disproportional temper outbursts (verbal and/or physical) occurring three or more times a week in at least two settings for 12 months or more. Diagnosis first made between ages six to ten years.
Substance Use Disorder	Urine toxicology screen confirms presence of substance.
Learning Disorder	Consultation with psychologist or neuropsychologist confirms presence of the disorder.
Language Disorder	Consultation with speech-language pathologist confirms presence of the disorder.
Tic Disorder/Tourette syndrome (TS)	Presence of vocal or motor tics (or both for TS).
Borderline Personality Disorder	Abandonment anxiety; hourly mood fluctuations; suicidal threats; identity disturbance; dissociative symptoms or micro psychotic episodes; feelings of emptiness.
Antisocial Personality Disorder	Lack of remorse; lack of responsibility; lack of empathy.
IQ-related problems: Intellectual disabilities Gifted child	Cognitive assessment confirms diagnosis <b>Note:</b> If IQ is within the normal range: explore whether curriculum is not well matched to child's ability.
<b>Medication-related</b>	
Medication with cognitive dulling side effect (e.g. mood stabilizers)	
Medication with psychomotor activation (e.g. decongestants, beta agonist)	
<b>General Medical Conditions</b>	<b>Investigations confirm the diagnosis of the medical condition</b>
Head Trauma/Concussion	Since underlying ADHD can increase risk for head trauma, it is important to look for timing of cognitive symptoms apparition (present before, or appeared or worsened after head trauma).
Seizure Disorders	Neurology assessment confirms diagnosis.
Hearing Impairment or Vision Impairment	Audiology and vision evaluation confirms diagnosis.
Thyroid Dysfunction	TSH levels indicate hypothyroidism or hyperthyroidism
Hypoglycemia	Abnormally low glucose blood levels confirms diagnosis
Severe Anemia	CBC and anemia investigations confirm diagnosis
Lead Poisoning	Lead blood level measurement confirms diagnosis
Sleep Disorders	Sleep lab assessment confirms diagnosis
Fragile X Syndrome	Molecular genetic testing for FMR-1 gene confirms diagnosis. Genotype confirms diagnosis
Fetal Alcohol Spectrum Disorder (FASD)	<ul style="list-style-type: none"> <li>- Possible presence of intellectual disability</li> <li>- Growth deficiency and FAS facial features</li> <li>- Evaluate prenatal alcohol exposure risk</li> <li>- Magnetic brain imaging</li> <li>- Psychological assessment (including intellectual, language processing, and sensorimotor)</li> </ul>
Phenylketonuria	Blood test confirms diagnosis
Neurofibromatosis	Café au lait spots
<b>Other Factors</b>	
Unsafe or disruptive learning environment	
Family dysfunction or poor parenting	
Child abuse or neglect	
Attachment Disorder	

A thorough history and full functional review accompanied by a physical examination will often confirm underlying physical conditions. In certain instances, laboratory work up will be needed in order to eliminate a suspected pathology. However, most individuals with ADHD do not need laboratory investigations as part of their diagnostic assessment. Some special investigations may be relevant, including polysomnography, electroencephalogram or brain imaging. Psychological testing, like WISC-IV (in children) or the WAIS (in adults), is often useful as it addresses any learning issues and helps to ascertain specific components of cognitive functioning that have overlaps with executive functioning (e.g. working memory and processing speed). Other tests, like personality assessment or projective testing, might be helpful to establish personality traits and assessing contact with reality.

## **Comorbidities**<sup>15-17</sup>

### **Comorbid Problems that can complicate ADHD evaluation and treatment**

<b>Psychiatric Problems</b>	<b>Clinical aspects to take into account in the treatment process when comorbid with ADHD</b>
<b>Mood Disorders</b>	
Major Depression	Treat the most impairing disorder first. Moderate to severe depression should be treated first and suicide must be assessed in all cases. Dysthymia and mild depression may benefit from ADHD treatment first.  Stimulants can be combined with the majority of antidepressants when monitored. Also consider CBT.  In adults, Bupropion and Desipramine may reduce ADHD symptoms, but with an effect size significantly lower than psychostimulants.
Bipolar Disorder	Treat Bipolar Disorder first. Treatment of ADHD can be offered when Bipolar Disorder is stabilized. Refer to specialist.
<b>Anxiety Disorders</b>	
Generalized Anxiety Disorder Panic Disorder Social Phobia OCD Post-Traumatic Stress Disorder	Treat the most impairing disorder first. Some patients may show worsening of anxiety and some may show improvement in their symptoms. ADHD treatments can be less tolerated in some individuals in this population. Note possible pharmacological interactions with meds metabolized through CYT2D6 system. Start low, go slow but titrate up to therapeutic dose. If not tolerated, switch to another medication, like atomoxetine. Also consider CBT. If Atomoxetine is much less effective, can refer to specialist for augmentation with stimulants.
Autism Spectrum Disorder (ASD)	ADHD treatments can be less tolerated in some individuals in this population but could be very helpful in the general management. Start low, go slow, but titrate up to therapeutic dose. If not tolerated, switch to another medication. Refer to specialist for specific interventions for ASD
Psychotic Disorders	Treat Psychotic Disorder first. (Refer to a specialist: treatment of ADHD can trigger a psychotic relapse in a predisposed patient). Stable patients who are in remission may benefit from ADHD treatment.
Oppositional Disorder and Conduct Disorder	Treat both conditions. Oppositional Disorder needs psychosocial interventions. Moderate and severe cases might require combinations of psychostimulants and an Alpha 2 agonist such as clonidine, or guanfacine.  Conduct Disorder needs psychosocial interventions and may involve legal issues. Pharmacological treatment of ADHD may help better modulate reactive-impulsive behaviours. Adding an antipsychotic might improve the symptoms of conduct disorder, according to some cases cited in the literature.
Borderline Personality Disorder	Reducing impulsivity and increasing attention when treating comorbid ADHD may help the patient with a personality disorder to better participate in their psychological treatments.
Antisocial Personality Disorder	Treating patients with APD + ADHD requires more complex and comprehensive interventions.
<b>Medical Problems</b>	
Epilepsy	Treat epilepsy first, then ADHD. New onset seizure should be managed with antiepileptic medication. Level of antiepileptic medications may increase with methylphenidate due to enzyme inhibition <sup>245</sup> .
Tics	ADHD medications do not cause tics but some may increase or reduce tics. However, the presence of tics is not a contraindication for ADHD medication. Atomoxetine, clonidine and guanfacine have shown promise in this population. Addition of antipsychotic may be required in severe cases.
Sleep-related Disorders	Treat primary disorder first.
Sleep Apnea	Psychostimulants can reduce residual sleepiness and improve daily function in sleep apnea and narcolepsy with or without ADHD.
Cardiovascular problems	Physical exam before treatment (BP, pulse and cardiac auscultation). EKG and cardiac consult if positive cardiac history or structural heart disease. Measure BP and pulse and monitor vital signs and cardiac side effects during treatment.
Obesity	Discuss healthy eating and sleep habits and increase exercise. ADHD treatment may improve patient's capacity to implement lifestyle changes

Other Problems	Clinical aspects to take into account in the treatment process when comorbid with ADHD
Learning disorders	Treat specific learning disorders. ADHD treatments can improve attention, allowing improvement in learning skills. School adaptations, study and academic organizational skills should be considered and offered when needed.
Speech Disorders	Treat specific speech disorders. Refer to special education teacher, psychologist and/or speech and language therapist for specific interventions.
Developmental Coordination Disorder	Treat coordination disorders. Refer to occupational therapist and/or physiotherapist for specific interventions.
Low IQ High IQ	Treat ADHD and adapt non pharmacological approaches to the patient's IQ level. Treat ADHD and adapt curriculum to child's IQ level.

**Note: Drug combinations and antipsychotics use described in this table is off-label use and reserved for complex cases.**

The presentation of ADHD subtypes and the most common comorbid disorders change over time and by developmental stage. The most common comorbid disorders in early childhood are oppositional defiant disorder (ODD), language disorders and enuresis. Many children with ADHD have a specific learning disorder<sup>20</sup>. ADHD is two to three times more common in children with developmental disabilities or borderline IQ and intellectual disabilities. In the mid-school-age years, symptoms of anxiety or tic spectrum disorders may also be observed. Mood disorders tend to be more observable by early adolescence<sup>21-23</sup>.

We will briefly describe the key comorbidities and the auxiliary treatments they require. An important clinical note is that outcome is generally determined by the most serious comorbid condition. Very little systematic research exists on sequencing of treatment for comorbidities, and this is generally handled on a case-by-case basis.

### ADHD and Specific Learning Disorder

It is important to recognize that the term "Learning Disorder" (LD) in DSM-IV<sup>6</sup> has changed to Specific Learning Disorders (SLD) in DSM-5<sup>246</sup>. SLD and ADHD are now placed in the neurodevelopmental disorders section in DSM-5. The DSM-5 uses a single overarching term, Specific Learning Disorders, rather than distinct Disorders such as Reading Disorder, Math Disorder, Written Expression Disorder and Not Otherwise Specified as used in the DSM-IV-TR. The DSM-5 allows for a single category of SLD with specifiers. That is, the clinician can specify manifestations of learning difficulties at the time of the assessment in three major academic domains such as reading, writing and mathematics (e.g. SLD with impairment in reading, which includes difficulties in word reading accuracy, reading rate or fluency, or reading comprehension).

Given historical concerns about using the IQ-Achievement Discrepancy method, which was a prerequisite in the DSM-IV, this method is no longer required in the DSM-5. Rather, the four new criteria (A-D) for diagnosis state that there needs to be - A: persistence of symptoms (list of clinical symptoms provided) for at least six months despite focused intervention; B: low academic achievement causing significant impairment; C: age at onset in school age years (may manifest fully later); and D: not attributable to intellectual disorder, uncorrected visual or auditory acuity, other mental or neurological disorders, psychosocial adversity, lack of proficiency in the language of academic instruction, or inadequate instruction. The DSM-5 requires multiple measures including those that are individually administered and culturally appropriate before making the diagnosis (i.e., testing, school reports, curriculum-based assessments).

Children/adolescents with ADHD frequency fall below control groups on standardized achievement tests. Teachers and parent often express concerns about a child's level of productivity and may label this child/adolescent as "lazy" or "unmotivated". There are a number of trajectories that can culminate in underachievement. One of the possibilities is that the individual has comorbid disorders of ADHD and Specific Learning Disorders (SLD). Indeed, research indicates that the comorbidity of ADHD and learning disorders is high.

## **Comorbidity of SLD and ADHD**

The comorbidity range has been suggested to be between 31% and 45%. One out of every three children with ADHD also have an SLD <sup>264</sup>. Comorbidity rates of SLD with ADHD can vary greatly depending on how SLD is diagnosed.

However, ADHD and SLD can often present with similar behavioral symptoms. For example, children who are struggling in reading or writing may present with difficulties sustaining their attention to such arduous tasks. Thus, they may appear distractible with their inattention considered secondary to the presence of a SLD. It is recommended that a comprehensive assessment be completed in order to tease apart the primary diagnosis or whether the two disorders are comorbid.

Even without comorbid learning disorders, children with ADHD may still have a great deal of difficulty, with performance deficits such as following instructions, listening in the classroom, or staying on task, which can result in significant underachieving compared to their potential. Additional individuals with ADHD often have executive function difficulties in the areas of initiation, organization, planning, self-directed activity, and ability to complete multistep tasks. The degree of difficulty individuals experience varies, with some individuals greatly impaired and their academic achievement subsequently falling well below their abilities. Learning disorders and executive function deficits are also developmental. That is, they may become more overt as cognitive demands in school increase.

## **Implications in Diagnostic Assessment**

In terms of assessment, practitioners should always (a) screen for academic skills deficits among students with ADHD and for ADHD symptoms among students with SLD; (b) assess academic functioning across subject areas (e.g., reading, math, writing) when evaluating students with ADHD; and (c) carefully evaluate whether interventions for ADHD enhance academic functioning<sup>264</sup>. Given the relatively high comorbidity rate between ADHD and SLD, students who are evaluated for one of these disorders should always be screened for possible symptoms of the other disorder. If the screening suggests the possibility of a learning disorder, then a referral should be made to the support staff and psychology practitioners at the child's school for consultation around school programming.

When psychoeducational assessments are completed, it is important to assess for comorbid SLD as well as to rule out other disorders, such as auditory processing disorders or motor disorders, which negatively impact on written output. Children with ADHD often have speech and language difficulties. Children with evident speech and language disorders should also have a hearing screen which may include central auditory processing.

It is important to differentiate between those academic difficulties that may be secondary to ADHD symptoms (i.e., performance deficits) and those academic difficulties that represent actual skill deficits (i.e., SLD related).

In adults, as in children, ADHD can occur along with specific problems in reading, math or with written expression. These can usually be identified by assessing whether these difficulties have caused previous problems in school and continue to cause more or less residual difficulty. What is more complex is the differential between a primary attention problem (ADHD-inattentive presentation) and various processing disorders, executive function problems secondary to organic conditions (e.g., head injury, exposure to toxins, drug abuse), or language deficits. The childhood history should reveal previous concerns of ADHD. It is additionally important to determine if the patient is inattentive only in the area in which learning

deficits present a challenge; if the attentional problems followed an accident involving a concussion or brain injury; or whether the problems with focus followed a period of heavy drug use.

### **Implications for Management**

Academic skill deficits may require intensive, direct instruction and modification of antecedent events beyond medication and motivational (i.e., consequence-based) behaviour modification strategies<sup>264</sup>. The physician diagnosing the child or adolescent with ADHD has a responsibility to aid the individual in accessing appropriate classroom accommodations. If specific learning disorders are diagnosed, *it is essential* that accommodations be documented that will address the individual's learning impairments. It is likely that the individual will require accommodations to target both productivity and learning. It is also important for the individual's self-esteem to be able to differentiate their overall level of intelligence from specific deficits that can be remediated.

Templates that can be used as a guide for writing letters requesting school accommodations are found in Chapter 6, supporting document 6A. In recent years, schools have been much more willing and skilled in providing appropriate adaptations for children and adolescents with ADHD. These adaptations should be understood as giving the student with a disability equal access to the learning environment and not perceived as an indication of academic incompetence. This is true throughout the individual's academic years.

**Practice Point:** *The templates for requesting psychoeducational testing and accommodations can be downloaded from the CADDRA ADHD Assessment Toolkit and printed on your letterhead. You can personalize and adapt them to suit your needs.*

*Educational accommodations are a right* (recognized in the Ontario Human Rights document, “Guidelines in Accessible Education”<sup>28</sup>). Although some school boards across Canada do not currently recognize ADHD as qualifying a student as a ‘special needs student’, this perspective is changing. Both CADDRA, the national physician’s ADHD alliance, and CADDAC, the national parent and patient support and advocacy network, will be advocating to the Ministries of Education for standardized educational accommodations across Canada. CADDRA and CADDAC believe that all neurobiological and mental health disorders need to be recognized by educational institutions in order for individuals to receive the necessary multimodal care.

Comprehensive intervention services for students with comorbid ADHD and SLD will require empirically supported treatment strategies that address both disorders and that are implemented across school and home settings<sup>246</sup>.

### **ADHD and Oppositional Defiant Disorder (ODD)**

Behavioural problems (including ODD, aggression and delinquency) account for most of the comorbidity in children with ADHD. The presence of comorbid ODD with ADHD is likely to generate substantial impairment and would be expected to result in increased referrals for treatment<sup>29</sup>. Between 25-75% of adolescents with ADD may have concurrent ODD<sup>30</sup>. Distinguishing between normal adolescent self-assertion and ODD may not always be easy. Among adults with ADHD, there is some continuity of ODD in that population<sup>247</sup>.

One of the most common reasons for ODD is parental vulnerability resulting in insecurity of the child who responds with a need to control. This manifests by active confrontation of authority they perceive as being weak. The treatment for psychosocial-based ODD is to reestablish the generational boundaries using positive parenting techniques. However, in patients with comorbid ODD with ADHD, it is advisable that

the first step is optimization of pharmacotherapy of ADHD followed by augmentation with psychosocial treatment, including parent and other behavioural treatments. It is important to distinguish ODD from CD. Children with ODD have recurring negativistic, defiant, hostile and disobedient behaviour, especially toward authority figures, whereas those with CD repeatedly violate the basic rights of others or age-appropriate societal norms, as defined by a pattern of repeated aggression, lying, stealing, and truancy<sup>31</sup>. The onset of both disorders is usually prepubertal, thus making early identification, diagnosis, and treatment crucial. ODD is a prodromal to conduct disorder in some cases but an unlikely outcome in more than 50% of the cases. Many children with ADHD and ODD do not evolve into CD<sup>32</sup>.

**Summary: Some patients with ADHD and ODD may respond adequately to stimulant medication or non-stimulant (atomoxetine, guanfacine) but moderate to severe cases are likely to require augmentation with another medication or with behavioural treatment. Effective treatment may reduce the risk of more severe conditions in adolescent and adult years, such as conduct disorder, substance use disorder and depression.**

### **ADHD and Conduct Disorder (CD)/Aggression**

CD comorbid with ADHD is a severe, persistent condition that has an earlier age at onset and is frequently preceded by ODD, therefore it is important to distinguish between the two disorders<sup>32, 33</sup>. CD is not always pre-pubertal onset; another group of children have adolescent-limited CD. Co-occurrence of ADHD and CD in adolescents is often a precursor of antisocial behaviours; nicotine use; substance use or abuse; anxiety or depression; and development of antisocial personality disorder as adults<sup>34, 35</sup>.

Pharmacotherapy for patients with ADHD, CD and aggression may be useful (stimulant and non stimulant medication). Although medications are usually effective in reducing the symptoms of ADHD and impulsive aggression<sup>18, 36</sup>, these patients typically benefit from multimodal treatment<sup>37</sup>. Medications initially should treat the most severe underlying disorder, after which targeting specific symptoms is appropriate. Some of these patients show aggression before and during the course of treatment, making it imperative to document their aggressive behaviours before the introduction of medications and to make these behaviours an explicit target of treatment. Clinicians should assess treatment tolerability and efficiency if patients show aggression after starting medication for ADHD.

Conduct problems are generally reduced by all effective ADHD treatments (stimulant and non stimulant medication and psychosocial treatment<sup>36, 38</sup>). However, treatment of the ADHD may not be sufficient to resolve all symptoms. Optimization of medication with a multimodal treatment approach indicated psychosocial treatments including individual and family interventions are required. Specialists in this area may use mood stabilizers or an atypical anti-psychotic. Other treatments (besides optimizing ADHD medication and psychosocial treatments) are controversial and referral to a specialist is recommended<sup>30, 39</sup>.

Research shows that ADHD and CD represent two complex and distinct entities that are often associated. Children with these conditions without comorbidity present with different core symptoms and perform differently on objective measures of ADHD symptoms. Children with these comorbidities show the poorest outcome within each individual group<sup>40</sup>.

Researchers have attempted to understand the reasons for the high comorbidity between ADHD and CD. They have suggested several reasons for this:

- that one disorder is a precursor to another;
- one disorder is a risk factor for developmental of the other;
- the disorders share the same related risk factors; or

- there is a common underlying symptomatic basis for one or more of these behaviours<sup>41,42</sup>.

DSM 5 emphasizes that aspects such as early onset (before 10 years old), high level of comorbidities and limited prosocial emotions (lack of remorse or guilt; callous - lack of empathy; unconcerned about performance; shallow or deficient affect<sup>247</sup>) are all poor prognostic indicators and increase the risk for development of antisocial personality disorders in adulthood.

**Summary: The essential characteristic of conduct disorder is repetitive and persistent behaviour manifested by violation of others' fundamental rights or violation of social rules/norms.**

- **Psychosocial treatment, parenting and problem-solving skills training, and family and/or individual therapy, is needed to improve patient outcomes.**
- **Pharmacological treatment of comorbid ADHD/conduct disorder may require combination of an ADHD medication and a medication that targets aggression.**

### **ADHD and Borderline Personality Disorder (BPD)<sup>43</sup>**

BPD may occur in either gender but is more prevalent in women. It is advised that the individual should be over 16 before a formal diagnosis of BPD is applied. While patients with BPD are often impulsive, labile and have difficulties with executive function, the presence of rage, chronic feelings of emptiness, identity disturbance, dissociative symptoms, primitive defence mechanisms, deliberate self-harm actions, abandonment anxiety and suicide threats differentiate the two disorders. While patients with BPD may have ADHD, the BPD is the more severe disorder and more likely to impact outcome. Therefore it should be treated and stabilized before ADHD treatment is undertaken. Some caution needs to be exercised with the use of pharmacological treatment due to potential misuse, abuse, overdose, diversion, activation and mood dysregulation.

However, effective treatment of underlying ADHD can improve active participation in psychosocial treatments. Patients with BPD who have clear evidence of ADHD in childhood often expect that treatment of the ADHD in adulthood will resolve the personality issues and they are frustrated that they continue to struggle. In these cases, it is important to explain the treatment limitations of ADHD medications. This will reduce the risk that patients will react with feelings of abandonment, rage, disappointment, devaluation or feel that they have been rejected.

### **ADHD and Antisocial Personality Disorder (ASPD)<sup>43</sup>**

Some children with ADHD and conduct disorder go on to have ASPD after the age of 18 (the age criterion is required), and show an absence of remorse, compassion and conscience. Since some patients with ASPD may be psychopathic and also drug-seeking, it is important to screen for cruelty, aggression, problems with the law and stealing. Treatment of ADHD in the context of ASPD may not lead to significant functional improvement in the patient's actual well-being but may improve the extent of their impulsivity<sup>45</sup>. Whether or not they are less impulsive, less hyperactive and more focused may or may not improve their functioning if symptomatic improvement is directed to antisocial activities rather than improved interpersonal relationships and life skills.

### **ADHD and Anxiety<sup>43</sup>**

There are anxious patients in whom problems concentrating, restlessness and other aspects of dysregulation are caused by a primary anxiety disorder and not ADHD:


- Check for other signs of anxiety and family history of anxiety.
- Check to see if the patient has symptoms of ADHD not typical for anxiety, such as stimulus-seeking behaviour, disinhibition or difficulty with organization and time-management.



- Determine if symptoms have developed de novo as a result of new onset anxiety or a particular stressor.

The natural course of ADHD moves towards an internalization of the symptoms. As a result, the emergence of anxiety may be a natural extension of ADHD. Individuals with the inattentive presentation have a stronger propensity for anxiety as they typically have internalizing temperaments. This is particularly true in females who may be highly sensitive and have more inattentive symptoms. However, having ADHD also exposes the individual to considerable negative situations and anxiety may be a compensation for environmental insults (i.e. in order to avoid conflict situations due to their impulsiveness, they use anxiety to create excessive internal control). Once anxiety develops, attention can be severely compromised. As a result, there are patients with comorbid anxiety and inattention. This results in significant damage to their self esteem, lack of academic success and other types of impairment. There are many forms of anxiety within the DSM-5 but they all have some components in common:

- a) the cognitive message always begins with the words “what if...” which is a need to anticipate a negative outcome before it has happened
- b) a tendency to hold on to beliefs, thoughts, belongings and emotions (i.e. not being able to easily “let go”)
- c) is likely related to heightened noradrenaline activity, and
- d) the behaviour leads to impairment in functioning.

As many as 33% of children<sup>18</sup> with ADHD have comorbid anxiety and that number increases to as many as 50% of adults<sup>5</sup>. Once the specific type of anxiety is identified the treatments are generally as follows: 

- Behavioural intervention: Relaxation therapy, yoga, meditation, exercise, simplifying their environment by throwing things out, delegating anxious activities, improved organization skills etc. are all useful interventions
- Psychological therapy: Cognitive behavioural therapy (CBT) and individual therapy focusing on the specific anxiety disorder
- Medical treatment: If ADHD exists with anxiety, treat the ADHD first. There may be a risk of increasing anxiety in the short term so it is important to start very slowly and increase the doses gradually. If the anxiety becomes too intense, then the ADHD medication should be reduced or withdrawn and the anxiety should be treated until the symptoms are tolerable. Then the ADHD medication should be restarted. Any of the ADHD medications can be successfully used when anxiety is comorbid although atomoxetine has been found to be specifically helpful in management of anxiety with attention disorder<sup>21, 22</sup>. Due to 2D6 inhibition, atomoxetine should be used with caution if combined with fluoxetine or paroxetine for example.

### **ADHD and Major Depression<sup>43</sup> (MD)**

There is considerable overlap between MD and ADHD. MD patients (without ADHD) may still have transitional inattention, short-term memory problems, irritability, impulsivity, trouble sleeping, trouble concentrating, restlessness and being fidgety. However, the differential with ADHD is based on two factors. Primary MD typically has consistent depressed mood or anhedonia. Typically bouts of depression are episodic whereas the attentional deficits associated with ADHD are ongoing. A drop in mood is qualitatively different from the lifelong deficits in maintaining focus or motivation that are typical in ADHD. There is a difference between poor concentration in the presence of depression and deficits in organization, impulsivity and lifelong difficulty with forced effort and listening even when happy. In the context of poor self-esteem or possible depression, a careful assessment of suicide risk needs to be conducted.

Patients with primary ADHD often have to deal with failure and may become demoralized, depressed or dysthymic as a result. In that case, they will present with both disorders. Patients with ADHD may look like they have a mood disorder when they do not. Lack of motivation may mimic anhedonia, chronic difficulty going to sleep and restless sleep may mimic insomnia secondary to MD. Patients with ADHD typically have dysregulated mood, are reactive and sometimes irritable, but it is not typical for ADHD in the absence of a mood disorder to be associated with entrenched, depressed affect. On the contrary, many individuals with ADHD maintain reasonable mood despite chronic rejection and difficulties with relationships and life skills. Some patients with ADHD are negative or chronically irritable (“life is a bore” or “I’ve never felt well”) in the absence of major neurovegetative features. The most appropriate designation for this particular attribute would be a persistent depressive disorder (dysthymia) since these symptoms are not included in the diagnostic criteria for ADHD itself. Antidepressants can be helpful in some cases.

It is not uncommon for ADHD and depression to coexist. It may be helpful to try to determine if the patient is depressed secondary to ADHD or vice-versa. Depression or more commonly dysphoric symptoms are also possible due to the withdrawal effects of the medications used to treat ADHD <sup>CB</sup>. Different guidelines differ on sequence of treatment, but clinically the “primary” disorder - meaning the more severe, early onset and pervasive disorder - is usually treated first. When initiating treatment with stimulants in a patient with untreated melancholic depression, worsening of already impaired sleep and appetite issues may be a problem.

When the depression is associated with problems in the psychosocial environment, treatment strategies including individual (e.g. CBT) and family therapy are primarily indicated<sup>5</sup>. However, pharmacological treatment is a useful intervention in the adolescent and adult age group. The evidence for successful treatment of childhood depression with medications is mixed. Stimulant medications may produce a dysphoric look in 30% of patients, even though the patient is not clinically depressed or reports depression. Adjustment of dose may improve the dysphoric symptoms; failing that, switching to a different ADHD medication may be successful. Treatment of the most disabling condition should be undertaken first. This is particularly true in the presence of suicide risk. If the MD continues to be impairing or worsens, referral is recommended. All of the drugs used to treat ADHD have potential antidepressant effect or can cause mood symptoms particularly in the rebound of their use ... *If suicide risk is imminent, an immediate referral or intervention must be carried out. Suicide risk should be assessed in the follow-up visits as well.*

#### **Summary:**

- **Risk of suicide in ADHD derives mostly from comorbidity and not from stimulants.**
- **Treat the most disabling condition with the most effective treatment for that condition first, then treat the other condition.**
- **Some evidence suggests that ADHD treatments may be less effective in patients with active depression and may lead to an exacerbation of dysphoria, poor sleep and decreased appetite.**
- **If a patient presents with chronic persistent depression and ADHD, or mild depression and ADHD, then ADHD should be the priority since its treatment may lead to amelioration of the mood symptoms.**
- **Moderate to severe depression should be managed as a priority, then ADHD treatment should take place.**

#### **ADHD and Bipolar Spectrum Disorder**

The risk of bipolar disorder in the general population, when considering the spectrum of bipolar presentations (BP I, II, NOS) is about 4%. In the adult ADHD patient population, the risk increases. Most children with ADHD do not go on to have BD, but a high index of suspicion should be maintained, particularly when a child or adolescent presents with depression symptoms. Any patient who experiences

a new and acute onset of increased energy, irritability, grandiosity and decreased need to sleep is, by definition, suffering a hypomanic/manic episode.

Children and adolescents diagnosed with ADHD may also be diagnosed with bipolar disorder but this comorbid diagnosis is controversial in young children<sup>44</sup>. A sample of patients with ADHD and comorbid bipolar disorder were compared to a sample of BP patients with no ADHD. Those ADHD patients with BP were found to have an earlier age of onset and short periods of wellness. They also had more irritability, violence, legal problems and less education. That sample exhibited more mania and depression and more suicide attempts, and those patients with ADHD and bipolar disorder had a greater number of other comorbidities on Axis 1<sup>45</sup>.

Treatment should usually start with managing the bipolar disorder symptoms first. The management of ADHD with bipolar disorder is usually more complicated and often requires the use of mood stabilizers and/or atypical antipsychotics. There is a very small risk of switching from euthymia or depression to mania when a bipolar patient is prescribed stimulant medication. If this occurs, the stimulant should be discontinued and treatment of bipolar disorder should commence. Once the patient's mood is stabilized, stimulant medication may cautiously be re-instituted (start low and go slow)<sup>248, 43</sup>.

Some patients have an early onset form of BD characterized by severe mood swings, anger outbursts, irritability, distractibility, hyperactivity and impulsive, self-destructive behaviour. Differentiating features include symptoms of grandiosity, euphoria and periodicity. Family history of BD is an important risk factor. However, children of bipolar parents are more likely to have ADHD (8-10%), rather than BD (5%)<sup>45</sup>. Other differentiating features include: discrete cyclical symptoms of emotional lability in BD as opposed to continuous symptoms in ADHD; psychosis or grandiose perceptions in BD are not present in ADHD; and possible depression and sleepiness after rage episodes in BD as opposed to baseline recovery in ADHD-based rages.

Ⓢ In adolescence and adulthood, BD should be considered as the primary diagnosis if there are prominent, episodic, distinct, cycling mood symptoms, grandiosity and hypersexuality. Mood stabilizers (lithium carbonate, anticonvulsants) and atypical antipsychotics are the treatment of choice for bipolar disorder<sup>46</sup>. Treatment of BD or BD + ADHD should be referred to a specialist.

### **ADHD and Disruptive Mood Dysregulation Disorder**

The diagnostic criteria for Disruptive Mood Dysregulation Disorder (DMDD) includes: severe recurrent disproportional temper outbursts (verbal and/or physical) occurring three or more times a week in at least two different settings for 12 months or more. Diagnoses are generally made between the ages of 6 and 10 and cannot first be made before the age of 6 years or after the age of 18 years. Mood generally between temper outbursts appears to be irritable. This diagnosis was created to address concerns about the potential for the overdiagnosis of, and treatment for, bipolar disorder in children<sup>246</sup>. A study by Copeland et al.<sup>249</sup> of some 3,258 participants aged 3 to 17 showed a prevalence rate of 0.8% to 3.3% with the highest rate in preschoolers. Disruptive Mood Dysregulation Disorder was also found to be very comorbid (62% to 92% of the time). The highest rate of comorbidity occurred with depressive disorder (odds ratio 9.9 to 23.5) and oppositional defiance disorder (52.9 to 103.0). Rate of co-occurrence with ADHD had odds ratios which ranged from 2.9 to 12.6.

The condition was associated with significant social impairment, school suspension, substance use and poverty. Thus the possibility of disruptive mood dysregulation disorder needs to be considered in patients with frequent temper outbursts and irritable mood, both as a differential or comorbid condition

with regards to ADHD. A combination of medications and psychosocial interventions is needed to treat this comorbid combination.

### **ADHD and Autistic Spectrum Disorder**

According to the literature:

- Until recently, ADHD was not recognized in persons with autism spectrum disorder but researchers and clinicians have now recognized the importance of attending to both syndromes when both are present and clinically impairing;
  - up to 58% of the individuals diagnosed with autism and 85% of those diagnosed on the continuum of autistic spectrum disorders (previously referred to as Asperger's syndrome) tend to meet full criteria for ADHD as well<sup>24</sup>;
  - attentional impairments in autism tend to be more of the "not listening" and "difficulty shifting focus" type than of "the short attention span" and "excessive distractibility" type;
  - medications used to treat ADHD can help alleviate ADHD impairments in the majority of patients with comorbid ADHD and autism spectrum disorder, though the effect is somewhat less than in those presenting with ADHD alone;
  - in people presenting with ADHD and ASD, side effects such as dysphoria are more common<sup>51</sup>
- ✓ **dosage titration in this population should be done at a slower rate to minimize adverse effects.**

### **ADHD and Addictions**

*Substance Use Disorder (SUD)*<sup>24, 52-56</sup>

Comorbidity of Substance Use Disorder and ADHD is high. Literature suggests that one-quarter of adults with SUD and one-half of adolescents with SUD have ADHD. Adults with SUD also show a higher risk for ADHD, as well as earlier onset and more severe SUD associated with ADHD. Several authors suggest a higher rate of SUD is recorded in adults with ADHD than in the general population, and ADHD itself is a risk factor for SUD. Patients with conduct or bipolar disorders co-occurring with ADHD have the greatest likelihood of developing SUD and major comorbidity. ADHD was related to SUD, but the main effect was related to conduct disorder.

ADHD can be a significant predictor of early initiation of cigarette smoking. Individuals start using with cigarettes, alcohol and other drugs of addiction.

Some controversy exists about the relationship between ADHD treatment and substance use. Some researchers suggest that ADHD and SUD-related craving share neurobiological similarities, and that treatment of ADHD may reduce craving for substances and subsequently reduce the risk for relapse to substance use. An aggregate of the literature seems to suggest that early stimulant treatment reduces or delays the onset of SUDs and perhaps cigarette smoking into adolescence; however, the protective effect is lost in adulthood.

The self-medication hypothesis is plausible in ADHD. Moreover, the accompanying poor self-judgement and impulsivity associated with ADHD may be conducive to the development of SUD.

Cocaine and stimulant abuse is not overrepresented in ADHD; in fact, marijuana continues to be the most commonly abused agent. Methylphenidate does not have the same abuse liability as cocaine does due to slower dissociation from the site of action, slower uptake into the striatum, and slower binding and dissociation with the dopamine transporter protein relative to cocaine.

The ADHD group that is at highest risk for diversion and misuse is those people with substance abuse and conduct disorder. Both immediate-release and, to a lesser degree, extended-release were diverted or misused.

The treatment needs of individuals with SUD and ADHD need to be considered simultaneously; however, if possible, the SUD should be addressed initially. If the SUD is active, immediate attention needs to be paid to the stabilization of the addiction. Depending on the severity and duration of the SUD, individuals may require inpatient treatment. Self-help groups and CBT can also be helpful. SUD individuals with ADHD require intervention(s) for ADHD (and, if applicable, for comorbid psychiatric disorders). Patients with ADHD and SUD require multimodal intervention incorporating both addiction and mental help treatment<sup>52, 54-57, 43, 250-252</sup>.

Patients with ADHD are at significant risk of using illicit substances, particularly nicotine, cocaine and cannabis, and of starting at an earlier age than the general population<sup>54</sup>. Concurrent disorders with ADHD, like CD and BD, increase the likelihood of SUD<sup>55</sup>. While patients with ADHD do self-medicate with substances, it is important to dispel their belief that the use of illicit substances has a positive therapeutic benefit. SUD is a diagnosis in its own right, and data to date does not demonstrate that treatment of ADHD in this population will eliminate the substance abuse<sup>56</sup>. A history of substance abuse should be explored with the individual in private.

**Practice point:** *With adolescents, first ask whether their friends use drugs or alcohol. A positive response suggests they are likely a high risk candidate. Where substance abuse exists, there continues to be controversy about the timing of ADHD pharmacological treatment. Though the CAP-G Committee feels it is important to treat the SUD first, it is recognized that ADHD treatment might be required concurrently.*


Patients with ADHD have a two-fold risk for substance abuse and dependence, including daily marijuana use, alcoholism, smoking and other drugs<sup>57</sup>. On the other hand, it is also true that patients with these substance abuse/dependence problems present with attention, behaviour and self-control symptoms that mimic ADHD. For this reason, we do not recommend making a diagnosis of ADHD in the face of current substance abuse or dependence, even when childhood history is positive. The primary diagnosis in this circumstance is the substance problem and diagnosis of ADHD should be deferred until the patient is in recovery. Treatment of ADHD in patients who use marijuana without dependence or abuse is controversial and the risks and benefits of doing this have not been studied. Marijuana smoking (to calm themselves or facilitate sleep) is extremely common in this population. No treatment carries risk in itself and that treatment may minimize self-medication. Marijuana may be laced with substances that are more dangerous and it makes little sense to use a medication to help a patient focus when they are self-medicating with a substance that impairs attention skills in the long-term.

According to current literature:

- methylphenidate does not have the same abuse liability as cocaine does due to slower dissociation from the site of action, slower uptake into the striatum, and slower binding and dissociation with the dopamine transporter protein relative to cocaine;
- in some studies, 11% of subjects with ADHD reported selling their medication and 22% reported misusing their medication compared with 5% of controls. The ADHD group at highest risk for diversion and misuse were those with SUD and CD. Immediate-release, but not extended-release, stimulants were diverted or misused;
- patients with ADHD and SUD require multimodal intervention incorporating both addiction and mental health treatment.

### **ADHD and Other Addictions**


The need for immediate feedback, the desire for reward and the enjoyment of risk all lead ADHD patients to be vulnerable to addictions. These may include not just substance abuse but also sports, shopping, sex,

internet and gambling addictions. Therefore it is essential that an ADHD assessment screen for any addiction is begun with a broad question, followed by a more detailed evaluation, and that both disorders be treated . There is no evidence that treatment of ADHD will treat the addiction, or that resolution of the addiction will lead to improvement in ADHD core symptoms.

### **ADHD and Enuresis**

Enuresis treatment may be improved with medication initiation, particularly for daytime events. Nocturnal enuresis often requires separate management. The most effective intervention for the motivated child and family is the alarm-based training system. Medical treatment options may include the use of Desmopressin, DDAVP, imipramine and (recently determined) atomoxetine<sup>58-60</sup>.

### **ADHD and Tic Disorders<sup>61-64</sup>**


The most common tic is blinking. Tics present as either phonic or physical movements. Research on tic disorders and ADHD is complex and this may be a disorder where the population statistics do not always reflect the risk to the individual . While stimulants do not cause tics, they may be implicated in uncovering a patient's propensity for them. There is some evidence that while atomoxetine may be associated with improvement in tics, it may also cause tic emergence. Some recent research studies suggest:

- patients with Tourette Syndrome (TS) co-occurring with ADHD may suffer from more impairment related to ADHD than tics;
- treatment interventions for TS include education about tics and related disorders, clinical monitoring, pharmacological or psychological treatments and school interventions for kids as needed;
- some studies indicate that stimulants are a safe and effective treatment for ADHD in most children with comorbid tic disorder;
- the alpha-2-adrenergic agonists, clonidine and guanfacine XR (Intuniv), have shown promise in the treatment of tics, particularly in combination with ADHD.

### **ADHD and Epilepsy**

Some studies have suggested a higher incidence of symptoms of ADHD in children with epilepsy. The five common epilepsy comorbid conditions are reduced bone health and fractures, stroke, depression, migraine and ADHD<sup>65, 253</sup>. There is a strong trend towards a higher incidence of epilepsy among children with ADHD than among children without ADHD<sup>66</sup> and epilepsy in children with ADHD appears to be more severe than in those without<sup>66</sup>.

There appears to be a reluctance to diagnose and initiate treatment for ADHD in children with epilepsy<sup>67</sup>. Older data suggests that stimulant medications could lower seizure threshold, though current data supports the use of stimulants and non-stimulants in most cases.

Adult epilepsy patients who received relief from treatment with methylphenidate showed an improved quality of life without significant alteration of seizure control in the presence of antiepileptic medication<sup>68, 254</sup>. New onset seizures can be managed with the addition of an antiepileptic medication. Some studies suggest drug interactions between methylphenidate and antiepileptic drugs inhibit metabolism and increase the level of antiepileptic medications (AE)<sup>69</sup> . A conservative approach is still indicated when treating patients with comorbid ADHD and seizure disorder. However, ADHD can be treated in the majority of patients with seizure disorder<sup>69</sup>.

### **ADHD and Brain Injury (any etiology)<sup>70-74</sup>**

Individuals with ADHD of all ages are at risk for physical injuries because they are impulsive, hyperactive and

inattentive **CB**. Any injury to the brain, particularly to the frontal lobes, can produce a syndrome known as Secondary-ADHD (S-ADHD). Trauma to the brain can also worsen the symptoms of pre-existing ADHD. Children and teens with ADHD are three times as likely to experience a moderate or severe brain injury than their peers without ADHD. Children and adolescents with a moderate or severe brain injury have a 20% chance of developing S-ADHD. The literature on adults is less clear. S-ADHD can be treated using the same principles and medications as ADHD, but the research literature supporting this is not as extensive or compelling as it is for ADHD.

Given that concussion and brain injury are relatively common experiences, it is recommended that all patients being assessed for ADHD be questioned as to whether they have ever had a concussion or brain injury in the past. It is generally accepted that the more severe the brain injury, the greater the likelihood of developing or worsening ADHD. This is the one instance in which a patient may present with de novo ADHD symptoms, having no past history of these types of symptoms before the injury. Motor vehicle accidents are a major cause of traumatic brain injury and patients with ADHD need to receive specific advice on driving only when medication is in effect (see the section on ADHD and driving). The literature on non-traumatic acquired brain injury, such as fetal alcohol syndrome or stroke, is less clear, but many patients with ADHD symptoms may respond to standard treatments. Patients with brain injury may be more sensitive to medication and starting out with lower doses may be recommended. As with all patients, however, the best advice is to start low, go slow, but to persist with upper dosage adjustments until symptoms remit or side effects are evident or suggested maximum dosage is reached.

### **ADHD and Sleep Disorder**

Twenty-five to fifty per cent of children and more than half of adults with ADHD reportedly suffer from sleep problems. Sleep plays a pivotal role in cognitive function, learning and memory consolidation. Sleep deprivation and disturbances of sleep architecture can result in symptoms varying in severity, from unrecognized deficits in cognitive performance to disabling sleepiness and/or fatigue that noticeably affect cognitive, emotional, and physical function, giving rise to, or exacerbating, ADHD symptoms<sup>75</sup>.

However, it is not clear whether sleep disturbances are intrinsic to ADHD or whether they occur as a result of an underlying primary sleep disorder. On the one hand, if sleep disturbances in ADHD are caused by an underlying primary sleep disorder, the extent to which ADHD-like symptomatology is attributable to the sleep disorder is not sufficiently studied. The manifestation of ADHD-like symptoms in primary sleep disorders such as sleep disordered breathing (SDB), periodic limb movements in sleep (PLMS) in restless legs syndrome (RLS), and disorders of excessive daytime sleepiness (EDS) such as narcolepsy and idiopathic hypersomnia (IH) have been documented<sup>76</sup>. In light of the similarity of symptom presentations between ADHD and primary sleep disorders, it has been suggested that misdiagnosis may be an issue between these two disorders<sup>77</sup>.

On the other hand, the association between sleep disturbances and ADHD-like symptomatology appears to extend to brain structure. Neuroimaging studies have shown similar metabolic changes in the prefrontal cortex (PFC) of patients with ADHD and sleep deprived subjects<sup>78</sup>. Some areas of the brain that are affected in ADHD are the very same structures that are involved in the regulation of sleep. Activation of areas of the cortex by the midbrain and locus coeruleus is required for sustained attention and alertness<sup>79</sup>. Attention and alertness, in turn, are properties that define the awake state. Cycling through the awake state and sleep state is an autonomically governed process that reflects changes in brain arousal. In ADHD, subjects appear to have problems with arousal, and deficits in cortical functioning have been reported.

**CB** Thus, it has been proposed that sleep problems such as insomnia or hypersomnia result from abnormal cortical arousal and, therefore, sleep problems are intrinsic to ADHD<sup>80</sup>.

### **ADHD and Obsessive Compulsive Disorder (OCD)<sup>82-86</sup>**

Some studies suggest that one third of children and adolescents with OCD may have ADHD. Clinicians assessing patients for ADHD should routinely enquire about symptoms of OCD to establish the diagnosis of OCD. Treatment of both disorders should be carried simultaneously. Medications used to treat ADHD are not useful for treatment of OCD and medications used to treat OCD are not effective for treatment of ADHD. CBT is often effective in treatment of certain types of OCD.

### **ADHD and Developmental Coordination Disorder (DCD)**

While there is no clear prevalence rate for the co-occurrence of these two disorders, evidence suggests that when ADHD and DCD occurred, there was a 58% rate of a poor outcome<sup>87</sup>. Balance problems, dyslexia, and poor handwriting may be related to cerebellar dysfunction and may be associated with DCD. Occupational therapy assessment is warranted to provide recommendations. Having the child learn keyboarding can often be beneficial. Relevant software programs can also help to overcome problems (e.g. voice recognition, etc.).

### **ADHD and Eating Disorders**

Kooij in 2004 suggested that bulimia nervosa is found to be more prevalent in patients with ADHD versus patients without ADHD<sup>255</sup>. Wentz et al. in 2005 found that ADHD is more prevalent in anorexia nervosa purging type<sup>256</sup>. Biederman in 2007 suggested that females with ADHD are 3.6 times more likely to meet the diagnosis of eating disorders<sup>257</sup>. Sobanski in 2007 found the prevalence rate of ADHD in eating disorders is 11.4%<sup>258</sup>. This would suggest that females with ADHD should be screened for an eating disorder, and vice versa. Patients with anorexia who have ADHD may seek treatment of ADHD for the purpose of weight loss.

### **ADHD and Obesity**

"There is a strong association between overweight/obesity and symptoms of ADHD in children, adolescents and adults. It is suggested that the inattention and impulsive behaviours that characterize ADHD could contribute to overeating. The fast food consumption of foods high in fat, sugar and salt might be a contributing factor to obesity in patients with ADHD as a form of self-medication or addiction. This hypothesis can be supported by the finding that addictions are substantially higher among those with ADHD than among the general population. Further research is needed in this area" [taken from Davis, C: *Attention deficit/hyperactivity disorder: associations with overeating and obesity* <sup>259</sup>.]