Clinical Practice Guidelines for the Assessment and Treatment of Attention-Deficit/Hyperactivity Disorder

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Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood and among the most prevalent chronic health conditions affecting school-aged children. Attention Deficit Hyperactivity Disorder (ADHD) is a neurological condition that involves problems with inattention and hyperactivity-impulsivity that are developmentally inconsistent with the age of the child. We are now learning that ADHD is not a disorder of attention, as had long been assumed. Rather, it is a function of developmental failure in the brain circuitry that monitors inhibition and self-control. This loss of self-regulation impairs other important brain functions crucial for maintaining attention, including the ability to defer immediate rewards for later gain (Barkley, 1998a).

In Child Guidance Clinics, a significant number of children are brought with the complaints of difficulties in school and at home that relate to their learning and behavior. The clinical findings of distractability, impulsivity and hyperactivity characterize attention deficit hyperkinetic disorder (ADHD).

ADHD affects children and adolescents in different ways and degrees, but the consequences of severe ADHD can be serious for both the individual and their family and careers. Children with severe ADHD often have low self-esteem, develop emotional and social problems, and frequently underachieve at school. The signs of ADHD may persist into adolescence and adulthood, and are often associated with continuing emotional and social problems, substance misuse, unemployment, and involvement in crime.

Three subtypes of ADHD are defined in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association 1994: 83–4):

Attention-Deficit/Hyperactivity Disorder, Predominantly Inattentive Type

Attention-Deficit/Hyperactivity Disorder, Predominantly Hyperactive-Impulsive Type

Attention-Deficit/Hyperactivity Disorder, Combined Type.

ADHD often coexists with other conditions such as oppositional defiant disorder, conduct disorder, learning disorders, anxiety, depression, epilepsy, tic disorders and Tourette's syndrome.

Probably the first reliable description of ADHD or in short also called ADD (Attention Deficit Disorder), comes from England in early 20th century.

Dr. Heinrich Hoffman in 1845 first described ADHD in a children's book, "The Story of Fidgety Philip," which contained an accurate description of a child with attention deficit hyperactivity disorder. In 1902, Sir George F.

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Still provided the first clinical description of the disorder in a series of papers about a group of children who displayed impulsivity and behavior problems. According to Still, these symptoms were caused by a genetic dysfunction and not by poor parenting. Since that time, a wealth of research on the symptoms, causes, and treatments for ADHD has been published.

EPIDEMIOLOGY

The prevalence of the disorder varies from 1 % to 20%, depending on the diagnostic criteria employed, the population of children studied, the methods of investigation and the sources of information. In some cases, symptoms may appear to be less severe as the child grows older, but, in most cases, ADHD symptoms persist. According to the National Institute of Mental Health (U.K.), about 80 percent of those who required medication for ADHD as children still need it as teenagers. Around 60% of ADHD children will carry some of their behavior into adulthood. In the last decade, Western Literature on this syndrome has grown but in India only a few studies have been done.. Boys are four to nine times more likely to be diagnosed, and the disorder is found in all cultures, although prevalence figures differ (Ross & Ross, 1982).

Despite considerable research, ADHD remains one of the most difficult diagnosis to categorize as evidenced by frequent changes in the diagnostic criteria in the various editions of the DSM. In the latest edition, the DSM IV lists the 3 cardinal symptoms into two core dimensions, inattention and hyperactivity/impulsivity and recognizes three sub types. Sub types are defined by whether a child meets the threshold criteria of 6 symptoms for inattention only, the predominantly inattentive type (ADHD-AD), 6 symptoms for hyper-activity/impulsivity only, the predominantly hyperactive/impulsive type (ADHD-HI), or 6 symptoms from both the dimensions, the combined type (ADHD-CT).

In India there is very little systematic research in ADHD in children(6). The few studies that are available report prevalence rates ranging from 10 to 20%.A study conducted in Post Graduate Institute of Medical Education and Research, Chandigarh in 1999 (Indian Pediatrics2000;37: 1256-1260.) found out the prevalence of 8.1%. The M : F ratio in children with ADHD was 5 : 1.

Another study was conducted by department of psychiatry, UCMS and GTB Hospital, Delhi found out the prevelence of 17.7% among children aging 3-12 yrs, here the M:F ratio was 3:1(Indian Pediatrics 1999;36:583-587)

ETIOPATHOGENESIS

The etiology of ADHD is unknown. It is believed to be the result of a complex interaction of genetic, psychosocial, environmental and biological risk factors.

The aetiology of ADHD is likely to involve a variety of genetic and neurological factors. Hereditary factors are thought to contribute most, accounting for 50 percent of the variance (Epstein et al 2000). Other studies found that majority of variance (70–90%) in the trait of hyperactivity– impulsivity is due to genetic factors averaging approximately 80% (Faraone, 1996; Gjone, Stevenson, & Sundet, 1996; Gjone, Stevenson, Sundet, & Eilertsen, 1996; Rhee, Waldman, Hay, & Levy, 1995; Silberg et al., 1996; Thapar, Hervas, & McGuffin, 1995; van den Oord, Verhulst, & Boomsma, 1996).

Between 10% and 35% of the immediate family members of children with ADHD were found to have the disorder, with the risk to siblings of these children being approximately 32% (Biederman, Faraone, & Lapey, 1992; Biederman, Keenan, & Faraone, 1990; Pauls, 1991; Welner, Welner, Stewart, Palkes, & Wish, 1977).

Even more striking, research has shown that if a parent has ADHD, the risk to the offspring is 57% (Biederman et al., 1995).

Studies using molecular genetic techniques had explored some possible offending genes. The initial focus of this research was on the dopamineType 2 gene (Blum, Cull, Braverman, & Comings, 1996; Comings et al., 1991), but others failed to replicate this finding (Gelernter et al., 1991; Kelsoe et al., 1989). Dopamine transporter gene has been implicated in ADHD (Cook et al., 1995; Cook, Stein, & Leventhal, 1997). Another gene related to dopamine, the D4RD (repeater gene) was found to be overrepresented in the seven-repetition form of the gene in children with ADHD (LaHoste et al., 1996). The presence of this allele increases the risk for ADHD by 1.5.

ADHD is the expression of a deficit, both in the quantity and function, of neurotransmitters. This deficit prevents normal transmission of information in the brain, leading to behaviors which hinder attention and learning. Empirical studies of brain neurochemistry (CSF^{-}) have demonstrated depletion of norepinephrine and its metabolites, in the *locus coeruleus*, thus preventing arousal; and depletion of dopamine and its metabolites, in the *nucleus accumbens*, thus inhibiting ability to sustain attention and to filter distractions *(Kotimaa 2003 [C], Gottesman 2003 [S], Mercugliano 1999 [S], Miller 1998 [S], Cantwell 1996 [S])*.

Research using neuroimaging techniques has served to isolate particular brain regions (especially the frontal–striatal–cerebellar network, and possibly other regions) as underlying the disorder, and particularly as involved in the difficulties with inhibition and executive functioning (Barkley ch.1 p.39). In studies conducting MRI of brain, children with ADHD were found to have abnormally smaller anterior cortical regions, especially on the right side, and they lacked the normal right–left frontal asymmetry (Hynd, Semrud-Clikeman, Lorys, Novey, & Eliopulos, 1990). Studies also documented significantly smaller right prefrontal lobe and striatal regions (Castellanos et al., 1994, 1996; Filipek et al., 1997).

Other risk factors which have been studied are: stress, such as that caused by poverty, neglect or abuse; diet; perinatal conditions; *in utero* exposure to nicotine, alcohol or cocaine; exposure to certain toxins in the environment; prematurity; and early television exposure *(Bhutta 2002 [M], Christakis 2004 [O])*.

Although some people claim that food additives, sugar, yeast, or poor child rearing methods lead to ADHD, there is no conclusive evidence to support these beliefs (Barkley, 1998a; Neuwirth, 1994; NIMH, 1999).

Social factors alone are not considered an etiological cause but may exacerbate preexisting symptoms and genetic or neurological vulnerability (Barkley 1998: Chapter 5).

DIAGNOSIS AND EVALUATION

DIAGNOSTIC CRITERIA

DSM-IV Diagnostic Criteria for Attention-Deficit/Hyperactivity Disorder	ICD-10 Diagnostic Criteria for Hyperkinetic disorder
One of the following two criteria must be met. A1. Six (or more) symptoms of inattention (see below) have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level. A2. Six (or more) symptoms of hyperactivity/impulsivity (see below) have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level. **In addition** to A1 or A2 above, the following criteria (B–E) must also be met. B. Some inattention or hyperactivity/impulsivity symptoms were present before age seven years. C. Some impairment from the symptoms is present in two or more settings (eg, at school (or work) or at home). D. There must be clear evidence of clinically significant impairment in social, academic or occupational functioning. E. The symptoms do not occur exclusively during the course of a pervasive development disorder, schizophrenia, or other psychotic disorder and are not better explained by another mental disorder, for example, mood disorder, anxiety disorder and dissociative disorder, or a personality disorder. **Inattention items** • often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities • often has difficulty in sustaining attention in tasks or play activities • often does not seem to listen when spoken to directly	**(ICD-10 RESEARCH)** ◴ Onset of disorder before age 7 ◴ Pervasive across situations. Evidence will require information from more than one source; parental reports about classroom behaviour are unlikely to be sufficient ◴ Clinically significant impairment in social, academic or occupational functioning have persisted for at least 6 months …to a degree that is maladaptive and inconsistent with developmental level. ***Inattention*** **(6 of the following)** ◴ Often fails to give close attention to details, or makes careless errors in schoolwork, work or other activities. ◴ Often fails to sustain attention in tasks or play activities. ◴ Often appears not to listen to what is being said to him/her. ◴ Often fails to follow through on instructions or to finish schoolwork, chores, or duties in the workplace (not because of oppositional behaviour or failure to understand instructions). ◴ Is often impaired in organizing tasks and activities. ◴ Often avoids or strongly dislikes tasks, such as homework, that require mental effort. ◴ Often loses things necessary for certain tasks or activities, such as school assignments, pencils, books, toys or tools. ◴ Is often easily distracted by external stimuli. ◴ Is often forgetful in the course of daily activities. ***Overactivity*** **(3 of the following**)

• often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behaviour or failure to understand instructions) • often has difficulty organising tasks or activities • often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (eg, schoolwork or homework) • often loses things necessary for tasks or activities (eg, toys, school assignments, pencils, books or tools) • often is easily distracted by extraneous stimuli • often is forgetful in daily activities **Hyperactivity items** • often fidgets with hands or feet or squirms in seat • often leaves seat in classroom or in other situations where remaining seated is expected • often runs about or climbs excessively in situations where it is inappropriate (in or adults, may be limited to feelings of subjective restlessness) • often has difficulty in playing or engaging in leisure activities quietly • often is 'on the go' or acts as 'if driven by a motor' • often talks excessively **Impulsivity items** • often blurts out answers before questions have been completed • often has difficulty awaiting turn • often interrupts or intrudes on others (eg, butts into conversations or games)	◴ Often fidgets with hands or feet or squirms on seat. ◴ Leaves seat in classroom or in other situations in which remaining seated is expected. ◴ Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults,only feelings of restlessness may be present). ◴ Is often unduly noisy in playing or has difficulty in engaging quietly in leisure activities. ◴ Exhibits a persistent pattern of motor activity that is not substantially modified by social context or demands. ***Impulsivity*** **(1 of the following)** ◴ Often blurts out answers before questions have been completed. ◴ Often fails to wait in lines or await turns in games or group situations. ◴ Often interrupts or intrudes on others (e.g .butts into others ' conversation or games). ◴ Often talks excessively without appropriate response to social constraints. Diagnostic Guidelines Impaired attention as manifested by • prematurely breaking off from tasks and leaving activities unfinished. • Changing frequently from one activity to another ,seeming losing interest in one task because they become diverted to another. **Overactivity** implying • E•cessive restlessness involving child running and jumping around; getting up from the seat when he/she is supposed to remain seated • E•cessive talkativeness and noisiness ,fidgeting and wriggling.

	• The activity is e•cessive in the conte•t of what is e•pected in the situation and by comparison with other children of same age and IQ • Age of onset before 6 yrs

Note—

Item list in DSM-IV is essentially the same but split into two sub-lists (inattention and hyperactivity-impulsivity)with only minor word differences here and there.

Inattention list is,for practical purposes, identical. List of hyperactivity-impulsivity items in DSM-IV combines the ICD-1O overactivity and impulsivity lists but has a threshold of 6/9 rather than 3/5 and 1/4).

EVALUATION

Components of a Comprehensive Evaluation
• Behavioral • Educational • Medical

PSYCHOLOGICAL TESTING/BEHAVIORAL RATING SCALES

A behavioural rating scale that has good reliability and validity should be administered as part of a comprehensive assessment.

Table 1. Common behavior rating scales used in the assessment of ADHD and monitoring of treatment.

Name of scale	Reference
Conners Parent Rating Scale-Revised (CPRS-R) The longer form should be used for initial assessment, while the shorter form is often used for assessing response to treatment, particularly when repeated administration is required.	Parent, adolescent self-report versions available (Conners, 1997)

Conners Teacher Rating Scale-Revised (CTRS-R) (See comment above)	(Conners, 1997)
Child Behavior Checklist (CBCL)	Parent-completed CBCL and Teacher-Completed Teacher Report Form (TRF) http://www.aseba.org/index.html
Conners Wells Adolescent Self Report Scale	(Conners and Wells,
Academic Performance Rating Scale (APRS)	The APRS is a 19-item scale for determining a child's academic productivity and accuracy in grades 1-6 that has 6 scale points; construct, concurrent, and discriminant validity data, as well as norms (n = 247), available (Barkley, 1990
ADHD Rating Scale-IV	The ADHD Rating Scale-IV is an 18-item scale using *DSM-IV* criteria (DuPaul et al., 1998)
Brown ADD Rating Scales for Children, Adolescents and Adults	1997Psychological Corporation, San Antonio, TX (2001)http://www.drthomasebrown.com/assess_tools/index.html (Brown, 2001))
Home Situations Questionnaire-Revised (HSQ-R), School Situations Questionnaire-Revised (SSQ-R)	The HSQ-R is a 14-item scale designed to assess specific problems with attention and concentration across a variety of home and public situations; it uses a 0-9 scale and has test-retest, internal consistency, construct validity, discriminant validity, concurrent validity, and norms (n = 581) available (Barkley, 1990)
Inattention/Overactivity With Aggression (IOWA) Conners Teacher Rating Scale	The IOWA Conners is a 10-item scale developed to separate the inattention and overactivity ratings from oppositional defiance (Loney and Milich, 1982)
Swanson, Nolan, and Pelham (SNAP-IV) and SKAMP Internet site ADHD.NET	The SNAP-IV (Swanson, 1992) is a 26-item scale that contains *DSM-IV* criteria for ADHD and screens for other *DSM* diagnoses; the SKAMP (Wigal et al., 1998) is a 10-item scale that measures impairment of functioning at home and at school
Vanderbilt ADHD Diagnostic Parent and Teacher Scales	Teachers rate 35 symptoms and 8 performance items measuring ADHD symptoms and common comorbid conditions (Wolraich et al., 2003a). The parent verison contains all 18 ADHD symptoms with items assessing comorbid conditions and performance (Wolraich et al., 2003b)

EDUCATIONAL EVALUATION

An educational evaluation assesses the extent to which a child's symptoms of ADHD impair his or her academic performance at school. The evaluation involves direct observations of the child in the classroom as well as a review of his or her academic productivity.

Behaviors targeted for classroom observation may include:

- Problems of inattention, such as becoming easily distracted, making careless mistakes, or failing to finish assignments on time;
- Problems of hyperactivity, such as fidgeting, getting out of an assigned seat, running around the classroom excessively or striking out at a peer;
- Problems of impulsivity, such as blurting out answers to the teacher's questions or interrupting the teacher or other students in the class; and
- More challenging behaviors, such as severe aggressive or disruptive behavior.

Classroom observations are used to record how often the child exhibits various ADHD symptoms in the classroom. The frequency with which the child with ADHD exhibits these and other target behaviors are compared to norms for other children of the same age and gender. It is also important to compare the behavior of the child with ADHD to the behaviors of other children in his or her classroom.

It is best to collect this information during two or three different observations across several days. Each observation typically lasts about 20 to 30 minutes.

An educational evaluation also includes an assessment of the child's productivity in completing classwork and other academic assignments. It is important to collect information about both the percentage of work completed as well as the accuracy of the work. The productivity of the child with ADHD can be compared to the productivity of other children in the class.

MEDICAL EVALUATION

A medical evaluation assesses whether the child is manifesting symptoms of ADHD, based on the following three objectives:

- To assess problems of inattention, impulsivity, and hyperactivity that the child is currently experiencing;
- To assess the severity of these problems; and
- To gather information about other disabilities that may be contributing to the child's ADHD symptoms.

The recommendations are designed to provide a framework for diagnostic decision making and include the following:

- Medical evaluation for ADHD should be initiated by the primary care clinician. Questioning parents regarding school and behavioral issues, either directly or through a pre-visit questionnaire, may help alert physicians to possible ADHD.
- In diagnosing ADHD, physicians should use ICD-10 criteria.
- The assessment of ADHD should include information obtained directly from parents or caregivers, as well as a classroom teacher or other school professional, regarding the core symptoms of ADHD in various

settings, the age of onset, duration of symptoms, and degree of functional impairment.

· Evaluation of a child with ADHD should also include assessment of co-existing conditions such as learning and language problems, aggression, disruptive behavior, depression, or anxiety.

COMORBIDITY

Comorbid conditions are common. Approximately 40–60 percent of children with ADHD have at least one coexisting disability (Barkley, 1990a; Jensen, Hinshaw, Kraemer, et al., 2001; Jensen, Martin, & Cantwell, 1997). In their review Green et al (1999) found that of children who presented to clinics and were diagnosed with ADHD:

s about one-third also qualified for a diagnosis of oppositional defiant disorder

s one-quarter qualified for a diagnosis of conduct disorder

s almost one-fifth had a depressive disorder

s more than one-quarter had an anxiety disorder

s about one-half of all children with ADHD also have a specific learning disability; the most common learning problems are with reading (dyslexia), mathematics and handwriting(Anderson, Williams, McGee, & Silva, 1987; Cantwell & Baker, 1991; Dykman, Akerman, & Raney, 1994; Zentall, 1993)..

s almost one-third had more than one comorbid condition.

ADULT ADHD

Sometimes the symptoms of ADHD persist into adulthood or the disorder may be diagnosed for the first time in adults. These cases may be kept in the category of Adult ADHD. The overall management is on the same lines, a detailed description is however beyond the scope of the present document.

REVIEW OF AVAILABLE TREATMENT MODALITIES

1) PHARMACOLOGIC

i) STIMULANTS

ii) NON-STIMULANTS

2) NON-PHARMACOLOGIC

i) BEHAVIORAL THERAPY

ii) COGNITIVE BEHAVIOUR THERAPY

iii) PSYCHOSOCIAL INTERVENTIONS

iv) PARENT TRAINING

v) TEACHER TRAING

Stimulant Medications

Stimulant medication	Minimum starting dose	Maximum daily dose*	Time to maximum effect	Duration of action	Mechanism of action
Short-Acting					
methylphenidate (MPH)	5 mg bid	60 mg	2 hr	3-5 hr	Selective inhibition of the pre-synaptic dopamine transporter
d-methylphenidate	2.5 mg bid	20 mg	1-2 hr	2-5 hr	
Dextroamphetamine***	5 mg bid	40 mg	3 hr	4-6 hr	Selective inhibition of the pre-synaptic norepinephrine and dopamine transporter
Intermediate- and Long-Acting					
methylphenidate (MPH)	18 mg/day	54 mg	6-8 hr	12 hr	Selective inhibition of the pre-synaptic dopamine transporter
dextroamphetamine ***	** 5 mg/day 10 mg/day	40 mg 30 mg	1-4 hr 7 hr	9 hr 12 hr	Selective inhibition of the pre-synaptic norepinephrine and dopamine transporter

CCHMC Formulary, manufacturers' prescribing information and Biederman, 2002 [A].

*This column is the manufacturer's recommended maximum dose, not evidence-based. A safe and effective dose without side effects may be higher than this for an individual patient, as determined through careful and systematic dosing titration.

**Extended release tablets may be used in place of the immediate release tablets when the equivalent dosage:duration ratio is met.

***Not available in India**

Second-Tier Medications (in alphabetical order)

Medication	Minimum starting dose	Maximum daily dose*	Mechanism of action	Comments
alpha$_2$-adrenoreceptor antagonists • clonidine • guanfacine	off label for ADHD and for children 0.05 mg/day 1 mg/day	off label for ADHD and for children 0.4 mg 3 mg	Central alpha$_2$-adrenoreceptor antagonist	If discontinued: gradual withdrawal over 4-5 days, to prevent hypertension.
atomoxetine	10 mg/day (0.5 mg/kg)	1.4 mg/kg , not to exceed 100 mg	Selective inhibition of the pre-synaptic norepinephrine transporter	May take up to 2 weeks for maximum effect. Caution in patients taking other drugs which increase heart rate or blood pressure.
bupropion	off label for ADHD and for children 0.5 mg/kg tid 0.7 mg/kg bid 1.4 mg/kg/day	off label for ADHD and for children 6 mg/kg, not to exceed 400 mg	Selective inhibition of the pre-synaptic dopamine transporter	Caution for immediate release formulation in patients with a history of seizures; this risk is decreased with use of extended release products.
tricyclic antidepressants • imipramine • desipramine	off label for ADHD and for children age 6-12: 2 mg/kg bid adolescents: 25-50 mg/day	off label for ADHD and for children 5 mg/kg, not to exceed 150	Selective inhibition of the pre-synaptic norepinephrine and serotonin transporter	Caution in patients with a family history of sudden death. Monitor blood pressure with initial treatment.

CCHMC Formulary and manufacturers' prescribing information

*This column is manufacturer's recommended maximum dose, not evidence-based. A safe and effective dose without side effects may be higher than this for an individual patient, as determined through careful and systematic dosing titration.

**Extended release tablets may be used in place of the immediate release tablets when the equivalent dosage:duration ratio is met

METHYLPHENIDATE

Methylphenidate is a CNS stimulant. It is licensed as part of a comprehensive treatment programme for ADHD, under specialist supervision, where remedial measures alone prove insufficient. It is available in immediate-release tablets that are usually given in two or three daily doses. Methylphenidate is also available in modified-release formulations that enable once-daily dosing.

Treatment with immediate-release formulations of methylphenidate should be initiated at a dose of 5 mg once or twice daily, and increased if necessary to a maximum of 60 mg per day.

sustained-release formulations of methylphenidate is formulated to replace three times daily dosing with the immediate-release formulation and is used where treatment effects are required to persist into the evening. Treatment should be initiated at a dose of 18 mg once daily (in the morning), and increased if necessary up to a maximum of 54 mg once daily.

LONG-ACTING METHYLPHENIDATE

Long-acting methylphenidate (Ritalin Slow ReleaseTM; Ritalin S-R) has recently been approved and funded for use in New Zealand. Generally, a methylphenidate S-R mg tablet is equivalent to 10 mg of the hydrochloride given twice (four hours apart) which usually eliminates the need for a lunchtime dose (Werry and Aman 1999: 226). Consider the use of sustained release medication

as it may:

• obviate the need for the child to take medication at school

• improve compliance and possibly even out the response to medication throughout the school day

• reduce the responsibility on schools along with the attendant risks of stigmatisation and inadequate storage and security of medication (AACAP Official Action 1997).

Start-up of effect is slower. If its slowness is a problem, medication can be given about half an hour earlier. This approach may not be an option if:

• medication cannot be administered half an hour earlier than usual

• parents find the first hour or two particularly troublesome

• children have problems on the school bus, where it is their transport to school.

In such circumstances, a small dose of the hydrochloride can be given on waking, with the S-R or before it is given, if it is important to maximise the duration during school.

DEXAMPHETAMINE

Dexamphetamine is a CNS stimulant. It is licensed as an adjunct in the management of refractory hyperkinetic states in children, under specialist supervision. Treatment should be initiated at a dose of 2.5 mg daily for children aged 3–5 years and 5–10 mg daily for children over 6 years, and increased if necessary up to a usual maximum of 20 mg per day (some older children have required 40 mg or more daily for an optimal response).

SECOND-LINE MEDICATION

Second-line medication should only be considered if stimulant medication compliance, dosages and accurate diagnosis have been thoroughly examined. For young people with a clear diagnosis of ADHD who fail to respond to stimulants or who have unacceptable side effects, second-line medication that can be considered.

Second-line medication should only be considered if stimulant medication compliance, dosages and accurate diagnosis have been thoroughly examined. For young people with a clear diagnosis of ADHD who fail to respond to stimulants or who have unacceptable side effects, second-line medication that can be considered includes:

ATOMOXETINE

Atomoxetine is licensed for the treatment of ADHD in children 6 years and older and in adolescents, under specialist supervision. It is a selective noradrenaline reuptake inhibitor, although the precise mechanism by which it works on ADHD is unknown. Atomoxetine is preferred if the patient experiences severe side effects to stimulants such as mood lability or tics .For children/adolescents of up to 70 kg body weight, treatment should be initiated at a dose of 500 micrograms/kg daily, and increased if necessary up to a maximum of 1.8 mg/kg daily, either as a single dose or in two divided doses. For adolescents of over 70 kg body weight treatment should be initiated at a daily dose of 40 mg and increased according to response to a usual maintenance dose of 80 mg. atomoxetine may be considered as the first medication for ADHD in persons with an active substance abuse problem, comorbid anxiety, or tics.

TRICYCLICS (HETEROCYCLICS)

There is strong evidence that tricyclic (TCA) antidepressants are as good or almost as effective as stimulants in treating ADHD. Of 29 studies evaluating tricyclic antidepressants, 27 report either moderate or robust response rates to tricyclics (Spencer, Biederman, Wilens et al 1996). The TCAs for which the evidence regarding efficacy is strongest are imipramine and desipramine, but other TCAs seem to be equivalent.

Tricyclics can cause changes in cardiac conduction on the electrocardiogram (ECG) typically only in high doses (in excess of 5 mg/kg imipramine equivalents). Desipramine, however, is thought to be more cardiotoxic and is generally not now used (Prince et al 2000).

Advantages of the antidepressants include:

- long half-life
- minimal risk of abuse or dependence
- benefits in treating comorbid anxiety and depression

Studies have shown that improvement can be maintained using doses of 3 to 5 mg/kg per day in imipramine equivalents (Spencer, Biederman, Wilens et al 1996), which is below the usual cardiotoxic level.

ALPHA-ANTAGONISTS

Clonidine or guanfacine may be effective adjuncts to stimulant treatment for children with ADHD, as they improve symptoms and counteract insomnia and appetite suppressant side effects common to stimulant use. Alpha-agonists (clonidine and guanfacine) have been widely prescribed to patients with ADHD – for the disorder itself, for comorbid aggression, or to combat side effects of tics or insomnia. Extensive controlled trials of these agents are lacking. Connor et al. (1999) .

BUPROPION

Bupropion is a noradrenergic antidepressant which showed modest efficacy in the treatment of ADHD in one double-blind, placebo-controlled trial (Conners et al., 1996 {rct}). It is contraindicated in patients with a current seizure disorder. It can be given in both immediate-release and long-acting forms.

SELECTIVE SEROTONIN REUPTAKE INHIBITORS

At this point, evidence is insufficient regarding the efficacy of serotonin reuptake inhibitors (SSRIs) in improving core ADHD symptoms. However, there are suggestions that they may be useful in the treatment of comorbid conditions or secondary mood and anxiety symptoms (AACAP Official Action 1997).

OTHER MEDICATION

Carbamazepine, an anticonvulsant, was reviewed by Silva et al (1996). Through a meta-analysis of studies with children and adolescents with ADHD, they found that carbamazepine produces a statistically significant therapeutic effect compared to baseline. However, its overall effect size is small .Due to its small effect size and side effects such as leukopaenia, anemia and hepatoxicity, carbamazepine cannot be recommended for ADHD.

VENLAFAXINE

Venlafaxine is one of the newer atypical antidepressants currently under investigation for ADHD in the United States. It has both noradrenergic and serotonergic properties. It was useful in four open trials (Barkley 1998: 557) but definitive evidence of its usefulness and safety is needed.

NEUROLEPTICS

neuroleptics can be useful in treating ADHD in the following circumstances:

- when stimulants and antidepressants are ineffective, not tolerated or only partially effective
- where tics are an associated severe problem
- where sleep disturbance and/or emotive aggression are also a problem.

Generally, neuroleptics should be used only in consultation with a specialist psychiatrist. The size and quality of their effect on ADHD core symptoms, while significant, are inferior to stimulants. Also, because of the development of tolerance and the risk of tardive dyskinesia from long-term use, they should be used only intermittently.

COMBINED PHARMACOTHERAPY

Combined pharmacotherapy should only be used exceptionally and with appropriate specialist consultation. It may be considered if trials of at least two individual agents (initially methylphenidate and dexamphetamine) have failed.

PSYCHOLOGICAL APPROACHES —- An intensive, year-long treatment program using primarily CBT strategies produced no substantial treatment effects, either at post treatment or at follow-up (Braswell et al., 1997). Similarly, a year-long intensive early intervention program for hyperactive–aggressive children found no significant impact of parent training either at post treatment or at 2-year follow-up (Barkley et al., 2000, 2002); the school-based portion of this multi-method program produced some immediate treatment gains, but by 2-year follow-up these had dissipated (Shelton et al., 2000). Finally, a multi site study of stimulant medication with and without intensive behavioral and psychosocial interventions was reported to have found that the psychosocial interventions added little or nothing to treatment outcome beyond that achieved by stimulant medication alone (Abikoff & Hechtman, 1995). MTA Cooperative Group (1999) study found that the combination of the treatments was generally no better than medication treatment alone. Advances in psychosocial treatment research have revealed specific subsets of individuals with ADHD who may be more or less likely to benefit from these empirically proven interventions. They have also revealed the limitations of these approaches for generalization and maintenance of treatment effects if they are not specifically programmed into the treatment protocol (Barkley ch.1, p. 40).

RECOMMENDATIONS

On the basis of extensive review of worldwide available literature, following recommendations are formulated.

Common Treatment Goals of Patients with ADH

Ability to do the following:

Remember recently read material

Get written work done in a reasonable amount of time (i.e., less work brought home to complete)

Avoid procrastination

Get organized

Finish one project before starting another

Initiate uninteresting but necessary tasks without wasting time

MULTIDISCIPLINARY APPROACH

ADHD problems occur in multiple settings, with a number of different caregivers and

professionals likely to be involved in managing the child's behaviour. **Co-operation among health professionals and effective consultation and liaison with family, schools and support services are essential for effective multidisciplinary management.** Treatment should:

- be individualised to the needs of the patient
- take into account the resources and capacity of the family.

PLANNING FOR TREATMENT

Planning for treatment should include

- definition of and attention to the holistic needs of child and family or whänau, and good quality clinical care (broadly defined)
- use of approved rating scales as part of the assessment and for monitoring of treatment effects, so that systematic information from different settings is obtained to establish a baseline and to gauge treatment response
- treatment for comorbid conditions
- prioritisation of interventions to fit target symptoms and available resources
- setting of intervals for monitoring treatment, evaluation of efficacy, review of treatment and the need for additional intervention
- means of communication, liaison and collaboration
- information to caregivers about the treatment, with use of written materials wherever possible.

History

It is recommended that evidence obtained includes information, regarding:

- core symptoms of ADHD (inattention, hyperactivity and impulsivity) in more than one setting
- age of onset
- duration of symptoms
- degree of functional impairment in more than one setting, including:

o academic performance

o family relationships and friendships

o independence in activities of daily living

o self-esteem

o disruptional and unsafe behaviors

• comorbid psychiatric conditions

• medical/social conditions that produce ADHD-like symptoms (e.g. conditions producing chronic sleep deprivation; obstructive sleep apnea; neurobehavioral side effects of medications taken for other chronic conditions; physical, sexual, and emotional abuse)

• past medical history (looking for previously diagnosed conditions that are associated with a risk of developing ADHD, e.g. meningitis, lead toxicity, fetal cocaine and alcohol exposure)

PHYSICAL EXAMINATION

It is recommended that a comprehensive physical examination be performed to exclude physical conditions whose symptoms mimic those of ADHD. Examples include hypothyroidism, anemia, visual and auditory impairment, and chronic adenoidal/tonsillar hypertrophy

TREATMENT MODALITY

A carefully executed regimen of medication management is superior to alternative treatments, including behavioural treatment alone.

Combined treatment – namely, medication and behavioural treatment – is superior to behavioural treatment alone. Whether combination treatments are superior to medication **alone is less clear.** Overall, results are inconsistent, with little evidence to support the value of adding behavioural approaches to medication. Studies in this area have methodological problems and have produced inconsistent results, such that evidence is insufficient to make definitive conclusions.

GENERAL PRINCIPLES OF PHARMACOLOGIC MANAGEMENT –

Prior to prescription

a) Measure height and weight (as well as taking pulse and blood pressure.

b) Obtain a history of and observe for any tics and involuntary movements.

c) Also obtain any history suggestive of cardiac problems, including family history especially of early sudden death or arrhythmia.

d) It is helpful if the general practitioner has screened for any physical problems prior to a visit to a specialist.

e) If medication is indicated, **inform the parents and patient**, as appropriate, of:

i) risk/benefits associated with using medication and with not using it;

ii) what changes to expect;

iii) appropriate dosage and administration schedule;

iv) possible side effects;

v) target symptoms for evaluation of response to establish effect and thereafter for regular monitoring to gain ongoing feedback; and

vi) how optimum duration of treatment with medication has not been established and will depend on the effect of other interventions.

f) Also provide parents/caregivers and, if appropriate, the young person with information sheets.

g) Manufacturers' prescribing information should be consulted though such information is not necessarily entirely evidence-based since it has a role in protecting the manufacturer as much as informing practitioners. For example, it is said that caution is required if there is a family history of bipolar disorder or cyclothymia. However, a recent preliminary study found no evidence that methylphenidate precipitated young adult bipolar disorders in susceptible individuals (Carlson et al 2000).

After prescription

1) Begin titration with a low dose and increase dosage, as frequently as **weekly**, until there is an adequate response on the selected outcomes or until unacceptable side effects are observed. During titration, use follow-up parent and teacher rating scales to measure symptoms and side effects *(AAP 2001 [S])*. It may be preferable to start a child on a short-acting formulation to determine the optimal dosing before titrating a long-acting formulation.

2) It is recommended, for a treatment plan that includes medication, that stimulant monotherapy be the first line medication for the treatment of ADHD in children without complex comorbidity. This is based on data suggesting a very high efficacy and overall safety profile for periods as long as 24 months with short-acting stimulants (MPH) *(MTA Cooperative Group 2004 [A], MTA Cooperative Group 1999 [A], MTA Cooperative Group 2004 [C])*. Effectiveness and safety longer than 24 months has not been systematically studied *(Ingram 1999 [S])*.

3) It is recommended that careful and systematic dosing titration be performed to determine the optimal dosing for a given child . Begin titration with a low dose and increase dosage, as frequently as **weekly**, until there is an adequate response on the selected outcomes or until unacceptable side effects are observed. During titration, use follow-up parent and teacher rating scales to measure symptoms and side effects . It may be preferable to start a child on a short-acting formulation to determine the optimal

4) It is recommended that if one stimulant does not achieve desired outcomes, then another medication be considered *(Faraone 2002a [M], Faraone 2002b [M])*. **Note:** An undesired idiosyncratic response to one stimulant does not predict failure with another stimulant. 80% of children with ADHD will eventually respond to one of the stimulants if medication response is monitored systematically *(AAP 2001 [S]).*

5) Use of stimulants in special groups – children under six years and over 14 years and adults – should only be initiated in specific consultation with, or under the direct care of, an appropriate specialist (paediatric specialist or child and adolescent psychiatrist).

6) It is recommended, stimulants have been tried without success, that 2nd tier medications be considered by clinicians if they are familiar with their use *(AAP 2001 [S])*.

7) The use of **agents other than stimulants** or the introduction of **combined pharmacotherapy** requires careful consideration and, ideally, proper consultation with a specialist.

8) Atomoxetine is preferred if the patient experiences severe side effects to stimulants such as mood lability or tics . In a meta-analysis of atomoxetine and stimulant studies, the effect size for atomoxetine was 0.62 compared with 0.91 and 0.95 for immediate-release and long-acting stimulants, respectively. However, atomoxetine may be considered as the first medication for ADHD in persons with an active substance abuse problem, comorbid anxiety, or tics.

9) Clonidine or guanfacine may be effective adjuncts to stimulant treatment for children with ADHD, as they improve symptoms and counteract insomnia and appetite suppressant side effects common to stimulant use *(Connor 1999 [M], Prince 1996 [D]). Spencer 2002 [A], Michelson 2001 [A], Biederman 2002 [B],*

Spencer 2002 [B], Spencer 2001 [C]).

10) **Comorbid conditions** frequently exist with ADHD. These need to be prioritized and specifically addressed.

11) Significant side effects that should always be taken seriously include tics, major mood changes with marked sadness, anxiety or aggression, and any bizarre or persecutory thoughts.

12) Tic disorders are no longer considered to be a contraindication to stimulant use (see Werry and Aman 1999: 223–5). Although it is clear that stimulants may increase the frequency of existing tics, it is doubtful that stimulants precipitate them. The initial augmenting effect on tics often diminishes after a few weeks but, if it does not, try lowering the dose. If this fails, consider an antidepressant. The decision about whether to continue involves weighing the severity of ADHD against the severity and conspicuousness of the tic.

13) If symptoms do not improve following the initial trial of medication, check compliance with the medication regime, vary the dosage or change the medication type, for example, with a trial of dexamphetamine instead of methylphenidate. If symptoms still do not improve, review the diagnosis, if necessary with a second or specialist opinion. Over time the medication dose may be insufficient to control symptoms and symptoms may worsen. It is important therefore to address such issues by regularly reviewing the child's medication.

14) After medication has been well stabilised, regularly review continued and long-term use of stimulant treatment at diminishing intervals (but never less frequently than 9–12 months in school-aged children and 6 months in preschoolers). The review should cover response to medication, other interventions and their relative roles in overall management of the disorder. Parents should also know that, if any problems occur, they can contact the prescribing doctor or specialist again.

MONITORING

Initial progress should be monitored:

• every three to six months

• more frequently after initiating any medication (eg, weekly phone contacts and visits at four to six weeks).

Treatment response may be monitored using **behavioural rating scales** and **standard assessment forms**.

Feedback from parents and **school reports** are equally important. There is no good evidence either for or against this monitoring regimen but it does represent accepted clinical practice.

ANNUAL REVIEW

It is recommended that an **annual review** is undertaken by, or under the direction of, a specialist, using the same parameters as for the initial diagnosis.

The review should cover:

• persistence of target symptoms

• academic performance and school behaviour

• peer interactions

• family interactions

• leisure activities.

If the child is on medication:
• check blood pressure, pulse, height and weight
• inquire about side effects
• note any effects from missed or delayed doses that may confirm continuing therapeutic efficacy.

The annual review should include determining whether there is a continuing need for

medication. Approximately 20 percent of children may be able to discontinue medication after a year. Ashort trial without medication, lasting a few days or a fortnight, can occur at a convenient time to parents and teachers, preferably not at the start of the school year. The start of the school year can be a stressful settling in time and it may get the child off to a bad start with teachers and peers. There is a risk that this initial impression of the child may persist even with resumption of medication. This trial should be undertaken at least annually. Information from both home and school is needed when monitoring medication response and side effects.

FOLLOW-UP INTERVIEWS AND STANDARDISED QUESTIONNAIRES

Follow-up interviews and standardised questionnaires should also be undertaken. Older

children may be able to provide information. Standardised rating scales of ADHD symptoms should be employed in both home and school. Clinicians should be aware of practice effects with repeated administrations, which tend to lower subsequent scores and may be mistaken for improvement (DuPaul, Barkley and Conner, in Barkley 1998).

It may be useful for parents and teachers and older children to complete a weekly rating scale regarding medication side effects following the initial medication trial and any dose changes. A questionnaire that can be administered to monitor side effects is available (see DuPaul, Barkley and Conner, in Barkley 1998: 539).

OTHER ISSUES :

Drug holidays : Drug holidays i.e. cessation of use of stimulants for a few days during the course of treatment is a well proven modality to reduce the side effects & or tolerance from these drugs. Summer & winter breaks may be the ideal period for these drug holidays.

OTHER INTERVENTIONS

A number of other interventions have been used to treat ADHD. These include family therapy family psychotherapy, individual psychotherapy, group therapies, social skills training and cognitive therapies. Currently evidence is insufficient to determine the effectiveness of these interventions.

ADHD — TREATMENT THROUGH BEHAVIOR THERAPY

Most experts recommend using both medication and behavior therapy to treat ADHD. There are many forms of behavior therapy, but all have a common goal — to change the child's physical and social environments to help the child improve his behavior.

Under this approach, parents, teachers and other caregivers learn better ways to work with and relate to the child with ADHD. You will learn how to set and enforce rules, help your child understand what he needs to do, use discipline effectively, and encourage good behavior. Your child will learn better ways to control his behavior as a result.

There are three basic principles to any behavior therapy approach:

- Set specific goals. Set clear goals for your child such as staying focused on homework for a certain time or sharing toys with friends.
- **Provide rewards and consequences.** Give your child a specified reward (positive reinforcement) when she shows the desired behavior. Give your child a consequence (unwanted result or punishment) when she fails to meet a goal.

· **Keep using the rewards and consequences.** Using the rewards and consequences consistently for a long time will shape your child's behavior in a positive way.

Table 3 shows specific behavior therapy techniques that can be effective with children with ADHD.

Table 3. Behavior Therapy Techniques

Technique	Description	E•ample
Positive reinforcement	Providing rewards or privileges in response to desired behavior.	Child completes an assignment and is permitted to play on the computer.
Time-out	Removing access to desired activity because of unwanted behavior.	Child hits sibling and, as a result, must sit for five minutes in the corner of the room.
Response cost	Withdrawing rewards or privileges because of unwanted behavior.	Child loses free-time privileges for not completing homework.
Token economy	Combining reward and consequence. The child earns rewards and privileges when performing desired behaviors. She loses the rewards and privileges as a result of unwanted behavior.	Child earns stars for completing assignments and loses stars for getting out of seat. The child cashes in the sum of her stars at the end of the week for a prize.

Behavior therapy recognizes the limits that having ADHD puts on a child. It focuses on how the important people and places in the child's life can adapt to encourage good behavior and discourage unwanted behavior. It is different from play therapy or other therapies that focus mainly on the child and his emotions.

As the child's primary caregivers, parents play a major role in behavior therapy. Parent training is available to help you learn more about ADHD and specific, positive ways to respond to ADHD-type behaviors. This will help your child improve.

Taking care of yourself also will help your child. Being the parent of a child with ADHD can be tiring and trying. It can test the limits of even the best parents. Parent training and support groups made up of other families who are dealing with ADHD can be a great source of help. Learn stress-management techniques to help you respond calmly to your child. Seek counseling if you feel overwhelmed or hopeless.

There are steps you can take to help your child succeed in controlling his behavior. These tips can be applied to everyday life in your house and can make a big difference for your child and family:

· **Keep your child on a daily schedule.** Try to keep the time that your child wakes up, eats, bathes, leaves for school and goes to sleep the same each day.

· **Cut down on distractions.** Loud music, computer games and television can be overstimulating to your child. Make it a rule to keep the TV or music off during mealtime and while your child is doing

homework. Whenever possible, avoid taking your child to places that may be too stimulating, like busy shopping malls.

- **Organize your house.** If your child has specific and logical places to keep his schoolwork, toys and clothes, he is less likely to lose them. Save a spot near the front door for his school backpack so he can grab it on the way out the door.

- **Reward positive behavior.** Offer kind words, hugs or small prizes for reaching goals in a timely manner or good behavior. Praise and reward your child's efforts to pay attention.

- **Set small, reachable goals.** Aim for slow progress rather than instant results. Be sure that your child understands that he can take small steps toward learning to control himself.

- **Help your child stay "on task."** Use charts and checklists to track progress with homework or chores. Keep instructions brief. Offer frequent, friendly reminders.

- **Limit choices.** Help your child learn to make good decisions by giving your child only two or three options at a time.

- **Find activities at which your child can succeed.** All children need to experience success to feel good about themselves.

- **Use calm discipline.** Use consequences such as time-out, removing the child from the situation, or distraction. Sometimes it is best to simply ignore the behavior. Physical punishment, such as spanking or slapping, is *not* helpful. Discuss your child's behavior with him when both of you are calm.

In addition to parents and caregivers, your child's school is a key partner in providing effective behavior therapy for your child. In fact, these principles work well in the classroom for most students.

Some successful classroom management techniques may include the following:

- Keeping a set routine and schedule for activities

- Using a system of clear rewards and consequences, such as a point system or token economy (see Table 3)

- Sending daily or weekly report cards or behavior charts to parents to inform them about the child's progress

- Seating the child near the teacher

- Using small groups for activities

- Encouraging students to pause a moment before answering questions

- Keeping assignments short or breaking them into sections

Close supervision with frequent, positive cues to stay on task.