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Clinical Management of Attention Deficit Hyperactivity Disorder

Kytja K.S. Voeller, MD

Abstract

This article reviews current approaches to the diagnosis and management of children with attention deficit hyperactivity disorder in a multidisciplinary setting. The physician's role in terms of data collection, formulation of the diagnosis, and discussion of findings with the parents and child is reviewed. The use of psychostimulants in this condition is reviewed, and some case vignettes are presented. (*J Child Neurol* 1991;6(Suppl):S49–S65).

The diagnosis and management of children with attention deficit hyperactivity disorder (ADHD) presents a major challenge to the physician. ADHD is the current label for a constellation of behaviors consisting of hyperactivity, inattention, and impulsivity, as defined in the *Diagnostic and Statistical Manual of Mental Disorders*, 3rd ed, revised (DSM III-R).¹ These are listed in Table 1 and are contrasted to the diagnostic criteria for attention deficit disorder with (ADDH) and without hyperactivity (ADDnoH) which appear in the earlier *Diagnostic and Statistical Manual of Mental Disorders*, 3rd ed (DSM III).²

ADHD is a relatively common disorder that substantially interferes with a child's ability to function in school and, later, in adulthood. From the physician's perspective, the diagnostic process is different from that encountered in most clinical situations because the child often does not display the relevant symptoms in the course of an office visit. Thus, the physician must rely on historical information obtained from parents and teachers. Unfortunately, informants do not always agree, and it is necessary to arrive at reasonable ways of resolving these disagreements. Since ADHD and its pharmacotherapy are covered on television talk shows and in women's magazines and newspapers, both parents and teachers have preconceptions (often emotionally laden)

about ADHD and its treatment. The differential diagnosis is lengthy and includes a large number of concomitant conditions (comorbidities). In fact, ADHD is one of the few conditions in medicine in which comorbidities are also included in the differential diagnosis. ADHD is a chronic illness, the manifestations of which change as the individual matures. Treatment involves much more than renewing prescriptions—it requires a long-term commitment to monitor what is going on in school and in other aspects of the child's life.

In any physician's office, time constraints are of extreme importance. One is faced with a trade-off between diagnostic certainty and the time required to achieve it. In our research laboratory, we reach a high level of diagnostic certainty, but we take 3 hours to evaluate various behaviors associated with ADHD and another 3 or 4 hours to assess other aspects of the child's educational and neuropsychological functioning. We use a team approach, relying heavily on information from psychologists, learning disability specialists, skilled psychometricians, and not infrequently, child psychiatrists. In a more clinically oriented context, considerably less time might be involved, but the physician would benefit from the input of other professionals.

In the context of a multidisciplinary team, the physician's job is to obtain a detailed history (both past and present), perform a physical and neurologic examination, and review the results of cognitive and academic achievement testing as well as specific assessments of attention and impulsivity. The physician's major contribution is cognitive—weighing the information, considering various as-

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TABLE 1

Comparison of *DSM III* and *DSM III-R* Criteria for Attention Deficit Disorder (ADD), Attention Deficit Hyperactivity Disorder (ADHD) and Undifferentiated Attention Deficit Disorder (UADD)

ADD	ADHD and UADD
<p>The child displays, for his or her mental and chronological age, signs of developmentally inappropriate inattention, impulsivity, and hyperactivity. The signs must be reported by adults in the child's environment, such as parents and teachers. Because the symptoms are typically variable, they may not be observed directly by the clinician. When the reports of teachers and parents conflict, primary consideration should be given to the teacher reports because of greater familiarity with age-appropriate norms. Symptoms typically worsen in situations that require self-application, as in the classroom. Signs of the disorder may be absent when the child is in a new or a one-to-one situation.</p>	<p>Note: Consider a criterion met only if the behavior is considerably more frequent than that of most people of the same mental age.</p>
<p>The number of symptoms specified is for children between the ages of eight and ten, the peak age range for referral. In younger children, more severe forms of the symptoms and a greater number of symptoms are usually present. The opposite is true of older children.</p> <p>A. Inattention. At least three of the following:</p> <ol style="list-style-type: none"> (1) often fails to finish things he or she starts (2) often doesn't seem to listen (3) easily distracted (4) has difficulty concentrating on schoolwork or other tasks requiring sustained attention (5) has difficulty sticking to a play activity <p>B. Impulsivity. At least three of the following:</p> <ol style="list-style-type: none"> (1) often acts before thinking (2) shifts excessively from one activity to another (3) has difficulty organizing work (this not being due to cognitive impairment) (4) needs a lot of supervision (5) frequently calls out in class (6) has difficulty awaiting turn in games or group situations <p>C. Hyperactivity. At least two of the following:</p> <ol style="list-style-type: none"> (1) runs about or climbs on things excessively (2) has difficulty sitting still or fidgets excessively (3) has difficulty staying seated (4) moves about excessively during sleep (5) is always "on the go" or acts as if "driven by a motor" <p>D. Onset before the age of seven.</p> <p>E. Duration of at least six months.</p> <p>F. Not due to Schizophrenia, Affective Disorder, or Severe or Profound Mental Retardation.</p>	<p>A. A disturbance of at least six months during which at least eight of the following are present:</p> <ol style="list-style-type: none"> (1) often fidgets with hands or feet or squirms in seat (in adolescents, may be limited to subjective feelings of restlessness) (2) has difficulty remaining seated when required to do so (3) is easily distracted by extraneous stimuli (4) has difficulty awaiting turn in games or group situations (5) often blurts out answers to questions before they have been completed (6) has difficulty following through on instructions from others (not due to oppositional behavior or failure of comprehension), e.g., fails to finish chores (7) has difficulty sustaining attention in tasks or play activities (8) often shifts from one uncompleted activity to another (9) has difficulty playing quietly (10) often talks excessively (11) often interrupts or intrudes on others, e.g., butts into other children's games (12) often does not seem to listen to what is being said to him or her (13) often loses things necessary for tasks or activities at school or at home (e.g., toys, pencils, books, assignments) (14) often engages in physically dangerous activities without considering possible consequences (not for the purpose of thrill-seeking), e.g., runs into street without looking <p>Note: The above items are listed in descending order of discriminating power based on data from a national field trial of the DSM-III-R criteria for Disruptive Behavior Disorders.</p> <p>B. Onset before the age of seven.</p> <p>C. Does not meet the criteria for a Pervasive Developmental Disorder.</p> <p>Criteria for severity of Attention-deficit Hyperactivity Disorder:</p> <p>Mild: Few, if any, symptoms in excess of those required to make the diagnosis and only minimal or no impairment in school and social functioning.</p> <p>Moderate: Symptoms or functional impairment intermediate between "mild" and "severe."</p> <p>Severe: Many symptoms in excess of those required to make the diagnosis and significant and pervasive impairment in functioning at home and school and with peers.</p>
<p>Attention Deficit Disorder without Hyperactivity</p> <p>All of the features are the same as those of Attention Deficit Disorder with Hyperactivity except for the absence of hyperactivity; the associated features and impairment are generally milder. Prevalence and familial pattern are unknown.</p>	<p>Undifferentiated Attention-deficit Disorder</p> <p>This is a residual category for disturbances in which the predominant feature is the persistence of developmentally inappropriate and marked inattention that is not a symptom of another disorder, such as Mental Retardation or Attention-deficit Hyperactivity Disorder, or of a disorganized and chaotic environment. Some of the disturbances that in DSM-III would have been categorized as Attention Deficit Disorder without Hyperactivity would be included in this category. Research is necessary to determine if this is a valid diagnostic category and, if so, how it should be defined.</p>

From *DSM III*² and *DSM III-R*.¹ Used with permission.

pects of the differential diagnosis and determining what comorbidities are present. The physician then reviews the findings and the proposed treatment program, as well as the risks and benefits of any medication, with the parents and child, selects the appropriate medication, and then monitors the child's response to the treatment plan. In the pages that follow, I will review the various stages of this process.

Obtaining a Detailed History

The history provides information about the behaviors and medical background. The physician also has an excellent opportunity to understand the parents' perception of ADHD, its causes, the use of psychostimulants, and tacit (and often emotionally laden) perceptions of the risks and benefits.

A detailed review of the parents' concerns about the child's behavior is a good starting point: What are the specific behaviors that trouble the parents? Or are the problems only reported by the teacher? Is it worse in school than at home or vice versa? Do problem behaviors occur in specific situations, or are they distributed across all situations? How do the parents handle these problem behaviors? How old was the child when the parent became aware of these problems?

Structured Interviews and Questionnaires

Structured interviews and questionnaires have a number of advantages for the clinician. First, they are time saving and cost-effective. Second, they provide a practical way of communicating with the teacher about the child's behavior in school, which is almost always the most problematic situation for these children. Third, they provide a permanent record of the perceptions of several other observers who have seen the child in different contexts. Fourth, questionnaires provide *dimensional*, rather than purely categorical (yes/no) information. Thus questionnaires supply information regarding the *severity* of the child's behaviors compared to those of other children of the same age and sex. Having some idea of how a child compares to others of the same age and sex is particularly helpful because parents of normal children often complain of hyperactivity and inattention.³ Fifth, questionnaires are frequently used to independently assess the behavioral subcomponents of the ADHD spectrum. Questionnaires can identify a child as having conduct-oppositional defiant disorder (CD-ODD)

and show whether he or she is prominently hyperactive, inattentive, or impulsive or has various combinations of these behaviors. A single global rating score is not as useful as scores for specific behaviors. Moreover, the presence of combinations of behavioral disorders (for instance ADHD and conduct disorder) may indicate more severe forms of conduct disorder than ADHD alone.^{4,5} Some of the questionnaires provide norms for specific behavioral components of the ADHD cluster—inattention, hyperactivity, and impulsivity. These enable the physician to arrive at *target behaviors*—the specific behaviors that are the focus of therapy. Parents and teachers often confuse "hyperactivity" with aggressive and oppositional behaviors, and questionnaires help to identify these behaviors separately. Sixth, questionnaires can also be used to assess drug response during the follow-up phase.

Needless to say, information obtained from questionnaires must be interpreted in the context of all medical and psychosocial information.

A number of standardized questionnaires are available, and some commonly used questionnaires are summarized in Table 2. This list is not complete or exhaustive, by any means. The interested reader is referred to Shaywitz and Shaywitz⁶ and Sleator⁷ for more detailed discussions. The Conners' Teacher Rating Scale (CTRS) was the first questionnaire to be specifically developed for assessing hyperactivity^{8,9} and comes in several versions. There is a 39-item version and a 28-item teacher's questionnaire that was made available through Abbott Laboratories in the early 1970s.¹⁰ The original Conners' Parent Rating Scale (CPRS) contained some 93 items, and a later version involved 48 items. A 10-item abbreviated questionnaire, identical for parents and teachers, based on items selected from the original parent and teacher scales, was also developed. Werry et al reported normative data on this scale.¹¹

The Conners' questionnaires have the advantage of having been in use for many years, having established norms, and having been subjected to extensive factor analytic studies. Goyette et al¹² carried out a factor analysis on the 48-item CPRS and the 28-item CTRS using 578 normal children from white, middle-class families. In the CPRS, five primary factors were identified: conduct problems, learning problems, psychosomatic problems, impulsivity-hyperactivity, and anxiety. On the CTRS, three factors were identified: conduct, hyperactivity, and inattention/passivity. Wilson and Kiessling¹³ replicated the factor analysis on a group of 354 clinic-referred children and arrived at similar factors.

TABLE 2
Selected Rating Scales

Scale Name	No. of Items	Rater	Time to Complete, min	Norms Available	Comments
Conners' Teacher Rating Scale ^{8,9}	Variable*	Teacher	< 5	Yes ^{12,13}	See comments by Sleator ⁷
Iowa Conners' Teacher Rating Scale ¹⁴	10		< 5	Yes ⁸	2 subscales: Inattention-overactivity and Aggression
Swanson, Nolan, and Pelham Rating Scale ¹⁹	23	Parent, teacher	5–10	Teacher only ¹⁹	4 subscales: Hyperactivity, Inattention, Impulsivity, and Peer Interaction†; relates to <i>DSM III</i>
Swanson, Nolan, and Pelham Rating Scale—Revised	46	Parent, teacher	10	No	4 subscales (as in SNAP); combines <i>DSM III</i> and <i>DSM III-R</i> items
Achenbach teacher report form of the Child Behavior Checklist ²¹	113	Teacher	10–17	Yes ²¹	Computer scoring available; well standardized; provides information on wide range of psychopathology; 2 scales relevant to ADHD: Inattentive (20 items) and Nervous-overactive (7 items)
Achenbach Child Behavior Checklist ²¹	113	Parent	1–17	Yes ²¹	See comments about Achenbach Teacher's Report Form; only one 14-item scale relevant to ADHD: Hyperactive
Yale Children's Inventory ²³	150	Parent	30–60	Yes ²³	11 scales covering behavioral and cognitive dimensions; one 17-item scale relevant to ADD
ADD Comprehensive Teacher's Rating Scale ²²	24	Teacher	10–15	Yes ²²	Rates attention, level of activity, social skills, and oppositional behavior; 5-point scales; AM and PM ratings; see also comments by Sleator ⁷

*Multiple versions and norms.

†No norms available for Peer Interaction subscale.

A global rating and a hyperactivity index can be derived from the CTRS. However, the CTRS tends to overidentify children with symptoms of CD-ODD and underidentify children with attention deficit without hyperactivity. In response to these concerns, second-generation questionnaires have been developed that are short and easy to score, and use subscales to separate out hyperactivity, inattention, impulsivity, and CD-ODD.

The Iowa Conners' Teacher Rating Scale, developed by Loney and Milich,¹⁴ consists of 10 items derived from the CTRS that correlated significantly with either the hyperactivity or aggression factors but not loading onto both. Both scales have predicted observed classroom behaviors.^{15–17} The two five-item scales assess inattention-overactivity and aggression (equivalent to an oppositional defiant disorder factor). Pelham et al¹⁸ established norms for this test using 608 children (grades K through 5) and noted adequate internal consistency. They obtained lower correlations than in the factor analysis re-

ported by Goyette et al¹² between Inattention-Overactivity and Aggression, suggesting that these subscales were independent. They concluded that the Iowa Conners' would be an efficient scale if differentiation between ADHD and CD-ODD is the goal.

The Swanson, Nolan, and Pelham (SNAP) Rating Scale¹⁹ is a 23-item checklist using *DSM III* criteria for ADD, with a four-point response scale. There are four subscales, corresponding to inattention, hyperactivity, impulsivity, and peer interactions. The global score for ADD is based only on the first three subscales. Norms are available for the teacher version. Lahey et al²⁰ conducted factor analyses of the SNAP checklist and the 16 *DSM III* symptoms (Table 1) that yielded almost identical two-factor solutions. Distractibility and attentional deficits loaded on one factor, and items related to hyperactivity loaded on the other. A 46-item revision has been developed using the *DSM III-R* symptoms of ADHD and oppositional defiant disorder, the SNAP peer interaction

items, the Carlson/Lahey items for ADD without hyperactivity (or undifferentiated attention deficit disorder from *DSM III-R*),² and four conduct disorder items from the International Classification of Diseases-9 (J.M. Swanson, personal communication, July, 1990).

The Achenbach parent and teacher rating scales²¹ are commercially available and can be computer scored. Norms have been established on 1442 children ranging in age from 4 to 16 years. The scales cover a wide range of child psychopathology, are long (114 items each), and require more time to fill out and score than the questionnaires described above. Although extremely helpful in terms of providing information about other aspects of the child's behavior, limited information is available regarding behaviors specific to ADHD. The relevant scales on the teacher's form deal with hyperactivity and inattention and on the parent form, with hyperactivity alone.

The ADD Comprehensive Teacher's Rating Scale²² is a 24-item scale, in which the teacher is asked to rate attention, activity level, social skills, and oppositional behavior. Two time periods (morning and afternoon) are built into the rating. This is helpful in terms of analyzing situations relating to increased symptomatology and in drug follow-up. Subscales make it possible to discriminate between inattention, hyperactivity, and behavior problems.

The Yale Children's Inventory²³ is a 62-item parent questionnaire designed to identify and measure a spectrum of behavioral, learning, and developmental problems. There are 17 items relating to ADD, including four of the five *DSM III* items for inattention, two of the six *DSM III* criteria for impulsivity, and three of the five *DSM III* criteria for hyperactivity. Preliminary data on 260 children, aged 8 to 14 years, have been analyzed. There is high test-retest reliability and internal consistency. Acceptable coefficients of congruence were obtained on the hyperactivity, attention, and impulsivity items. Normative data has not yet been published with regard to age and sex.

One should not be surprised if the parent and teacher ratings do not agree with each other and these in turn do not agree with the physician's rating. Klein and Gittleman-Klein²⁴ reported on the extent of agreement in rating scales between parents, teachers, and clinic staff. In only 25% of the subjects did all three raters agree. In close to 60%, the child's behavior in the clinical setting was not strikingly abnormal.

In general, agreement between two observers in the same situation (eg, teachers) will be higher than agreement between observers in different situations (eg, parents and teachers). In a study based on 135 patient referrals, Cohen et al²⁵ compared the 39-item CTRS, 48-item CPRS and the Revised Behavior Problem Checklist—an 89-item scale (identical for parents and teachers) developed by Quay and Peterson,²⁶ and the score on the Freedom from Distractibility factor* of the Wechsler Intelligence Scale for Children-Revised (WISC-R).²⁷ Although there was good agreement between the teacher rating scales, the agreement in ratings declined when correlations between parents and teachers were obtained. Different scales may differentially trap various behaviors associated with these syndromes.

Medical and Neurologic History

The standard pediatric neurologic history, including information regarding the pregnancy, early development, and medical history should be obtained. A history of encephalopathy is important in the assessment: Were there any unusual drug exposures, or untoward events in the course of the pregnancy? Was the delivery prolonged and difficult? Was the child subjected to hypoxia? Was there neonatal jaundice? Information about the child's reactivity and activity levels in infancy is useful: Has the child always been irritable? Did she or he overreact to stimuli and have difficulty settling down? Or, did the behaviors emerge gradually after entrance into school? Are there frequent tantrums? Was the developmental history marked by delayed motor milestones or delayed acquisition of language? What about social behaviors? Has the child always been on the periphery of his or her social group? Is there a history of aggressivity?

With regard to medical history, was there a postnatal history of head trauma, meningitis, or epilepsy? What medications does the child take? Some medications (eg, phenobarbital and some antihistamines) may result in attentional and behavioral disturbances.

A review of the family history offers significant insights. There is now evidence that there may be a genetic basis for ADHD.²⁸⁻³² Some studies have supported a link to affective disorders in first-degree relatives.³³ Other researchers have found that conduct disorder rather than ADHD is familial.³⁴

*The Freedom from Distractibility factor is calculated by summing the scaled scores of the Arithmetic, Digit Span, and Coding subtests of the WISC-R and dividing by 3.

A pedigree should be obtained, focusing not only on the standard medical issues but also on psychiatric history. Is there a family history of affective illness, alcoholism, or psychosis? Evidence of ADHD-residual type³⁵ in a parent or a relative of the parent would tend to support the possibility that the child also has ADHD.

Examination

Physical and Neurologic

The standard physical and neurologic examination may uncover a variety of findings leading to the diagnosis of chromosomal anomalies or neurofibromatosis (see below under Differential Diagnosis). The physician can often observe the behaviors characteristic of ADHD if task demands are appropriate and the tight structure of the neurologic examination is abandoned. For instance, the successive and repetitive finger-tapping tasks, for which norms for children are available,^{36,37} provide a simple way of observing not only fine-motor performance but also how well a child can sustain self-paced motor movements that are quite tedious. Interestingly, there is often a dramatic difference in the ability of a child to perform these tasks and those requiring interaction with external objects, such as the Purdue pegboard³⁸ and the Halstead-Reitan tapper.³⁹

Cognitive and Academic

Before making any recommendations for psychostimulant therapy, it is important to evaluate a child's intellectual performance, and identify any co-existing learning disabilities that will not respond to psychostimulant treatment. This evaluation should involve, as a bare minimum, an intellectual assessment (WISC-R⁴⁰), and a screening assessment of academic achievement (for instance, the Wide Range Achievement Test-Revised,⁴¹ which is easily and rapidly administered and well standardized). Academic achievement level should be interpreted in age and IQ for that child, rather than absolute grade-level scores. A very bright child may be functioning at (or even above) grade level but far below the level predicted by IQ. A substantial discrepancy between IQ and academic performance may not emerge until age 8 years, but the history will reveal that the child is struggling with certain academic tasks. In either case, the child should be referred for psychoeducational testing, which is often available through the school.

Assessing Inattention and Impulsivity

It is useful to administer tasks that tap a number of different behaviors linked to ADHD. Unstructured tests that are reminiscent of the school situation are particularly helpful. Thus, simply observing how the child handles the 10-minute arithmetic segment on the Wide Range Achievement Test-Revised is very instructive.

More structured and quantifiable assessments are also useful. In our unit, we are in the process of developing a test battery that assesses a wide range of behaviors. ADHD is likely to be a collection of different types of deficits, only some of which may occur in any given child. As a result, although significant differences may be demonstrated between group means of children with ADHD and controls on a given test, a specific test will not necessarily identify an individual child as belonging to the ADHD group. Some children with ADHD will perform normally and some unaffected children will perform within the range of ADHD subjects. Trommer et al⁴² demonstrated this for the Gordon Delay Test,⁴³ and we have observed the same phenomenon on many occasions. Thus, assessment of a variety of behaviors, rather than only one or two will provide a more clinically helpful picture of the child's functioning. I would recommend administering tasks that can be quantified and that tap the ability to detect spatially distributed visual stimuli with distractors (eg, a cancellation task),⁴³ tasks requiring sustained attention (computerized continuous performance tasks) with and without distractors, as well as tasks assessing the ability to initiate, sustain (eg, the Motor Impersistence Battery⁴⁴), and inhibit responses (eg, the Luria Go-No Go Test as modified for children by Trommer et al⁴⁵). In addition, assessment of frontal lobe function should be carried out.

This approach largely eliminates the problem described by Werry in which ". . . a petrified child sits immobilized awaiting the customary injection."⁴⁶ Not only does fear decrease the child's hyperactive behaviors, but it is possible for the doctor, who observes the child only when in this "petrified" state, to draw erroneous conclusions. In our unit, this is not likely to be a problem, because the child has a long time to habituate to the setting, recognizes that there are no injections, and is asked to perform tasks that are similar to those that he or she must perform in school. Thus, many of the target behaviors can be observed in the office setting. Moreover, different types of situations can be created within the office setting, ranging from the relatively structured assessments performed by the physician, to the

"games" played on the continuous performance tasks, to academic assessments distinctly reminiscent of school. We also observe how the child interacts with different people. All of this information is then synthesized in the course of the final diagnosis. Parents appreciate the thoroughness, and baseline information is available to compare with retests during the follow-up phase to monitor response to medication.

Differential Diagnosis

There is a lengthy differential diagnosis of ADHD, which has been reviewed from several different perspectives elsewhere in this issue^{47,48} and thus will be only briefly summarized here. From a medical perspective, ADHD may reflect the presence of a genetic syndrome. For instance, fragile X⁴⁹ and XYY⁵⁰ have been reported to be associated with hyperactivity and inattention. Neurofibromatosis has also been reported to be associated with ADHD.⁵¹ Rarely, ADHD may be the initial manifestation of a progressive neurologic disease in its early stages. Although the criterion of chronicity in the *DSM III-R* guidelines (onset before age 7 years; of at least 6 months duration) should eliminate many cases, young school-age children in the early stages of a neurodegenerative disease can manifest a spectrum of behaviors similar to ADHD.

Epilepsy can coexist with ADHD, although it is not always clear whether it is the seizure disorder itself or the anticonvulsant medications that contribute to the attentional disturbances. Every now and then, one will encounter a child whose subclinical epilepsy presents as attention deficit:

Case 1

A 15-year-old girl had been admitted to a psychiatric ward for management of chronic depression. Academic difficulties were reported to start at age 7 years. In the course of the admission, the hospital teacher noted that she had great difficulty remaining on task, and requested a work-up for attention deficit. In the middle of a continuous performance task, the examiner noted that the patient stopped, stared, blinked her eyes rhythmically, pushed the button in a random fashion, and after a brief period of confusion returned to her previous level of performance. Although the first electroencephalogram was normal, a second one revealed an unequivocal abnormality.

Lead poisoning, ingestion of food additives, a variety of drugs, and allergies have been suggested as possible contributing factors in ADHD. Marshall has recently reviewed the literature dealing with the

relationship between ADHD and allergies and suggested that in a subgroup of children with ADHD, allergies exacerbate ADHD behaviors, possibly by way of an imbalance in the cholinergic-adrenergic system.⁵²

From a psychiatric perspective, an anxious child may appear both inattentive and hyperactive, but under scrutiny in a laboratory situation will manifest slower reaction times, as well as an unimpressive response to psychostimulant therapy.⁵³ However, these children will usually meet *DSM III-R* criteria for ADHD and will have sufficiently high ratings on questionnaires to fall into the ADHD group.

Attentional disturbances may also be relative to environmental demand. The presence of an unrecognized and untreated learning disability may place a substantial strain on the attentional capacity of a child.⁵⁴ Thus, a dyslexic child who is struggling with reading may "tune out" in reading class and focus in math class. Children with severe receptive language deficits often seem markedly inattentive in classrooms (I call this the Beijing University syndrome). This is similar to what would happen if a non-Chinese speaker was placed in a classroom on mainland China and asked to listen to Chinese lectures for 6 to 7 hours a day. Some waning of attention would be expected!

The diagnosis must also be interpreted in terms of the patient's sex. Although there is disagreement on this issue, it is possible that the manifestations of ADHD may differ in girls and boys. De Haas and Young⁵⁵ and Berry et al⁵⁶ have reported that girls with ADHD are less aggressive than boys with ADHD. The girls typically have an array of language and cognitive deficits coupled with impaired peer relationships. However, not all reports have substantiated these findings.^{57,58} McGee et al⁵⁹ approached the problem using a slightly different strategy and found that the average inattention scores of ADD girls were four to five scale points below the average scores for ADD boys. However, inattentiveness was equally prevalent between the two sexes, and there were no differences in cognitive profiles. There is also a suggestion that disruptive behaviors of boys tend to bring them to the attention of teachers.⁶⁰

Exploring Parental Attitudes

When interviewing and presenting findings to the parents, the physician should review the parents' understanding of what constitutes ADHD ("hyperactivity") and how it relates (in nontechnical terms) to learning disabilities, mental retardation, CD-

ODD, and other behavior problems. Parental knowledge and expectation of the use of psychostimulant medications should be explicitly addressed. If the physician does not explore these issues, it is likely that the treatment program will be compromised at some stage. Parents often have hazy notions of the relationship of cognitive deficits and behavior problems to ADHD. More often than not, the parent will have unrealistic negative or positive expectations about the use of psychostimulants. Few parents will be both knowledgeable and balanced in their views on these issues. Some parents are exceedingly concerned about the use of "drugs," particularly drugs that affect brain function, and wonder about the long-range side effects. There is a considerable lay literature on this subject, and there have been numerous television programs in which the dangers associated with psychostimulant treatment have been extensively discussed.

One approach is to ask if the parents are acquainted with a child who is on psychostimulants. Why was the child treated? Did the child improve or were there undesirable side effects? Alternative explanations can be provided in this context. Suppression of appetite, slowing of growth, or unwanted changes in behavior ("he was like a zombie") should be discussed, and the physician can provide alternative interpretations and additional information as needed. However, some parents have deeply embedded fears regarding psychostimulant medication. Parents may believe that psychostimulants are sedating, and it is often helpful to provide a simple explanation of their effect on attentional capacity.

In contrast to parents with unrealistic negative notions about psychostimulants are those who have equally unrealistic expectations in the opposite direction. These parents assume that psychostimulants will treat behavior problems, regardless of cause. Requests of this sort, even in children who are known to have ADHD, should be evaluated with care, as other factors may be involved.

Case 2

A 9-year-old boy was referred for evaluation. His Full Scale IQ was 77 (Verbal IQ, 75; Performance IQ, 82). There were marked deficits in both receptive and expressive language. He also met the criteria for ADHD, and both parents had accepted the recommendation for psychostimulant therapy. He was placed in a classroom for children with specific language impairment. During the summer, there were multiple telephone calls demanding psychostimulant medication for aggressive and resistant behaviors. It ultimately

became apparent that the parents were in the throes of a separation, which was undoubtedly contributing to the child's behavior problems.

Although the distinction is clear to professionals, parents may have a hazy idea of what is meant by "hyperactivity" as contrasted to "mental retardation." Thus, some parents anticipate that drug treatment will also alleviate the child's cognitive deficits. Although ADHD can certainly coexist with mental retardation, and psychostimulant therapy may be entirely reasonable, the time taken to clarify the other issues is of tremendous importance in the long-range management. If not addressed, the parent may continue to have tacit, but erroneous, expectations about the value of drug therapy, fail to implement other treatments, and be bitterly disappointed.

Case 3

An 8½-year-old adopted boy (WISC-R Full Scale IQ, 99) was referred for evaluation for continued treatment with methylphenidate. A review of the history indicated that he had continuous episodes of angry, acting-out behaviors. The parents tended to avoid him—they had purchased a television set so that he would stay in his room and amuse himself and maintained marginal supervision. The father tended to avoid disciplinary confrontations altogether, and the mother was left to manage the situation, which she resented. The evaluation indicated that the boy was performing marginally in school, and had a moderately severe reading and language disability. Methylphenidate seemed to help his functioning, but it was not clear if he would need to be continued on it if the family situation could be stabilized. The parents refused to become involved in family therapy.

Another example of inappropriate expectations is described in case 5 below.

Discussion of Diagnosis and Treatment Recommendations

It is helpful to review the diagnosis and treatment issues separately. Some parents balk at treatment because they do not accept the diagnosis, while others do not accede to the diagnosis because they resist the therapy. An occasional parent feels that the child will "grow out of it," and states that the child is "just like me when I was a kid."

Moreover, it is rare that psychostimulant medication is the only therapeutic recommendation. Each recommendation should be discussed and accepted by the parents. Medication should be presented as part of a total program, which might involve a be-

behavior management program, consultation with a child psychiatrist, parental counseling, special class placement, and/or tutoring by a learning disabilities specialist. Although medication is the least costly aspect of the treatment program, it is important that parents understand the value of the other components and have started to follow these recommendations before prescriptions are written.

Defining Target Behaviors

It is particularly useful to specifically define target behaviors. Target behaviors are those that can realistically be expected to improve on medication. As discussed above, parents may anticipate that a wide variety of other behaviors will also improve. In many cases, psychostimulant therapy will ameliorate aggressive and antisocial behavior,⁶¹ particularly when based on teacher observation,⁶² but it is unrealistic to believe that behavior problems will improve on drug therapy alone. Moreover, learning disabilities will require specific therapy. This makes it possible to focus expectations on behaviors that are likely to be helped by psychostimulants—improved attention and concentration, decreased activity, and more reflectivity.

Informing Parents About Pharmacokinetics and Side Effects

Parents may not have a chance to observe the child at the time of peak effect of the psychostimulant. They need to be told about this and should be given a clear idea of the duration of action of the medication (which, for methylphenidate, may not be more than 4 hours). Parents should also be prepared for possible end-of-dose effects, since they may observe a child only in the late afternoon after a day of school, when methylphenidate is on the wane. At this point, some children become quite irritable, active, and occasionally depressed. It is helpful to supply the parents with some guidelines for managing this—a snack, vigorous outdoor exercise, or a nap if the child is so inclined. Transient anorexia, sleep disturbance, tics, and new behavioral problems (eg, mania) should be discussed. Parents should be advised what to do if the child develops a rash. The child should be seen immediately by the treating physician. In some cases, a rash is not a drug allergy, but is a contact dermatitis. Evaluating this when it arises is much less troublesome than having to deal with the problem historically.

Discussing Findings and Medication Recommendations With the Child

An explanation to the child, couched in terms that are appropriate to the child's age and the situation, should be carried out. Children, like their parents, have heard about medication for hyperactivity ("chill-down" pills as they are locally termed) and have preconceived notions. There has been concern expressed that treatment with psychostimulants, particularly if successful, may result in the child attributing success to the medication rather than to her or his own efforts.⁶³ This is, of course, a serious issue and can be forestalled to some extent by reviewing the results of the psychometric assessments, neurologic evaluation, and educational testing with the child in a manner appropriate to his or her level of understanding and generally in the presence of the parents, so that they can reinforce it. The discussion should be supportive and in comprehensible language, describing *concretely and objectively* any associated learning or behavior problems. Terms like "hyperactivity," "attention deficit disorder," and "dyslexia" communicate little if anything to the child. Rather, a description of the problem should be stated in understandable terms: "You have difficulty sitting still." "It takes a lot of effort to pay attention, and your attention span is short." "You have trouble sounding out words, and for that reason have trouble reading fast." The child's strengths should be emphasized simultaneously: "You are a good athlete." "You are a good artist." "Reading may be an effort, but look how good you are in math." Psychostimulant therapy should be presented as a way of increasing attention and decreasing the tendency to move around. The child's responsibility in the treatment program should be stressed, and the role of medication as an adjunct under the child's control, rather than a means of controlling the child, should be emphasized. Furthermore, a recent study suggests that ADHD children tend to attribute medication as the reason for their success less often than either effort or ability.⁶⁴

The child should be encouraged to give medication a try, with the understanding that her or his input will be solicited at follow-up visits.

To Treat or Not To Treat

If there is evidence that the child meets the criteria for ADHD and is sufficiently disabled to benefit from treatment, then treatment should be recommended.

The issue of severity is also worthy of note. Some children are relatively minimally involved, and under certain circumstances, following the child without using medication is warranted. This is particularly true when one has also identified a comorbid, untreated learning disability. If the child receives appropriate educational remediation, structure, and support, and task demands are aligned with the child's ability, the attention deficit may become less important in the whole picture.

The decision of whether or not to treat a child should be separated from the child's response to psychostimulant medication. If response is the only criterion used, one might run the risk of treating a child who was minimally involved. Rapoport et al⁶⁵ have shown that normal adults and children respond in the same fashion as hyperactive children to dextroamphetamine, namely with a decrease of truncal activity and improved performance on certain aspects of continuous performance tasks. If necessary, an individual crossover double-blind trial, alternating drug and placebo, may resolve such issues, as described by McBride.⁶⁶

Even if parents have consented to drug treatment, there are certain circumstances in which one should proceed very cautiously. First, if there is evidence of major conflict between the school and the parent, with the battlegrounds being drawn around the subject of psychostimulant therapy, I would recommend dealing with the conflict before starting the child on therapy. School officials may have overlooked other academic interventions, and the combination of an irate parent and a school system advocating therapy is an inflammatory situation. Second, when there is a strong suspicion that some member of the family is a drug abuser and might misuse the psychostimulant, a well-thought-out plan for dealing with this problem should be developed.⁶⁷ Third, when the child adamantly refuses to try drug therapy, he or she should be referred to a child psychiatrist for further exploration of the matter. A fourth contraindication, which is relative, is serious parental psychopathology. Finally, if there is disagreement between parents as to the advisability of drug therapy, this needs to be dealt with before starting medication.

Drugs Used in the Treatment of ADHD

Three psychostimulants are widely used for the treatment of ADHD—methylphenidate, dextroamphetamine, and pemoline. These drugs increase available catecholamines by a variety of mecha-

nisms: inhibiting reuptake, increasing release, and inhibiting the effects of monoamine oxidase, which inactivates catecholamines.^{68,69} Differences are noted in both biochemical and behavioral effects depending on whether drugs are presented acutely or chronically and whether the dose is small or large. The reader is referred to an extensive review by Solanto⁷⁰ of the biochemistry and behavioral effects of psychostimulants in ADHD. Lou et al⁷¹ have demonstrated that in children with ADHD, cerebral blood flow, which is decreased in the region of the striatum (particularly on the right), is normalized after methylphenidate ingestion. Dose-related effects of methylphenidate on late event-related potentials were reported in children and adolescents with ADHD,⁷² with some evidence of an age effect.⁷³

Methylphenidate is available in generic form, and as Ritalin in 5-, 10-, and 20-mg tablets and in a 20-mg sustained-release tablet in a wax matrix. Although the sustained-release product has a longer half-life and good bioavailability, there is a highly variable time period to peak action (mean, 4.7 hours; range, 1.3 to 8.2 hours).⁷⁴ The variability can result in unpredictable blood levels and behavioral control. For instance, Pelham et al noted that the peak effect could occur after most of the academic work was done for the day, and the peak levels could be lower, resulting in less effective behavioral control.⁷⁵ Thus, the standard and sustained-release forms of methylphenidate are not equivalent. The sustained-release form may be effective in a given child, but needs to be evaluated on an individual basis. The sustained-release form should not be chewed, as this will disrupt the matrix. Contrary to earlier reports, methylphenidate can be taken at any point before or after meals.⁷⁶

Several studies on the pharmacokinetics of methylphenidate have appeared. Kupietz et al reported on 47 children who were studied on a variety of behavioral assessment tools and tasks. They found a good correlation between plasma levels and dose (0.3, 0.5, and 0.7 mg/kg) and behavior and test performance.⁷⁷ Winsberg et al,⁷⁸ Shaywitz and colleagues,⁷⁹ and Sebrechts and others⁸⁰ have also found significant correlations between peak plasma concentration and behavior change and performance on laboratory tasks. In contrast, Gualtieri and colleagues noted considerable variability from one individual to the next and variability in the response of any individual from day to day.⁸¹

Dextroamphetamine is available in generic form and as Dexedrine in 5-mg (unscored) tablets and elixir (5 mg/5 mL). Sustained-release Dexedrine

spansules are made in 5-, 10-, and 15-mg dosages. Peak levels of regular tablets occur about 2 hours after ingestion, with an average half-life of 10.25 hours. After ingestion of the spansule, peak levels occur in 8 to 10 hours.

Pemoline is available as Cylert in 18.75-, 37.5-, and 75-mg (scored) tablets and in chewable 37.5-mg scored tablets. Pemoline, an oxazolidine compound, is structurally different from methylphenidate and dextroamphetamine. Peak blood levels occur 2 to 4 hours after ingestion, with a half-life of 12 hours. About 50% of the drug is bound to plasma proteins (not the case with methylphenidate or dextroamphetamine). Cylert has been reported to produce elevated liver enzymes.⁷⁴

For certain children, antidepressants such as imipramine may be quite effective.^{82,83} However, antidepressants are not an across-the-board substitute for psychostimulants. Overdose can result in significant toxicity. Occasional adverse cardiovascular effects⁸⁴ and tolerance for therapeutic effects have been described.⁸² Gualtieri and Evans⁸⁵ reported that imipramine improved hyperactive behavior and attention, but decreased motor speed and motor pursuit. Zametkin and Rapoport⁸⁶ have recently summarized information regarding both clinical and experimental drugs in the treatment of ADHD.

Starting Dose

In general, starting at a low dose of methylphenidate (0.2 to 0.3 mg/kg) is advisable. Parents should be encouraged to call to discuss any problems. Occasionally, one will encounter a child who becomes extremely drowsy on the psychostimulant, at least for the first few days.

The dosing schedule depends somewhat on the child's daily schedule. If a child is in a situation that demands little of her or his attentional capacities, the dose can be adjusted to take the schedule into account. For instance, some children have little difficulty functioning in the course of nonacademic subjects such as music, gym, or art and may not need to be medicated.

With regard to the amount of methylphenidate, the usual dose is in the range of 0.3 to 0.6 mg/kg. However, recent studies have suggested that doses higher than 0.6 mg/kg improve behavior and performance on a variety of tasks. For instance, Kupietz et al⁷⁷ used doses of 0.7 mg/kg with good response. Thus, in some cases, doses in the range of 1.0 mg/kg may not, in fact, be contraindicated.^{87,88}

It is likely that specific behavioral components of ADHD are affected by different dose levels. It is our

impression that attentional behaviors respond to low (0.2 to 0.3 mg/kg) doses of methylphenidate, whereas impulsivity and hyperactivity require higher dose ranges. For instance, in the study by Tannock et al,⁸⁸ there was a response at both low and high dose levels on a letter search task and on task behavioral rating, whereas activity level continued to improve at the high dose level.

End-of-dose ("rebound") effects have been reported in children on psychostimulants.⁸⁹ These behaviors take the form of increased talkativeness and motoric activity in the evenings following a single morning dose of medication, compared to placebo days.⁹⁰ However, Johnston et al⁹¹ conducted a study that suggested that such effects tended to be relatively minimal. In my experience, there is considerable variability, and a small number of children will have prominent rebound effects.

Side Effects

Side effects of psychostimulant treatment, consisting of transient appetite suppression, sleep disturbance, weight loss, and decrease in growth rate have been reported.⁹² The issue of whether or not psychostimulants decrease growth velocity is of considerable importance. Since the initial report,⁹³ some studies have supported this observation,⁹⁴⁻⁹⁶ and others have failed to replicate it.⁹⁷⁻¹⁰⁰ Klein and colleagues^{101,102} recently published a pair of studies that address some of the methodologic problems of previous studies (ie, differing dosage, length of treatment, and age). In the first study,¹⁰¹ children were either on or off methylphenidate over the summer. Being off methylphenidate for one summer resulted in a significant positive effect on weight. After two summers, the group that had been off methylphenidate over the summer was 1.5 cm taller than those who had remained on the drug (a significant difference). In the second study,¹⁰² 61 hyperactive adolescent males who had been treated for 6 months or longer (average, 2.24 years) at a mean daily dose of 45 mg were compared to controls. There was no difference between the heights of the two groups. Since some of the subjects overlapped with those of the first study, in which a growth-impairing effect of methylphenidate was documented, it seems likely that catch-up growth occurred after the child was taken off the drug.

Hypersensitivity reactions (eg, angioneurotic edema and urticaria) occur but are rare.¹⁰³ Increases in systolic blood pressure at a 1.0-mg/kg dose, but not at a 0.3-mg/kg dose, have been reported, but this is of little clinical import.⁸⁸ However, Brown and

Sexson report that black adolescents may be at risk for developing increased diastolic blood pressure.¹⁰⁴

Dyskinesias are rare but have been reported. Children with frank neurologic impairment (eg, seizures and motor deficits) may be at greater risk.¹⁰⁵ Cognitive and behavioral disturbances, which can be much subtler, can pose a problem because they may initially look like behaviors that require increased medication. Sprague and Sleator¹⁰⁶ reported that children treated with methylphenidate at dose levels of 1.0 mg/kg or above (the point at which teachers noted behavioral improvement), manifested declining ability to learn. Winsberg et al¹⁰⁷ noted a high incidence of side effects at doses in this range. In a study of psychiatric patients using a visual backward masking paradigm, Braff and Huey¹⁰⁸ demonstrated that patients taking methylphenidate showed a detrimental effect on information processing compared to controls and those on a pharmacologic control (oxazepam). More florid behavioral effects, consisting of mania,¹⁰⁹ delusions,¹¹⁰ paranoid behavior, and social withdrawal,¹¹¹ if not psychosis,^{112,113} have been reported for the major psychostimulants. However some children show improvement of certain aspects of behavior at doses above 0.6 mg/kg, so astute dose adjustment coupled with close observation is indicated.

In children with ADHD who have coexisting Tourette's syndrome, methylphenidate is not necessarily contraindicated, but the pros and cons must be discussed with the parents. ADHD has been reported to occur with high frequency in Tourette's syndrome. Sverd et al¹¹⁴ reported that over 90% of Tourette's syndrome patients also have ADHD. Some clinicians¹¹⁵ have recommended that psychostimulants not be used in Tourette's syndrome because of the sensitivity to dopamine agonists. However, there is a variable response to psychostimulants, with decreased and increased tics each occurring in some Tourette's syndrome patients.^{116,117} Shapiro and Shapiro¹¹⁸ have attributed this variability to the characteristic waxing and waning of the disorder. The reader is referred to a recent report on four children with Tourette's syndrome and ADHD who were treated with methylphenidate for a thoughtful discussion of this subject.¹¹⁹

Children with ADHD and seizures can generally be treated with methylphenidate safely, without altering plasma levels of anticonvulsants or exacerbating seizures.¹²⁰

About 25% of children treated with psychostimulants will be nonresponders. A nonresponder is a child who either does not improve or manifests an

undesirable response. Richardson et al¹²¹ noted that 12 of 48 children had a good response and 12 had a poor response. There was good stability over the 12 weeks that the study was conducted, and the overall gain of responders was almost twice that of nonresponders. There are several reasons for nonresponse. One obvious reason is failure to take the drug as prescribed. If this is suspected, a child can be evaluated in the office setting. A second reason is that either the initial diagnosis was in error or the behaviors that have not shown a response are not due to ADHD. For instance, Pliszka found that children with comorbid anxiety failed to improve on methylphenidate.⁵³ Third, it is possible that the dosage should be increased or decreased. If the child does not respond to methylphenidate dose adjustment, a trial of dextroamphetamine, imipramine, or pemoline would be the next step. Other drugs, such as clonidine¹²² or even lithium (which appears to be useful in children with ADHD and affective disorders),¹²³ could also be tried.

Follow-up Visits

Parents should be encouraged to call if they have any questions or problems. The first follow-up visit should be scheduled about a month after medication was initiated. During this visit, reports from the teacher, parents, and child should be elicited. The major issues are: (1) Have any changes in behavior occurred? if so, what? (2) Should the dose be increased or decreased? (3) Are there any untoward behavioral side effects that are attributable to the medication (eg, tics, mania, depression)? (4) Are there effects related to peak dose or end-of-dose effects? (5) What about sleep and appetite? The child should be interviewed separately and her or his input obtained. In my experience, children who have improved their level of performance on psychostimulant medication are quite willing to tell you.

If there is some evidence of a salutary response, but an incomplete one, the dose can be increased, but it should be done cautiously, taking into consideration that it is possible that some behaviors (eg, hyperactivity) may improve, but cognitive function or behavior may be impaired. It is possible that some residual hyperactivity should be accepted if other behaviors and focused academic effort are good. There appears to be a U-shaped curve, with hyperactivity responding to a given dose of methylphenidate, and then, in some cases, recurring with stereotypy and disruptive behaviors in response to a dose increase.

Case 4

This 8½-year-old boy was referred for assistance in managing dosing of methylphenidate. He was a student in a small private academy and was experiencing considerable difficulty because of a high activity level and inattention. These symptoms responded well to 10 mg/day (0.25 mg/kg) in the morning, but because of a marked rebound in activity level in the afternoon, his parents and pediatrician continued to increase the dosage. The dosage was increased so that ultimately he was receiving 40 mg/day (1.0 mg/kg/day in four divided 0.25-mg/kg doses) 7 days a week. He became hostile, aggressive, and antisocial, playing with food in the lunch room and pushing other children. He started biting his fingers in a repetitive "compulsive" fashion, had multiple tics and was in "constant motion." He was tapered off the medication and the tics, finger biting, and aggressivity disappeared, but the hyperactivity and inattention returned and seriously interfered with his school work. In the course of assessing him, it became apparent to me that he was exceedingly bright: he whipped through the Ravens Progressive Matrices at breakneck speed with only one error. On the WISC-R he achieved a Full Scale IQ of 139. He was placed in a local public school class for the gifted learning disabled. Methylphenidate was reduced to 0.25 mg/kg/dose, two doses a day, school days only. He has continued to do well on this regimen for the last 4 years.

This case illustrates several points. First, the U-shaped curve discussed above is apparent: there was an optimal point of control. Increased dosing then produced an apparent increase in hyperactivity and misbehavior. It is interesting that the behaviors that emerged resembled the aggressivity, increased movement, and stereotypic gnawing that is seen in experimental animals after treatment with amphetamine or apomorphine.^{124,125} Although it is hard to substantiate the existence of tachyphylaxis, it is possible that the intermittent dosage pattern made it possible to control target behaviors at a relatively low dose. Third, although tics became very prominent at high dose levels, at a lower dose level they disappeared and did not recur. Fourth, the case points up the importance of careful assessment of all aspects of the child's functioning and the need to identify target behaviors. Once these were in place and he was receiving a high level of intellectual stimulation coupled with structure, the child has done very well.

The following case emphasizes the need for continuing to see the child at regular intervals and supervising parental administration of the drug:

Case 5

This bright 8½-year-old adopted girl was referred by another pediatric neurologist who was aware of our interest in ADHD. At age 5 years, she had been evaluated because

she was a "wild child," as her mother called her, and started on methylphenidate. The dosing had been in the hands of the mother who had, over the next 3 years, increased it to 80 mg per day, 20 mg qid, (0.9 mg/kg/dose, 3.5 mg/kg/day). The child was cared for much of the time by a live-in baby-sitter. In the course of our dealings with the mother and baby-sitter (the father never came to appointments), it became apparent that the mother had little insight into child management. She did not know how to set limits, provide structure, or avert impending behavior problems. It appeared that she used methylphenidate to control the behaviors she perceived as "wildness." There was considerable friction between the mother and baby-sitter over the issue of behavior management and medication. We noted an enormous difference between the child's behavior when working with us on attentional tasks (she was businesslike, controlled, and attentive) and when she was in the presence of her mother (she was highly active, demanding, and noisy). After discussing the issue of the high levels of medication, a very slow taper of methylphenidate was initiated. The child was retested at monthly intervals, and there was essentially no change. Methylphenidate was reduced to a total of 2.3 mg/kg/day, at which time the mother felt she was too active and unilaterally reinstated the previous dosage, obtaining medication from her pediatrician. Several months later the child was admitted to a child psychiatry ward of a local hospital and withdrawn and started on a neuroleptic. At that point the mother reported for the first time that she herself was under treatment for depression. She was lost to follow-up.

Other Aspects of Follow-up

It would be desirable to have an array of tests that would assess the array of behaviors that are targeted in treatment with methylphenidate. At present this is very hard to implement in a clinical practice situation. For one thing, retesting is extremely time-consuming. It is also difficult to control for learning effects, which can occur even on continuous performance tasks, although in general, the simpler the task, the less the learning effect. In laboratory situations one can get some degree of control over these factors and be relatively confident that one is tapping drug effect, but the logistics are complicated. In clinical practice situations, I would recommend repeat assessments only when there is a problem concerning the child's response to psychostimulant treatment. Hopefully, the test-retest issues will be clarified so that a workable test battery, relatively free of learning effect, can be devised to resolve this problem. Another way of approaching this problem is the use of placebo.

Summary

Research studies have provided a great deal of clinically useful information on ADHD. These studies

throw light on how to select children with ADHD who are likely candidates for psychostimulant therapy and clarify which aspects of behavior and learning are likely to respond to drug therapy. The use of questionnaires and certain types of standardized office assessments of children suspected of having ADHD will be helpful in targeting specific behaviors and assessing response to therapy.

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