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Attention deficit hyperactivity disorder (ADHD)

F Forbes
Consultant Child and Adolescent Psychiatrist, Child and Family Mental Health Service, Royal Hospital for Sick Children, Edinburgh, Scotland

ABSTRACT Attention deficit hyperactivity disorder has attracted considerable media attention, in particular questioning its validity as a diagnostic concept and the use of stimulant medication in its treatment. This does especial disservice to the children and young people with ADHD and their parents: ADHD is a common, chronic neurodevelopmental disorder affecting many areas of a child's life, with a high rate of secondary problems and a high risk of associated disorders. It requires multi-modal assessment and management, usually including medication..

KEYWORDS ADHD, multi-modal assessment, multi-modal management, stimulants

LIST OF ABBREVIATIONS Attention deficit hyperactivity disorder (ADHD), child and adolescent mental health service (CAMHS), diagnostic and statistical manual (DSM), general practitioner (GP), hyperkinetic disorder (HKD), immediate-release (IR), international classification of diseases (ICD), National Institute for Health and Clinical Excellence (NICE), occupational therapy (OT)

DECLARATION OF INTERESTS The author has previously received funding from two drug companies who produce drugs to treat ADHD, to attend conferences. She has declined to do so in the last two years.

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Correspondence to ***F Forbes, Child and Family Mental Health Service, Royal Hospital for Sick Children, Edinburgh, EH9 1LL, Scotland***

tel. ***+44 (0)131 536 0520***

fax. ***+44 (0)131 536 0545***

e-mail
Fiona.Forbes@lpct.scot.nhs.uk

WHAT IS ADHD?

Children with ADHD have persistent and disabling levels of restlessness and impulsiveness ('hyperactive–impulsive' sub-type) or inattention ('inattentive' sub-type) or all three ('combined' type), beyond developmental norms. Attention deficit hyperactivity disorder is the term used in the American DSM-IV. The International Classification of Diseases system, ICD-10, uses the term HKD, and its diagnostic criteria are more strict; the core symptoms of HKD, impaired attention and overactivity, need to be evident in more than one situation and onset must be before the age of six years. As with DSM-IV, symptoms need to be of at least six months' duration. Hyperkinetic disorder equates best with the 'combined' type of ADHD. However, the term 'ADHD' has become common parlance, even among UK specialists.

WHAT IS IT NOT?

Attention deficit hyperactivity disorder is not a 'new' disorder; nor is it medicalised 'bad behaviour' or medicalised 'bad parenting'.

Descriptions of attention disorders can be found as far back as 1798, when Crichton, a physician, described two types of 'morbid attentional disorders', one of which would be consistent with the DSM-IV inattentive subtype.[1]

HOW COMMON IS IT?

The prevalence rates of the broader category of ADHD vary considerably across studies where there are often major methodological differences; most would concur that a conservative estimate would be 5%.

The point prevalence of the more severe form of ADHD, HKD, is about 1·5% in the primary school age population. In the UK, the rates from epidemiological studies published in the 1980s and 1990s, remained around 1·5%; however the rate of recognition of the disorder rose dramatically during this same period in UK. It is up to four times more common in boys than in girls.

WHAT CAUSES IT?

The cause of ADHD is unknown, but it is likely that there are several different causal pathways linking risk factors to the behavioural symptoms of ADHD. There is a hereditary component, and various environmental and genetic risk factors have been identified. Environmental risk factors include antenatal exposure to toxins (alcohol, benzodiazepines, nicotine), obstetric complications, brain disease and injury, and severe early deprivation. A recent meta-analysis of molecular genetic studies found a significant association between ADHD and dopamine system genes, especially DRD4 and DRD5.[2] Converging research evidence, and the mode of action of drugs effective in treating ADHD, suggest that dysregulation of brain catecholaminergic systems may play a role.

WHY IS IT IMPORTANT?

Children with ADHD are at increased risk of a wide range of adverse sequelae, including low self-esteem, academic underachievement, poor peer relationships, disrupted family relationships and anti-social behaviour. They are more prone to accidents. They may also be at increased risk of later substance misuse.

Attention deficit hyperactivity disorder is also associated with an increased rate of other disorders, including depression, anxiety, other behavioural disorders, tic disorders, specific learning difficulties and developmental co-ordination disorder. Sleep problems are common.

Attention deficit hyperactivity disorder is a chronic disorder. At least two-thirds of children continue to have ADHD symptoms through adolescence and, for some of them, symptoms persist into adulthood. Early diagnosis and intervention with the implementation of a long-term management plan is therefore crucial.

ASSESSMENT

If the core features of ADHD are present (inattention, impulsiveness, over-activity), referral for specialist assessment is indicated, usually to the local CAMHS, although in a few areas community paediatricians have developed specialist interest in ADHD. The diagnosis of ADHD is a clinical one. There are no specific biological, radiological or psychological diagnostic tests.

A comprehensive assessment is required in order to confirm a diagnosis of ADHD and any associated disorders, or to find an alternative explanation for the symptoms.[3, 4] This should include at least one clinical interview with parents and child, a clinical examination as necessary, and a psycho-educational assessment, including a report from the school. Standardised behaviour rating scales completed by parents and school (and, where appropriate, by the adolescent) are helpful adjuncts. A classroom study allows observation of the child's concentration and behaviour in a familiar setting, but is labour-intensive. Psychometric assessment will help identify any specific learning difficulties as well as illustrating to what extent the child has been achieving academic potential. Physical investigations are required only as indicated from the assessment.

TREATMENT

As with the assessment process, this is best carried out in a multidisciplinary setting. The aim is to treat the core symptoms of ADHD and associated disorders and to reduce the risk of secondary sequelae.[3–5] As it is a chronic condition, management will be long-term and will necessarily have to adapt to changing developmental needs. Involvement of the child's school is crucial.

Careful explanation of the disorder, including written information, is required for parents, child and school staff. In many instances, a negative pattern of interaction has developed – at home and at school – and a greater understanding of what is driving the child's behaviour can be the first step in reversing this. It also helps in understanding why some strategies are more likely to work than others.

MEDICATION

Medication is indicated as first-line treatment for moderate to severe ADHD and for milder forms when simple behavioural interventions alone have been unsuccessful.[3, 5] It is the use of medication, and in particular stimulants such as methylphenidate, which has sparked most controversy, at least in the media. And yet these are relatively safe drugs, which have been used for decades, and have been shown in numerous studies to be effective in treating the core symptoms of ADHD, at least in the short to medium term. Two important longer term treatment outcome studies warrant mention as they showed the superiority of stimulant medication over intensive behavioural programmes in treating ADHD symptoms. In one study,[6] the addition of intensive behavioural programmes conferred some additional benefit in treating some of the associated problems such as aggression. In the other,[7] no additional benefit was observed. Of note, the behavioural programmes were considerably beyond what could be offered in a standard clinical service.

In the UK, three drugs are currently licensed for use in the treatment of ADHD: the stimulants, methylphenidate and dexamfetamine, and the non-stimulant, atomoxetine. In March 2006, NICE issued recommendations on their use.[5]

STIMULANT MEDICATION

In the UK, the first-line drug treatment has been stimulant medication, and in practice this is usually IR methylphenidate. If there is no response to methylphenidate, or poor tolerance of side effects, dexamphetamine can be tried. The effect of stimulants occurs very quickly in approximately 20 minutes and lasts for only three or four hours.

Common side effects include reduced appetite, nervousness and tearfulness (all tend to be short-lasting and respond to dose reduction). Insomnia and tics can occur. Best practice is to discuss the medication at length with parents and child. A trial of methylphenidate is instituted, starting with a small dose (5 mg) three times daily and slowly increasing the dose, titrating response against adverse effects, to a maximum of 20 mg three times daily. The equivalent dose of dexamphetamine is half that of methylphenidate.

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During this trial period, there should be close liaison with parents and school. Once an optimum response has been reached, arrangements for follow up and six-monthly checks of height, weight and blood pressure are necessary. Good practice entails continuing liaison with the school to help in decisions regarding possible dose adjustments. Regarding long-term prescribing of stimulant medication, shared care protocols should be developed with GPs.

Two modified-release formulations of methylphenidate are particularly useful if there are issues of poor compliance. Concerta XL is designed to replace three times daily dosing with IR methylphenidate. Concerta XL 18 mg (given in the morning) is equivalent to IR methylphenidate 5 mg three times daily. The maximum recommended daily dose is 54 mg. Equasym XL is formulated to be similar to twice daily dosing with IR methylphenidate. The maximum recommended dose is 60 mg once daily.

In clinical practice some specialists, including the author, occasionally find it necessary and beneficial to prescribe higher than the maximum recommended doses of stimulant medication. Documentation of the rationale is important; as is discussion with the parents (and young person, as appropriate) and close monitoring of side effects.

ABUSE POTENTIAL OF STIMULANTS

Despite some media reports suggesting otherwise, methylphenidate has a much lower abuse potential than cocaine, but abuse does occur, mainly by intravenous injection. Attention deficit hyperactivity disorder *per se* may increase the risk of later substance misuse, but treatment with stimulants may confer a protective effect compared to no treatment.[8]

NON-STIMULANT MEDICATION

Atomoxetine is a relatively new drug. It is a noradrenaline re-uptake inhibitor and licensed for use in the UK for the treatment of ADHD in children aged six years and older and in adolescents. Several studies have demonstrated the short-term effectiveness of atomoxetine over placebo in treating ADHD symptoms. Treatment should be initiated at a dose of 500 μg/kg daily and increased if necessary to a maximum of 1·8 mg/kg daily, in a single dose, or two divided doses. Clinical practice has found that up to 12 weeks treatment at the highest dose may be necessary before benefits are seen. Common adverse effects include abdominal pain, decreased appetite, nausea and vomiting.

Non-licensed treatments include tricyclic antidepressants (desipramine and imipramine) and the alpha-2-noradrenergic drug clonidine. There is less evidence for their effectiveness in treating ADHD symptoms although they can be considered if there are significant problems with side effects, including tics, of licensed medications.

TREATMENT DURATION

It is important to establish the necessity of continuing drug treatment by having annual drug-free periods in adolescence and monitoring response. In practice, most children with ADHD will require to remain on medication through high school.

PSYCHOSOCIAL INTERVENTIONS

Parents Equipping parents with behaviour management techniques can be useful, particularly for oppositional behaviour problems often associated with ADHD. A behavioural analysis ('ABC' 'Antecedents, Behaviour, Consequences') allows problem behaviours to be targeted by trying to avert them, and by instituting immediate consequences if they occur. Encouraging parents to identify and positively reinforce good behaviours – a process which has often been lost amidst heightened family tension and arguments – needs to occur in parallel.

Child Individual cognitive, self-regulatory training (particularly targeting impulsive behaviours) has not been shown to be very successful. Psychosocial treatment approaches with the child are best reserved for associated problems such as anxiety, low self-esteem, problems with peer relationships.

SCHOOL-BASED MEASURES

Well-recognised classroom strategies exist which will help reduce distractions, legitimise time for movement and increase the likelihood of a child following instructions and staying on task. Learning support will be required if there is evidence of specific learning difficulties. Special educational provision will be indicated for a few children who, despite support, are struggling in a mainstream setting. This is usually as a result of associated problems rather than ADHD *per se*.

OCCUPATIONAL THERAPY INPUT

Specialist OT input can be helpful for co-existing fine and gross motor co-ordination difficulties, including problems with handwriting. In addition, OT can provide advice and strategies in dealing with the sensory-seeking behaviours (e.g. fidgeting) present in many children with ADHD.

DIET

For many years, a variety of dietary approaches, usually excluding specific foodstuffs, have been

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advocated in the treatment of ADHD. They may be helpful in a small minority of children, but current evidence does not support establishment of a guideline for dietary treatment. There have been more recent claims that a lack of certain polyunsaturated fatty acids may be linked to learning difficulties and neurodevelopmental disorders, including ADHD. It is a promising area of research, but to date there have been no published long-term randomised controlled trials of fatty acid supplementation. Despite this, many parents give their children omega-3 and omega-6 fatty acid supplements.

KEYPOINTS

- Attention Deficit Hyperactivity Disorder is a common, chronic neurodevelopmental disorder; it is estimated it affects 5% of children and is up to four times more common in boys than in girls. Attention Deficit Hyperactivity Disorder is not medicalised 'bad behaviour' or 'bad parenting'.
- It is a risk factor for a wide range of adverse sequelae, including conduct disorder, academic and occupational underachievement, and poor peer and family relationships.
- There is an increased rate of associated disorders including learning difficulties, developmental co-ordination disorder, anxiety and mood disorders.
- Multimodal assessment and intervention is indicated.
- Treatment should include education of child, family and school about ADHD; behavioural strategies at home and at school, and in most cases, medication.
- Stimulant drugs, methylphenidate and dexamfetamine, are effective in treating core ADHD symptoms in at least two-thirds of correctly diagnosed children, and are relatively safe.
- The more recent development of a non-stimulant drug, atomoxetine, licensed to treat ADHD, has afforded greater choice for parents and clinicians, although most UK specialists would use this as a second line drug.

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