ARTICLE

Principles for managing attention deficit hyperactivity disorder

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SUMMARY

Attention deficit hyperactivity disorder in children is characterised by developmentally excessive symptoms of inattention, impulsiveness and hyperactivity. This disrupts learning, socialisation and family life.

The cause is a complex interaction of biopsychosocial factors. Comorbid mental health problems are common.

General practitioners may detect the problem, but confirmation of the diagnosis requires a specialist psychiatrist or paediatrician. The child's general practitioner then has a vital role in ongoing care.

The children need psychosocial interventions, but if these are ineffective drug treatment can be added. Psychostimulants (dexamphetamine and methylphenidate) are effective first-line drugs.

Introduction

Children and adolescents with attention deficit hyperactivity disorder (ADHD) have significant impairment in their daily life due to developmentally excessive and pervasive, hyperactive, impulsive and inattentive behaviour. Estimates of the prevalence of ADHD vary because of the diagnostic methods and criteria used (DSM-IV-TR[1] was more inclusive than ICD-10[2]), and because of cultural and demographic characteristics. The most recent Australian survey in 2000 found that 11% of 6–17 year-olds had symptoms.[3] The prevalence estimates vary from 1.5% in Europe to 5% in the USA for clinical cases of ADHD in primary school-aged children. In clinic populations ADHD is at least twice as common in boys, but is more likely to persist in girls.

The diagnostic criteria in DSM-IV-TR are essentially unchanged in the new DSM-5.[4] However, in DSM-5 symptoms must start before 12 years of age, not seven years, and only four instead of six symptoms of both inattentiveness and hyperactivity are required for the diagnosis in individuals older than 16 years.

Aetiology

For some children the likely explanation for their symptoms is a condition such as fetal alcohol syndrome, a genetic disorder such as fragile X syndrome, an acquired brain injury, or parental abuse and neglect. For most the explanation is usually more complex and indeterminate.

ADHD results from an interaction of various biological, environmental and social factors.[5] Family heredity is common and is associated with gene variants for specific dopamine and noradrenaline neuroreceptors and structural differences in brain areas such as the frontostriatal cortex. These brain regions are critical for attention, working memory, executive function and the regulation of emotions and behaviour.

Environmental influences such as the effects of maternal alcohol consumption on the fetal brain, malnutrition, food colourings (tartrazine), exposure to lead and the impact of neglect and abuse during infancy have the capacity to adversely affect the developing brain and impair attention and behavioural control. The quality and consistency of formative social, parenting and educational experiences also act to either build resilience or contribute to inattention and hyperactivity.

Comorbidity

The majority of children with ADHD have comorbid mental health problems. Hostile and argumentative behaviour (oppositional defiant disorder) is a challenge in about 30% of children. This is a risk for the subsequent emergence of offending and antisocial behaviour conduct disorder in approximately 3% of older children and adolescents with ADHD.

Around 75% of children with a tic disorder (for example Tourette's disorder) have ADHD symptoms. The emergence or worsening of tics may be an adverse effect of stimulant medication.

Anxiety (generalised, separation, school refusal, social, or obsessive compulsive) is common in about a third of children with ADHD. A similar proportion of older children and adolescents with ADHD also experience depression and irritability that is usually persistent (dysthymia). Suicidal behaviour can be a risk, perhaps exacerbated by impulsiveness.

Neurodevelopmental problems are common and adversely affect learning (spelling, writing, reading and numeracy), motor coordination, and speech and language skills. At least 20% of children with an autism spectrum disorder have problems with inattention, impulsiveness and hyperactivity. Unfortunately, these symptoms of ADHD may be less responsive to stimulant medication and adverse effects are more likely. In DSM-IV-TR, the diagnosis of autistic disorder precluded a diagnosis of ADHD, however in DSM-5 ADHD is recognised as a comorbid diagnosis.

Assessment and diagnosis

General practitioners have a key role to play because they understand the family, community and cultural context. They can review the child again and assess if the difficult behaviour is developmentally excessive. Parents first contact their doctor because of concern about the child's behaviour and the stress this is causing the family. Referral also comes from other professionals such as a maternal and child health nurse, or school psychologist. In addition to a specialist referral and referral to a psychologist and speech pathologist, GPs can link the family with support services and provide information on child development.

General practitioners may suspect a child has ADHD, but the diagnosis should be confirmed by a specialist. It requires a comprehensive assessment of the:

- spectrum of symptoms of inattention, impulsiveness and hyperactivity
- developmental history
- cognitive and learning skills
- physical and mental health
- family and social environment
- cultural context.

This requires the expertise of a child and adolescent psychiatrist or a paediatrician, supported when necessary by assessments from a clinical psychologist or neuropsychologist, a speech pathologist and perhaps an occupational therapist or physiotherapist. In rural areas GPs with training in child development and ADHD can be supported to undertake an assessment during a telemedicine consultation with a specialist.

The diagnosis is based on clinical judgement and the application of DSM-5 (previously DSM-IV TR) or ICD-10 criteria. These are met if the symptoms:

- started before the age of twelve years (seven years in DSM-IV)
- are excessive for the child's developmental level
- persist for at least six months
- are pervasive in more than one setting, and disabling
- are not due to another mental disorder such as an anxiety disorder.

A structured cognitive assessment is invaluable if available, as it defines associated attention and cognitive problems such as impaired short-term auditory memory, intellectual disability, and learning and motor coordination disorders. Information from a variety of settings, using structured parent and teacher questionnaires and perhaps direct observation, as well as a physical and neurological examination puts the symptoms into context.

Treatment guidelines

In 2009 the Royal Australasian College of Physicians developed draft guidelines on ADHD. These were placed on the website of the National Health and Medical Research Council (NHMRC). However, these guidelines were not approved by the NHMRC because some unspecified work of overseas researchers, whose publications were often cited in the draft guidelines, was potentially open to bias due to conflicts of interest.

In the absence of a detailed Australian guideline the NHMRC established an expert working group to prepare clinical practice points as evidence-based, practical advice to Australian clinicians on the assessment and management of children and adolescents with ADHD. The NHMRC approved these clinical practice points in 2012.[6] They complement other more comprehensive clinical guidelines such as those by the National Institute of Clinical Excellence[7], the Scottish Intercollegiate Guidelines Network[8] and the American Academy of Pediatrics[9].

Management

Given the complex interaction of biological, cognitive, family and social factors and comorbid conditions, treatment begins with a comprehensive assessment. This guides the management plan. The management is first focused on parent education and skills training, educational and behaviour management strategies, and treatment of comorbid problems, such as speech therapy for language disorder or cognitive behaviour therapy for anxiety. The GP has a key coordinating role especially if a mental health care plan, allied health care or psychological treatment is required. There is insufficient evidence on the benefits or harms of elimination and supplementary diets, naturopathic and physical activity to recommend their use.[6]

Parental involvement and consultation with others involved in the care of the child – such as teachers, an Aboriginal and Torres Strait Islander education worker or a disability case manager – is essential to facilitate

a consistent and sustained approach to management. If these psychosocial strategies fail, drug treatment is indicated.

Drug treatment

This treatment is usually started by a specialist paediatrician, child psychiatrist or neurologist approved by the relevant Australian State or Territory to prescribe restricted stimulant drugs.

Psychostimulants

Stimulant drugs are usually the first choice. There is consistent evidence that they reduce the symptoms of ADHD, improve cognitive and learning difficulties and improve family and social adjustment in the medium term of up to three years.[10] As yet there is no clear evidence for the longer-term (beyond three years) superiority of stimulant medication compared to behaviour management or to these treatments combined, but children with the best response to any of these treatments have the best long-term outcomes.[10]

Dexamphetamine sulfate and methylphenidate are short acting (2–6 hours) and therefore usually require 2–3 doses each day (see Table)[11]. Modified slow-release forms of methylphenidate are available which smooth out the drug concentration over a longer period of the day and are useful if there is a problem with compliance or stigma with taking a dose at school or adverse effects due to fluctuations in drug concentration. The equivalent dose of a modified form may be more than the combined daily dose of the short-acting form. In the short to medium term (up to three years), drug treatment alone or combined with behavioural treatment is more effective than psychosocial and behavioural treatment alone.

Precautions

Before drug treatment begins, measure weight, height, pulse and blood pressure. An ECG or further cardiovascular investigations can be performed if there is a personal or family history of heart disease.

When treatment begins, weekly monitoring is required as it usually takes several weeks to find the

Table **Psychostimulant drug regimens** [11]

	Action	Daily dose	Monitor
Dexamphetamine sulfate (immediate release)	onset 20–60 minutes duration 3–6 hours	initially 2.5–5 mg after breakfast, titrated weekly give in 2–3 divided doses when dose is above 5 mg (max 20 mg, occasionally 40 mg)	blood pressure pulse height and weight sleep appetite tics mood risk of drug diversion may have more adverse effects than methylphenidate[11]
Methylphenidate (immediate release)	onset 20–60 minutes duration 2–4 hours	initially 5–10 mg after breakfast titrated weekly up to 2 mg/kg/day in 2–3 divided doses (max 40 mg)	blood pressure pulse height and weight sleep appetite tics mood
Methylphenidate (modified release)	onset 20–60 minutes duration 8–12 hours	may require slightly more than the combined daily dose of the immediate form	as for the immediate form discontinue if no benefit seen in one month, as the response may not always be equivalent or better than with the immediate release form
Atomoxetine	benefit develops over 4–6 weeks	children ≤70 kg start with 0.5 mg/kg/day increasing after 3 days to 1.2 mg/kg/day, then if indicated after 2–4 weeks to 1.4 mg/kg/day or 100 mg max, whichever is less children/adults >70 kg start with 40 mg/day then increasing after 3 days to 80 mg/day to a max of 100 mg/day after 2–4 weeks if indicated	pulse blood pressure height and weight mood suicidal ideation* liver function

* See: Atomoxetine and suicidality in children and adolescents. Medicines Safety Update. Aust Prescr 2013;36:166.

optimum dose. Symptom checklists and standardised parent and school reports are robust methods for following the response. The GP is best placed to review the child weekly, then monthly. The specialist reassesses the child every six months and considers the justification for the continuation of treatment or a trial of withdrawal. Other family, school and social problems may require intervention and occasionally the illegal use of the drug by the child or parent (drug diversion) might emerge. If there is no benefit after titration to the maximum tolerable dose then alternative treatments should be considered.

Adverse effects

Common adverse effects to stimulant medication are reduced appetite, nausea, headache and initial insomnia, although insomnia is also a symptom of ADHD. Anxiety, irritability, tics, growth retardation[12] and more rarely palpitations and minor increases in blood pressure and manic excitement might occur. Adverse effects may be more likely in children under seven years of age. For these young children drug treatment should be started at a low dose and frequently reviewed.

Currently there is no evidence of long-term adverse effects. Most of the known adverse effects are reversible and can usually be managed by clinical care and dose adjustment. Delay in growth is likely to attenuate after three years of treatment, but there is a risk of delayed pubertal maturation pointing to the need to use the lowest effective dose and regularly review the justification for stimulant therapy.[12]

Other drugs

Atomoxetine, a selective inhibitor of noradrenaline reuptake, is a second-line treatment. It can be used when tics or anxiety are a problem or when a once-daily dose is necessary. Suicidal thinking and liver disease are potential adverse effects which require monitoring.

Clonidine is a third-line treatment which reduces hyperactivity and impulsiveness more than inattention. It is given at a low dose that avoids sedation and hypotension, usually as a single or twice-daily dose of 50–100 microgram.[13] Antipsychotic drugs such as risperidone do not have an evidence-based role in the treatment of ADHD. They are used to treat aggression and mood instability, particularly in young people with both ADHD and neurodevelopmental disorders such as autism.

Prognosis

Given the developmental nature of ADHD symptoms, regular review by the GP supported by the specialist is required to help the child move through the transitions of childhood and adolescence into young adult life. The best outcomes occur when there is a working relationship with the child, the parents and others such as teachers, which takes account of the community and cultural context.

With brain maturation the prevalence of ADHD symptoms reduces through adolescence. However, young people with ADHD symptoms, particularly of inattention, and associated learning difficulties and problems with mental health are more likely to experience persistent difficulties with relationships and employment and offending behaviour in adult life.

Bruce Tonge was the chair of the National Health and Medical Research Council Expert Working Group which produced the Clinical practice points on the diagnosis, assessment and management of attention deficit hyperactivity disorder.[6]

Q:

SELF-TEST QUESTIONS

True or false?

7. The symptoms of attention deficit hyperactivity disorder begin before the age of 12 years.

8. Risperidone is an effective treatment for attention deficit hyperactivity disorder.

Answers on page 179

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