Australian Government
National Health and Medical Research Council

NHMRC

CLINICAL PRACTICE POINTS ON THE DIAGNOSIS, ASSESSMENT AND MANAGEMENT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN CHILDREN AND ADOLESCENTS

WORKING TO BUILD A HEALTHY AUSTRALIA

ISBN Online: 1864965622

These Clinical Practice Points (CCPs) were issued by the Chief Executive Officer of the National Health and Medical Research Council (NHMRC) on 3 September 2012. This approval is valid for a period of five (5) years at which time the document should be reviewed and revised.

Funding
The development of this document was funded by NHMRC.

Suggested citation
National Health and Medical Research Council (2012). *Clinical Practice Points on the diagnosis, assessment and management of Attention Deficit Hyperactivity Disorder in children and adolescents*. Commonwealth of Australia.

Acknowledgements
Special thanks and acknowledgment are due to the members of the ADHD Expert Working Group for their generous donation of time, their technical advice and ongoing commitment to the project.

Professor Bruce Tonge (Chair)
Professor Vicki Anderson
Professor Kim Cornish
Professor Mark Dadds
Dr John Dowden
Professor Jon Jureidini
Professor Michael Kohn
Professor Helen Milroy
Associate Professor Nicole Rinehart
Ms Margaret Vikingur

NHMRC
Ms Cathy Connor
Ms Tanja Farmer
Ms Melissa Lawrance

Disclaimer
These CPPs are designed to provide general guidance to appropriate practice, to be followed subject to the clinician's judgement and patient's preference in each individual case. Each individual case requires due consideration of the child's developmental stage and maturity, and consultation with their parents/carers and the multidisciplinary team involved.

These CPPs are based on expert consensus and their consideration of literature at the time of publication. The Commonwealth does not accept any legal liability or responsibility for any loss or damages incurred by the reliance on, or interpretation of, information contained in this guide.

To obtain information regarding NHMRC publications contact:

Email: nhmrc.publications@nhmrc.gov.au

Phone: Toll free 13 000 NHMRC (13 000 64672) or call (02) 6217 9000

Website: www.nhmrc.gov.au

NHMRC Publication reference: MH26

Published: 3 September 2012

Contents

Introduction

These *Clinical Practice Points on the Diagnosis, Assessment and Management of Attention Deficit Hyperactivity Disorder* (the CPPs) have been developed to guide health professionals in the diagnosis, assessment and management of clinically significant symptoms of inattention, impulsivity and hyperactivity known as Attention Deficit Hyperactivity Disorder (ADHD) in children and adolescents.

If you have ADHD, or are a family member or friend seeking advice about the issues discussed in this guidance, please refer to your general practitioner or specialist. Support groups may offer assistance for some people and additional information is available on NHMRC's website at **http://www.nhmrc.gov.au/guidelines/publications/ch54**.

Who are these CPPs for?

These CPPs were developed to assist general practitioners (GPs), paediatricians (including paediatric neurologists), child/adolescent psychiatrists, clinical and neuro-psychologists, allied health professionals and special educators in decision-making and coordination of care when working with children and adolescents with ADHD.

Purpose and scope

Under the guidance of an Expert Working Group, NHMRC developed these CPPs using the process outlined in Appendix C.

The CPPs are designed to provide succinct, simple, and practical guidance to health professionals. They contain practice points based on the consensus of members of the Expert Working Group on what constitutes good practice. These CPPs aim to clarify best practice on the assessment, diagnosis and appropriate management of clinically significant symptoms of inattention, impulsivity and hyperactivity (ADHD) faced by children and adolescents (up to 18 years).

In terms of management, interventions addressing ADHD symptoms are the focus of these CPPs rather than specific treatment of any underlying problems or associated comorbid conditions such as anxiety. In regards to the section on pharmacological management, these CPPs are restricted to the use of stimulants. It is beyond the scope of this review to compare the different types or forms of stimulants.

These CPPs have been developed to complement, not replace, existing guidelines, institutional policies and procedures in this area, such as *Therapeutic Guidelines*: *Psychotropic*[1], NICE Clinical Guideline 72[2], SIGN Clinical Guideline 112[3] and the American Academy of Paediatrics Clinical Practice Guideline.[4 i]

The guidance has been developed for Australian practice, but its application will be subject to local and professional protocols.

i The *Draft Australian Guidelines on Attention Deficit Hyperactivity Disorder* (Royal Australasian College of Physicians, 2009), are not approved by NHMRC, as the Council of NHMRCS could not determine whether undisclosed sponsorship may have affected the findings of a large number of publications relied on for the Draft Guidelines. This was a result of Professor Joseph Biederman and Drs. Thomas Spencer and Timothy Wilens failing to report their industry-sponsored activities and subsequently violating certain requirements of their organisations' conflict of interest policies. While Harvard Medical School and Massachusetts General Hospital have completed their investigations and the researchers have been sanctioned, the extent to which the conflicts may have impacted on the integrity of the research remains unknown. Other professional organisations will determine their own response to the investigation's findings.

Differences in parenting styles, acceptance of behaviour, cultural phenomenology and exposure to trauma and adverse life circumstances may impact on the more general advice within this guidance and may be particularly relevant in Aboriginal and Torres Strait Islander children and other cultural groups. Additional considerations are required for specific populations such as children/adolescents with intellectual disabilities, acquired brain injuries, other mental health conditions that are primary to ADHD (such as autistic disorder), or who are abusing substances or have been traumatised, in which case the provision of detailed guidance is beyond the scope of these CPPs.

Summary of Key Practice Points

Diagnosis

- The DSM-IV or ICD10 criteria must be met for a diagnosis of ADHD to occur.
- This requires that the symptoms of hyperactive, impulsive and inattentive behaviour must be deemed by a *specialist clinician* (refer to Appendix B) to:
  - have had their onset in early childhood (before age seven)
  - be maladaptive and excessive for the child/adolescent's age and developmental level
  - have persisted over time (at least six months)
  - be evident in more than one setting
  - have caused significant functional impairment
  - have no better alternative explanation, such as another mental disorder.
- The process leading to diagnosis of ADHD should also include a physical examination, and a holistic assessment of the individual's needs, family, social and educational circumstances and coexisting conditions.
- Information should be gathered from multiple sources, particularly the child/adolescent's school.
- Diagnosis in young children (under 7 years) should be made by a specialist clinician who observes the child over several months and reviews them as they start school.

Assessment and case formulation

- ADHD is a description rather than an explanation of a pervasive, persistent, disabling pattern of inattentiveness, overactivity and/or impulsivity. A child/adolescent who meets diagnostic criteria for ADHD may not be always best served by making that diagnosis. For example, their behaviour could be understood as a reaction to specific cognitive difficulties or family/environmental circumstances.
- Assessment requires establishing evidence of impairment across multiple settings, via gathering information from multiple informants including the child/adolescent, health professionals, parents/carers and teachers.
- GPs may carry out the initial assessment. If, on the basis of this assessment it is suspected that a child/adolescent has ADHD and/or has behavioural, emotional or cognitive symptoms causing significant and persistent impairment to them, the family or at school, the GP can provide information and referral to a specialist clinician and parent training/education or support programmes for the family (this can precede a formal diagnosis of ADHD).
- Thorough assessment for possible ADHD requires a specialist clinician to consider:
  - a comprehensive medical, developmental and mental health assessment of the child/adolescent
  - a psychosocial assessment of the child/adolescent and their family (refer to 3.2)
  - a cultural and social assessment of the meaning and significance of the behaviours
  - seeking out available explanations for the presentation, including but not restricted to alternative medical diagnoses (refer to 1.4)
  - whether the symptoms are developmentally excessive for the child's developmental age and associated expectations
  - any comorbid diagnosis.
- If indicated (based on the assessments above), additional assessment may be required. In this circumstance, the specialist clinician should consider:
  - a cognitive and behavioural assessment (refer to 3.2)
  - allied health and educational assessments
  - the assistance of a cultural interpreter or Aboriginal and Torres Strait Islander health worker.

General principles of management

- A holistic and child-centered approach is recommended in the management of ADHD in children/adolescents.
- The initial program of management should be that deemed most appropriate by the clinician, as informed by the findings of a comprehensive assessment and after discussion with the patient and family of all treatment options. This may include psychological, pharmacological or educational interventions used alone or in combination.
- An effective management plan will usually include input from a range of clinicians and service providers, including teachers, and the parents/carers as active partners.
- In formulating an individualised management plan, a specialist clinician should consider:
  - the best available explanation for the child/adolescent's presentation and specific interventions for issues that might underpin the presentation
  - the severity of ADHD symptoms and the level of subsequent impairment across multiple settings
  - the child/adolescent's overall health and associated problems
  - comorbid disorders that may require specific treatment strategies
  - the family's resources and their capacity to adhere to the plan.
- Parents/carers must be given information on the diagnosis and management plan, including any potential adverse effects of treatment.
- Ongoing monitoring and review is advised to ensure the child/adolescents management plan is appropriate for their current symptoms and family, social and cultural circumstances and should include information from multiple sources (including parents/carers, and teachers).
- GPs have an important role in providing surveillance and support for children/adolescents with ADHD and/or may oversee their mental health care plan (refer to 4.2).

Psychological management

- Where indicated, young children (under 7 years) and school age children diagnosed with ADHD, and their families, may benefit from evidence-based psychological interventions that have demonstrated effectiveness for associated mental health problems. Such interventions can improve outcomes for internalising (emotional) and externalising (behavioural) symptoms. Not all psychological approaches have an evidence base, and only those where this is the case should be implemented.
- In prioritising intervention and management, consideration should be given to the ability of the child/adolescent and their parents/carers to implement strategies. These interventions may be impractical for families due to time demands and cost associated with them or may not be locally available particularly in some rural areas.
- In adolescents diagnosed with ADHD cognitive behavioural therapy may improve internalising symptoms.
- The acceptability and the effectiveness of these interventions should be monitored including following up the child after the psychological treatment has finished and providing relapse prevention booster sessions if indicated.

Pharmacological management

- Use of stimulant medications (methylphenidate and dexamphetamine sulphate) can reduce core ADHD symptoms and improve social skills and peer relations in children and adolescents diagnosed with ADHD in the short term (up to 3 years).
- Not all children and adolescents with ADHD will require, or benefit from, pharmacological management. The use of clinical judgement is required to evaluate the harms versus benefits of stimulant use for each individual case upon discussion with the child/adolescent and their family.
- If medication is to be used in management, stimulants are presently the first line of treatment.
- If pharmacological treatment is implemented, it should be based on a comprehensive assessment under the direction of a paediatrician (including a paediatric neurologist), or child/adolescent psychiatrist.
- Before prescribing stimulants to a child/adolescent diagnosed with ADHD, the clinician should consider:
  - baseline physical assessment data, including, as a minimum, pulse, blood pressure, weight and height. Change in weight and height should be followed over time using centile charts. If there are any abnormal symptoms, findings or history regarding cardiovascular status, appropriate investigation and referral should be organised
  - the specific needs and expressed preferences of the child/adolescent, and the circumstances of their family and culture
  - underlying or associated psychosocial problems, educational difficulties, cognitive profile and/or comorbid conditions
  - potential short-term benefits
  - likelihood of compliance
  - potential harms, allergies, adverse effects and contraindications, including diversion of medications for misuse and abuse
  - duration of treatment and signals to stop treatment
  - schedule for follow-up, monitoring and review.
- These factors, as well as the risks and benefits of medication and what to do if they have concerns about treatment, need to be directly discussed with the child/adolescent and their parents/carers. Following this discussion, if drug treatment is not accepted by the child/adolescent or their parent/carers, alternatives such as those indicated at 4.3 should be discussed if this has not already been done.
- If the maximum dose (after titration) has been reached and feedback from parents/carers (and if possible teachers), suggest that there is no significant improvement after a month of treatment, then alternative treatments should be considered.
- The optimal dose of stimulant medication can be titrated against clinical benefit and may be prescribed in various forms of the medications, including: immediate release, extended release or both.
- When stimulant treatment is used it should only be continued if there is demonstrated benefit in the absence of unacceptable side effects.
- If medication is stopped, regular assessments are needed to assess the child/adolescent's responses across multiple settings.
- Children/adolescents on stimulant medication require 3-6 monthly clinical assessment and review to ensure the management strategies remain appropriate and effective. Monitoring should include assessment of side effects and particularly psychological symptoms and plotting of growth parameters, pubertal development, heart rate and blood pressure.
- If it is indicated that a child/adolescent no longer requires stimulant medication, then the clinician should discuss trialling such a period off medication with the child/adolescent and their parents/carers and teachers. This trial should last at least several weeks and begin at an appropriate time.
- Consideration of the changing needs of patients with ADHD as they transition through school and into adult life is imperative to the provision of optimal clinical care.

- For young children (under 7 years) psychological, environmental and family interventions should, if possible, be trialed and evaluated before initiating pharmacological treatment. If all these other interventions have not been effective then stimulants might be considered for this age group in consultation with the parents or guardians and including when appropriate teachers or other carers.
- If medication is prescribed for young children (under 7 years), it should be started with a low dose and regularly monitored; for example, initially weekly by the GP in consultation with the specialist to assess improvements and the presentation of any adverse effects, then every 2-3 months if benefits from medication have been demonstrated.

Educational management

- In terms of improving behavioural and academic outcomes, children/adolescents may benefit from individually tailored modifications to the educational setting and curriculum, as informed by the overall case formulation. These modifications could include classroom based approaches that restructure how information is presented to students with ADHD and should form part of an individual education plan for the child (or its equivalent), at their school.

1. Preamble

1.1 What are the core symptoms?

ADHD in children and adolescents is characterised by excessive levels of hyperactive, impulsive and inattentive behaviour. Not all children and adolescents diagnosed with ADHD will function abnormally in all three domains. Some children/adolescents are predominantly hyperactive and impulsive, while others are mainly inattentive.[5]

All children and adolescents can display active, impulsive and inattentive behaviour as part of normal development. This does not mean that they have a disorder, and important controversies exist about the use of ADHD as a diagnosis for children and adolescents. Current systems, such as DSM-IV-TR, specify the criteria for diagnosing ADHD including that there is clear evidence of clinically significant impairment in social and school functioning (refer to criteria at 2.1). A diagnosis of ADHD should only be made after a comprehensive assessment and not be made solely on the basis of using a rating scale.

1.2 What causes ADHD?

There is no one single known cause of ADHD and there is continuing debate over the interplay of genetic, environmental and social factors.

Heredity, genetic, neuro-imaging and neuro-psychological studies provide evidence for a biological basis for inattention and impulsiveness.[6-8] It is likely that this biological underpinning interacts with environmental and social factors. For example, heavy alcohol consumption in the early months of pregnancy is associated with an increased risk of foetal alcohol spectrum disorder in offspring. In addition to the alcohol consumption, the presence of foetal gene variants coding for specific neuro-receptors, can further increase the risk of an adverse ADHD behavioural outcome in the infant.[9]

Environmental events also can impact on the development of these patterns of inattentive and impulsive behaviour in the same manner that formative/learning experiences have the capacity to alter the structure and function of the developing brain. The timing of these environmental influences may also determine the degree and particular functions that will be affected.[10]

1.3 Does the presentation vary with age and over time?

Yes. There is general consensus that attention and motor activity sit on a spectrum.[5] Gender, age, developmental stage and the social and cultural environment play a role in determining a child/adolescent's place on the spectrum.[5]

The behavioural and cognitive manifestations of attentional difficulties change over time, from the pre-school years all the way through to adulthood. Therefore, ADHD symptoms seen in early childhood may not necessarily remain at the same intensity in adolescence.[11] For example, hyperactive behaviour can lessen or disappear later in life, whereas inattentive behaviour tends to be more constant across development.[12]

1.4 Are there a variety of explanations for hyperactive, inattentive and impulsive behaviours?

Yes. Symptoms of ADHD can have a variety of explanations. Children and adolescents who experience traumatic family environments (e.g. abuse, neglect, substance abuse, domestic violence, parental mental or chronic illness), or have an acquired brain injury, perinatal brain damage (e.g. fetal alcohol syndrome) or a genetic developmental disorder (e.g. fragile X syndrome, neurofibromatosis) may present with ADHD symptoms. If the cause or underlying contributing factors can be determined then this might offer specific opportunities for intervention. In other cases no clear explanation can be found for ADHD symptoms.

Regardless of whether the cause is explicable or not these symptoms impact so adversely on the child or adolescent and their family that the symptoms cannot be left untreated.

It is rare that symptoms of ADHD occur in isolation. In the assessment of a child/adolescent with ADHD the specialist clinician should assess for other psychological, social, emotional and behavioural difficulties that might coexist with ADHD (comorbidities).

A careful assessment of differential diagnoses should also be undertaken at the time of assessment to ensure that disorders that produce behaviours similar to those of ADHD are considered.

The ability to accurately diagnose ADHD requires clinical training and experience and hence should be made by a specialist paediatrician, child/adolescent psychiatrist or clinical or neuro-psychologist supported when necessary by other allied health clinicians.

1.5 How common is ADHD?

International studies based on DSM-IV criteria clinical assessment provide point prevalence figures for ADHD of around 5-7%.[13-14] There is a lack of recent Australian data on the prevalence of ADHD among children aged 6–14 years.[15] Estimates of the prevalence of ADHD vary widely according to the diagnostic criteria, measures used, ascertainment methods, and the cultural characteristics and demographics of the population sampled.[13] Data from 2000 indicates the prevalence rate of ADHD symptoms among 6–17 year-olds in Australia is around 11%.[16] This rate is based on primary caregivers' screening questionnaire assessments of their child's emotional and behavioural problems, rather than a diagnosis of ADHD made by a clinician based on an assessment of functional impairment.

The two main diagnostic manuals currently used in Australia are the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (Text Revision) (DSM-IV-TR) and the International Statistical Classification of Diseases, 10th revision (ICD-10). The ICD-10 criteria for diagnosis are more restrictive than the DSM-IV criteria, meaning application of ICD-10 results in fewer patients being diagnosed with ADHD.[17]

In referred populations most studies have found that the childhood prevalence of ADHD is higher in males than females[18], but is more likely to reduce over time in males while in females it tends to remain stable into adulthood.[19]

1.6 Prognosis

Although these CPPs concern the assessment and management of children and adolescents with ADHD, many children/adolescents diagnosed with ADHD will retain some ADHD symptoms or associated mental health problems into adolescence and adulthood[20,21] that are likely to cause impairment and require treatment.

ADHD is associated with a range of adverse outcomes including educational[22], social, emotional and behavioural problems during childhood, and subsequent mental health, relationship, occupational, substance abuse antisocial, and offending problems in adult life.[21,23-24] The flow-on effects of ADHD can have a significant impact on families, schools, workplaces and the community.

While interventions can reduce the core symptoms of ADHD in the short-term, the effect of medication and behavioural or educational interventions on long-term outcomes such as academic and social and emotional outcomes, has not been established and requires further study.[21,25-29]

2. Diagnosis

2.1 Criteria for diagnosis

'ADHD' is a description, rather than an explanation of, a pervasive, persistent, disabling pattern of inattentiveness, overactivity and/or impulsivity.

Only after appropriate assessment by a specialist clinician can a child/adolescent be diagnosed with ADHD. The diagnosis of ADHD is a clinical judgment based on the application of the DSM-IV[ii] or the ICD-10, where it is defined as hyperkinetic disorder. ICD-10 uses a narrower diagnostic category, meaning more severe symptoms and impairment are required to meet a diagnosis.[17]

The DSM-IV or ICD10 criteria must be met for a diagnosis of ADHD to occur. This requires that the symptoms of hyperactive, impulsive and inattentive behaviour must be deemed by a specialist clinician to:

- have had their onset in early childhood (before age seven)
- be maladaptive and excessive for the child/adolescent's age and developmental level
- have persisted over time (at least six months)
- be evident in more than one setting (e.g. at home, at school, socially)
- cause significant functional impairment
- have no obvious alternative explanation, such as another mental disorder.[30-31]

The process leading to diagnosis of ADHD should also include a physical examination, and a holistic assessment of the individual's needs, family, social and educational circumstances and coexisting conditions. Clinical thresholds can be influenced by social and cultural factors[32] making it important to consider each child/adolescent's level of functioning relative to their usual social and cultural environment. Information should be gathered from multiple sources, particularly the child/adolescent's school. Children who are the youngest in their grades are more likely to be diagnosed with ADHD and be prescribed medication for the condition than their peers born earlier in the same year.[33]

The risk of not making a diagnosis is that the child/adolescent may not receive appropriate management and care.

2.2 Subtypes of ADHD

Three sub-types of ADHD are identified: inattentive, hyperactive and combined. While diagnosis is based on symptom predominance, meeting criteria for one subtype, e.g., inattentive subtype, does not preclude the presence of some symptoms from another subtype, e.g. hyperactive symptoms. The inattentive type may not present until secondary school when there are increased demands for organisation and independent study.

Boys are more likely to meet the diagnostic criteria for hyperactivity-impulsive type[34], and tend to have higher levels of disruptive behavioural disorders than females.[35] Although there is speculation that girls may display more inattentive symptoms than boys, this difference has not been found to be statistically significant.[35] The causes of these gender differences are unclear but an interaction between biological, psychological and social factors is likely.

ii DSM-IV criteria are under review for the development of DSM-V, but these changes will not be available until after the publication of the CPPs. If and when this occurs NHMRC may consider revising the CPPs.

2.3 Can young children (under 7 years) be diagnosed with ADHD?

Yes. The diagnostic criteria require that the symptoms are developmentally excessive and therefore a full understanding of the child's developmental age and associated expectations is critical in the diagnosis.

Significant caution is needed in diagnosing young children as the core ADHD symptoms may be normal for children in this development stage, making it difficult to distinguish an impairment from normal developmental expectations.[36] ADHD symptoms may become less prominent when children start school in response to a more structured social and learning environment. Therefore, diagnosis may not be reliable until the child has had at least one year in school which allows time to assess how they manage the transition into school and settle into this new environment.[37]

3. Assessment and case formulation

Assessment requires establishing evidence of impairment across multiple settings, via gathering information from multiple informants including the child/adolescent, health professions, parents/carers and teachers.

The underpinning goal of assessment is to give the child/adolescent every opportunity to obtain the correct diagnosis and information to inform and guide an individualised management plan detailing the need for further assessment and appropriate interventions. The clinician should always be mindful of seeking a more meaningful explanation of the child/adolescent's behaviour than simply labelling it as ADHD because it meets diagnostic criteria.

3.1 Initial assessment

A child/adolescent will often present to a general practitioner as the first point of call. In addition to an assessment of the child/adolescent's physical health, important information can be obtained at this stage which may suggest the need for specialist referral. GPs involved in carrying out the initial assessment need to assess when the child/adolescent's challenging behaviour is different from developmentally and culturally appropriate behaviour and is causing significant impairment, especially as the child/adolescent may not exhibit the behaviour causing concern in front of the GP. An advantage of general practice is that the GP can ask to see the child/adolescent again.

If, on the basis of initial assessment: it is suspected that a child/adolescent has ADHD; and/or the child/adolescent has behavioural, emotional or cognitive symptoms causing significant and persistent impairment to them, the family or at school, the GP should make a referral to a specialist clinician and offer parents/carers a referral to a parent training/education programme (this can precede a formal diagnosis of ADHD).

GPs should not make the initial diagnosis or start drug treatment in children/adolescents with suspected ADHD.

GPs can explain and give information about ADHD to the child/adolescent and their family. As GPs are likely to see other members of the family, they also need to be alert for any stress and/or impairment in parents/carers so that they can offer advice or provide a referral to local family support services and groups.

3.2 Specialist assessment

If indicated (based on the assessments above), additional assessment may be required by a specialist clinician. This may involve:

- a comprehensive medical, developmental and mental health assessment of the child/adolescent
- a psychosocial assessment of the child/adolescent and their family, including parent/carer/family interview comprising of:
  - family context including genogram
  - family assessment
  - detailed analysis of the presenting behaviour
  - appraisal of the child/adolescent's functioning including academic and cognitive status and peer relationships (if possible this should be documented by cognitive assessment, school reports and observations of the child/ adolescent at school)
  - assessment of the child/adolescent's mental state and regulation of emotions

- a cultural and social assessment of the meaning and significance of the behaviours. This may require advice from a cultural consultant such as a local indigenous community elder or Aboriginal or Torres Strait Islander health or mental health worker to assist with communication, translation and assessment
- seeking out available explanations for the presentation, including but not restricted to alternative medical diagnoses (refer to 1.4)
- whether the symptoms are developmentally excessive for the child's developmental age and associated expectations
- identifying any comorbid diagnoses.

If indicated (based on the assessments above), additional assessment may be required. In this circumstance, the specialist clinician should consider:

- a cognitive and behavioural assessment, if this has not already been done, using age-appropriate, psychometrically sound tools or other more detailed assessments measuring: aspects of attention, working memory, executive functioning, processing speed and associated learning deficits
- allied health and educational assessments, e.g. to assess for specific cognitive and learning deficits as well as speech and language and motor coordination difficulties
- the assistance of a cultural interpreter or Aboriginal and Torres Strait Islander health worker.

Special consideration is necessary in rural and remote areas where access to specialist services is limited or unavailable. In these situations, GPs with paediatric training and training in assessment of emotional and behavioural problems in children/adolescents should be able to screen and follow-up, particularly when some form of consultation with a specialist clinician is possible, for example by telemedicine.

3.3 Why is a thorough assessment important?

A comprehensive assessment of the presentation of symptoms in consultation with parents/ carers and teachers is essential to inform an individualised management plan that addresses the specific needs of the child/adolescent and is appropriate to their family and cultural context, resources and capacity to adhere to the plan.

For example, including a cognitive assessment when indicated may highlight cognitive issues such as those seen in children/adolescents with intellectual disability or with exceptional cognitive abilities, in which the diagnosis can be overlooked and which can complicate ADHD symptoms and require special management. Children/adolescents with ADHD may have other mental health problems, such as depression, which may be associated with an increased risk of suicidal ideation.[38] Conducting a mental health assessment, where indicated, can detect mental health problems and inform appropriate management.

4. Management

While there are no specific treatments to 'cure' ADHD, there are evidence-based interventions that can improve core symptoms of ADHD (inattention, hyperactivity and impulsivity), might ameliorate some of the biological features of ADHD[39], and assist in managing the child/adolescent's associated problems as well as build on their strengths. Interventions addressing ADHD symptoms will be the focus of these CPPs rather than specific treatment of any underlying problems or associated comorbid conditions such as anxiety.

The initial program of management should be that deemed most appropriate by the clinician, as informed by the findings of a comprehensive assessment and after discussion with the patient and family of all treatment options. It might be a psychosocial treatment alone initially, or it might include medication if justified by the assessment. It should be noted that psychosocial treatments and educational approaches for ADHD rely on parents/carers and teachers to implement them consistently.[40] For Aboriginal and Torres Strait Islander children/adolescents, assistance may be sought from the Aboriginal and Torres Strait Islander education workers.

4.1 General principles of management

An effective management plan needs to be child centered and give consideration to family and family context. The clinician must try to make sense of the child/adolescent's problems and understand all aspects of the child/adolescent's world.

An effective management plan will usually include input from a range of clinicians and service providers, including teachers, and the parents/carers as active partners.

In formulating an individualised management plan, a specialist clinician should consider:

- the best available explanation for the child/adolescent's presentation and specific interventions for issues that might underpin the presentation, for example, language disorder, maltreatment[iii]
- the severity of ADHD symptoms and the level of subsequent impairment across multiple settings (e.g. academic performance, self-esteem, personal distress from the symptoms, social interactions and relationships, behavioural problems)
- the child/adolescent's overall health and associated problems (e.g. learning difficulties, peer relationships, low self-esteem and family problems)
- comorbid disorders that may require specific treatment strategies
- the family's resources and their capacity to adhere to the plan.

It is important to determine which condition is impacting most severely on the child/ adolescent's life. The one with the greatest negative effects must be addressed first and sometimes might even obviate the need for further intervention.

Parents/carers must be given information on the diagnosis and management plan, including any potential adverse effects of treatment in order to fully inform them and to have them make a decision regarding the treatment that is offered to their child.

ADHD symptoms can persist throughout life, although the symptom profile might change, therefore some young people may need ongoing monitoring into adult life. Ongoing monitoring and review ensures the child/adolescents management plan is appropriate for their current symptoms and family, social and cultural circumstances. Assessment of response to treatment and periodic review of progress is facilitated by the use of questionnaires from parents/carers, teachers and if possible the child/adolescent using psychometrically sound, evidence-based checklists such as the Conners' ADHD/DSM-IV Scales (CADS).[41]

iii Where maltreatment is suspected, usual child protection protocols should be followed.

Frequency of review will depend on age, stage of development, transition periods (e.g. from primary to secondary school and school to employment), type, stage and complexity of treatment, educational and family factors. Such a review should include information from multiple sources (including parents/carers, and teachers) and include an evaluation of any reported deterioration in symptoms or behaviours.

4.2 What is the GP's role in management?

GPs and community healthcare workers have a key role in recognising when a child/ adolescent's behaviour signals that things are not right in their life. If the severity of the child/ adolescent's behavioural problems suggests ADHD, then referral is recommended to confirm the diagnosis.

While management of ADHD is uncommon in general practice[42], families are likely to consult their GPs several times a year, meaning the GP has an important role in providing surveillance and support for the child/adolescent and/or may oversee the child/adolescent's mental health care plan. These roles include:

- detecting and discussing problems that the child/adolescent and their family and carers are experiencing
- being a useful source of information for the specialist/s regarding the family history
- offering continuity of care to the child/adolescent over a number of years, e.g. reinforcing the advice given by specialist services
- assisting adolescents in the transition to adulthood, when paediatric services may be withdrawn
- encouraging adherence to treatment
- offering support to other members of the family, which may include referral to local support groups
- assessing the child/adolescent's response to treatment
- monitoring for adverse effects of treatment and prompting a review of the diagnosis if progress is not satisfactory
- preparing a GP Management Plan, preferably a GP Mental Health Treatment Plan, when appropriate
- participating in school-based case conferences.

There are models for the shared care of patients with ADHD. These require good communication between primary and specialist care.

4.3 Psychological management

ADHD symptoms can be challenging for parents/carers and the parent–child relationship may be affected. Parents of children with ADHD often face increased levels of stress, low parenting self-efficacy, low self-esteem, marital discord and depression. They may develop maladaptive and counterproductive parenting strategies that serve to maintain their child's existing behavioural difficulties or even exacerbate them.[43-44] Practical supports for families, such as respite care, parenting education and guidance and counselling, may be helpful or even a sufficient intervention perhaps obviating the need for specific treatment and psychological management of the child. These family interventions may be impractical for families due to time demands and cost associated with them or may not be locally available particularly in some rural areas but the increasing availability of on-line family education and skills training programs help to address these barriers to services.

Psychological treatment and social/educational management for children/adolescents with ADHD symptoms should be based on the current assessment and case formulation. The approach to management centres around understanding why the child/adolescent presents in this way at this time and seeks to alter those circumstances, whether they be internal (e.g. language disorder, deafness) or external (e.g. family conflict).

For children and adolescents of Aboriginal and Torres Strait Islander background, further consultation about what intervention and management options are appropriate, can be provided by a cultural interpreter/ consultant, Aboriginal mental health worker, or Elder.

The acceptability and the effectiveness of psychological interventions should be monitored including following up the child after the psychological treatment has finished and providing relapse prevention booster sessions if indicated.

4.3.1 Young (under 7 years) and school aged (6-12 years) children

Where indicated, young and school aged children diagnosed with ADHD, and their families, may benefit from psychological interventions that have demonstrated effectiveness for associated mental health problems. Such interventions can improve outcomes for internalising (emotional) and externalising (behavioural) symptoms, and include:

- behaviour modification, particularly parent-administered behavioural training that provides parents with parenting skills to meet the additional parenting needs of children with ADHD symptoms[3,7,45-47]
- instruction in the implementation of behaviour modification techniques[48]
- family therapy[40,49-51]
- cognitive behavioural therapy (CBT). However, there is little evidence that CBT is effective for young children (under 7 years) who may lack the cognitive skills to benefit from it.[52]

Not all psychological approaches have an evidence base, and only those where this is the case should be implemented.

4.3.2 Adolescents

In adolescents with ADHD:

- the evidence base for parent-based psychological interventions is substantially weaker than in younger children.[45,49] This may be partly explained by the complexity of this developmental stage, e.g. less parental supervision and involvement, and increasing academic demands, peer pressure and opportunities to engage in risky behaviour[52]
- there is little evidence to support or refute social skills training[53]
- CBT has demonstrated effectiveness in improving internalising symptoms (e.g. reducing anxiety[40] and depression[54]).

4.3.3 Aboriginal and Torres Strait Islander children and adolescents

There is scant evidence for psychosocial interventions in Aboriginal and Torres Strait Islander communities. The evidence that is available suggests that parent-training programs that have been culturally tailored to Aboriginal and Torres Strait Islander communities (e.g. a variation of the Group Triple P) are culturally acceptable and can have positive outcomes in terms of reducing children's challenging behaviours and parent's reliance on some dysfunctional parenting practices.[55-56]

4.4 Pharmacological management

The scope of these CPPs is limited to the use of stimulants that have been approved by the Therapeutic Goods Administration for management of ADHD symptoms in children.[iv] In the absence of another diagnosis, neuroleptics (anti-psychotics) have no role in the treatment of ADHD. They may have a limited role in the symptomatic management of behaviour problems with other causes, but this should only be as part of a management plan initiated by a specialist paediatrician with expertise in child and adolescent mental health, or child/adolescent psychiatrist.

In Australia, two stimulant medications are registered: methylphenidate and dexamphetamine sulfate. These stimulants are available in short-acting/immediate-release forms (e.g. Ritalin 10) and long-acting/extended-release forms (e.g. Ritalin LA, Concerta). It is beyond the scope of this review to compare the different types or forms of stimulants.

There is evidence showing that the use of stimulant medications can reduce core ADHD symptoms and improve social skills and peer relations in children and adolescents diagnosed with ADHD in the short term (up to 3 years).[57-61] It is plausible that improvements in symptoms and the child's adaptive behaviour

iv Non stimulant medications, such as atomoxetine (Strattera®) are not discussed in the CPPs and require management by a specialist in compliance with the Pharmaceutical Benefits Scheme (PBS) regulations. They are discussed in other documents such as the *Therapeutic Guidelines: Psychotropic*[1] NICE Clinical Guideline[2] and SIGN Clinical Guideline.[3]

and learning in response to pharmacological treatment may create opportunities at school and home, and change experiences from being developmentally destructive to ones that promote development. There is no unequivocal evidence of long-term benefit in these parameters.

Both medication and combined medication and behavioural treatment have been shown to be more effective in treating ADHD symptoms than psychosocial or behavioural interventions alone.[56]

Not all children/adolescents with ADHD require pharmacological management. The use of clinical judgement is required to evaluate the harms versus benefits of stimulant use for each individual case upon discussion with the child/adolescent and their family.

Evidence of the long-term benefit of psychostimulant treatment on ADHD symptoms is not established.[55,62-64] There appears to be some long-term benefits of stimulants in improving ADHD symptoms and academic outcomes in children diagnosed with ADHD, compared to those not treated[25,56], but how these outcomes compare to those following behaviour training or educational interventions is not clear and further research is required.[26-27] Challenges in examining longer-term effects are that treatment continuity is uncontrolled and that there may be multiple co-interventions offered in home, school, and clinic settings.

4.4.1 What factors should be considered before a child/adolescent starts taking stimulant medication?

If pharmacological treatment is implemented, it should be based on a comprehensive assessment under the direction of a paediatrician (including a paediatric neurologist), or child/adolescent psychiatrist.[v] Methylphenidate and dexamphetamine are Schedule 8 controlled drugs for which particular prescribing restrictions apply in most Australian States and Territories.[vi]

Prescribers should be familiar with the pharmacokinetic profiles of all preparations available before prescribing and ensure that treatment and dosage are tailored effectively to the individual needs of the child/adolescent.[2]

Before prescribing stimulants to a child/adolescent diagnosed with ADHD, the clinician should consider:

- baseline physical assessment data, including, as a minimum, pulse, blood pressure, weight and height. Change in weight and height should be followed over time using centile charts. If there are any abnormal symptoms, findings or history regarding cardiovascular status, appropriate investigation and referral should be organised[65]
- the specific needs and expressed preferences of the child/adolescent[66], and the circumstances of his/her family and culture
- underlying or associated psychosocial problems, educational difficulties, cognitive profile and/or comorbid conditions such as anxiety, depression or substance abuse
- potential short-term benefits, e.g. improved symptoms
- likelihood of compliance[67]
- potential harms, allergies, adverse effects and contraindications, including diversion of medications for misuse and abuse[68]
- duration of treatment and signals to stop treatment
- schedule for follow-up, monitoring and review.

---

v GPs that have been approved through their state drug regulatory authority to prescribe stimulants and have expertise in ADHD, and/or trained in psychosocial approaches and culturally sensitive practice, may be approved to prescribe stimulants to children/adolescents with ADHD in some cases.

vi For example, in NSW medical practitioners (other than paediatricians and child psychiatrists), can apply to prescribe stimulants if approved as an 'Other Designated Prescriber' (ODP). ODPs are usually adult psychiatrists, advanced trainees in community paediatrics or child psychiatry, or GPs with paediatric training, working in rural or remote areas or in a predominantly paediatrically orientated practice. (NSW Ministry of Health, Legal and Regulatory Services Branch, Pharmaceutical Services. Criteria for the diagnosis and management of attention deficit hyperactivity disorder in children and adolescents. January 2012. Available at **http://www.health.nsw.gov.au/resources/publichealth/pharmaceutical/adhd_criteria_child.asp)**

These factors, as well as the risks and benefits of medication and what to do if they have concerns about treatment, need to be directly discussed with the child/adolescent and their parents/carers. Following this discussion, if drug treatment is not accepted by the child/adolescent or their parent/carers, alternatives such as those indicated at 4.3 should be discussed if this has not already been done.

4.4.2 What are the adverse effects of stimulant medications?

Prescribers should be aware of allergies and the adverse effects, and contraindications of ADHD medications and provide parents/carers with this information.[vii] Regular monitoring and communication between the prescriber, patient and their family/carer can minimise the impact of adverse side effects and prompt changes in medication (e.g. dose adjustment, transiting to another type or form of stimulant, adjunct therapies).

Commonly reported adverse effects of stimulant medications include sleep disturbance, reduced appetite, abdominal pain and/or headaches.[3,4,28] However, recent studies suggest that sleep disturbance may be associated with ADHD and that stimulants probably do not further aggravate sleep disturbance.[69,70-73]

Other symptoms reported in conjunction with taking stimulant medications include: crying spells, repetitive movements, slowed growth (height and weight), restlessness, dizziness, anxiety and irritability and cardiovascular effects such as tachycardia, palpitations and minor increases in blood pressure.[2-3,74-75] Recently, psychosis or mania have been reported as a potential adverse reaction to drugs used in the treatment of children with ADHD.[76]

Regarding the association between stimulant use and growth retardation, methylphenidate treatment has been associated with small but significant delays in growth but these effects seem to attenuate over time.[77-79] There is also some evidence that growth retardation may be related to ADHD itself, as it occurs in children not treated with stimulants for ADHD symptoms.[80]

Recent large population based studies confirm that stimulant medication does not increase risk of cardiovascular events. The available evidence suggests that the cardiovascular effects of these drugs are generally not clinically significant and do not pose a risk to patients.[81-82]

There is emerging evidence to indicate that stimulant medication does not produce cytogenetic abnormalities (cancer producing effects) but further long-term studies are required.[83-87]

Adverse effects are typically dose related, vary between individuals and resolve when treatment is discontinued or the dose adjusted.[3] Individual variations in response and tolerability to stimulant therapy are likely to be influenced by a child's specific genotype.[88-89]

It is difficult to provide rates of adverse events as reporting adverse reaction is based on a voluntary system. TGA encourages health professionals to report all suspected adverse reactions to medicines available in Australia and clinicians are reminded of the importance of this reporting. Patients or carers can also report adverse reactions directly. The reporting of seemingly insignificant or common adverse reactions can contribute to the TGA's investigation of a potential safety signal. More detail is available at **http://www.tga.gov.au/**

As methylphenidate and dexamphetamine are Schedule 8 controlled drugs, their supply, distribution, possession and use are restricted to reduce abuse, misuse and physical or psychological dependence.

Most adverse effects associated with the use of stimulant medication, are reversible or manageable with appropriate clinical care, and the short term benefits of stimulant medications in children and adolescents with ADHD can outweigh the risks, when used in an appropriate manner and with careful and regular monitoring.

vii Product Information and Consumer Medicine Information is available via the Therapeutic Goods Administration (**http://www.tga.gov.au**).

4.4.3 Monitoring and review

When stimulant treatment is used:

- if the maximum dose (after titration) has been reached and feedback from parents/carers (and if possible teachers), suggest that there is no significant improvement after a month of treatment, then alternative treatments should be considered
- the optimal dose of stimulant medication can be titrated against clinical benefit and may be prescribed in various forms of the medications, including: immediate release, extended release or both[90-91]
- it should only be continued if there is demonstrated benefit in the absence of unacceptable adverse effects.

The management and treatment of the symptoms of ADHD is an ongoing process that requires ongoing review by the prescribing clinician as they strive to find an available and useful explanation that provides specific treatment options for the child/adolescent. Monitoring and review should be conducted with the support of the GP who should review the child/adolescent more frequently, and when necessary supported by the pharmacist.

Considering that there is insufficient evidence on the long-term outcomes and long-term adverse effects following use of stimulants, the continuing benefit from, and need for medication should be regularly assessed.

Children/adolescents on stimulant medication require 3-6 monthly clinical assessment and review to ensure the management strategies remain appropriate and effective. Monitoring should include assessment of adverse effects and particularly psychological symptoms and plotting of growth parameters, pubertal development, heart rate and blood pressure. It should also include information from multiple sources (including parents/carers, and teachers) and an evaluation of any reported deterioration in symptoms or behaviours.

If it is indicated that a child/adolescent no longer requires stimulant medication, then the clinician should discuss trialling such a period off medication with the child/adolescent and their parents/carers and teachers. This trial should last at least several weeks and begin at an appropriate time (e.g. when the usual demands of school, family and social life are present, but not at times critical to development or schooling such as during exams). If medication is stopped, regular assessments are needed to assess the child/adolescent's responses across multiple settings.

Consideration of the changing needs of patients with ADHD as they transition through school and into adult life is imperative to the provision of optimal clinical care. Good communication between the GP, treating specialists, child/adolescent, parents/carers and teachers is essential for effective management and monitoring.

4.4.4 Special considerations for young children (under 7 years)

Behaviours in the pre-school period are changeable. While there is some evidence that methylphenidate reduces ADHD symptoms in the short-term compared to a placebo in children aged 3.5 to 6 years[92-93], there are concerns that they may cause unwanted side effects at rates is greater than that observed in older children.[94]

Best practice indicates that psychological, environmental and family interventions should, if possible, be trialled and evaluated before initiating pharmacological treatment in young children (under 7 years). If all these other interventions have not been effective then stimulants might be considered for this age group in consultation with the parents or guardians and including, when appropriate, teachers and other carers.

If medications is prescribed in young children it should be started on a low dose and regularly monitored; for example, initially weekly by the GP in consultation with the specialist to assess improvements and the presentation of any adverse effects, then every 2-3 months if benefits from medication have been demonstrated.

4.5 Combination treatment

Psychosocial interventions may be used alone or in combination with stimulant medication. The Multimodal Treatment of ADHD study (MTA study) was a multisite long term follow up study designed to evaluate the leading treatments for ADHD, including behaviour modification therapy, medication management, and the combination of the two.

Conclusions from the MTA study at 24 months, 3 years and 8 years of follow-up revealed inconsistent findings[26-27,57] and there is some debate over how to interpret these findings.[95] The authors of the eight-year study concluded "that children with behavioral and sociodemographic advantage, with the best response to any treatment, will have the best long-term prognosis" (pp.484).[27]

It is clear that all of the groups showed symptom improvement over baseline[26-27], and remained significantly different from their same aged peers (on 91% of the variables tested). These findings confirm that treatments for ADHD, even when highly structured and intense, can provide temporary symptomatic improvement, though not a cure.

4.6 Educational management

In terms of improving behavioural and academic outcomes children/adolescents may benefit from individually tailored modifications to the educational setting and curriculum, as informed by the overall case formulation.

Educational strategies include:

- behaviourally based classroom interventions
- academic interventions that manipulate antecedent conditions such as academic instruction or materials
- social skills training
- individual education plans (or an equivalent) which are informed by the case formulation and may include modification to how home-work is structured and time-tabled.

4.7 Other therapies

Current evidence does not support the use of the following treatments:

- elimination or restriction diets[96-97]
- diet supplementation with essential fatty acids (e.g. fish oils)[98]
- chiropractic treatment[99]
- behavioural optometry
- biofeedback (including neurofeedback)[97,100]
- homeopathy[101,102]
- acupuncture[104]
- physical activity[105-109]
- massage[110-111]
- sensory integration therapies.[112]

References

1 Psychotropic Expert Group. *Therapeutic guidelines: psychotropic* (Version 6). Melbourne: Therapeutic Guidelines Limited; 2008. Available from: **http://www.tg.org.au/index.php?sectionid=48**.

2 National Institute of Clinical Excellence (NICE). *Attention deficit hyperactivity disorder: diagnosis and management of ADHD in children, young people and adults, National clinical practice guideline number 72*. London: The British Psychological Society and The Royal College of Psychiatrists; 2009. Available from: **http://guidance.nice.org.uk/CG72/Guidance/pdf/English**.

3 Scottish Intercollegiate Guidelines Network (SIGN), *Management of attention deficit and hyperkinetic disorders in children and young people: A national clinical guideline 112*. Edinburgh: SIGN; 2009. Available from **http://www.sign.ac.uk/guidelines/fulltext/112/index.html**.

4 American Academy of Pediatrics; Management steering committee on quality improvement and Subcommittee on attention-deficit/hyperactivity disorder. ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *Pediatrics*; 2011. 128(5):1007–1022.

5 Cornish KM and Wilding J. *Attention, genes and developmental disorders*. OUP: New York; 2010.

6 Thapar A, O'Donovan M and Owen MJ. The genetics of attention deficit hyperactivity disorder. *Hum Mol Genet*. 2005. 14 Spec No. 2:R275-82.

7 Aguiar A, Eubig PA and Schantz SL. Attention deficit/hyperactivity disorder: A focused overview for children's environmental health researchers, *Environ Health Perspect*. 2010; 118(12):1646-53.

8 Schoemaker K, Bunte T, Wiebe SA, Espy KA, Dekovi ć M and Matthys W. Executive function deficits in preschool children with ADHD and DBD. *J Child Psychol Psychiatry*. 2012; 53(2):111-9.

9 Brookes KJ, Mill J, Guindalini C, Curran S, Xu X, Knight J, et al. A common haplotype of the dopamine transporter gene associated with attention-deficit/hyperactivity disorder and interacting with maternal use of alcohol during pregnancy. *Arch General Psychiatry*. 2006; 63(1):74-81.

10 Sullivan R, Wilson DA, Feldon J, Yee BK, Meyer U, Richter-Levin G, et al. The International Society for Developmental Psychobiology annual meeting symposium: Impact of early life experiences on brain and behavioral development. *Dev Psychobiol.* 2006; 48(7):583-602.

11 Schmidt S and Petermann F. Developmental psychopathology: Attention deficit hyperactivity disorder (ADHD). *BMC Psychiatry.* 2009; 17(9):58.

12 Pingault JB, Tremblay RE, Vitaro F, Carbonneau R, Genolini C, Falissard B, et al. Childhood trajectories of inattention and hyperactivity and prediction of educational attainment in early adulthood: A 16-year longitudinal population-based study. *Am J Psychiatry*. 2011, Jul 28. [Epub ahead of print].

13 Skounti M, Philalithis A and Galanakis E. Variations in prevalence of attention deficit hyperactivity disorder worldwide. *Eur J Pediatr.* 2007; 166(2):117-23.

14 Swanson JM, Sargeant JA,Taylor E, Sonuga-Barke E, Jenson PS and Cantwell DP. Attention-deficit hyperactivity disorder and hyperkinetic disorder. *Lancet.* 1998. 351(9100):429- 433.

15 Australian Institute of Health and Welfare 2009. *A picture of Australia's children 2009*. Canberra: AIHW. 2009. Cat. no. PHE 112. Available from: http://www.aihw.gov.au/publication-detail/?id=6442468252.

16 Sawyer MG, Arney FM, Baghurst PA, Clark JJ, Graetz BW, Kosky RJ, et al. The mental health of young people in Australia: Key findings from the child and adolescent component of the national survey of mental health and well-being. *Aust N Z J Psychiatry*. 2001; 35(6):806-14.

17 Döpfner M, Breuer D, Wille N, Erhart M and Ravens-Sieberer U. How often do children meet ICD-10/DSM-IV criteria of attention deficit-/hyperactivity disorder and hyperkinetic disorder? Parent-based prevalence rates in a national sample--results of the BELLA study. *Eur Child Adolesc Psychiatry*. 2008;7(Suppl 1):59-70.

18 Agency for Healthcare Research and Policy. *Diagnosis of attention-deficit/hyperactivity disorder: summary technical review number 3*. Rockville: MD; 1991. Available from: http://www.ahrq.gov/clinic/epcsums/adhdsutr.htm.

19 Szatmari P, Offord DR, and Boyle MH. Correlates, associated impairments and patterns of service utilization of children with attention deficit disorder: findings from the Ontario Child Health Study. *J Child Psychol Psychiatry*. 1989; 30(2):205-17.

20 Langley K, Fowler T, Ford T, Thapar AK, van den Bree M, Harold G, et al. Adolescent clinical outcomes for young people with attention-deficit hyperactivity disorder. *Br J Psychiatry*. 2010;196(3):235-40.

21 Smith G, Jongeling B, Hartmann P, Russell C and Landau L. *Raine ADHD study: long term outcomes associated with stimulant medication in the treatment of ADHD in children*. Western Australia: Department of Health, 2010.

22 Barbaresi WJ, Katusic SK, Colligan RC, Weaver AL and Jacobsen SJ. Long-term school outcomes for children with attention-deficit/hyperactivity disorder: a population-based perspective. *J Dev Behav Pediatr.* 2007;28(4):265-73.

23 Polderman T, Boomsma D, Bartels M, Verhulst F and Huizink A. A systematic review of prospective studies on attention problems and academic achievement. *Acta Psychiatra Scand*. 2010; 122(4):271-284.

24 Loe IM and Feldman HM. Academic and educational outcomes of children with ADHD. *J Pediar Psychiatry*. 2007; 32(6): 643-54.

25 Powers RL, Marks DJ, Miller CJ, Newcorn JH and Halperin JM. Stimulant treatment in children with attention-deficit/hyperactivity disorder moderates adolescent academic outcome. *J Child Adolesc Psychopharmacol.* 2008; 18(5):449-59.

26 Jensen PS, Arnold LE, Swanson JM, Vitiello B, Abikoff HB, Greenhill LL, et al. 3-year follow-up of the NIMH MTA study. *J Am Acad Child Adolesc Psychiatry.* 2007; 46(8):989-1002.

27 Molina BS, Hinshaw SP, Swanson JM, Arnold LE, Vitiello B, Jensen PS, et al. MTA Cooperative Group. The MTA at 8 years: prospective follow-up of children treated for combined-type ADHD in a multisite study. *J Am Acad Child Adolesc Psychiatry*. 2009; 48(5):484-500.

28 Agency for Healthcare Research and Quality. 2011. *Attention Deficit Hyperactivity Disorder: effectiveness of treatment in at-risk preschoolers; long-term effectiveness in all ages; and variability in prevalence, diagnosis, and treatment*. Comparative Effectiveness Review No.44.

29 McDonagh MS, Peterson K, Dana T and Thakurta S. *Drug class Review on pharmacologic treatments for ADHD, final report*. Oregon Evidence-based Practice Center. Dec 2007.

30 American Psychiatric Association. *Diagnostic guidelines and statistical manual of mental disorders, fourth edition (DSM-IV).* Washington DC: American Psychiatric Association, 1994.

31 World Health Organization. *The ICD–10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization; 1992.

32 Luk E, Leung P and Ho T. Cross-cultural / ethnic aspects of childhood hyperactivity In: Sandberg S, ed. *Hyperactivity and attention disorders of childhood* (2nd Ed): Cambridge University Press, 2002:64-98.

33 Morrow RL, Garland, EJ, Wright JM, Maclure M, Taylor S and Dormuth CR. Influence of relative age on diagnosis and treatment of attention-deficit/hyperactivity disorder in children. *CMA*. 2012. Early release, published at www.cmaj.ca on March 5, 2012, subject to revision.

34 DuPaul GJ, Jitendra AK, Tresca KE, Junod RE, Volpe R and Lutz JG. Children with attention hyperactivity deficit disorder: Are there gender differences in school functioning? *Sch Psychol Rev.* 2006; 35:292-308.

35 Barkley RA, editor. *Attention-deficit/hyperactivity disorder: A handbook for diagnosis and treatment.* 3rd ed. New York: The Guilford Press; 2006, cited in Smith G, Jongeling B, Hartmann P, Russell C and Landau L Raine ADHD study: long term outcomes associated with stimulant medication in the treatment of ADHD in children. Western Australia: Department of Health, 2010.

36 Tandon M, Si X, Belden A and Luby J. Attention-deficit/hyperactivity disorder in preschool children: an investigation of validation based on visual attention performance. *J Child Adolesc Psychopharmacol.* 2009; 19(2):137-46.

37 Greenhill LL, Posner K, Vaughan BS and Kratochvil CJ. Attention deficit hyperactivity disorder in preschool children. *Child Adolesc Psychiatr Clin N Am.* 2008; 17(2):347-66, ix.

38 McCarthy S, Cranswick N, Potts L, Taylor E and Wong IC. Mortality associated with attention-deficit hyperactivity disorder (ADHD) drug treatment: a retrospective cohort study of children, adolescents and young adults using the general practice research database. *Drug Saf.* 2009; 32(11):1089-96.

39 Shaw P, Sharp WS, Morrison M, Eckstrand K, Greenstein DK, Clasen LS, et al. Psychostimulant treatment and the developing cortex in attention deficit hyperactivity disorder. *Am J Psychiatry.* 2009; 166(1):58-63.

40 Toplak ME, Connors L, Shuster J, Knezevic B and Parks S. Review of cognitive, cognitive-behavioral, and neural-based interventions for attention-deficit/hyperactivity disorder (ADHD). *Clin Psychol Rev*. 2008; 28(5):801-23.

41 Conners KC. Conners Rating Scales–R™ assessment. Available from: http://www.mhs.com/product.aspx?gr=edu&prod=cads&id=overview#

42 Harrison C, Charles J and Britt H. AD(H)D. *Aust Fam Physician*. 2008; 37(5):393.

43 Kendall J, Leo MC, Perrin N and Hatton D. Modelling ADHD child and family relationships. *West J Nurs Res*. 2005; 27(4):500-18.

44 Kendall J and Shelton K. A typology of management styles in families with children with ADHD. *J Fam Nurs.* 2003; 9(3):257-280.

45 McMenamy J, Sheldrick RC and Perrin EC. Early intervention in pediatrics offices for emerging disruptive behavior in toddlers. *J Pediatr Health Care.* 2011; 25(2):77-86.

46 Thompson MJ, Laver-Bradbury C, Ayres M, Le Poidevin E, Mead S, Dodds C, et al. A small-scale randomized controlled trial of the revised new forest parenting programme for preschoolers with attention deficit hyperactivity disorder. *Eur Child Adolesc* Psychiatry. 2009 Oct;18(10):605-16.

47 Zwi M, Jones H, Thorgaard C, York A and Dennis JA. Parent training interventions for ADHD in children aged 5 to 18 years. *Cochrane Database of Systematic Reviews* 2011, Issue 12.

48 Fabiano GA., Pelham Jr WE, Coles EK, Gnagy EM, Chronis-Tuscano A and O'Connor BC. A meta-analysis of behavioral treatments for attention-deficit/hyperactivity disorder. *Clin Psycho Rev.* 2009; 29(2):129-140.

49 Chronis AM, Jones HA and Raggi VL. Evidence-based psychosocial treatments for children and adolescents with attention-deficit/hyperactivity disorder. *Clin Psychol Rev*. 2006; 26(4):486-502.

50 Young S and Amarasinghe JM. Practitioner review: Non-pharmacological treatments for ADHD: A lifespan approach. *J Child Psychol Psychiatry*. 2010; 51(2):116-33.

51 Bjornstad GJ and Montgomery P. Family therapy for attention-deficit disorder or attention-deficit/hyperactivity disorder in children and adolescents. *Cochrane Database of Systematic Reviews,* 2005; Issue 2.

52 Cartwright-Hatton S, Roberts C, Chitsabesan P, Fothergill C and Harrongton R. Systematic review of the efficacy of cognitive behaviour therapies for childhood and adolescent anxiety disorders. *Br J Clin Psychol*. 2004; 43(4):421-436.

53 Storebø OJ, Skoog M, Damm D, Thomsen PH, Simonsen E and Gluud C. Social skills training for attention deficit hyperactivity disorder (ADHD) in children aged 5 to 18 years. *Cochrane Database of Systematic Review;* 2011, Issue 12.

54 Klein JB, Jacobs RH and Reinecke MA. Cognitive-behavioral therapy for adolescent depression: a meta-analytic investigation of changes in effect-size estimates. J *Am Acad Child Adolesc Psychiatry*. 2007; 46:1403–13.

55 Turner, K. 2007. Supporting Indigenous health professionals: Key issues and supports for the adoption of evidence–based behavioural family intervention in Indigenous communities. Available at http://www.aracy.org.au/publicationDocuments/TOP_Supporting_Indigenous_Health_Professionals_Key_issues_and_supports_for_the_adoption_of_evidence_based_behavioural_family_intervention_in_Indigenous_communities_2007.pdf

56 Turner KM, Richards M and Sanders MR. Randomised clinical trial of a group parent education programme for Australian Indigenous families. *J Paediatr Child Health*. 2007; 43(6):429-37.

57 MTA Cooperative Group. National Institute of Mental Health Multimodal Treatment Study of ADHD follow-up: 24-month outcomes of treatment strategies for attention-deficit/hyperactivity disorder. *Pediatrics.* 2004; 113(4):754-61.

58 King S, Griffin S, Hodges Z, Weatherly H, Asseburg C, Richardson G, et al. A systematic review and economic model of the effectiveness and cost-effectiveness of methylphenidate, dexamfetamine and atomoxetine for the treatment of attention deficit hyperactivity disorder in children and adolescents. *Health Technology Assessment.* 2006; 10(23):iii-iv, xiii-146.

59 Faraone, SV. Using meta-analysis to compare the efficacy of medications for attention deficit/hyperactivity disorder in youths. *P T.*; 2009; 34(12):678-94.

60 Schachter HM, Pham B, King J, Langford S and Moher D. How efficacious and safe is short-acting methylphenidate for the treatment of attention-deficit disorder in children and adolescents? A meta-analysis. *CMAJ*. 2001; 165(11):1475-88.

61 Buitelaar J and Medori R. Treating attention-deficit/hyperactivity disorder beyond symptom control alone in children and adolescents: a review of the potential benefits of long-acting stimulants. *Eur Child Adolesc Psychiatry*. 2010;19(4):325-40.

62 Advokat C. Update on amphetamine neurotoxicity and its relevance to the treatment of ADHD. *J Atten Disord.* 2007; 11(1):8-16.

63 Antshel KM, Hargrave TM, Simonescu M, Kaul P, Hendricks K and Faraone SV. Advances in understanding and treating ADHD. *BMC Medicine*. 2011, 9:72.

64 Poulton A. Growth on stimulant medication; clarifying the confusion: a review. *Arch Dis Child*. 2005; 90(8):801-6.

65 Silva RR, Skimming JW and Muniz R. Cardiovascular safety of stimulant medications for pediatric attention-deficit hyperactivity disorder. *Clin Pediatr (Phila).* 2010; 49(9):840-51.

66 Mühlbacher AC, Rudolph I, Lincke H and Nübling M. Preferences for treatment of attention-deficit/hyperactivity disorder (ADHD): a discrete choice experiment. *BMC Health Services Research.* 2009; 9:149.

67 Atzori P, Usala T, Carucci S, Danjou F and Zuddas A. Predictive factors for persistent use and compliance of immediate-release methylphenidate: a 36-month naturalistic study. *J Child Adolesc Psychopharmacol.* 2009;19(6):673-81.

68 McCabe SE, Teter CJ and Boyd CJ. Medical use, illicit use and diversion of prescription stimulant medication. *J Psychoactive Drugs.* 2006; 38(1):43-56.

69 Giblin JM and Strobel AL. Effect of lisdexamfetamine dimesylate on sleep in children with ADHD. *J Atten Disord.* 2011; 15(6):491-8.

70 Faraone SV, Glatt SJ, Bukstein OJ, Lopez FA, Arnold LE and Findling RL. Effects of once-daily oral and transdermal methylphenidate on sleep behavior of children with ADHD. *J Atten Disord*. 2009; 12(4): 308-15.

71 Huang YS, Tsai MH and Guilleminault C. Pharmacological treatment of ADHD and the short and long term effects on sleep. *Curr Pharm Des*. 2011;17(15):1450-8.

72 Kim HW, Yoon IY, Cho SC, Kim B, Chung, S, Lee H, et al. The effect of OROS methylphenidate on the sleep of children with ADHD. *Int Clin Psychopharmacol*. 2010; 25(2):107-15.

73 Gau SS and Chiang HL. Sleep problems and disorders among adolescents with persistent and subthreshold ADHD. *Sleep*. 2009; 32(5):671-9.

74 Graham J, Banaschewski T, Buitelaar J, Coghill D, Danckaerts M, Dittmann RW, et al. European guidelines on managing adverse effects of medication for ADHD. *Eur Child Adolesc Psychiatry.* 2011; 20(1):17-37.

75 Institute for Clinical Systems Improvement (ICSI). Diagnosis and management of attention deficit hyperactivity disorder in primary care for school-age children and adolescents. 8th ed. ICSI; 2010. Available from: http://www.icsi.org/guidelines_and_more/gl_os_prot/behavioral_health/adhd/adhd_in_primary_care_for_children___adolescents__diagnosis_and_management_of_.html

76 Mosholder AD, Gelperin K, Hammad TA, Phelan K and Johann-Liang R. Hallucinations and other psychotic symptoms associated with the use of ADHD disorder drugs in children. *Pediatrics* 123(2):611-616.

77 Faraone SV and Giefer EE. Long-term effects of methylphenidate transdermal delivery system treatment of ADHD on growth. J *Am Acad Child Adolesc Psychiatry.* 2007; 46(9):1138-47.

78 Moungnoi P and Maipang P. Long-term effects of short-acting methylphenidate on growth rates of children with ADHD wat Queen Sirikit National Institute of Child Health. *J Med Assoc Thai.* 2011; 94(Suppl 3):S158-63.

79 [no authors listed] Methylphenidate: growth retardation. *Prescrire Int.* 2011; 20(120):238-9.

80 Ptacek R, Kuzelova H, Paclt I, Zukov I and Fischer S. ADHD and growth: anthropometric changes in medicated and non-medicated ADHD boys. *Med Sci Monit*. 2009;15(12):CR595-9.

81 Stiefel G and Besag FM. Cardiovascular effects of methylphenidate, amphetamines and atomoxetine in the treatment of attention-deficit hyperactivity disorder. *Drug Saf.* 2010; 33(10):821-842.

82 Cooper WO, Habel LA, Cox SM, Chan KA, Arbogast PG, Cheetham TC, et al. ADHD drugs and serious cardiovascular events in children and young adults. *N Engl J Med.* 2011; 365(20): 1896-1904.

83 Walitza S, Kampf K, Oli RG, Warnke A, Gerlach M and Stopper H. Prospective follow-up studies found no chromosomal mutagenicity of methylphenidate therapy in ADHD affected children. *Toxicol Lett.* 2010; 193(1):4-8.

84 Kumar V, Tucker JD, Suter W, Petibone DM, Thomas RA and Bailey NL. Cytogenetic assessment of methylphenidate treatment in pediatric patients treated for attention deficit hyperactivity disorder. *Mutat Res*. 2009; 677(1-2): 53-8.

85 Ponsa I, Ramos-Quiroga JA, Ribasés M, Bosch R, Bielsa A, Ordeig MT, et al. Absence of cytogenetic effects in children and adults with attention-deficit/hyperactivity disorder treated with methylphenidate. *Mutat Res*. 2009; 18;666 (1-2):44-9.

86 Walitza S, Kämpf K, Artamonov N, Romanos M, Oli G, Wirth S, et al. No elevated genomic damage in children and adolescents with attention deficit/hyperactivity disorder after methylphenidate therapy. *Toxicol Lett.* 2009;184(1):38-43.

87 Witt KL, Shelby MD, Itchon-Ramos N, Faircloth M, Kissling GE, Chrisman AK, et al. Methylphenidate and amphetamine do not induce cytogenetic damage in lymphocytes of children with ADHD. *J Am Acad Child Adolesc Psychiatry*. 2008; 47(12):1375-83.

88 Gruber R, Joober R, Grizenko B, Leventhal BL, Cook EH and Stein MA. Dopamine transporter genotype and stimulant side effect factors in youth diagnosed with attention-deficit/hyperactivity disorder. *J Child Adolesc Psychopharmacol.* 2009; 19(3): 233-9.

89 Mick E, McGough JJ, Middleton FA, Neale B and Faraone SV. Genome-wide association study of blood pressure response to methylphenidate treatment of attention-deficit/hyperactivity disorder. *Prog Neuropsychopharmacol Biol Psychiatry*. 2011;30; 35(2):466-72.

90 Findling RL. Evolution of the treatment of attention-deficit/hyperactivity disorder in children: a review. *Clinical Therapeutics*. 2008. 30(5):942-957.

91 Rader R, Callen E and McCauley L. Current strategies in the diagnosis and treatment of childhood attention-deficit/hyperactivity disorder. *Am Fam Physician*. 2009. 79(8): 657-665.

92 Greenhill L, Kollins S, Abikoff H, McCracken J, Riddle M, Swanson J, et al. Efficacy and safety of immediate-release methylphenidate treatment for preschoolers with ADHD. *J Am Acad Child Adolesc Psychiatry* 2006; 45:1284-93.

93 Musten LM, Firestone P, Pisterman S, Bennett S and Mercer J. Effects of methylphenidate on preschool children with ADHD: cognitive and behavioural functions. *J Am Acad Child Adolesc Psychiatry.* 1997; 36:1407-15.

94 Wigal T, Greenhill L, Chuang S, McGough J, Vitiello B, Skrobala A, et al. Safety and tolerability of methylphenidate in preschool children with ADHD. *J Am Acad Child Adolesc Psychiatry* 2006; 45:1294-303.

95 Pappadopulos E, Jensen PS, Chait AR, Arnold LE, Swanson JM, Hechtman L, et al. Medication adherence in the MTA: Saliva methylphenidate camples versus parent report and mediating effect of concomitant behavioral treatment. *J Am Acad Psych*. 2009; 48(5): 501-510.

96 Curtis LT and Patel K. Nutritional and environmental approaches to preventing and treating autism and attention deficit hyperactivity disorder (ADHD): a review. *J Altern Complement Med.* 2008 Jan-Feb;14(1):79-85.

97 National Institute for Health and Clinical Excellence (NICE), Centre for Clinical Practice. Review of clinical guideline (CG72)- Attention deficit hyperactivity disorder. 30 Aug – 12 Sep 2011.

98 Raz R and Gabis L. Essential fatty acids and attention-deficit-hyperactivity disorder: a systematic review. *Dev Med Child Neurol.* 2009. 51(8):580-92.

99 Karpouzis F, Bonello R and Pollard H. Chiropractic care for paediatric and adolescent Attention Deficit/ Hyperactivity Disorder: A systematic review. *Chiropr Osteopat.* 2010 Jun 2; 18:13.

100 Galicia-Connolly EZ, Shamseer L and Vohra S. Complementary, holistic, and integrative medicine: therapies for learning disabilities. *Pediatr Rev.* 2011; 32(2):e18-24.

101 Heirs M and Dean ME. Homeopathy for attention deficit/hyperactivity disorder or hyperkinetic disorder. *Cochrane Database of Systematic Reviews*. 2007; Issue 4.

102 Davidson J, Crawford C, Ives J and Jonas W. Homeopathic treatments in psychiatry: a systematic review of randomised placebo-controlled studies. *J Clin Psychiatry.* 2011; 72(6):795-807.

103 Krisanaprakornkit T, Ngamjarus C, Witoonchart C and Piyavhatkul N. Meditation therapies for attention deficit/ hyperactivity disorder (ADHD). *Cochrane Database of Systematic Reviews* 2010, Issue 6.

104 Li S, Yu B, Zhou D, He C, Kang L, Wang X, et al. Acupuncture for attention deficit hyperactivity disorder (ADHD) in children and adolescents. *Cochrane Database of Systematic Reviews* 2011, Issue 4.

105 Jensen P and Kenny D. The effects of yoga on the attention and behavior of boys with attention-deficit/hyperactivity disorder (ADHD). *J Attention Disord.* 2004; 7:205-216.

106 Harrison LJ, Manocha R and Rubia K. Sahaja yoga meditation as a family treatment programme for children with attention deficit-hyperactivity disorder. *Clin Child Psychol Psychiatry.* 2004; 9:479-497.

107 Hernandez-Reif M, Field TM and Thimas E. Attention deficit hyperactivity disorder: benefits from tai Chi. *J Bodyw Mov Ther.* 2001; 5:120-123.

108 Gapin, J and Etnier JL. The relationship between physical activity and executive function performance in children with attention-deficit hyperactivity disorder. *J Sport Exerc Psychol.* 2010, 32:753-763.

109 Medina JA, Netto TL, Muszkat M, Medina AC, Botter D, Orbetelli R, et al. Exercise impact on sustained attention of ADHD children, methylphenidate effects. *Atten Defic Hyperact Disord.* 2010; 2(1):49-58.

110 Field TM, Quintino O, Hernandez-Reif M and Koslovsky G. Adolescents with attention deficit hyperactivity disorder benefit from massage therapy. *Adolescence.* 1998; 33:103-8.

111 Khilnani S, Field T, Hernandez-Reif M and Schanberg S. Massage therapy improves mood and behavior of students with attention-deficit/hyperactivity disorder. *Adolescence.* 2003; 38:623-38.

112 Miller LJ, Coll JR and Schoen SA. A randomized controlled pilot study of the effectiveness of occupational therapy for children with sensory modulation disorder. *Am J Occup Ther.* 2007; 61:228-38.