Australian Guidelines on Attention Deficit Hyperactivity Disorder (ADHD)

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The Royal Australasian
College of Physicians

Disclaimer

This document is a general guide to appropriate practice, to be followed subject to the clinician's judgement and the patient's preference in each individual case. The Guidelines are designed to provide information to assist decision making and are based on the best evidence available at the time of development.

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EXECUTIVE SUMMARY

Attention deficit hyperactivity disorder (ADHD) is a common condition that has been defined in the *Diagnostic and Statistical Manual of Mental Disorders IV* (DSM-IV) as a pattern of inattention and/or hyperactivity-impulsivity symptoms that persist for at least 6 months to a degree that is maladaptive and inconsistent with developmental level. There must be some impairment from symptoms that is present in 2 or more settings (e.g. at school or work and at home) and there must be clear evidence of significant impairment in social, school or work functioning.

Not every person with ADHD will have all of the symptoms, and the severity of the symptoms of ADHD and the level of impairment will vary between individuals. In addition, ADHD symptoms and severity can change with age. Some symptoms, such as hyperactivity-impulsivity, diminish abruptly or present differently with age; other symptoms, such as inattention, are more likely to persist into adulthood. Many people with ADHD have one or more associated problems, such as learning difficulties or anxiety. The long-term outcomes for individuals with ADHD are wide ranging. For the majority of people with ADHD the disorder will persist through childhood into adolescence and adulthood. Although many people with ADHD will grow up without persistent problems, individuals with ADHD are at increased risk of a range of adverse outcomes. These include academic underachievement, difficulties with interpersonal relationships and low-self-esteem, all of which have potentially serious consequences for the individual, and the flow-on effects of ADHD can have a significant impact on families, schools, workplaces and the community more broadly.

The Guidelines on ADHD have been developed in accordance with National Health and Medical Research Council (NHMRC) guideline development requirements by a multidisciplinary expert reference group. The reference group was comprised of experts from throughout Australia and included representatives from each of the key professional disciplines involved with ADHD: paediatrics, child and adolescent psychiatry, adult psychiatry, psychology, general practice, education and consumers/carers.

The Guidelines provide a series of evidence-based recommendations for the assessment, management and care of preschoolers, children, adolescents and adults with ADHD. Where possible, the recommendations have been developed on the basis of current research that was identified by systematic review and reflect current scientifically based "best practice". For areas of practice not addressed by current research, recommendations were developed on the basis of the consensus opinion of the clinicians, educators and consumers from the reference group. The recommendations that are derived from expert consensus are extensive, but it is important that they are included in the guidelines in order to provide practitioners with as comprehensive set of directions as possible.

The recommendations should not be used prescriptively; they are intended as a general guide to appropriate practice, to be followed subject to the clinician's judgement and the preference of the person with ADHD and/or his or her parents or guardians. The guideline recommendations are far reaching in scope, covering the areas of assessment and diagnosis of ADHD; treatment and management of ADHD; and social considerations.

Key messages

Assessment and diagnosis of ADHD

1. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
2. The diagnosis of ADHD should only be made after a comprehensive assessment. This includes medical, developmental and psychosocial assessment, and elicitation of evidence of impairment in multiple settings, via gathering information from multiple informants.

Management of ADHD

3. Individuals with ADHD and their families and carers should be provided with information and education about ADHD and its impact, and the advantages and disadvantages of potential treatment strategies.
4. Multimodal therapy is recommended for the treatment of ADHD in all age groups. This could include psychosocial management strategies, medication and educational interventions.
5. An individualised management plan should be drawn up in collaboration with the person with ADHD and their parents/carers and teachers. Taking into account;
    - The specific needs and expressed preferences of the person, and the circumstances of his or her family and culture.
    - The associated psychosocial problems, educational difficulties and comorbid conditions.
    - The suitability of the plan for the individual and their family, considering affordability, accessibility and acceptability.
6. Clinicians should be alert to the risk of depression or other psychiatric disorders in parents/caregivers of children or adolescents with ADHD. Parents/caregivers may need referral for support and treatment.
7. Medication and ADHD
    - Not all people with ADHD will require pharmacological management.
    - Medications should only be used when symptoms are pervasive across settings (eg. school and home) and causing significant impairment in academic, social or behavioural function, and after careful consideration of non-pharmacological approaches. Clearly defined goals should be identified prior to commencing a trial of medication treatment.
    - Medication should not be used as first-line treatment for ADHD in preschool-aged children.
    - Patients receiving treatment for ADHD should be reviewed regularly (at least 6-monthly) to ensure that the management strategies remain appropriate and effective.
8. Other therapies
    - Elimination and restriction diets are not supported as a general treatment for individuals with ADHD. A subset of children may be sensitive to certain foods or food additives and may benefit from careful exclusion diets. Assessment of food sensitivity and initiation of a special diet should be under the care and supervision of a medical specialist and an Accredited Practising Dietitian.

- Alternative treatments (including fatty acid supplements, biofeedback, homeopathy or sensory integration diets) are not currently supported as treatments for individuals with ADHD.

RECOMMENDATIONS

The *Guidelines on Attention Deficit Hyperactivity Disorder (ADHD)* have been developed to provide a series of evidence-based recommendations for the assessment, management and care of preschoolers, children, adolescents and adults with ADHD. The guidelines are intended to provide a framework based on the best available evidence that can be adapted to local needs and resources, and individual circumstances.

The Guidelines on ADHD have been developed in accordance with National Health and Medical Research Council (NHMRC) guideline development requirements by a multidisciplinary expert reference group. The reference group was comprised of experts from throughout Australia from the key professional disciplines involved with ADHD: paediatrics, child and adolescent psychiatry, adult psychiatry, psychology, general practice, education and consumers/carers.

Guideline recommendations have been developed on the basis of current research that was identified by systematic review. These recommendations have been given an overall grading (A, B, C or D) based on NHMRC criteria. For areas of practice not addressed by current research, recommendations were developed on the basis of the consensus opinion of the clinicians, educators and consumers from the reference group. Research recommendations have not been graded.

Grade	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendation must be applied with caution
Best practice points	
√	Recommended best practice based on clinical experience and expert opinion, where there is inadequate evidence to establish evidence based recommendations.

Note: Refer page 4 – *Table 1. NHMRC levels of evidence according to type of research question* (1).

Key Definitions
DSM-IV: *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition.

ADHD Severity: Determining the severity of ADHD is a matter for clinical judgement that will take into account the level of impairment, pervasiveness and individual factors, as well as family, social and cultural contexts.

Assessment and diagnosis

Initial screening assessment

1. A short scale such as the Strengths and Weaknesses of Attention Scale (SWAN) or the Diagnostic Rating Scale (DRS), or for adults the Short Adult ADHD Screening Scale or Barkley's Adult ADHD Quick Screen should be used as an initial screen.
   ✓*Recommended best practice based on clinical experience and expert opinion*
2. Clinicians, especially primary care physicians, need to consider that there is more than one form of ADHD and many children may not present with the most obvious symptoms of hyepractivity/impulsivity. The inattentive type may not present until secondary school with increased demands for organisation and independent study.
   ✓*Recommended best practice based on clinical experience and expert opinion*

Assessment and diagnosis of ADHD in school-aged children and adolescents

3. Full assessment for possible ADHD requires a comprehensive medical, developmental and psychosocial assessment by the best qualified clinician available. This would usually be a paediatrician or child and adolescent psychiatrist with the training and skills required to assess and treat ADHD.
   ✓*Recommended best practice based on clinical experience and expert opinion*

4. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
   ✓*Recommended best practice based on clinical experience and expert opinion*

5. Information from and discussion with multiple informants, including the child/adolescent, parents/caregivers, and educational and health professionals, needs to inform a diagnosis of ADHD in school-aged children.
   ✓*Recommended best practice based on clinical experience and expert opinion*

6. Diagnosis requires evidence of moderate to severe impairment across settings, including home and school.
   ✓*Recommended best practice based on clinical experience and expert opinion*

7. A thorough psychosocial assessment of the child/adolescent and family and medical assessment of the child/adolescent are part of a comprehensive assessment.
   ✓*Recommended best practice based on clinical experience and expert opinion*

8. Assessment should cover the presence and functional significance of comorbidities, including learning disabilities, anxiety/depression and disruptive behaviour disorders. This could include use of broad-based screening questionnaires.
   ✓*Recommended best practice based on clinical experience and expert opinion*

Assessment and diagnosis of ADHD in preschool-aged children (3–5 years)

9. For children under 6 years of age, a stage when child development is rapid, it is essential to distinguish ADHD symptoms from normal developmental variation in impulsivity and attention.
   ✓*Recommended best practice based on clinical experience and expert opinion*

10. Assessment of children under 6 years of age should be undertaken especially thoroughly by paediatricians or child psychiatrists with expertise in developmental assessment, paying particular attention to identification of comorbidities and understanding of family dynamics and of cultural/religious diversity.
    ✓*Recommended best practice based on clinical experience and expert opinion*

11. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

12. Information from and discussion with multiple informants, including the child, parents/caregivers, kinder and preschool teachers, childcare staff, preschool staff and health professionals, needs to inform a diagnosis of ADHD in preschool-aged children.
    ✓*Recommended best practice based on clinical experience and expert opinion*

13. Diagnosis requires evidence of moderate to severe impairment across settings, including home and kinder/preschool.
    ✓*Recommended best practice based on clinical experience and expert opinion*

14. Assessment of children under 6 years of age should include, as a minimum, a screening developmental measure, such as the Ages and Stages Questionnaire, and, when developmental delay is suspected, a formal developmental assessment such as the Griffiths Mental Developmental Scales.
    ✓*Recommended best practice based on clinical experience and expert opinion*

15. Regular review is critical to review the course of symptoms over time.
    ✓*Recommended best practice based on clinical experience and expert opinion*

16. In this age range, where it is difficult to differentiate ADHD from other common problems, including developmental delays and specific speech and motor disorders, allied health assessments should be considered, especially when developmental difficulties are evident.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Assessment and diagnosis of ADHD in adults

17. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

18. ADHD needs to be considered in adults who present with longstanding symptoms suggestive of ADHD (inattention, impulsivity, disorganisation) that appear to have started in childhood and are persisting into adult life.
    ✓*Recommended best practice based on clinical experience and expert opinion*

19. People with personality disorder and/or substance abuse accompanied by a significant level of impulsivity accompanied by inattention should be referred for evaluation of ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

20. Assessment of adults with suspected ADHD should include a comprehensive medical and psychosocial assessment.
    ✓*Recommended best practice based on clinical experience and expert opinion*

21. Assessment of adults with suspected ADHD should be undertaken by the best qualified clinician available. This would usually be an adult psychiatrist or a comprehensive psychiatric service with the training and skills required to assess and treat ADHD. This is due to the high incidence of comorbid psychiatric conditions and the overlap of clinical features of ADHD with other conditions such as bipolar disorder and personality disorders.
    ✓*Recommended best practice based on clinical experience and expert opinion*

22. Other possible diagnoses or comorbidities should be considered, via history; for example, acquired brain injury, neurological condition or other DSM-IV diagnosis such as anxiety disorder or pervasive developmental disorder.
    ✓*Recommended best practice based on clinical experience and expert opinion*

23. Adult presentations may occur in the context of problems encountered with work and study. In such instances, vocational/intellectual assessments may be useful, not for diagnostic purposes, but to clarify the functional consequences of the diagnosis.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Psychoeducational assessment

24. Most children with ADHD have intellectual development within the normal range. A significant proportion, however, present with cognitive deficits, learning difficulties and social adaptive difficulties, and in these individuals a comprehensive psychoeducational assessment is particularly necessary.
    ✓*Recommended best practice based on clinical experience and expert opinion*

25. Psychoeducational assessment should cover all aspects of academic performance. At a minimum this should consist of an individually administered intelligence test such as the age-appropriate version of the Wechsler series.
    ✓*Recommended best practice based on clinical experience and expert opinion*

26. Educational difficulties are common in people with ADHD. Where these problems are suspected (e.g. via parent/caregiver or teacher report, or national/State/Territory literacy and numeracy assessments),

psychoeducational assessment should be conducted to assess learning potential and attainment.
✓*Recommended best practice based on clinical experience and expert opinion*

27. Assessment of educational difficulties is important in people of all ages with suspected ADHD and/or suspected educational difficulties, to inform diagnosis and identify learning difficulties that should be targeted for intervention. Such assessments are not diagnostic of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Allied health assessments

28. Allied health assessment may be helpful in many children and adolescents with suspected ADHD, to identify comorbid speech and language difficulties, motor co-ordination and sensory difficulties that can be targeted with intervention.
✓*Recommended best practice based on clinical experience and expert opinion*

29. The need for allied health assessment should be determined on a case-by-case basis.
✓*Recommended best practice based on clinical experience and expert opinion*

Assessment when acquired brain injury and other neurological conditions are present

30. A thorough medical history and examination are required to identify any acquired brain injury or other neurological condition that may contribute to the presenting symptoms.
✓*Recommended best practice based on clinical experience and expert opinion*

31. Individuals with ADHD symptoms and a history of acquired brain injury and other neurological conditions should received comprehensive neuropsychological evaluation.
✓*Recommended best practice based on clinical experience and expert opinion*

32. In consultation with the neurologist or neurosurgeon, ADHD medications may be one component of a comprehensive management plan.
✓*Recommended best practice based on clinical experience and expert opinion*

Measuring impairment

33. While the DSM-IV diagnosis of ADHD does require impairment, impairment at home, school/work and in social relationships is poorly defined. Careful discussion is needed with the family as to the extent to which problems are specifically related to ADHD symptomatology.
✓*Recommended best practice based on clinical experience and expert opinion*

34. Measures of impairment specific to ADHD for preschoolers, children and adolescents are not yet sufficiently robust for routine use. (Grade D)

35. The Current Behaviour Subscale could be used as a measure for functional impairment in adults with ADHD. (Grade C)

Retrospective self-reports

36. The reports provided by adults with ADHD on the symptoms they had in childhood are accurate and valid for informing diagnosis and assessment. (Grade B)

Information from multiple informants

37. For diagnosis of ADHD in children and adolescents, input from multiple informants (e.g. parents/caregivers, teachers) should be considered in evaluating the chronicity and pervasiveness of impairment. (Grade B)

38. Diagnosis of ADHD should not solely rely on the use of parent *or* teacher information, as this may lead to over-diagnosis. Information from both parents *and* teachers should be included.
    ✓*Recommended best practice based on clinical experience and expert opinion*

39. For diagnosis of ADHD in adults, input from multiple informants (e.g. partners, family members) should be considered, where possible, in evaluating chronicity and pervasiveness of impairment. (Grade B)

40. When evaluating parent reports describing children with suspected ADHD, consideration should be given to the psychiatric status of the parent, as maternal depression may have an impact on the mother's reporting of symptoms in her child. (Grade D)

41. There are insufficient research data to determine whether ADHD in the parent has an impact on their reporting of ADHD symptoms in their children. (Grade D)

Assessment and diagnosis in specific populations

Culturally and linguistically diverse populations

42. Cultural differences in perceived levels of impulsivity, hyperactivity and inattention should be considered in the diagnosis of ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Indigenous Australians

43. There is need for a culturally appropriate assessment of ADHD in Indigenous people.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Diagnostic tools

Neuropsychological measures

44. There are insufficient research data to recommend the inclusion of neuropsychological measures in routine diagnostic assessment for ADHD. (Grade D)

45. Where functional difficulties persist in the context of ADHD (e.g. learning problems, organisational difficulties), despite initial educational, pharmacological and psychological strategies, neuropsychological assessment can provide information on cognitive strengths and weaknesses. This information can then be used by the person with ADHD and the teacher and/or parent/caregiver to develop compensatory approaches to learning and daily functions.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Neurophysiological measures

46. There are insufficient research data to recommend the inclusion of neurophysiological measures in routine diagnostic assessment for ADHD. (Grade D)

Neuroimaging

47. There are insufficient research data to recommend the inclusion of neuroimaging in routine diagnostic assessment for ADHD. (Grade D)

Overall management

Developing an individualised management plan

48. An individualised management plan should be drawn up in collaboration with the person with ADHD and their parents/carers and teachers as appropriate. The management plan should take into account:
    - the specific needs and expressed preferences of the person, and the circumstances of his or her family and culture.
    - the associated psychosocial problems, educational difficulties and comorbid conditions.
    - the suitability of the plan for the individual and their family, taking into account affordability, accessibility and acceptability.

    ✓*Recommended best practice based on clinical experience and expert opinion*

49. People with ADHD and their families and carers should be provided with information and education about ADHD and its impact, and the advantages and disadvantages of potential treatment strategies.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Multimodal therapy

50. A multimodal approach is recommended for treatment of ADHD. This may include medication, psychosocial management strategies and, where appropriate, educational interventions.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Treatment monitoring and review

51. Patients receiving treatment for ADHD should be reviewed regularly (at least 6-monthly) to ensure that the management strategies remain appropriate and effective.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Family support/intervention

52. Participation in support groups can be of benefit for parents/carers of children and adolescents with ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*
53. Participation in adult ADHD support groups can be of benefit to adults with ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Psychosocial management

Psychosocial interventions for preschool-aged children (3–5 years)

54. Structured parenting programs with demonstrated effectiveness could be considered for preschoolers with ADHD and associated behavioural problems. (Grade B)
55. In considering the use of psychosocial interventions, availability, the family's resources and their capacity to adhere to the program should all be taken into account.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Psychosocial interventions for school-aged children

56. Structured parenting programs with demonstrated effectiveness could be considered for children with ADHD and associated behavioural problems. (Grade B)

57. Used alone, clinic-based social skills training is not recommended for improving social skills in children with ADHD. (Grade D)

58. There are insufficient research data to recommend the use of cognitive behavioural therapy (CBT) or family therapy for the treatment of ADHD symptoms. (Grade D)

59. Cognitive behavioural therapy (CBT) or family therapy may, however, be useful in addressing certain comorbidities, including anxiety, ODD and CD.
✓*Recommended best practice based on clinical experience and expert opinion*

Psychosocial interventions for adolescents

60. The interventions described for children (with the exception of parenting programs) could be applied to young adolescents with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

61. For older adolescents with functional impairments associated with ADHD, the cognitive behavioural therapy (CBT) strategies described for adults may prove beneficial.
✓*Recommended best practice based on clinical experience and expert opinion*

Psychosocial interventions for adults

62. For adults whose ADHD has been stabilised on medication, a course of either group or individual cognitive behavioural therapy (CBT) could be considered to improve ADHD symptoms further and assist with daily functioning in areas such as organisational skills, self-esteem and social skills. (Grade B)

63. Psychoeducation, counselling, psychotherapy or coaching may benefit some adults with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

64. Consideration of the use of psychosocial interventions should take into account availability, and the individual's resources and capacity to adhere to the program.
✓*Recommended best practice based on clinical experience and expert opinion*

Psychosocial interventions for ADHD when comorbidities are present

65. Psychosocial interventions should be considered for individuals with ADHD and comorbidities.
✓*Recommended best practice based on clinical experience and expert opinion*

66. Psychosocial interventions can be particularly beneficial when the individual with ADHD has comorbid anxiety. (Grade C)

Medication

67. Not all people with ADHD require pharmacological management.
✓*Recommended best practice based on clinical experience and expert opinion*

68. Medications should only be used when symptoms are pervasive across settings (eg. school and home) and causing significant impairment in academic, social or behavioural function, and after careful consideration of non-pharmacological approaches. Clearly defined goals should be identified prior to commencing a trial of medication treatment
✓*Recommended best practice based on clinical experience and expert opinion*

69. A multimodal approach is recommended for treatment of ADHD. Psychosocial management strategies and, where appropriate, educational interventions should be used in conjunction with medication treatments.
✓*Recommended best practice based on clinical experience and expert opinion*

Notes: Also see recommendations on Side effects: special considerations. Informed consent should be gained if off-label prescribing is being contemplated. Refer to Chapter 8.

Stimulant medication (methylphenidate (MPH), dexamphetamine (DEX) and mixed amphetamine salts (MAS))

Preschool-aged children (3–5 years of age)

70. Medication should not be used as first-line treatment for ADHD in preschool-aged children.
    ✓*Recommended best practice based on clinical experience and expert opinion*

71. The use of medication should only be considered in preschool-aged children when there has been poor response to behavioural or psychosocial therapy and the ADHD symptoms are having a severe impact on the child and their family/carers. For preschool-aged children medication should only be initiated following specialist assessment and in the context of multidisciplinary care, preferably in a tertiary setting.
    ✓*Recommended best practice based on clinical experience and expert opinion*

72. Where a decision is made to trial medication, MPH-IR should be used at low dose, in conjunction with appropriate behavioural intervention. (Grade C)

73. Preschool-aged children on medication need to be monitored closely because of the increased incidence of side effects in this age group. (Grade B)

74. Extended-release forms of stimulants should not be routinely used in preschool-aged children.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Note: Use of stimulant therapy in preschool-aged children is regulated underspecific State and Territory legislation.

School-aged children

75. Where severe ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

76. The choice of MPH-immediate-release or MPH-extended-release depends on the symptom profile, as well as individual child and parent/caregiver preferences. (Grade A)

Adolescents

77. Where severe ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

78. The choice of MPH-immediate-release or MPH-extended-release depends on the symptom profile, as well as the preference of the adolescent with ADHD. (Grade B)

Adults

79. Where severe ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

80. The choice of MPH-immediate-release or MPH-extended-release depends on the symptom profile, as well as the preference of the person with ADHD. (Grade B)

All age groups

81. When stimulant treatment is used, it should be continued for as long as it is of assistance to the person with ADHD and is not causing unacceptable

side effects.
✓*Recommended best practice based on clinical experience and expert opinion*

82. All patients should be carefully monitored for side effects of medication.
✓*Recommended best practice based on clinical experience and expert opinion*

Stimulants not available in Australia

83. MAS may have a role in the pharmacological management of ADHD in primary school-aged children, adolescents or adults. (Grade B)
Note: MAS is not currently available in Australia.

Immediate-release versus extended-release

84. Immediate-release forms should be the initial treatment, to titrate to the optimal dose, and they may be the preferred maintenance therapy for various reasons, for example, flexibility of dosing.
✓*Recommended best practice based on clinical experience and expert opinion*

85. If starting on immediate-release stimulants, consideration should be given to changing to an extended-release form once the optimal dose has been established. This can help to avoid the stigma and inconvenience of taking medication at school.
✓*Recommended best practice based on clinical experience and expert opinion*

86. In some cases the combined use of immediate-release and extended-release forms is required. This should only be considered if there is inadequate symptom control with the extended-release form.
✓*Recommended best practice based on clinical experience and expert opinion*

Atomoxetine (non-stimulant)

87. Preschoolers: There is no published research to show benefit from ATX in treating ADHD in preschool-aged children.

88. Children and adolescents: ATX should be considered for children and adolescents with severe ADHD who do not respond to or are intolerant of stimulant medication, or in whom stimulant medication is contraindicated. (Grade B)

89. Adults: Treatment with ATX should be considered for adults with severe ADHD who do not respond to or are intolerant of stimulant medication, or in whom stimulant medication is contraindicated. (Grade B)

90. ADHD and comorbidities: ATX may be considered as the first-line medication if there is comorbid substance abuse, severe tic disorder or anxiety disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

Other medications used in ADHD

Clonidine

91. Clonidine may provide some benefit in modifying ADHD symptoms in children, particularly in the home setting, used either alone or in combination with MPH. It could be trialled in the absence of clinical response to stimulants and ATX. (Grade D)

Modafinil

92. Modafinil is not recommended as an alternative medication in school-aged children and adolescents with ADHD due to concerns about the associated side effects in this age group. (Grade C)

93. Modafinil may be considered as an alternative medication in adults with ADHD who do not respond to stimulants or ATX. (Grade C)

Selegiline

94. There are insufficient research data to recommend the use of selegiline for the treatment of ADHD. (Grade D)

Guanfacine

95. Guanfacine may have a role in the pharmacological management of ADHD. (Grade C)
    Note: Guanfacine is not currently available in Australia.

Nicotine patch

96. There are insufficient research data to recommend the use of nicotine patches in the treatment of ADHD in school-aged children and adolescents. (Grade D)

Bupropion

97. Bupropion may provide some benefit in treating ADHD symptoms in adults. It could be trialled in the absence of clinical response to stimulants and ATX. (Grade D)

Risperidone

98. There are insufficient research data to recommend the use of risperidone for the treatment of ADHD. (Grade D)

Medication when comorbidities are present

99. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants. There are no antidepressant medications with TGA-approved indications for treatment of children and adolescents with depressive symptomatology or major depressive disorder. There are significant concerns about serious adverse reactions (increased suicidality and thoughts of self-harm) in a small percentage of this patient group.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Anxiety

100. Psychosocial management of comorbid anxiety should always be considered.
    ✓*Recommended best practice based on clinical experience and expert opinion*

101. In individuals with ADHD and anxiety, treatment with stimulant medication or ATX should still be considered to treat the ADHD symptoms. (Grade C)

102. If anxiety symptoms do not respond to psychosocial interventions, the use of selective serotonin reuptake inhibitors (SSRI) could be considered, either alone or in combination with a medication to treat the ADHD. Antidepressant medication should only be used in the context of comprehensive patient management and should be combined with psychological interventions. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Other disruptive behaviour disorders (oppositional defiant disorder, conduct disorder)

103. Non-pharmacological management of comorbid disruptive behaviour disorders should always be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

104. In children and adolescents with ADHD and comorbid ODD, MPH or ATX should be considered to treat the ADHD symptoms. (Grade B)

105. In children and adolescents with ADHD and comorbid ODD or CD, MPH plus clonidine could be considered to treat the ADHD symptoms. (Grade C).

106. In children with ADHD and comorbid CD, MPH plus risperidone could be considered to treat the ADHD symptoms. (Grade C)

Depression

107. If major depression is suspected in a person with ADHD, consultation with a psychiatrist should be considered to review diagnosis and assist in management.
✓*Recommended best practice based on clinical experience and expert opinion*

108. Non-pharmacological management of comorbid depression should always be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

109. The relative contribution of any currently prescribed stimulant medication to the onset of depression should be reviewed. Trials off stimulant medication may be appropriate.
✓*Recommended best practice based on clinical experience and expert opinion*

110. Where depression is identified in an adolescent or adult with ADHD, the potential contribution of illicit drugs to the onset of the depression should be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

111. In people with ADHD and comorbid major depressive disorder, use of ATX could be considered to treat the ADHD symptoms. (Grade C)

112. The use of stimulant medication could be considered to treat ADHD symptoms in people with ADHD and comorbid major depressive disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

113. Antidepressant medication may be considered to treat ADHD symptoms in adults with ADHD and comorbid moderate to severe depression.
✓*Recommended best practice based on clinical experience and expert opinion*

114. Antidepressant medication could be considered for adolescents with ADHD and comorbid moderate to severe depression. Antidepressant medication should only be used in the context of comprehensive patient management and should be combined with psychological interventions. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants.
✓*Recommended best practice based on clinical experience and expert opinion*

Bipolar disorder

115. If bipolar disorder is suspected in a child or adolescent with a diagnosis of ADHD, consultation with a child and adolescent psychiatrist should be considered to review diagnosis and assist in management.
✓*Recommended best practice based on clinical experience and expert opinion*

116. In adults with ADHD and non-psychotic comorbid bipolar disorder, use of low dose stimulant medication, in addition to mood-stabilising medication, may be considered. (Grade C)

Epilepsy

117. In individuals with ADHD and well-controlled epilepsy, stimulant medication or ATX should be considered to treat the ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

118. The impact of ADHD medication on seizure frequency should be monitored, especially in the initial medication trial period.
✓*Recommended best practice based on clinical experience and expert opinion*

Tic disorders and Tourette syndrome

119. In people with ADHD and a comorbid tic disorder or Tourette syndrome, stimulant medication is not necessarily clinically contraindicated and should be considered to treat ADHD symptoms. (Grade C)

120. In people with ADHD and comorbid tic disorder or Tourette syndrome, use of ATX should be considered to treat the ADHD. (Grade C)

121. In children and adolescents with ADHD and a comorbid tic disorder /Tourette syndrome, clonidine should be considered if ADHD symptoms show poor response to stimulants or ATX. (Grade C)

122. If a tic occurs or becomes worse after commencing an ADHD medication, a clinical decision should be made in collaboration with the person with ADHD and/or the parents/caregivers on whether to:

    - continue the ADHD medication alone
    - add an anti-tic medication, or
    - trial another ADHD medication.

    The decision will be informed by the degree of response to the stimulant and the severity of the tics. (Grade C)

Medications in children with a developmental disability

Learning disabilities

123. Where a person with a learning disability also has ADHD, management of the learning disability should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

124. Stimulant medication or ATX should be considered to improve the ADHD symptoms.
✓*Recommended best practice based on clinical experience and expert opinion*

Intellectual disability

125. Where a person with an intellectual disability also has ADHD, management of the intellectual disability should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

126. In people with an intellectual disability and ADHD, use of stimulant medication should be considered. (Grade C)

Autism spectrum disorders

127. Where a person with an autism spectrum disorder also has ADHD symptoms, management of that disorder should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

128. In children with an autism spectrum disorder and symptoms of ADHD, use of stimulant medication or ATX should be considered to treat ADHD symptoms. (Grade C)

129. Careful monitoring is required due to the possibility of exacerbating ritualistic behaviours and stereotypies.
✓*Recommended best practice based on clinical experience and expert opinion*

Side effects: special considerations

Growth

130. If a child is prescribed stimulant medication or ATX, growth parameters should be assessed at baseline and monitored every 3–6 months. (Grade B)

131. Monitoring should include plotting of growth parameters (weight, height, growth velocity) on appropriate charts.
✓*Recommended best practice based on clinical experience and expert opinion*

132. For children most at risk of growth attenuation (younger age, higher dose), medication at low doses only, and/or other intervention strategies, should be considered. (Grade C)

133. Where there are concerns about reduced growth velocity (crossing centiles or inadequate weight gain), intervention strategies might include medication "holidays" (dose reduction or cessation during weekend and vacation periods).
✓*Recommended best practice based on clinical experience and expert opinion*

Cardiac events

134. Before initiating pharmacological treatment for ADHD, cardiac risk factors should be assessed, including:
    - history of congenital heart disease or arrhythmias, palpitations, exercise intolerance or chest pain
    - family history of early cardiac disease (<50 years) or unexplained sudden death
    - cardiovascular examination. (Grade B)

135. Routine monitoring at review appointments should include heart rate and blood pressure, and recent history of palpitations, exercise intolerance and chest pain. (Grade B)

136. Specialist cardiologist advice is recommended for people with cardiovascular risk factors (congenital heart disease, arrhythmias, family history) and in whom blood pressure or heart rate exceeds normal limits. (Grade B)

Psychiatric disturbance

All ADHD medications

137. For individuals taking ADHD medications there is a rare but serious risk of psychiatric adverse events. Before prescribing ADHD medication, the person with ADHD and/or their caregiver should be specifically told of the risk of emergent psychiatric adverse effects, including aggression, anxiety, mania and psychosis. (Grade B)

138. As part of ADHD medication management, the person with ADHD and/or their caregiver should be specifically asked about emergent psychiatric adverse effects. (Grade B)

139. This is especially important for people who are receiving both ADHD medications and other psychotropic medications, have significant psychiatric comorbidities and/or have a family history of psychiatric illness. (Grade B)

Atomoxetine

140. All people for whom ATX is being considered should be told of the possibility of suicidal ideation, and people on ATX should be monitored for this side effect with extra vigilance. (Grade B)

Stimulant medication

141. All people for whom stimulant medication is being considered should be told of the possibility of suicidal ideation, and people on stimulant medication should be monitored for this side effect with extra vigilance. (Grade B)

Monitoring of medication effectiveness and side effects

142. Individuals on medication for ADHD should be monitored by their treating doctor for medication effectiveness and side effects. This should occur frequently in the early phase of treatment, and thereafter at intervals of 3–6 months.
✓*Recommended best practice based on clinical experience and expert opinion*

143. Monitoring should include reports from caregivers, partners and/or teachers (as applicable). Brief parent and teacher behaviour rating scales can also contribute to monitoring of behaviour or performance at home or school.
✓*Recommended best practice based on clinical experience and expert opinion*

144. Monitoring at each visit should include height, weight and growth in children/adolescents and psychiatric disturbance, heart rate and blood pressure in all age groups. (Grade B)

145. Trials off medication should be conducted to evaluate whether the medication is still clinically indicated.
✓*Recommended best practice based on clinical experience and expert opinion*

ADHD and substance misuse

Effect of ADHD management on risk of developing substance use disorders

146. The use of stimulant medication to treat people with ADHD does not increase the risk of developing substance use disorder. (Grade B)

Treatments for ADHD when comorbid substance use disorder is present

147. A history of substance abuse and previous treatments should be included in the evaluation of patients.
✓*Recommended best practice based on clinical experience and expert opinion*

148. If the substance use disorder is active the symptoms of the substance use disorder should be addressed prior to attending to the symptoms of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

149. Medication treatment for ADHD comorbid with substance use disorder should only be provided by a medical practitioner with expertise in both conditions.
✓*Recommended best practice based on clinical experience and expert opinion*

150. ATX should be the first medication trialled if the person with ADHD has a comorbid substance use disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

151. Relapse or worsening of substance use should necessitate reassessing the appropriateness of stimulant treatment.
✓*Recommended best practice based on clinical experience and expert opinion*

Medication compared to and combined with psychosocial interventions

Comparing psychosocial and pharmacological interventions

152. Although the evidence suggests that ADHD symptoms improve more in the short to medium term with pharmacological management than with psychosocial interventions, it is not possible to draw conclusions about the best management of ADHD symptoms in the long term. The likely presence of modifying factors, including comorbidities and the age of the child, warrant the use of psychosocial interventions. (Grade D)

153. Psychosocial interventions should be considered in the long-term management of children and adolescents with uncomplicated ADHD, with or without medication.
✓*Recommended best practice based on clinical experience and expert opinion*

154. Psychosocial interventions should be considered, in addition to pharmacological management, in people with ADHD associated with ODD or CD.
✓*Recommended best practice based on clinical experience and expert opinion*

Combined interventions for preschool-aged children, children and adolescents

155. Although the evidence suggests that ADHD symptoms are most improved in the short to medium term with pharmacological management alone, it is not possible to draw conclusions about the best management of ADHD symptoms in the long term. The likely presence of modifying factors, including comorbidities and the age of the child, warrant the inclusion of psychosocial interventions. (Grade D)

Combined interventions for adults

156. The likely presence of comorbidities in adults with ADHD favours the inclusion of psychosocial interventions alongside pharmacological interventions. (Grade D)

Moderators and mediators of outcomes from psychosocial interventions and combined interventions

157. Psychosocial interventions can be particularly beneficial in a person with ADHD and comorbid anxiety. (Grade C)

158. Individualised treatment strategies should be developed. When variables such as parental depression, severe ADHD symptoms or below-average IQ are present, additional intervention strategies may be required. (Grade C)

Educational management

Inclusion: a legal requirement

159. All professionals supporting students with ADHD should be familiar with their legal responsibilities under the 1992 Disability Discrimination Act (DDA) and Disability Standards for Education (2005). ADHD is recognised as a disability under the DDA. As such, schools are responsible for explicit planning and review of support strategies and services for students with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Teacher knowledge

160. Pre-service and in-service teacher preparation courses should be designed to prepare all teachers with the knowledge and skills to accommodate students with specific learning needs and to manage students in need of additional support for their learning, behaviour, organisation and concentration difficulties.
✓*Recommended best practice based on clinical experience and expert opinion*

Resources

161. Resource allocations to schools should be accessible to teachers and school-based personnel for professional development in areas where established and emerging empirical scientific evidence about academic and social learning in children can inform more effective pedagogical practice. Such upgrading of skills should have an emphasis on practical school-based interventions.
✓*Recommended best practice based on clinical experience and expert opinion*

Tertiary/post-school years

162. Australian research into the impact of learning and behaviour challenges for adults pursuing tertiary qualifications is needed to identify what reasonable accommodations can be made to enhance their chances of success.
✓*Recommended best practice based on clinical experience and expert opinion*

Collaborative approaches

163. Medical and education personnel should engage in high-level collaboration (e.g. with Wraparound teams or Positive Behavioural Intervention Support teams, exchange of information, completion of surveys/questionnaires, joint meeting with the family) when a student presents with the characteristics of ADHD to effect the best possible support for both student and family.
✓*Recommended best practice based on clinical experience and expert opinion*

School-based interventions

164. Schools should have policies and procedures in place to support students experiencing learning, behaviour, organisation and concentration difficulties, for example, pre-referral processes, Wraparound and Positive Behavioural Intervention Support teams.
✓*Recommended best practice based on clinical experience and expert opinion*

165. Effective school-based interventions, including peer tutoring, mentoring and peer support (e.g. buddy systems), should be considered for children and adolescents experiencing learning, behaviour, organisation and concentration difficulties to enhance their learning, social and behavioural outcomes. (Grade C)

166. Well-designed research into behavioural and school-based academic interventions that teachers can effectively and easily implement for the benefit of students with ADHD is needed.

Complementary and alternative treatments for ADHD

Elimination and restriction diets

167. Healthcare professionals should encourage good nutrition and a balanced diet.
✓*Recommended best practice based on clinical experience and expert opinion*

168. Elimination and restriction diets are not supported as a general treatment for all individuals with ADHD. Consumers considering the use of elimination or restriction diets should be informed about the uncertainties surrounding the efficacy of these diets in treating ADHD and of the potential risks of unsupervised elimination diets. (Grade D)

169. A subset of children may be sensitive to certain foods or food additives and may benefit from careful exclusion diets. Assessment of food sensitivity and initiation of a special diet should be under the care and supervision of a medical specialist and an Accredited Practising Dietitian.
✓*Recommended best practice based on clinical experience and expert opinion*

Diet supplements

170. There are insufficient research data to recommend the use of diet supplementation with essential fatty acids for the treatment of ADHD. Consumers considering the use of essential fatty acids should be informed about the uncertainties surrounding their efficacy in treating ADHD. (Grade D)

171. The use of essential fatty acids in the management of ADHD symptoms warrants further investigation in well-designed randomised controlled trials (RCTs), including clarification of dosage levels and types of essential fatty acid used.

Chiropractic

172. Consumers considering chiropractic should be informed about the current lack of research to assess its efficacy in the treatment of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Behavioural optometry

173. Consumers considering behavioural optometry should be informed about the current lack of research to assess its efficacy in the treatment of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Biofeedback

174. There are insufficient research data to recommend the use of biofeedback for the treatment of ADHD. (Grade D)

175. Consumers considering biofeedback should be informed about the uncertainties surrounding its efficacy in the treatment of ADHD, the time required to undertake the treatment and its costs.
✓*Recommended best practice based on clinical experience and expert opinion*

176. The use of biofeedback in the treatment of ADHD symptoms warrants further investigation using well-designed RCTs.

Homeopathy

177. There are insufficient research data to recommend the use of homeopathy for the treatment of ADHD. Consumers considering the use of homeopathy should be informed about the uncertainties surrounding its efficacy in treating ADHD. (Grade D)

Cerebellar therapies

178. There are insufficient research data to recommend the use of cerebellar therapies for the treatment of ADHD. (Grade D)

179. Consumers considering the use of cerebellar therapy should be informed about the uncertainties surrounding its efficacy in treating ADHD, the time required to undertake the treatment and its costs.
✓*Recommended best practice based on clinical experience and expert opinion*

Sport, exercise and relaxation

180. Yoga, massage and Tai Chi may be of some benefit in treating ADHD. (Grade D)

181. While other sport, exercise and relaxation programs may have many mental and physical health benefits, their role in the management of ADHD has yet to be demonstrated.

Sensory integration interventions

182. There are insufficient research data to recommend the use of sensory diets / sensory integration therapies for the treatment of ADHD. Consumers considering the use of sensory diets / sensory integration therapies should be informed about the uncertainties surrounding the efficacy of these programs in treating ADHD. (Grade D)

ADHD in the workplace

183. Career and workplace assessments are often valuable in assisting adults with ADHD in their selection of career or workplace function.
✓*Recommended best practice based on clinical experience and expert opinion*

ADHD and driving

Effect of treatment on driving ability in people with ADHD

184. People with ADHD should be strongly advised to take their stimulant medication if they are driving. Treatment with MPH improves driving performance in people with ADHD. The use of extended-release stimulants is preferable if the person drives at night. (Grade C)

185. There are insufficient research data to recommend the use of ATX for the improvement of driving performance in individuals with ADHD. (Grade D)

186. The use of a manual transmission over an automatic transmission should be considered for individuals with ADHD. (Grade C)

Issues for families, parents and caregivers

Families with ADHD in a child or adolescent

187. Clinicians should be alert to the risk of depression in parents/caregivers of children or adolescents with ADHD. Parents/caregivers may need referral for support and treatment.
✓*Recommended best practice based on clinical experience and expert opinion*

188. When a child or adolescent is diagnosed with ADHD, the clinician should consider the impact of marital discord on the children over and above the effects of the ADHD, as ADHD may exacerbate underlying family tensions.
✓*Recommended best practice based on clinical experience and expert opinion*

189. Consideration should be given to the siblings of children with ADHD. Siblings may need additional support at school if there is an expectation that they care for their sibling with ADHD or if they become the focus of peer ridicule because of the behaviour of their sibling with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Adult ADHD and its impact on the family

190. Treatment planning for adults with ADHD needs to include strategies for daily living and additional support during life transitions such as changes in career or family situation.
✓*Recommended best practice based on clinical experience and expert opinion*

191. Treatment planning for children with ADHD needs to take into account whether the parent/caregiver has symptoms of ADHD, as parents/caregivers with ADHD symptoms may need additional support to implement the program with their child successfully.
✓*Recommended best practice based on clinical experience and expert opinion*

192. When an adult is diagnosed with ADHD, the clinician should consider the impact on their partner and family as additional support may be needed.
✓*Recommended best practice based on clinical experience and expert opinion*

Children and adolescents with ADHD in out-of-home care

193. All children and adolescents in out-of-home care should receive a medical assessment that includes a developmental and mental health assessment.
✓*Recommended best practice based on clinical experience and expert opinion*

194. Special care needs to be taken in establishing or refuting a diagnosis of ADHD in children in out-of-home care, because of the high risks of misdiagnosis, and the equally high risks of doing harm by ceasing established therapy for children already at high risk of long-term disadvantage and disability.
✓*Recommended best practice based on clinical experience and expert opinion*

195. When a child with a diagnosis of ADHD is placed in out-of-home care, every effort should be made to maintain continuity of treatment and to ensure that foster carers are educated about the special needs of the child.
✓*Recommended best practice based on clinical experience and expert opinion*

196. The professionals in Australia's welfare system who are responsible for the care of children and adolescents should be educated about ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

197. Research on the management and care of children and adolescents with ADHD in out-of-home care is needed.

ADHD and the justice system

Prevalence of ADHD and comorbidities among offenders

198. As ADHD and ADHD symptoms are common in individuals entering the justice system, screening for ADHD may be indicated in this population.
✓*Recommended best practice based on clinical experience and expert opinion*

Impact of treatment for ADHD on rates of offending and recidivism

199. More research is needed to determine whether treatment of ADHD can reduce the risk of crime and recidivism.

Particular vulnerabilities of people with ADHD in the justice system

200. Officers of the legal and justice systems should be made aware of the potential vulnerabilities and needs of people with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

201. Proper assessment and diagnosis of ADHD is important for identifying symptoms that may make an individual vulnerable to standard police and court procedures. Psychoeducational and neuropsychological assessment may be useful in this situation to assess individual vulnerability in comparison to population standards.
✓*Recommended best practice based on clinical experience and expert opinion*

202. Special provisions may be appropriate for some individuals with ADHD (e.g. regular breaks, repetition of important information).
✓*Recommended best practice based on clinical experience and expert opinion*

203. For individuals with ADHD within the prison system, management of ADHD symptoms should be considered in order to improve outcomes in prison, including substance use, antisocial behaviour and critical incidents.
✓ *Recommended best practice based on clinical experience and expert opinion*

INTRODUCTION

Aim of the Guidelines

The aim of these Guidelines is to support and inform the care of individuals with ADHD by providing a series of recommendations to guide assessment, management and care. It is anticipated that the recommendations will provide a guide to best practice that can be followed subject to the judgement of the professional involved and the preference of the person with ADHD and/or his or her parents or guardians.

Who are the Guidelines for?

The Guidelines are written for the range of professionals involved with ADHD, including teachers, psychologists, paediatricians, psychiatrists, allied health professionals and general practitioners. The Guidelines are also intended to inform researchers, policymakers, carers, consumers and interested community members. Accordingly, the expressed views and concerns of consumers and carers were considered throughout the development of the Guidelines.

What do the Guidelines address?

The development of these Guidelines acknowledges the burden of ADHD for individuals and their families and is indicative of a concerted effort by professional and governmental bodies to enhance, provide and sustain equitable clinical care across the country for patients and their families.

ADHD is a condition that affects people across the lifespan. The Guidelines address the specific needs of:

- preschool-aged children (3–5 years)
- children (6–12 years)
- adolescents (13–17 years)
- adults (18 years and above).

The guidelines are not applicable to children under the age of 3 years.

The recommendations are relevant to the diversity of Australian communities. Consideration has been given to rural and remote settings, and community groups such as Aboriginal and Torres Strait Islanders and people from culturally and linguistically diverse (CALD) backgrounds. It is anticipated that the Guidelines will enable a consistent response to ADHD across all Australian States and Territories and will facilitate a co-ordinated approach across sectors, including Health, Education, Justice and Community Services.

Several groups are poorly represented in the research literature on ADHD. For example, ADHD in girls and women has only recently garnered attention and there is a paucity of research on ADHD in individuals over 50 years of age. Research on ADHD in many specific communities, including Aboriginal and Torres Strait Islander peoples, is also rare. Consequently, guidelines and recommendations in relation to these groups can generally be made only on the basis of expert consensus.

Terms of Reference

To revise the 1997 NHMRC *Guidelines on Attention Deficit Hyperactivity Disorder (ADHD)*, incorporating literature published since, to inform health professionals, educators, researchers, policymakers, carers, consumers and interested community members.

Specifically, the revision of the 1997 NHMRC Guidelines on ADHD should:

1. Define and describe the current conceptualisation of ADHD.
2. Address aspects of ADHD that have generated community and professional interest over the past decade, including:
    - neurobiology
    - aetiology – genetics, environmental factors
    - comorbid conditions
    - symptom patterns and management at different developmental stages, including preschool-aged children, school-aged children, adolescents and adults
    - issues specific to particular populations, e.g. Indigenous Australians and people from culturally and linguistically diverse (CALD) backgrounds
    - role of newer medications, e.g. long-acting stimulant preparations, non-stimulants
    - long-term outcomes
    - quality of life for the individual with ADHD and their family
    - complementary and alternative therapies
    - diagnostic practices (differential diagnosis)
    - access to services.
3. Synthesise and interpret the current state of knowledge on ADHD for different stakeholders.
4. Update the list of available resources to assist clinicians, educators, carers and consumers in the evaluation and management of ADHD.
5. Advise on national data collection in the management of ADHD.
6. Advise on targets for further research into the causes, management and outcomes of ADHD.
7. Provide recommendations for policy and practice for different stakeholders.

Guideline development process

The revision of the NHMRC Guidelines on ADHD has been undertaken in accordance with NHMRC guideline development processes, and following the NHMRC handbooks on guideline development (2-4) and the NHMRC standards and procedures for externally developed guidelines (5).

The Guidelines were prepared by a project officer and scientific writer working closely with a multidisciplinary expert reference group. The reference group brought expertise from the key professional disciplines involved with ADHD, including paediatrics, child and adolescent psychiatry, adult psychiatry, psychology, general practice, education and consumers/carers. The project has been overseen by an NHMRC-appointed Guidelines Assessment Register Consultant, and a project management team has directed the administrative aspects of guideline development. Consultation with other individuals and organisations has been included in the development process in line with NHMRC standards.

Details of the membership of the guideline development groups are provided in Appendix A. The dualities and conflict of interest statements of all individuals involved in the development of the Guidelines are provided in Appendix B. The terms of reference for each guideline development group and a detailed report on the development process is provided in Appendix C.

The next revision: It is anticipated that these Guidelines will have a lifespan of 5 years and will need to be revised in 2014.

Literature review

The content of the Guidelines is based largely on the results of a systematic review of the literature. The systematic review is presented as a separate document and is available to download from the RACP website. The review presents each research question and a series of summary tables describing the identified studies. Each summary table provides the lead author, a brief description of the participants in the study, the study design, a brief description of the intervention or diagnostic criteria, the outcome measures used and a brief conclusion. The level of evidence for each study has been designated according to the NHMRC levels of evidence (Table 1). Within the text of the Guidelines, unless otherwise specified the level of evidence refers to intervention studies. For studies with levels of evidence based on diagnosis, prognosis, aetiology or screening intervention, this is noted.

The methods used to conduct the review comply with NHMRC requirements (3-5) and are described in Appendix D. The research questions addressed by systematic review are listed in Appendix E. For each included article, data were extracted into a standardised data-extraction / critical appraisal table (Appendix F).

The guideline recommendations have been developed using the procedure outlined` in the *NHMRC additional levels of evidence and grades for recommendations for developers of guidelines: Stage 2 consultation 2008–2010* (1). A standardised form has been used to formulate and grade the recommendations: the NHMRC Evidence Statement Form (Appendix G). When Level I, II, III or IV evidence was available from the systematic review the recommendation was graded as A, B, C or D. In areas where no Level I, II, III or IV evidence was available, best practice points that are based on the clinical experience and expert opinion of the reference group of clinicians, educators and consumers have been provided. Research recommendations have not been graded. Table 2 sets out the evidence gradings.

In this guideline document, when a recommendation is based on evidence derived from the systematic review, the relevant research question(s), summary evidence statement(s) with level of evidence, and resultant recommendation(s) are provided in a box at the start of the appropriate section, followed by an outline of the research evidence.

Table 1. NHMRC levels of evidence according to type of research question (1)

Level	Intervention	Diagnosis	Prognosis	Aetiology	Screening
I	Systematic review of level II studies	Systematic review of level II studies	Systematic review of level II studies	Systematic review of level II studies	Systematic review of level II studies
II	Randomised controlled trial	Study of test accuracy with an independent, blinded comparison with a valid reference standard, among consecutive patients with a defined clinical presentation	A prospective cohort study	All or none	Randomised controlled trial
III-1	Pseudo-randomised controlled trial (i.e. alternate allocation or some other method)	Study of test accuracy with an independent, blinded comparison with a valid reference standard, among non-consecutive patients with a defined clinical presentation	All or none	All or none	Pseudo-randomised controlled trial (i.e. alternate allocation or some other method)
III-2	Comparative study with concurrent controls: •Non-random, experimental trial •Cohort study •Case-control study •Interrupted time series with a control group	Comparison with reference standard that does not meet the criteria required for Level II and III-1 evidence	Analysis of prognostic factors amongst untreated control patients in a randomised controlled trial	Retrospective cohort study	Comparative study with concurrent controls: •Non-random, experimental trial •Cohort study •Case-control study
III-3	Comparative study without concurrent controls: •Historical control study •Two or more single arm studies •Interrupted time series without a parallel control group	Diagnostic case-control study	Retrospective cohort study	Case control study	Comparative study without concurrent controls: •Historical control study •Two or more single arm studies
IV	Case series with either post-test or pre-test/post-test outcomes	Study of diagnostic yield (no reference standard)	Case series, or cohort study of patients at different stages of disease	Cross-sectional study	Case series

Table 2. Grading of recommendations (1)

Grade	Description
A	Body of evidence can be trusted to guide practice
B	Body of evidence can be trusted to guide practice in most situations
C	Body of evidence provides some support for recommendation(s) but care should be taken in its application
D	Body of evidence is weak and recommendation must be applied with caution
Best practice points	
√	Recommended best practice based on clinical experience and expert opinion, where there is inadequate evidence to establish evidence based recommendations.

PART I: WHAT IS ADHD? CONCEPTUALISATION, CAUSES, PREVALENCE AND CONSEQUENCES

CHAPTER 1. INTRODUCTION: DEFINITION, HISTORY AND CURRENT DIAGNOSTIC CRITERIA

1.1 Definition

Attention deficit hyperactivity disorder (ADHD) is defined as a persistent pattern of inattention and/or hyperactive and impulsive behaviour that is more frequent and severe than is typically seen at a given stage of development. Symptoms are usually present from early childhood, they tend to become particularly problematic when the child starts school and they may remain troublesome across the lifespan. The symptoms of ADHD are associated with impairment in educational, social and emotional function.

Over the past 30 years there has been extensive scientific research published that examines ADHD causes, associations, outcomes and treatments. ADHD continues to be a subject of great interest in the community, with frequent discussion in the media. Diverse and strong opinions are often expressed, particularly about causes and treatments.

There are essentially two clinical subtypes of ADHD: combined subtype, which includes both inattention symptoms and impulsive/hyperactive symptoms, and predominantly inattentive subtype, in which the impulsive/hyperactive symptoms are minimal. A third subtype, predominantly hyperactive/impulsive, is described, but is rarely diagnosed.

ADHD occurs in all ethnic groups and social classes and is the most common neurobehavioural disorder of childhood (6). The childhood community prevalence of 6.8% found in Australia (7) is similar to that reported in other countries (8-10).

Many individuals with ADHD also have related problems in areas including language, learning, mood, emotional regulation and motor control (11-15) (see section 3.2 Comorbidities, page 22). Academic and social struggles can lead children with ADHD to feel demoralised and depressed, or angry and oppositional. They are at increased risk of a range of adverse outcomes including academic underachievement, difficulties with interpersonal relationships and low self-esteem, with potentially serious consequences for the individual and society (16, 17) (see Chapter 4. Consequences of ADHD, page 25).

1.2 A historical perspective

The earliest account of inattention, recognition of its potential for causing disability and speculation on its nature date from 1798 when Alexander Crichton published "On Attention and its Diseases" as part of a treatise entitled "An enquiry into the nature and origin of mental derangement" (18) Children with problematic hyperactivity, impulsivity and inattention were described in more detail by George Still in the Coulstonian Lectures of 1902 (19).

Other features such as defiance, aggression and emotionality have also often been observed in these children. Professional understanding of these behaviours has evolved over time and diagnostic labelling has followed, with a range of descriptions including defective moral control (19), minimal brain damage, post-encephalitic behaviour disorder (20), brain injured child (21) and hyperkinetic reaction of childhood (22). In the 1970s, the developing understanding of the fundamental neurocognitive problem saw a shift in focus from excessive motor activity to deficits in sustained attention and impulse control (23), and the condition was renamed attention deficit disorder in 1980 (24).

Psychostimulant medication to assist children with behavioural disturbance was first described in 1937 (25). Improved behaviour and school performance was observed

as an unexpected effect of using the amphetamine benzedrine to reduce headaches following lumbar punctures, undertaken to perform investigative pneumoencephalograms in hyperactive children. Stimulant medications began to be used for treating ADHD symptoms in children in the 1970s in North America, and in the 1980s in Australia.

1.3 Current conceptualisation and diagnostic criteria

ADHD is a neurobiological disorder with genetic and environmental contributions. The dominant current paradigm suggests that disordered fronto-striato-cerebellar brain circuitry underpins the executive function deficits at the core of this condition (26). Twin studies have established a strong genetic component (27, 28). This appears to involve polymorphisms in a number of genes, including those coding for dopamine transporters.

Like a number of other psychological characteristics, the features of ADHD vary throughout the entire population. These characteristics are recognisable on a population continuum from minimal signs to dominant characteristics. Individuals in whom a diagnosis of ADHD is made have more marked or more intense features, and represent one end of the continuum (29).

Environmental risk factors for ADHD include antenatal exposures such as tobacco and alcohol, adverse early childhood experiences (including social, family and cultural factors), head trauma, and environmental toxins such as lead (see section 2.1 Aetiology, page 14). The relative contribution of environmental risk factors is the subject of a significant body of research (30).

Children with ADHD are not a homogenous group. While they share the characteristics of poor self-regulation, planning, execution and monitoring of their behaviour (31), they vary widely in the way these characteristics are manifested, and the overall effect on the child is determined by his or her underlying personality, individual strengths and other associated developmental difficulties.

The symptoms of ADHD are not specific to ADHD and a range of differential diagnoses and co-existing conditions need to be considered. These include learning difficulties, sleep deprivation, hearing impairment, attachment deficits and affective disorders (e.g. anxiety and depression). Family conflict, bullying and child abuse can also present with ADHD-like symptoms, and may be alternative explanations for the symptoms, or co-occurring problems in a person who also has ADHD.

The two diagnostic systems most commonly used in both clinical practice and research are the *Diagnostic and Statistical Manual of Mental Disorders* (DSM), published by the American Psychiatric Association, and the *International Statistical Classification of Diseases* (ICD), published by the World Health Organization. The DSM system is used in North America, while the ICD system has been used more in Europe. In Australia the DSM-IV system is generally used.

DSM-IV diagnostic criteria for ADHD (1994) (32) are outlined in Table 3. While earlier editions of the DSM relied on the consensus of experts, based on clinical descriptions to define diagnostic categories, the DSM-IV committee carefully applied psychometric measurement theory (33). Based on extensive literature review, large multi-site field trials were conducted to determine and test the validity and reliability of diagnostic criteria. Factor analysis was used to test the consistency of aggregation of behavioural symptoms and their dimensional fidelity, and threshold cut-off points (required number of symptoms) were determined based on ability to predict impairment (overall, academic and social) and further tested for test-retest and inter-clinician reliability.

This methodical analysis of empirical scientific data resulted in a substantially improved set of diagnostic criteria. A number of issues related to the DSM-IV criteria for ADHD, however, remain unresolved. These include:

- definition of impairment – a problem common to many psychiatric diagnoses
- refinement of the term "often" in terms of frequency and intensity
- appropriateness of items for different developmental stages. The DSM symptom set was based on research in children. Some items are not relevant for adults, for example, "leaves seat in classroom", "runs about or climbs excessively"
- need for variation in symptom thresholds for different developmental stages, for example, preschool, school age, adolescent, adult
- the age of onset criterion. Given the lack of evidence that the life course of people with ADHD varies according to symptom onset before or after age 7, it has been suggested that the age-of-onset criterion be broadened to include onset of symptoms during childhood (34)
- Predominantly Inattentive Type – people with this type of ADHD present as qualitatively different from those with ADHD combined subtype, have a different pattern of comorbidities and respond less well to stimulant medication. It has been suggested that at least some people in this group may be better described as having a condition distinct from ADHD (35).

The Externalising Disorders Research Group has begun work to develop DSM-V, (scheduled to be published in 2012) and is addressing these issues.

ICD-10 (1992) criteria for hyperkinetic disorder (36), outlined in Table 4, describe similar symptoms to DSM-IV and, like DSM-IV, require early onset of symptoms that are "excessive for the child's age and IQ", symptom presence across situations, the persistence of symptoms over time and the exclusion of certain other psychiatric disorders. However, the ICD-10 system requires, in addition to at least 6 inattention symptoms (from a list of 8), the presence of at least 3 (of 5) hyperactive symptoms and at least 1 (of 4) impulsive symptoms. It also excludes people with autism or other pervasive developmental disorders, anxiety or depression. The application of these more restrictive criteria would clearly result in fewer patients with this diagnosis than with DSM-IV ADHD (37), with people meeting ICD-10 criteria being more severely impaired (38).

Neuroscience research has been investigating genetic polymorphisms, biological markers and neuropsychological endophenotypes in ADHD (39, 40). While this work has greatly enhanced understanding of the biology of ADHD, the prospect of shifting from the present behavioural approach to a laboratory-based diagnostic method remains remote.

Table 3. DSM-IV diagnostic criteria for ADHD (32)

1. Either A or B	
A. Inattention – 6 or more symptoms persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level	
	Often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
	Often has difficulty sustaining attention in tasks or play activities
	Often does not seem to listen when spoken to directly
	Often does not follow through on instructions; fails to finish schoolwork, chores or workplace duties (not due to oppositional behaviour or failure to understand instructions)
	Often has difficulty organising tasks and activities
	Often avoids, dislikes or is reluctant to do tasks requiring sustained mental effort
	Often loses things necessary for tasks or activities
	Is often easily distracted by extraneous stimuli
	Is often forgetful in daily activities
B. Hyperactivity-impulsivity – 6 or more symptoms persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level	
Hyperactivity	Often fidgets with hands or feet or squirms in seat
	Often leaves seat in classroom or in other situations where remaining seated is expected
	Often runs or climbs excessively where inappropriate (feelings of restlessness in young people or adults)
	Often has difficulty playing or engaging in leisure activities quietly
	Is often "on the go" or often acts as if "driven by a motor"
	Often talks excessively
Impulsivity	Often blurts out answers before questions have been completed
	Difficulty awaiting turn
	Interrupts or intrudes on others (e.g. butts into conversations or games)
2. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.	
3. Some impairment from symptoms is present in 2 or more settings (e.g. at school or work and at home).	
4. There must be clear evidence of significant impairment in social, school or work functioning.	
5. The symptoms do not happen only during the course of a pervasive developmental disorder, schizophrenia or other psychotic disorder. The symptoms are not better accounted for by another mental disorder (e.g. mood disorder, anxiety disorder, dissociative disorder or a personality disorder).	
Based on these criteria, 3 types of ADHD are identified: **ADHD, Combined Type:** if both criteria 1A and 1B are met for the past 6 months. **ADHD, Predominantly Inattentive Type:** if criterion 1A is met but criterion 1B is not met for the past 6 months. **ADHD, Predominantly Hyperactive-Impulsive Type:** if Criterion 1B is met but Criterion 1A is not met for the past 6 months.	

Table 4. ICD-10 diagnostic criteria for hyperkinetic disorders (36)

G1 Inattention
At least 6 of the following symptoms of inattention have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child: o often fails to give close attention to details, or makes careless errors in school work, work or other activities o often fails to sustain attention in tasks or play activities o often appears not to listen to what is being said to him or her o often fails to follow through on instructions or to finish school work, chores or duties in the workplace (not because of oppositional behaviour or failure to understand instructions) o is often impaired in organising tasks and activities o often avoids or strongly dislikes tasks, such as homework, that require sustained mental effort o often loses things necessary for certain tasks or activities, such as school assignments, pencils, books, toys or tools o is often easily distracted by external stimuli o is often forgetful in the course of daily activities.
G2 Hyperactivity
At least 3 of the following symptoms of hyperactivity have persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child: o often fidgets with hands or feet or squirms on seat o leaves seat in classroom or in other situations in which remaining seated is expected o often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, only feelings of restlessness may be present) o is often unduly noisy in playing or has difficulty in engaging quietly in leisure activities o exhibits a persistent pattern of excessive motor activity that is not substantially modified by social context or demands.
G3 Impulsivity
At least 1 of the following symptoms of impulsivity has persisted for at least 6 months, to a degree that is maladaptive and inconsistent with the developmental level of the child: o often blurts out answers before questions have been completed o often fails to wait in lines or await turns in games or group situations o often interrupts or intrudes on others (e.g. butts into others' conversations or games) o often talks excessively without appropriate response to social constraints.
G4 Age of onset
Onset of the disorder is no later than the age of 7 years.
G5 Pervasiveness
The criteria should be met for more than a single situation, e.g. the combination of inattention and hyperactivity should be present both at home and at school, or at both school and another setting where children are observed, such as a clinic (evidence for cross-situationality will ordinarily require information from more than one source; parental reports about classroom behaviour, for instance, are unlikely to be sufficient).
G6 Impairment
The symptoms in GI & G3 cause clinically significant impairment in social, academic or occupational functioning.
G7 Exclusion criteria
The disorder does not meet the criteria for pervasive developmental disorders (F84,-), manic episode (F30,-), depressive episode (F32,-) or anxiety disorders (F41,-).

ADHD Subtypes

Three major ADHD subtypes have been described:the combined subtype (inattention symptoms and impulsive/hyperactive symptoms), the predominantly inattentive subtype and the predominantly hyperactive/impulsive subtype. The first formal description of ADHD subtypes was in DSM-III, where the distinction of ADHD with and without hyperactivity was made (24). This distinction between ADD and ADHD which has been confusing for both the public and clinicians has subsequently been removed. In DSM-III-R ADHD was described as a unitary disorder with the requirement that 8 out 14 inattentive and/or hyperactive/impulsive symptoms be present for the diagnosis of ADHD. In DSM-IV three subtypes were described; combined, predominantly inattentive and predominantly hyperactive/impulsive (32). It is generally held that the subtyping of ADHD is clinically useful as prior to the introduction of subtypes clinicians were in the position of giving individuals the same diagnosis despite the very different presenting symptoms (41).

Concurrently ICD-10 developed a different and more stringent approach to the diagnosis of ADHD with the requirement that there be symptoms of inattention, hyperactivity and impulsivity (36). In effect this diagnosis is equivalent to a severe form of the DSM-IV combined type (42). While ICD-10 does not provide subtypes based on ADHD symptomatology, it does provide classifications based on comorbidity and recognises a subtype of ADHD that includes significant conduct disorder (CD).

Although the classification is likely to be modified again in DSM-V which is scheduled for publication in 2012 (see http://www.psych.org/MainMenu/Research/DSMIV/DSMV/DSMRevisionActivities/DSMVTaskForceReport.aspx) these Guidelines will follow the DSM-IV classification.

Four lines of evidence address the heterogeneity of ADHD fundamental to the DSM-IV description of ADHD subtypes; 1. symtomology, 2. patterns of comorbidity, 3. genetics and 4. neuroscience. The current status of this research in each of these areas is discussed.

1. Symptomatology

In contrast to historical attempts to statistically unravel patterns of association among symptoms of ADHD, the DSM approach has focussed on utilising clinical acumen to determine likely symptoms and then testing them in field trials to make the final decisions regarding syndrome definition (43). Studies, including from Australia (44), have used factor analysis to identify two distinct dimensions in the inattention and hyperactivity/impulsivity subtypes with coherence among the items. That is, the items are measuring each particular dimension and have little overlap.

Factor analysis however does not adequately allow for the distinction of the combined subtype and for this reason Latent Class Analysis (LCA), which allows the combined type to be distinguished from the other two subtypes has been utilised. This approach has been promoted for ADHD by Rassmussen et al (45) using twin data from Missouri and the Australian Twin ADHD Project-ATAP (46). These data came from twins recruited and assessed in very different ways and as such provide support for the current subtypes as the classifications were consistent across the two samples and followed DSM-IV fairly closely.

2. Patterns of comorbidity

One clear reason for the subtyping in DSM-IV is the clinical heterogeneity observed in individuals with ADHD. There are now data on a wide range of comorbid conditions, especially from population (47) rather than clinical samples which is important in avoiding biases caused by multiple reasons for seeking clinical help. The population-based study of Levy et al (47) included internalising as well as externalising comorbidities and separation anxiety to be commonly comorbid in

girls with the inattentive subtype and generalised anxiety commonly comorbid in girls with the combined subtype (47).

Although the data are much less extensive, subtype differences in psychopathology have also been found in adults. For example, the self-report measure, the Brief Symptom Inventory (BSI), showed surprisingly large differences between the ADHD subtypes on most of the BSI subscales (48).

3. Genetics

ADHD has a substantial genetic component (see Section 2.1.2 Genetics). Consequently, if the subtypes of ADHD are defensible, there should be evidence that they "breed true", that is symptom subtypes should occur in multiple members of the same family. Stawicki et al (49) in a meta-analysis show a modest association of symptom sub-type and family aggregation. The expected pattern of associations is stronger, however, in studies utilising data from same-sex twins (46, 50) which allows much more statistical power for the analysis as data from monozygotic (MZ) and dizygotic (DZ) twins can be combined.

Genetic data also allows us also to address concerns regarding the arbitrariness of the six-item cut off for the two dimensions of inattention and hyperactivity/impulsivity and demonstrate that the distinction between the subtypes is not an artefact of the cut-off score. Concern is raised that individuals miss out on a combined type diagnosis because they have five rather than six symptoms on the other dimension. Martin et al (46, 50) examined the distribution of hyperactive/impulsive symptoms in twins who met the criteria for the inattentive subtype (and vice versa) and their MZ or DZ co-twin. For MZ twins, the data are very clear. If you have the inattentive subtype, you (and your cotwin) are as likely to have 0, 1, 2, 3, 4 or 5 hyperactivity/impulsivity symptoms. The results for those with the hyperactive/impulsive subtype are similar but not as clear cut which may reflect support for Barkley's (31) subtype model which argues that those with hyperactive/impulsive symptoms "grow" into the combined subtype.

4. Neuroscience

There has been a major research emphasis on identifying differences between ADHD subtypes based on brain structure and functioning and this research has included electrophysiological and neuropsychological measures (51). These studies are, however, limited in their clinical validity (52). While there are differences between groups when comparing those with ADHD and a control group on most measures, many of the individuals with ADHD will fall within the normal range which means the measures have only modest validity at a clinical level. Other difficulties in using electrophysiological and neuropsychological measures arise due to differences between subtypes in IQ score and in patterns of relevant comorbidities such as learning problems which confound arguments for or against the existence of subtypes. Overall, while this is a vital area of research, it remains of limited use in terms of clarifying the debate over subtyping.

CHAPTER 2. AETIOLOGY AND NEUROBIOLOGY

2.1 Aetiology

2.1.1 Introduction

The aetiology of ADHD is complex and includes both genetic and environmental components. Current understanding is that ADHD is a heterogeneous neurobiological disorder caused by the interaction of many different types of risk factors. The condition is highly heritable, and environmental risk factors include prenatal exposures such as tobacco, alcohol and lead; perinatal issues such as low birth weight; and postnatal factors such as adverse early childhood experiences, childhood illness and brain injury.

2.1.2 Genetics

Family, adoption and twin studies

Family, adoption and twin studies have demonstrated the importance of genetic factors in the aetiology of ADHD (27). Family studies show that the occurrence of ADHD is elevated amongst the relatives of people with ADHD, with first-degree relatives (parents/siblings/children) having a 4–5-fold increase in risk of ADHD compared to the general population (for review see (53)). Adoption studies have consistently shown that the biological families of people with ADHD are at greater risk of developing the disorder than the adoptive families (54-56).

Twin studies can be utilised to determine general estimates of heritability; that is, the proportion of phenotypic variance that can be attributed to genetic effects. Based on data from 20 twin studies from a number of countries, the heritability of ADHD has been estimated to be 76% (57).

While the heritability of ADHD is high, environmental factors are critical in determining whether the disorder will develop in a particular individual and how it will present. Within a family, not everyone with the susceptibility genes will develop ADHD, and among those family members who do develop the disorder, the clinical presentation may differ widely (58).

Molecular genetic studies

ADHD is a polygenic disorder in which multiple genes contribute to susceptibility. No single gene of large effect has been identified (59); that is, no single gene has been found to be sufficient or necessary to cause ADHD. Rather, the development of ADHD requires a combination of genes of moderate effect interacting with environmental factors.

Molecular genetic studies aimed at identifying susceptibility genes for ADHD generally take one of two approaches: genome-wide linkage analysis or direct targeting of candidate genes. Genome-wide linkage analyses compare the genomes of individuals with and without ADHD to identify chromosomal regions that may include susceptibility genes. Genome-wide scans have been rare and, although they have identified areas of the genome that may be of further interest, no major susceptibility genes have been identified by this approach (59-62).

Candidate gene studies have focused on genes from three neurotransmitter pathways that are thought to be involved in the aetiology of ADHD: the dopaminergic, serotonergic and noradrenergic neurotransmission pathways. There have been numerous candidate gene studies, findings have been independently replicated and meta-analyses have identified significant levels of association for several susceptibility gene variants (for review see (53, 63, 64)). These gene

variants include the dopamine receptors D4 (DRD4) and D5 (DRD5), the dopamine transporter (DAT1), the serotonin transporter gene and the synaptosomal-associated protein 25 gene (SNAP-25). Weak association has been found for the dopamine transporter gene DAT1/SLC6A3 and no association has been found with the catechol-O-methyltransferase gene (COMT) (63).

Molecular genetic research is also generating information on how susceptibility genes may interact with the environment. For example, in the Mannheim Study of Children at Risk (65), children with a particular genetic variation (the VNTR polymorphism of DAT1) who had experienced psychosocial adversity were more likely to display both inattentive and hyperactive/impulsive symptoms. Ultimately, these studies not only highlight the complex relationship between genes and environment, but also suggest why susceptibility genes for ADHD are not fully penetrant, as environment is such a critical component in disease development.

The interaction between genetic factors and medications is commonly referred to as pharmacogenetics. Ultimately, the goal of psychiatric pharmacogenetics is to use the patient's genotype to predict both the response to treatment and the development of side effects. As the stimulant medications used to treat ADHD affect the dopaminergic system, the possibility of fruitful results from pharmacogenetic studies seems high. This research is, however, at the earliest of stages and no clear relationship between medication and genotype has been identified for ADHD (for review see (64)).

Links between ADHD and genetic syndromes

Genetic syndromes associated with ADHD include Angelman, Prader-Willi, Smith Magenis, Williams, Turner, Klinefelter, velocardiofacial (22q.11.2 deletion) and fragile X. These syndromes are rare in routine presentations of ADHD, and chromosome analysis or DNA testing for them is warranted only when other signs and symptoms of the syndromes are present (66).

2.1.3 Environment

Prenatal exposure to nicotine and alcohol

Prenatal exposures to nicotine and alcohol are associated with an increased risk of developing ADHD in childhood. Although numerous studies have been conducted, early research was hampered by potential confounding factors and other methodological limitations. The many possible confounding risk factors include psychopathology or ADHD in the parent and psychosocial adversity, and these confounding factors must be carefully controlled for in the study design. Smoking and alcohol consumption could be a mother’s way of coping with her own ADHD symptoms or her partner’s or other family members’ ADHD symptoms, and may indicate a high genetic risk of ADHD in her child. Similarly, both smoking and alcohol use disorders have a large genetic component and there may be an overlap in susceptibility genes between these disorders and ADHD.

Linnet et al (67) considered 24 studies investigating the possible association of maternal smoking during pregnancy and the development of ADHD or ADHD-like symptoms in the child. The majority of studies reported an association between prenatal exposure to nicotine and inattention and hyperactivity; however, 5 found no statistically significant association (67). More recently, 2 well-designed population-based studies that controlled for maternal ADHD and used full diagnostic criteria for ADHD found a significant association between prenatal smoking and an increased risk of ADHD in the offspring (68, 69). In addition, data from twin studies show a significant association between maternal smoking and ADHD in the offspring, in addition to the influence of genetic factors (70).

Several studies have identified an interplay between specific genotypes and maternal smoking in determining the risk of ADHD. Children who were homozygous for a DAT1 polymorphism and were also exposed to prenatal smoking were found to be at significantly increased risk of hyperactivity, impulsivity and oppositional symptoms, compared to children with only one of these factors (71). Similarly, polymorphisms in the DAT1 or DRD4 genes were associated with altered risks of ADHD in individuals also exposed to prenatal smoking (72). In twins exposed to prenatal smoking, the risk of developing ADHD was 2.9-fold greater when the DAT1 polymorphism was present and 2.8-fold greater with the DRD4 polymorphism, compared to unexposed twins without the risk allele (72).

The mechanism underlying any association between maternal smoking and an increased risk of ADHD in the offspring is thought to be driven by the impact of nicotine on the dopaminergic pathways in the brain (67). Animal studies suggest that prenatal nicotine exposure influences brain development and elicits neurobehavioural outcomes such as hyperactivity that are similar to those seen in ADHD (73).

Prenatal nicotine exposure can also be associated with premature birth and low birth weight (74) which, as discussed below, are also linked with the development of ADHD or ADHD-like symptoms in the child.

Alcohol readily crosses the placenta and its teratogenic effects are established. Prenatal exposure to high levels of alcohol can result in the child developing one of a spectrum of disorders termed foetal alcohol syndrome disorders (FASD). FASD are characterised by facial abnormalities and intellectual disability, and can be associated with ADHD-like behaviours (75). The relationship between FASD and ADHD has contributed to the suggestion of a causal role for prenatal alcohol consumption and an increased risk for ADHD in the child.

Studies considering maternal alcohol consumption during pregnancy and ADHD or ADHD-like symptoms in the child have yielded inconsistent results. Linnet et al (67) reviewed nine studies, of which five reported no significant association between alcohol consumption and increased risk of ADHD, and of the studies that did find a link, 2 were based on very high levels of alcohol consumption (67). More recent studies have found a significant association between heavy prenatal alcohol exposure and an increased possibility of ADHD in the child (76, 77).

Using a children-of-twins design, an Australian study has found a significant genetic correlation between maternal alcohol use disorder (AUD) and ADHD in the offspring (78). In this study, the children of twins with a history of AUD and the children of twins without AUD, but whose co-twin had AUD, were significantly more likely to exhibit ADHD than the children of individuals without AUD. AUD was also associated with an increased probability of maternal smoking during pregnancy, but this did not alter the significant contribution of the genetics. In this study, and in a previous twin study that found ADHD was more likely to be diagnosed in adolescent girls with a parent with AUD, the genetic and environmental risks appear to be additive (78, 79). Consequently, children at high genetic risk for ADHD may also be at higher environmental risk for ADHD (78).

Prenatal exposure to maternal stress

A recent systematic review that included four studies addressing ADHD symptoms found a robust association between prenatal maternal stress and aspects of child development including ADHD symptoms (80). These effects were independent of postnatal depression and anxiety. Maternal stress may influence the in utero environment through changes in the level of hormones. Animal and human studies suggest a link between the stress-responsive hypothalamic-pituitary-adrenal axis and its hormonal end-product cortisol, which can affect the serotonergic system and interfere with neurone development (80).

Exposure to toxins

An increased risk of ADHD or ADHD-like behaviours is associated with prenatal exposure to toxins such as lead, mercury, manganese and polychlorinated biphenyls (PCBs, a group of compound used in brake liners, electrical insulation and paints); for review see (81). Recently a large population-based study of 4700 US children aged 4–15 years found a significant dose-dependent association between the level of lead in the blood and a clinical diagnosis of ADHD (82). The children had a 4-fold increased risk of ADHD when blood levels of lead were >2.1 µg/dL.

Birth complications

Children born prematurely (earlier than 37 weeks gestation) are at 2-fold greater risk of ADHD compared to children born at full term (83). Several studies support the association between low birth weight and an increased risk of ADHD (84-88). There is also support for an association between ADHD and perinatal factors such as young age of mother and caesarean delivery (89). The research in this area, however, is inconsistent, with some studies finding no association between ADHD and low birth weight, delivery characteristics or multiple births (90). Perinatal hypoxic-ischemic encephalopathy (damage to cells in the central nervous system from inadequate oxygen during birth) has also been shown to increase the risk of developing ADHD (91).

Acquired brain injury

Secondary ADHD is a common neurobehavioural consequence of acquired brain injury (ABI). ADHD is reported to occur in 20–50% of children following ABI and is predictive of poorer functional outcomes (92, 93). Attentional deficits are not as common following ABI in adults, and the deficits appear to differ. In adult ABI, many attentional skills are intact, but processing speed is reduced. With childhood injury, deficits tend to be more global, incorporating processing speed and sustained and shifting attention (94, 95). Deficits vary according to injury severity and the nature of underlying brain pathology (96, 97). Attentional deficits may persist over time, and attentional and processing speed deficits have been reported in children 5 years after an ABI (98).

Thyroid function

Thyroid hormones are essential to normal brain development and over- or under-availability of these hormones can influence behaviour and cognitive function in children and adults. Prospective screening of 277 children with ADHD found that the prevalence of thyroid abnormalities was higher (5.4%) in children with ADHD than in the normal population (<1%) (99). A cross-sectional study in preschool-aged children reported that high concentrations of thyroid stimulating hormone and low free thyroxine index were associated with ADHD symptoms in healthy preschoolers (100). ADHD has also been associated with generalised resistance to thyroid hormone, a condition where there is a reduced responsiveness of peripheral and pituitary tissues to thyroid hormones (101). However, not all studies have found an association between ADHD and generalised resistance to thyroid hormone (102).

Diet

The proposal that certain foods or food additives might cause ADHD and that the use of modified diets, such as the Feingold diet, can help to reduce ADHD symptoms has been the subject of ongoing debate among researchers and has been widely discussed in the media. Methodological problems and small sample sizes are common in the research in this area (103). Several studies have reported a link between additives and preservatives in the diet and behavioural symptoms (104-107). These studies support the notion that a small subset of children may be sensitive to certain foods or food additives that could be helped by careful exclusion

diets. The research does not support alterations to the diet as a general treatment for all individuals with ADHD (see Section 11.2 Diet, page 159).

Meta-analysis of 23 controlled studies found that sugar does not affect the behaviour or cognitive performance of children (108).

A number of controlled studies have reported zinc deficiencies in children with ADHD compared to control groups or population averages (for review see (109)). There is some support for the beneficial use of zinc sulphate supplements; however, these studies have been conducted in countries where dietary zinc levels are commonly low (Turkey and Iran) (109). Iron deficiency has been suggested as a risk factor for ADHD, but no studies to date have confirmed this (110).

The long chain polyunsaturated fatty acids (PUFA) such as omega-6 arachidonic acid (AA) and the omega-3 eicosapentaenoic acids (EPA) and docosahexaenoic acids (DHA) are critical to the development and function of the brain. It has been suggested that deficiencies in these essential fatty acids (EFAs) have an impact on brain function that causes or worsens some ADHD symptoms. This has been supported by research findings showing that levels of EFAs in the blood plasma of people with ADHD are reduced compared to healthy controls (for reviews see (98–100)). EFA supplements as a treatment for children with ADHD have been trialled in several studies; however, methodological limitations make it difficult to draw clear conclusions on the efficacy of this treatment (see Chapter 11. Complementary and Alternative Treatments for ADHDsection 11.2.2 Diet supplements, page 160).

Psychosocial factors

Increased risk of ADHD has been linked to several psychosocial factors related to an adverse family environment, including family dysfunction, chronic conflict and exposure to maternal psychopathology (111, 112). Controlled studies have also found that the prevalence of ADHD and other behavioural disorders was significantly higher among children who had suffered maltreatment (113) or sexual abuse (114).

The core symptoms of ADHD – inattention, overactivity and impulsiveness – are commonly reported outcomes when children have spent their early years under deprived conditions in institutional care (115-117). Recent evidence from an ongoing study of Romanian children raised in deprived conditions who have been adopted into UK families shows that the outcomes of inattention and overactivity have persisted into early adolescence (115).

These adoptee studies and several animal studies point to the possibility of a neurobiological basis to the ADHD-like symptoms, where an alternative neuro-developmental pathway has been triggered by the stressful environment during an early critical period (115, 118). What is not clear is whether institutional, deprivation-related inattention and overactivity are phenotypically and neurobiologically distinct from ADHD.

Childhood illness

Viral infections during pregnancy (e.g. measles, varicella, rubella) and in childhood (e.g. enterovirus 71, HIV, encephalitis) have been associated with an increased risk of developing ADHD (for review see (119)). Febrile seizures related to viral infections such as human herpes virus 6 or influenza A have also been identified as risk factors for the development of ADHD and ADHD-like symptoms (119).

2.2 Neurobiology

The precise mechanisms involved in the neurobiology of ADHD are not fully understood. The dominant current paradigm suggests that disordered fronto-striato-cerebellar brain circuitry underpins the executive function deficits at the core

of this condition. Neuroimaging studies suggest that these deficits arise as a result of changes in the structure and function of the prefrontal cortex, the basal ganglia and the cerebellum (120).

Structural neuroimaging can be used to assess differences in brain structure, such as total brain volume or the size of specific regions of the brain. Functional neuroimaging techniques can also look at differences in regional cerebral blood flow as a measure of brain activation (see section 5.12.3 Neuroimaging, page 59). Several recent reviews and meta-analyses have collated the available data in this area (120-123).

It is now well accepted that children with ADHD have a significantly smaller total brain volume compared to matched healthy controls (124). A recent meta-analysis of structural imaging studies found that the largest differences were observed in the cerebellum, the corpus callosum, total and right cerebral volume, and right caudate (122). The impact of medication status was not assessed, as information on current or lifetime medication use was not well reported across studies (122).

The most consistently significant findings from structural and functional neuroimaging studies of people with ADHD, compared to matched controls, are differences in the frontal cortex, the basal ganglia and the cerebellum (for review see (120)).

A systematic review of functional MRI (fMRI) studies in ADHD identified group differences in activation in many brain areas (123). Individuals with ADHD showed dysfunction in the frontal lobes during tasks of inhibitory control. In analyses that examined inhibition errors, attention processes, motor function and working memory, the group with ADHD showed lower brain activity in temporal and parietal areas in attentional tasks and over frontal areas in motor tasks. Review of the fMRI data from people with ADHD who had not used medication suggests that altered brain activation patterns in children with ADHD are not due to the effects of treatment (123).

Meta-analysis of fMRI and PET studies in children, adolescents and adults found a consistent pattern of decreased frontal activity in those with ADHD compared to controls (121). Group differences encompassed the anterior cingulate and dorsolateral prefrontal and inferior prefrontal cortices, as well as related regions, including the basal ganglia, thalamus and portions of the parietal cortex (121).

Studies investigating the relationship between regional brain volumes and measures of functioning, such as behavioural rating scales and neuropsychological tests, have found that smaller volumes are associated with greater ADHD symptom severity (124). It is not clear whether the different subtypes of ADHD have differences in their neurobiological basis.

Limitations of the current neurobiological research

Inconsistencies in the literature remain, resulting from:

- methodological differences such as variation in reporting and inconsistent use of standardised measures, which make it difficult to compare studies
- small sample sizes, which give low statistical power
- heterogeneity in sample characteristics such as age, gender, medication status and ADHD subtype.

CHAPTER 3. PREVALENCE AND ASSOCIATED DEVELOPMENTAL PROBLEMS

3.1 Epidemiology

3.1.1 Prevalence in children and adolescents

Three recent systematic reviews of studies on the prevalence of ADHD suggest a prevalence of 5% to 10% (125-127).

Early studies suggested differences between North America and England in the prevalence of childhood hyperactivity; however, it was later recognised that these were not true differences in prevalence, but arose from use of different criteria to define ADHD (128, 129).

It is difficult to compare prevalence estimates across the last 30 years, due to changes in the DSM criteria for ADHD. The criteria were operationally described in the DSM-III in 1980 (24), and two revisions of the DSM have subsequently been published with somewhat different conceptualisations of the disorder (32, 130). Faraone et al (125) have described the prevalence of ADHD obtained when these different criteria for the disorder were employed:

- Thirteen studies used DSM-III criteria (125). Four of these studies were of US populations with a mean age of 9–11 years, and prevalence estimates ranged from 9.1% to 12%. Among the studies using non-US populations conducted in children and adolescents aged 4–16 years, prevalence estimates ranged from 5.8% to 11.2%.
- Twenty-two studies used DSM-III-R criteria to estimate the prevalence of ADHD among children aged 5–14 years (125). Prevalence estimates ranged from 7.1% to 12.8%, with the exception of one study which used teacher assessments and reported a prevalence of 26%. One further study (131) reported a prevalence of 2.8%. Twelve studies used DSM-III-R diagnostic criteria in non-US populations. In adolescents, prevalence ranged from 1.8% to 3.9%. Among children, prevalence ranged from 3.9% to 14.4%.
- Nineteen studies used DSM-IV criteria. Among the six studies that examined both male and female children, reported prevalence ranged from 9.5% to 16.1%. In studies of non-US populations, reported prevalence for children with a mean age between 7 and 11 years covered a wide range, from 2.4% to 19.8%. The authors note that in US studies, the highest prevalence had generally been obtained when using DSM-IV criteria.

Skoutini et al (126) also suggested that the estimated prevalence of ADHD was higher when DSM-IV criteria rather DSM-III-R were used. They reported that the majority of studies showed that ADHD predominantly inattentive subtype was the most common subtype, hyperactive-impulsive subtype was the least common and the combined subtype occupied an intermediate position. ADHD was more prevalent among males in all three subtypes.

Polanczyk et al (127) also noted that studies based on DSM-III-R or ICD-10 criteria had significantly lower ADHD/HD prevalence rates than those using DSM-IV criteria. These authors noted that the different definitions of ADHD in DSM-IV would be expected to yield higher prevalence rates than diagnoses based on ICD-10 because the latter requires that all criteria be met in at least two different situational contexts, whereas DSM-IV requires the presence of some impairment in more than one setting. ICD-10 also identifies mood, anxiety and developmental disorders as "exclusion diagnoses", whereas DSM-IV allows these diagnoses to be made as comorbid conditions.

Other factors that may influence estimates of the prevalence of ADHD include the informants used to describe children's problems (children, parents/caregivers and/or teachers), the age of participating children, the survey methodologies, the populations studied, the methods used to recruit participants, the diagnostic criteria used and whether or not the presence of impairment is required for diagnosis. Different interpretations of the meaning of "impairment" may also explain some of the variations in estimated prevalence (126, 127).

In epidemiological studies, children's problems are typically identified by means of questionnaires completed independently by children, parents/caregivers and/or teachers, rather than on the basis of an assessment undertaken by a clinician. The level of agreement between these informants when describing child and adolescent mental health problems is often relatively low (132). It cannot therefore be assumed that information from one informant accurately reflects the views of others. Studies need to describe clearly how discrepancies in information obtained from different informants were reconciled. Different protocols may be used in this situation. For example, recording of a positive symptom may require that the symptom be endorsed by one informant, or by more than one.

The assessment techniques used may influence prevalence estimates. For example, few behaviour checklists are designed to establish whether individuals meet criteria for diagnosis, but rather to identify the number of emotional and behavioural problems a person experiences. The use of checklists rather than structured interviewing may therefore affect the results of surveys. Finally, because there is typically a higher prevalence of males with ADHD, the ratio of males to females in a population may influence the prevalence of ADHD identified.

Estimated prevalence may be influenced by the age of children included in studies. In their review, Skoutini et al (126) reported a prevalence of 12.8% among 10–13 year olds, 9% among 14–16 year olds and 6% among 17–20 year olds. Egger et al (133), in a review of the nosology and epidemiology of ADHD in children aged 2–5 years, found that in studies using DSM diagnostic criteria, ADHD reported prevalence was between 2% and 7.9%. In this age range, they suggested that the hyperactive-impulsive subtype and the combined subtype were significantly more common than the inattentive subtype. Males and older preschoolers were more likely to meet the criteria for ADHD. Skoutini et al (126) also suggested that higher prevalences were associated with lower socio-economic status and urban as compared to rural residency.

The most comprehensive review of studies examining the prevalence of ADHD is that reported by Polanczyk et al (127). This review examined 102 studies comprising 171,756 participants from all regions of the world (the studies are listed at http://www.ufrgs.br/psiq/prodah-e.html). The overall pooled prevalence was 5.29% (95% CI, 5.01–5.56) and the pooled prevalences for children and adolescents were respectively 6.48% (4.62–8.35) and 2.74% (2.04–3.45). The authors reported that studies in children consistently suggest that ADHD is more prevalent in boys than in girls, with a male-to-female ratio ranging from 3:1 to 9:1, depending on the source of the sample.

3.1.2 Prevalence of ADHD among adults

ADHD, previously considered to be a disorder limited to childhood and adolescence, is now recognised to be, in many instances, a lifelong disorder. Follow-up of large cohorts of children with ADHD has demonstrated that, for the majority, clinically significant ADHD symptoms persist into adulthood (134, 135), and a smaller proportion of individuals continue to meet the full diagnostic criteria in early adulthood (136). There are discrepancies between the reported rates of persistent ADHD in adulthood, probably due to methodological differences between studies, which include differing study populations, discrepant diagnostic criteria and differing age at final assessment.

A recent meta-analysis of follow-up studies confirmed a significant age-dependent decline in ADHD symptoms (137) and highlighted that the extent to which the syndrome is found to persist into adulthood depends heavily on how it is defined. In this meta-analysis, about 65% of children with ADHD experienced partial remission in adulthood, and the full ADHD diagnosis persisted in approximately 15%. Such data highlight the need to consider ADHD as a lifelong disorder in some individuals.

Clinical populations represent the "tip of the iceberg", and community prevalence needs to be examined to appreciate the full extent of ADHD. Such prevalence data are rare and, as a result of the methodology applied in such large surveys, are inevitably difficult to interpret. Estimates of the prevalence of adult ADHD vary significantly. A population survey conducted in the United States estimated the current prevalence of adult ADHD to be 4.4% (138). This is comparable with a large cross-national survey which estimated adult ADHD prevalence across 10 countries to be 3.4% (range 1.2–7.3%) (139).

The factors that predict persistence of ADHD from childhood through to adulthood are poorly understood. However, there is evidence that increasing severity of ADHD symptoms in childhood is a predictor of its persistence into adulthood (140).

Such population-based findings highlight the public health importance of adult ADHD and the scope for improving access to appropriate treatments.

3.2 Comorbidities

The term comorbidity can be used in different ways. For the purpose of these guidelines, it is used to indicate that a person with ADHD also meets the criteria for another psychiatric disorder, or is experiencing other significant problems (e.g. cognitive difficulties, learning problems, problems with sleep).

3.2.1 Comorbidities in children and adolescents

There is substantial evidence that many psychiatric disorders are comorbid with each other; that is, the rate of simultaneous occurrence of these disorders among children and adolescents in the community is greater than would be expected by chance on the basis of their individual prevalence. This pattern is evident among children with ADHD (141). Several factors may contribute to this (141), for example:

- Comorbidity rates may be high among children with ADHD who are referred to clinics because those with more than one psychiatric disorder may be more likely to be referred.
- There is overlap between symptoms of ADHD and other disorders and this may lead clinicians to make comorbid diagnoses.
- It is possible that the presence of ADHD increases the risk for a second disorder among children and adolescents.

Current diagnostic criteria preclude the diagnosis of comorbidity between some conditions. For example, children cannot be diagnosed as having ADHD using DSM-IV criteria if their problems are better explained by another diagnosis category, such as autism or other pervasive developmental disorders (142). As such, by definition these conditions cannot be comorbid with each other.

Comorbidities may consist of different disorders present in the same children or adolescents:

- at the same time – for example, many children who meet the criteria for ADHD also, at the same time, meet the criteria for ODD or CD (141, 143, 144)
- at different times – for example, the presence of ODD is known to increase the risk for subsequent CD (145).

Finally, comorbidities not only occur within individuals, but also within families. For example, there is evidence that children with ADHD have relatives with higher rates of antisocial personality disorder, alcoholism and substance dependence (144).

As noted, children attending clinics may have higher rates of comorbidity than those in the general community. To determine rates of comorbidity in the community, it is important that studies randomly select children from the general community rather than those attending clinical services.

Comorbid psychiatric disorders

Over the last 20 years, substantial evidence has accumulated to show that children with ADHD are at increased risk for other psychiatric disorders. For example, Szatmari et al (11) reported that 44% of children with ADHD had at least one other psychiatric disorder, 32% had two other disorders and 11% had three other disorders.

ODD and CD are the most common comorbid disorders experienced by children and adolescents with ADHD. For example, Barkley (143) reported that between 45% and 84% of children and adolescents with ADHD meet diagnostic criteria for either ODD and/or CD. In their meta-analysis, Angold et al (144) reported a median odds ratio of 10.7 (95% CI = 7.7 to 14.8) between ADHD and CD/ODD. This is important because subsequent problems identified among children with ADHD may reflect the impact of ODD or CD rather than ADHD.

There is also evidence that children and adolescents with ADHD are at increased risk for major depressive disorder or dysthymic disorder. Angold et al (144) reported a median odds ratio of 5.5 (95% CI = 3.5 to 8.5) between ADHD and depressive disorder. The relationship between ADHD and paediatric bipolar disorder remains controversial, and reaching any conclusion about this relationship is difficult because of the lack of internationally agreed diagnostic criteria for paediatric bipolar disorder.

Children and adolescents with ADHD are more likely than others of the same age to meet criteria for anxiety disorder. An odds ratio of 3.0 (95% CI = 2.1 to 4.3) has been reported for this comorbidity (144). Other studies have reported that 25% to 35% of children with ADHD meet the criteria for an anxiety disorder (143).

Finally, there is evidence that children with other conditions may experience higher rates of ADHD. For example, children with Tourette syndrome have been found to be at increased risk for ADHD (146).

There may be gender differences in the types of comorbid disorders seen in children with ADHD. Data from the Australian Twin ADHD Project suggest higher rates of ODD and CD in males, and higher rates of separation anxiety disorder in females (147). This study also found differences between ADHD subtypes, with separation anxiety disorder more common in females with the inattention subtype and generalised anxiety disorder more common in females with the combined subtype (147).

Other comorbid problems

Children with ADHD may experience a range of other problems, including lower levels of intellectual performance than other children of the same age (143), higher rates of learning disorders (148) and problems with academic performance (143). Indeed, Barkley (143) suggests that virtually all clinic-referred children with ADHD perform poorly in school.

Estimated rates of learning disorders among children with ADHD vary across studies, in part at least because different studies use different definitions of learning disorder. For example, in some studies learning disorder is defined on the basis of a specific discrepancy between scores on intelligence tests and

achievement tests for reading and maths. Others base the discrepancy on standard deviation units identified in individual studies (143).

Barkley (143) has drawn attention to a range of other problems experienced by children with ADHD. These include language difficulties, problems with speech and verbal problem solving, and deficits in a range of other cognitive functions. Executive function deficits may be present in some individuals with ADHD (149). Barkley (143) also suggested that ADHD is strongly associated with difficulties in emotional regulation, particularly the management of frustration.

Several studies have found that children with ADHD are more likely to have sleep problems than children of the same age without ADHD (150, 151). These problems include difficulties in falling asleep and more disruptions during the course of the night.

Many children with ADHD display movement difficulties consistent with developmental co-ordination disorder (152). There is evidence to suggest differences between subtypes in the type and degree of movement difficulty. One study identified poorer fine motor skills in children with the predominately inattentive subtype, while children with the combined subtype had greater difficulty with gross motor skills (152).

Children with ADHD are at increased risk for accidents. For example, Szatmari et al (11) reported that 7.3% of children with ADHD experienced accidental poisoning and 23.2% had had bone fractures, compared to 2.6% and 15.1% respectively in comparison groups. Another study (153) found that adolescents with ADHD were at increased risk for later accidents involving driving. They were also more commonly caught driving without a licence and reported for traffic violations, even after controlling for the presence of conduct problems, driving experience and gender (153).

3.2.2 Comorbidities in adults

The rates of comorbid psychiatric disorders in adults with ADHD are substantial and have a significant bearing on the clinical approach in this population.

Rates of psychopathology among adults who have been followed through after a childhood diagnosis of ADHD are 2–2.5 times those of controls, with a particularly high risk for antisocial personality disorder (up to 10 times that of controls) and drug or alcohol misuse (4–5 times that of controls) (134) (154). Compared to control populations, adults with ADHD have elevated rates of mood disorder (2–6 times) (154, 155), anxiety disorders (2–4 times) (154, 155), relationship dysfunction (2 times) and learning disorder (154).

Evidence from population studies points to substantially elevated rates of comorbid psychiatric disorders in adults with ADHD. The USA National Comorbidity Survey Replication (138) found, in a community sample of 3,199 individuals, that having ADHD as an adult was significantly associated with past marriage failures and unemployment, and that adults with ADHD were significantly more likely than those without the condition to experience other psychiatric disorders. Odds ratios were: for comorbid mood disorder, 5.0 (95% CI 3.0–8.2); for comorbid anxiety disorder, 3.7 (95% CI 2.2–5.5); and for comorbid substance abuse disorder, 7.9 (95% CI 2.3–27.3). In this survey the vast majority of respondents with ADHD (90%) were untreated.

The high rate of comorbid psychopathology seen in adults with ADHD may in part reflect the impact of longstanding adaptive impairments on development, as well as shared familial, environmental and possibly genetic vulnerabilities.

CHAPTER 4. CONSEQUENCES OF ADHD

4.1 Natural history

ADHD is one of the most common conditions of childhood and the persistence of symptoms into adulthood is well established. The core symptoms of inattention, distractibility, disorganisation, hyperactivity and impulsivity can cause clinically significant impairment in social, academic or occupational functioning. In addition, the disorders that frequently accompany ADHD, such as CD, ODD, tic disorders and learning disorders, add to the morbidity associated with ADHD.

Several longitudinal studies have documented the natural history of ADHD, clearly demonstrating that for the majority of people with ADHD the disorder persists through childhood into adolescence and adulthood. Faraone et al (137) analysed data from 32 follow-up studies of children with ADHD into adulthood. When full criteria for ADHD were used, approximately 15% of people diagnosed as children were still diagnosed with ADHD at age 25. In addition, meta-analysis found that approximately 65% of people by age 25 fulfilled the broader definition of DSM-IV, ADHD "in partial remission", indicating persistence of some symptoms of ADHD associated with significant clinical impairments (137). Consequently, even though they no longer met the full DSM-IV criteria for ADHD, people in partial remission may have significant functional impairment from their remaining symptoms (156).

The presentation of ADHD is highly variable. Some people have only very minor symptoms, while others may have severe impairments. In addition, there are cultural differences in the level of activity and inattention that are regarded as a problem. The core behaviours of ADHD are typically present from before the age of 7 and may be noticed as early as 3 years of age. Late onset of ADHD symptoms in adolescents and adults has also been observed (157-159).

A person's ADHD symptomatology can also vary throughout the lifespan, in both severity and types of symptoms seen. Longitudinal studies show that, on the whole, ADHD symptoms decrease over time (29, 160). Some symptoms, such as hyperactivity-impulsivity, diminish abruptly or present differently with age; other symptoms, such as inattention, are more likely to persist into adulthood in both males and females (161-163).

Symptom continuity appears to be mediated to a large extent by genetic influences (164-166). For the majority of children with ADHD, symptoms appear relatively stable when measured over periods of 2 to 10 years (164-167); but for a minority, symptoms will change over this period. A large population-based twin-study (166) assessed symptoms of ADHD in children at 8 to 9 years of age and then again at 13 to 14 years. For some children the number of ADHD symptoms decreased with age, with the number of children meeting the study's cut-off for ADHD decreasing from 4.7% to 3.1%; however, some children in the study began to display ADHD symptoms for the first time in early adolescence (166).

Changes in symptoms across childhood and adolescence may be a consequence of natural developmental processes seen in all children, but symptoms may also diminish due to learned skills, coping strategies and environmental restructuring. Accordingly, there is evidence to suggest that the change in symptoms between childhood and adolescence is mediated by both genetic and environmental effects that come into play during adolescence (166).

Outcomes over the lifespan cover a wide range. Although children with ADHD are at increased risk of continuing difficulties, many will grow up without persistent problems (168). Analysis of a 4-year longitudinal study of 85 boys with persistent ADHD found heterogeneous outcomes in education and social and emotional adjustment (169). Twenty percent of the boys were functioning poorly in all three

domains, 20% were functioning well in all three domains and 60% had intermediate outcomes (169). Poorer functioning was in part predicted by exposure to maternal psychopathology, larger family size, DSM-III-R psychiatric comorbidity and impulsive symptoms.

As the presentation and challenges of ADHD change over time, clinicians must take a lifespan approach and follow patients closely, modifying their care and treatment according to the individual's present needs.

4.2 Impairments and issues across the lifespan

4.2.1 Preschool-aged children

The early onset of ADHD symptoms and associated impairment has been recognised in both community and clinical samples (170, 171). Longitudinal studies report that preschool-onset ADHD symptoms persist well into adolescence (12, 170, 172-174). Difficulties for preschool-aged children with ADHD include problems with social behaviour and impaired fine motor skills. In one study, preschool-aged children with ADHD exhibited more negative social behaviours and scored significantly lower on a test of pre-academic skills than their healthy counterparts (175). The early onset of ADHD is also associated with an increased risk for accidents or injuries compared to children without ADHD (170, 176).

4.2.2 School-aged children

School-aged children with ADHD may face problems in many different domains, including low self-esteem, learning difficulties, impaired social skills, inappropriate social behaviour, poorer psychosocial adjustment and fewer friends (177).

Many of the difficulties for these children arise from the demands of school. Children with ADHD may perform poorly at school, and there is a well-established link between ADHD and academic outcomes that are poor compared to those achieved by children without ADHD (11, 16, 178-182). For example, compared to a healthy control group, children with ADHD were more likely to have a history of learning disabilities, repeated grades, placement in special education and academic tutoring (183). Academic underachievement may vary according to ADHD subtype (174, 184, 185). A longitudinal study that investigated academic achievement in children over 8 years old with ADHD found that only children with the predominantly inattentive subtype had lower reading, spelling and mathematics scores over time, compared to children without ADHD and children with ADHD combined subtype or ADHD hyperactive-impulsive subtype (174).

Difficulties in parent–child interactions have been identified for both boys and girls with ADHD, with consistent reports of greater adversity and more problems in their styles of interaction (see section 15.1.2 Parent–child interactions, page 185). In addition, greater conflict has been observed in the sibling relationships of children with ADHD, compared to controls (see section 15.1.4 Siblings of children with ADHD, page 188). Social interactions with peers are also often problematic and social rejection by peers is common (for review see (186)). Children with ADHD have been reported to form fewer friendships than those without the disorder (187, 188). Hyperactive and impulsive symptoms may result in unrestrained and overbearing behaviour that is not received well by peers (189) and inattention may hinder a child's ability to attend to social cues (187). These social difficulties may be more extensive if the child also has ODD or CD.

A study addressing the relationship between aggression and ADHD compared the maternal reports of aggressive behaviour in children with ADHD and children with no history of the disorder (190). Results revealed that the children with ADHD were significantly more aggressive than those without the condition. Work is needed to

determine whether the increase of aggression is in fact associated with ADHD symptomatology or is more closely linked to symptoms of ODD and/or CD.

Other difficulties are associated with ADHD in childhood. An increased number of accidents are common in this age group and school-aged children who have ADHD have more emergency department visits than their peers who do not have the disorder (191). There are higher-than-expected rates of ADHD amongst obese children, with two prevalence surveys finding a significant association between ADHD and paediatric obesity (192, 193).

4.2.3 Adolescents and adults

Longitudinal studies show the chronic course of ADHD through adolescence into adulthood. ADHD symptoms continue to be a source of significant impairment for around 60% of people who are diagnosed with ADHD in childhood (137). Although ADHD symptoms tend to change with age, with improvement in hyperactivity and attention span, adolescence and adulthood bring additional demands in education, at work, and in social and family relationships. Consequently, educational difficulties continue, and problems may appear in the areas of employment, driving and sexual relationships.

Compared to controls, fewer people with ADHD go on to higher education and they are less likely to complete their studies (194). One study on college students with ADHD found that these students had a significantly lower mean grade point average, were more likely to be on academic probation and reported significantly more academic problems (195).

Adult ADHD is associated with significant deficits in work performance and greater levels of unemployment compared to control groups (196-199). In addition, employment can turn over rapidly through dismissal or a persistent need for change unless the person is self-employed or in a position that allows autonomy at work (198, 200) (see Chapter 13. ADHD in the Workplace, page 176).

Individuals with ADHD have been found to have poor driving outcomes compared to peers without the disorder (17) (see Chapter 14. ADHD and Driving, page 180). Adolescents and adults with ADHD are more likely to have their licence suspended, to have received traffic infringement notices and to have had motor vehicle accidents (17, 201).

There is evidence for earlier and increased use of alcohol, tobacco and substance abuse in adolescents with ADHD compared to controls (202-204). In addition, several prospective longitudinal studies of children and adolescents with ADHD have found that ADHD is a significant predictor for later substance abuse (205-208). This risk was found to be greater if the individual also has CD (205, 208-210) or mood disorder (205). There is also a consistent association between ADHD and delinquency, criminal behaviour and recidivism (211-214).

ADHD is associated with being overweight and obese. Individuals with ADHD are overrepresented in paediatric and adult obesity clinic populations and obesity is identified as a problem in some paediatric ADHD clinics (192, 215, 216). In addition treatment of ADHD has recently been reported to result in improvement in weight control in subjects with a long history of weight loss failure (217). A large US population based study reported a 1.5 fold risk of being overweight for children and adolescents with ADHD (218), but not all population studies have confirmed this association (219). A US adult population study reported that adults with ADHD had a greater likelihood of being overweight (Odds Ratio 1.5, CI 1.05-2.38) and obese (Odds Ratio 1.81, 1.14-2.64) (220). It has been suggested that impulsivity may overeating with resultant increased weight however biological factors have not been ruled out (221).

Adolescents and adults with ADHD face a range of difficulties in social interactions and psychosocial adjustment. A 5-year prospective study following adolescent girls with ADHD found significant impairments in social skills, peer relationships and self-perception, compared to controls (163). Adults with ADHD have reported having fewer close friends, more trouble keeping friends and more social problems (198, 222). Adults with ADHD have also reported higher rates of separation and divorce (154, 223). In one study, adults with ADHD reported poorer overall marital adjustment and more family dysfunction than controls (224). However, there was no significant difference in reports between the spouses of adults with ADHD and the spouses of controls, suggesting that adults with ADHD have more negative perceptions of the health of their relationships and families than their spouses (224).

Adolescents and adults with ADHD may take greater sexual risks than their peers without ADHD. A survey of young adults found that childhood ADHD predicted earlier initiation of sexual activity and intercourse, more sexual partners, more casual sex and more partner pregnancies (225). Similarly, Barkley et al (198) found, in a longitudinal study from childhood, that young adults with ADHD (mean age 20, range 19–25) had become parents more often (38% versus 4%) and had been more frequently treated for sexually transmitted disease (16% versus 4%).

Low self-concept and low self-esteem are common in adults with ADHD, often resulting from educational and interpersonal difficulties (for review see (226)). People with ADHD are more likely than their peers without ADHD to have been diagnosed with any of a wide range of psychiatric disorders including anxiety and mood disorders (154, 227), and girls with ADHD are more at risk of developing eating disorders (163, 228, 229).

These long-term outcomes have major social implications for individuals with ADHD and are discussed in detail in other areas of this guideline document.

There remain many gaps in the research into the course of ADHD across the lifespan. Although adults with ADHD are increasingly a focus of research (230), some adult groups have not been adequately investigated. In particular, research is needed into the effects of menopause on women with ADHD and the incidence of ADHD in geriatric populations (231). Studies that include culturally diverse groups and Aboriginal and Torres Strait Islander peoples are also lacking, and more research is needed across all age groups.

PART II: ASSESSMENT AND DIAGNOSIS

Key messages

Assessment and diagnosis of ADHD

1. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.

2. The diagnosis of ADHD should only be made after a comprehensive assessment. This includes medical, developmental and psychosocial assessment, and elicitation of evidence of impairment in multiple settings, via gathering information from multiple informants.

CHAPTER 5. ASSESSMENT AND DIAGNOSIS

5.1 Recognition

It is clear from the literature that many individuals with ADHD are not initially recognised as having a problem related to attention, activity or impulsivity, even though they or their parents recognise that here are difficulties. These individuals may seek help from a variety of health and education professionals or through social or criminal justice services, all of whom need to be aware of the core features of ADHD and its varied presentations.

Because of under-recognition many children with ADHD do not receive therapy (232-235). In an Australian study Sawyer identified that only 28% of children with ADHD symptoms had attended any service, 23% attending a health service and 17% a school based service (234).

Often these children have been identified by parents or teachers as having problems with behavioural, emotional, learning difficulties or social interactions (235). Comorbid problems such as conduct disorder, anxiety disorder and mood disorder may also be the reason for bringing a child to attention (236).

Adolescents and adults with ADHD may come to notice because of substance abuse, including alcohol and cigarettes, especially if there is associated conduct disorder (237-239). Young women with ADHD run the risk of having the diagnosis overlooked, and instead be labelled with a diagnosis of depression or anxiety (240).

5.2 Overview of Assessment

5.2.1 Steps in assessment and diagnosis

There are five stages to "best practice" assessment and diagnosis of ADHD:

1. **Initial assessment by a GP or allied health professional** (see page 33). Identification of the core symptoms that comprise DSM-IV ADHD should form the basis of referral to a paediatrician or psychiatrist.
2. **Initial assessment by a paediatrician or psychiatrist** (see page 36). This should address diagnostic evaluation and consider differential diagnosis and/or comorbidities. Specific medical conditions that may involve attentional problems or hyperactivity, and conditions such as pervasive developmental disorder, post-traumatic stress disorder, attachment disorder and bipolar disorder should be considered.
3. **Diagnosis of ADHD.** This should be carried out according to DSM-IV criteria and based on a full developmental, medical, psychosocial and psychiatric history, with data from other informants such as family members and teachers, obtained by rating scales or via interview or report. Assessment must not be too time-consuming (although must be of sufficient detail to consider the complexity of presentation). It should not require specialised training on diagnostic interviews to which many practitioners may not have access, or be restricted to certain professions (as with some of the "broadband" measures of psychological functioning which can only be accessed by certain professional groups). It is recommended that both broadband rating scales and scales more specific to ADHD symptoms be used (see section 5.4.3 Symptom checklists and behaviour rating scales, page 37). The former can aid in recognition of comorbidities and differential diagnosis assessment; the latter, in assessing pervasiveness and severity of symptomatology.

   There are particular challenges for diagnosis in preschool-aged children and in adults. These are discussed below.

4. **Assessment to inform management.** This covers four main areas:
    a) recognition of comorbid conditions such as:
        - in children, anxiety, ODD and developmental co-ordination disorder
        - in adults, anxiety disorders, affective disorders, substance use disorders and personality disorders
    b) medical assessment of potential contraindications to some medications (e.g. pre-existing cardiac problems; see section 8.7 Side effects: special considerations, page 116)
    c) allied health assessment if the person has speech and language or co-ordination or sensory problems
    d) formal psychoeducational or neuropsychological assessment if the patient has academic difficulties
    e) evaluation of family and social issues, as behavioural management of ADHD generally requires active input from the family.
5. **Regular assessment of response to intervention**, whether medication or behavioural.

5.2.2 Approach taken

This chapter takes the position that the physician should follow DSM-IV criteria in assessing symptomatology and impairment in the diagnosis of ADHD (see Table 3, page 10, for the DSM-IV criteria). This position has been endorsed by other published best practice guidelines (241-244).

As discussed in Chapter 1, the ICD-10 diagnostic system is more restrictive and less widely used in Australia. The ICD-10-defined hyperkinetic disorder identifies a severely affected subset of patients with ADHD combined subtype. Such criteria do not encompass the group whose symptoms are predominantly inattention, despite the fact that individuals with these symptoms may experience significant impairments as well as comorbidities.

It is recognised that alternative viewpoints exist, especially from sociology and anthropology; however, discussion of these is beyond the scope of this clinically oriented document.

DSM-IV does not provide specific, developmentally adjusted ADHD criteria; the same diagnostic criteria are applied to patients across the lifespan. Consequently, there are particular issues in the diagnosis and assessment of ADHD for adults and preschool children. The application of the criteria in relation to preschool children and adults is discussed below.

The chapter incorporates some of the issues under discussion for the future DSM-V. The concept of a "sluggish" type of ADHD with hypoactivity remains a matter of speculation and is not included in current clinical guidelines (33).

There is scant information on ADHD in culturally and linguistically diverse (CALD) groups or Indigenous populations (in Australia or elsewhere). What little is available has been incorporated.

5.3 Initial screening assessment

Recommendation

1. A short scale such as the Strengths and Weaknesses of Attention Scale (SWAN) or the Diagnostic Rating Scale (DRS), or for adults the Short Adult ADHD Screening Scale or Barkley's Adult ADHD Quick Screen, should be used as an initial screen.
   ✓*Recommended best practice based on clinical experience and expert opinion*

2. Clinicians, especially primary care physicians need to consider that there is more than one form of ADHD and many children may not present with the most obvious symptoms of hyepractivity/impulsivity. It is easy to overlook the most common subtype, the inattentive one and it may not present until secondary school when there are many additional demands on organisational skills and less support from teachers.
   ✓*Recommended best practice based on clinical experience and expert opinion*

Initial assessment may be by a GP or other health professional. The clinician needs to:

- recognise each of the three core symptoms of ADHD, inattention, impulsivity and hyperactivity, and be aware that a diagnosis of ADHD does not require the presence of all three. Core symptoms need to have been present since a young age; however, during the brief time in a primary care consultation, a child may not show any obvious features of the ADHD, and this is not necessarily a helpful diagnostic approach
- be aware that ADHD without hyperactivity (i.e. predominantly inattentive symptoms) is a diagnosis that needs to be considered, particularly in girls and in adults
- be aware that the family and child may present initially for commonly comorbid conditions such as learning difficulties or oppositional defiant behaviour and be alert to the possibility that ADHD may be the underlying problem or an associated problem
- consider the use of symptom checklists. For children and adolescents, a modified version of the Strengths and Weaknesses of Attention Scale (SWAN – see http://www.adhd.net) is included in Appendix H. The Diagnostic Rating Scale (DRS) (245), a DSM-IV based ADHD screen, could also be used. For adults, the Short Adult ADHD Screening Scale (246) could be used. This scale is included in Appendix H. These measures do not provide a formal cut-off score for diagnosis, but are intended to help the clinician to decide if a full assessment is needed. For children with suspected ADHD, symptom checklists may be of value where there is family disagreement about the extent of a child's problems and the need for referral
- be aware that symptoms should occur in all environments (although they may not be evident or equally impairing in all settings) and discuss with the family any associated impairment in functioning at home, at school or in peer relationships. If a child presents via primary care then consultation with the school or kinder/preschool is critical
- be aware of the comorbid conditions that may occur with ADHD in children and adolescents, such as ODD, anxiety and autism spectrum disorders
- be aware of common comorbid conditions that may occur in adults with ADHD, such as mood disorders, anxiety disorders, substance use disorders and personality disorders

- be aware of family circumstances. In particular, recent changes in behaviour that may be linked to life events are far less likely to be due to ADHD
- be aware of the child's developmental and medical history. Issues such as hearing problems or inadequate sleep may be particularly relevant.

5.3.1 Education and training of GPs, and engagement in management of ADHD

In Australia (unlike some other countries) GPs are the gatekeepers to referral. Studies of Australian GPs have found that there can be a low interest in involvement in the diagnosis or care of children with ADHD (247, 248). GPs will therefore need continued support to facilitate their role in initial assessment and on-referral of children and adults presenting with attentional problems. They will need increased awareness of ADHD and associated conditions and to be able to access appropriate training and supportive materials. This could be enhanced by training by specialist colleges and supported by local divisions of general practice. As the hub of family health, the GP needs a framework to co-ordinate multidisciplinary management of families with ADHD, a role taken on especially by rural GPs who have developed special interest in ADHD. Ideally, GPs should be able to utilise models similar to the Wraparound approach, which provides a framework for collaboration between parents/caregivers and education and health professionals.

5.4 Assessment and diagnosis of ADHD in school-aged children and adolescents

Recommendations

3. Full assessment for possible ADHD requires a comprehensive medical, developmental and psychosocial assessment by the best qualified clinician available. This would usually be a paediatrician or child and adolescent psychiatrist with the training and skills required to assess and treat ADHD.
   ✓*Recommended best practice based on clinical experience and expert opinion*

4. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
   ✓*Recommended best practice based on clinical experience and expert opinion*

5. Information from and discussion with multiple informants, including the child/adolescent, parents/caregivers, and educational and health professionals, needs to inform a diagnosis of ADHD in school-aged children.
   ✓*Recommended best practice based on clinical experience and expert opinion*

6. Diagnosis requires evidence of moderate to severe impairment across settings, including home and school.
   ✓*Recommended best practice based on clinical experience and expert opinion*

7. A thorough psychosocial assessment of the child/adolescent and family and medical assessment of the child/adolescent are part of a comprehensive assessment.
   ✓*Recommended best practice based on clinical experience and expert opinion*

8. Assessment should cover the presence and functional significance of comorbidities, including learning disabilities, anxiety/depression and disruptive behaviour disorders. This could include use of broad-based screening questionnaires.
   ✓*Recommended best practice based on clinical experience and expert opinion*

5.4.1 Criteria for diagnosis

As a minimum, the DSM-IV diagnostic criteria should be met before a diagnosis of ADHD can be made. The DSM-IV criteria break down symptoms into two groups: inattention and hyperactivity/impulsivity.

Diagnosis of ADHD require the presence of 6 of 9 symptoms of inattention or 6 of 9 symptoms of hyperactivity/impulsivity from the 18 ADHD symptom criteria set down in DSM-IV. Symptoms must occur "often", not occasionally, and persist for at least 6 months. Symptoms must be severe enough to be "maladaptive and inconsistent with developmental level" and must cause impairment across two or more contexts (e.g. home and school).

Consequently, symptom checklists and rating scales need to be accompanied by questions on:

- the age at which each symptom began
- duration of symptoms
- the severity of the symptom, with examples
- the pervasiveness across situations
- the impairment associated with that symptom at home, school (or work) and in social situations.

DSM-IV requires that six inattentive and/or hyperactive/impulsive criteria be met for a diagnosis of one of the three subtypes of ADHD (inattentive, hyperactive/ impulsive or combined). It is clear that the six-symptom cut-off needs to be more age- and gender-specific (249). There has also been discussion in the literature

(27) on what to do when five criteria for each subgroup are met and no formal diagnosis can be made. Overall, suitable discretion that takes into account the issues of pervasiveness and impairment is advised in making a diagnosis.

5.4.2 Assessment by a paediatrician or child and adolescent psychiatrist

Full assessment for possible ADHD requires a comprehensive medical, developmental and psychosocial history by a paediatrician or child and adolescent psychiatrist, accompanied by the administration of ADHD symptom rating scales (parent/teacher/self-report) and an evaluation of impairment associated with ADHD symptoms across a variety of settings. The clinician needs to have a sound understanding of the normal patterns of infant, child and adolescent development, in order to differentiate behaviours/symptoms of ADHD from the normal patterns of cognitive function and behavioural features appropriate for the developmental age.

Medical, developmental and psychosocial history

- A thorough physical examination is required to exclude other conditions that may mimic or cause some symptoms of ADHD. It is import to check for symptoms and signs of:
    - hearing or vision impairment
    - epilepsy
    - thyroid dysfunction
    - allergic history
    - sleep disorders such as sleep apnoea
    - dysmorphic syndromes
    - general medical problems.
- It is important to exclude possible aetiological causes of ADHD symptoms such as Fragile X syndrome, foetal alcohol syndrome, epilepsy or acquired brain injury.
- Factors known to be associated with risk of ADHD such as maternal stress in pregnancy, prematurity and neonatal complications should be considered.
- Developmental evaluation may include the use of a screening tool such as the Brigance (clinician rated) OR Ages and Stages (parent rated).
- Assessment of cognitive functioning and patterns of behaviour is needed to identify other developmental disorders (such as intellectual disabilities, speech and language disability, global or specific learning disabilities, developmental co-ordination disorder, autism and related spectrum disorders, and Tourette syndrome).
- A history of psychiatric problems should be taken, including attachment disorders, anxiety, depression, bipolar disorder and psychosis.
- Primary learning disability should be considered where problems emerged after school commencement.
- Any family history of medical and psychiatric problems should be considered.
- Social history and family dynamics should be discussed, and the contribution of family and social adversity, including neglect and abuse, assessed.
- If medications are being considered, the clinician must check for contraindications to the use of specific medications for ADHD, including cardiac disease and substance abuse/dependence in adolescents.

- Any co-existing disorders and risk factors need to be identified and their contribution to the behavioural/symptom profile and level of impairment assessed.
- Observation during the clinical consultation is important, but people vary in their behaviour during a consultation and the presence or absence of hyperactivity in this setting does not reflect the pervasiveness of symptoms.

Further assessment may be necessary for selected children to exclude other diagnoses:

- Comprehensive audiological assessment, including auditory acuity, "speech-in-noise" discrimination and auditory memory (250) may be useful in some cases, for example, where there are learning difficulties and teachers concerned about auditory processing (see section 5.8.3 Auditory processing difficulties, page 47).
- Psychoeducational assessment is recommended for children who have educational or learning difficulties. The clinician may be aided in decision making here by reviewing previous school reports and results of standardised achievement tests such as the National Assessment Program Literacy And Numeracy (NAPLAN) completed in Years 3, 5, 7 and 9. Similarly, a range of assessment tests such as the Wide Range Achievement Test (WRAT) and Peabody Picture Test may provide some guidance in clinical assessment as to which children may require a more formal psychoeducational assessment.

5.4.3 Symptom checklists and behaviour rating scales

Data from Latent Class Analysis (251, 252) indicate the robustness of the 18 DSM-IV questions, given in different formats. Twin studies in Missouri and Australia (251) showed very similar latent structures – that is, the same constructs were being understood by the ADHD informants – despite different ways of asking the same questions (telephone interview, questionnaire).

Many symptom checklists for children and adolescents (e.g. as described in (27) or (253)) include the symptoms of ODD, which often co-occurs with ADHD (27).

Behaviour rating scales can provide useful information from the point of view of multiple informants, in a standardised fashion. The patient's symptoms are compared with age- and sex-matched normative data to provide a profile of behavioural symptoms.

While extensive diagnostic interviews such as the Diagnostic Interview Schedule for Children may be useful in research, the length of such interviews makes them unsuitable for routine clinical settings.

Three basic types of assessment measures may be used in assessing ADHD:

- **"Broadband" measures** of behavioural problems, including:
    - the Child Behaviour Checklist (CBCL)
    - the Behavioural Assessment Schedule for Children (BASC)
    - the Strengths and Difficulties Questionnaire (SDQ).

  All these exist in multiple forms by age and by informant (parent, teacher or child). None is specific to ADHD and they should not be used to diagnose ADHD or any other disorder. They can, however, be an appropriate first step in identifying comorbidities and are widely used in Australia to assess the mental health of children attending agencies. Studies in clinically referred children with ADHD support the usefulness of the CBCL to identify patterns of comorbidities in the context of ADHD (254).
  Note: The CBCL is now available, through the Australian Council for Educational Research, for paediatricians and psychiatrists experienced in ADHD.

- **Narrow-band questionnaires** that are specific to the symptoms of ADHD. For review see (255). The Conners' series is most widely used in Australia, with versions available for parents, teachers and older children (as well as for adults). It is available for experienced paediatricians through the Australian Council for Educational Research.
- **Interview and other schedules** that are based specifically on the DSM-IV ADHD items.

5.4.4 Evaluation of impairment

In formulating an individualised management plan, the severity of the person's ADHD needs to be taken into account. In determining the severity, the symptoms of hyperactivity, impulsivity or inattention and the level of subsequent impairment in multiple settings must be assessed. Issues that should be considered include academic performance, self-esteem, personal distress from the symptoms, social interactions and relationships, behavioural problems, and the development of psychiatric syndromes.

The question of how best to measure impairment has been the subject of debate and a number of instruments have been evaluated (see section 5.10.1 Measuring impairment, page 48).

5.5 Assessment and diagnosis of ADHD in preschool-aged children

Recommendations

9. For children under 6 years of age, a stage when child development is rapid, it is essential to distinguish ADHD symptoms from normal developmental variation in impulsivity and attention.
   ✓*Recommended best practice based on clinical experience and expert opinion*

10. Assessment of children under 6 years of age should be undertaken especially thoroughly by paediatricians or child psychiatrists with expertise in developmental assessment, paying particular attention to identification of comorbidities and understanding of family dynamics and of cultural/religious diversity.
   ✓*Recommended best practice based on clinical experience and expert opinion*

11. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
   ✓*Recommended best practice based on clinical experience and expert opinion*

12. Information from and discussion with multiple informants, including the child, parents/caregivers, kinder and preschool teachers, childcare staff, preschool staff and health professionals, needs to inform a diagnosis of ADHD in preschool-aged children.
   ✓*Recommended best practice based on clinical experience and expert opinion*

13. Diagnosis requires evidence of moderate to severe impairment across settings, including home and kinder/preschool.
   ✓*Recommended best practice based on clinical experience and expert opinion*

14. Assessment of children under 6 years of age should include, as a minimum, a screening developmental measure, such as the Ages and Stages Questionnaire, and, when developmental delay is suspected, a formal developmental assessment such as the Griffiths Mental Developmental Scales.
   ✓*Recommended best practice based on clinical experience and expert opinion*

15. Regular review is critical to review the course of symptoms over time.
   ✓*Recommended best practice based on clinical experience and expert opinion*

16. In this age range, where it is difficult to differentiate ADHD from other common problems, including developmental delays and specific speech and motor disorders, allied health assessments should be considered especially when developmental difficulties are evident.
   ✓*Recommended best practice based on clinical experience and expert opinion*

5.5.1 ADHD in preschool-aged children

The presence of ADHD symptoms and associated impairment in preschoolers has been reported in both community and clinical studies. Prevalence estimates from community studies range from 2.8% to 6.3%, depending on the method of diagnosis (for review see (256)). Longitudinal studies report that preschool-onset ADHD symptoms persist over time (12, 170, 172-174). For many children, the effects continue well into adolescence and should not be dismissed as temporary or minor problems.

Accurate diagnosis of ADHD in preschool-aged children can be difficult as the range of normal behaviour is wide and the differential diagnosis for the constituent symptoms of ADHD is broad (257). Assessment should include consideration of other causes of behavioural dysregulation, including family contextual patterns, anxiety processes and medical problems. As early childhood development is particularly sensitive to the quality of the caregiver–child relationship, as well as

the family, childcare, community and cultural contexts, assessment should include a review of a child's relationship patterns and developmental and attachment history, as well as parental and other contextual stressors and supports (258). That decisions about diagnosis and treatment planning are reached only after multiple appointments, reports from multiple informants and, in many cases, access to a multidisciplinary team are particularly important in this age group.

There is some evidence that both DSM-IV and ICD-10 criteria are valid for the assessment of young children with suspected ADHD (for review see (256)), though ICD-10 does not adequately recognise inattentive features.

5.5.2 Key considerations for diagnosis

Both ICD-10 and DSM-IV indicate the need to consider preschool behaviour in both its developmental and social context. Assessment should be informed by a thorough knowledge of normal development: young children typically have a shorter attention span than older children, impulsivity is more common and self-regulation in social settings is often not developed until around 3.5 to 4 years. A recent Dutch study found that symptoms of ADHD were reported in over 40% of typically developing preschool children (259). Furthermore, children with developmental delay, sensory deficits or language delay or disorder, or early acquired brain injury, for example, commonly exhibit symptoms which are seen in ADHD. Children who have been exposed to domestic violence, child abuse or other trauma can develop symptoms similar to those of ADHD. Similarly, disturbed patterns of attachment between a young child and his or her caregiver can be associated with difficulties in affective and behavioural regulation; a review of attachment relationships therefore is relevant in the assessment of any abnormal pattern of behaviour (260). Careful assessment of cognitive/developmental status, as well as emotional health and the child's social circumstances, is imperative and frequently will need the services of several professionals, preferably working collaboratively. The Ages and Stages screening tool may be useful as a minimum to determine if the child needs to be referred to a speech pathologist and/or other allied health professionals.

Assessment of children less than 4 years of age with impairing ADHD symptoms should be undertaken especially thoroughly, with particular attention to identification of comorbidities and understanding of family functioning. Management should be guided by a multi-axial approach to assessment, and is likely to include behavioural therapy, family therapy and developmental therapy.

5.6 Assessment and diagnosis of ADHD in adults

Recommendations

17. The DSM-IV criteria are the minimum necessary for diagnosis of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

18. ADHD needs to be considered in adults who present with longstanding symptoms suggestive of ADHD (inattention, impulsivity, disorganisation) that appear to have started in childhood and are persisting into adult life.
✓*Recommended best practice based on clinical experience and expert opinion*

19. People with personality disorder and/or substance abuse accompanied by a significant level of impulsivity accompanied by inattention should be referred for evaluation of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

20. Assessment of adults with suspected ADHD should include a thorough medical and psychosocial assessment.
✓*Recommended best practice based on clinical experience and expert opinion*

21. Assessment of adults with suspected ADHD should be undertaken by the best qualified clinician available. This would usually be an adult psychiatrist or a comprehensive psychiatric service with the training and skills required to assess and treat ADHD. This is due to the high incidence of comorbid psychiatric conditions and the overlap of clinical features of ADHD with other conditions such as bipolar disorder and personality disorders.
✓*Recommended best practice based on clinical experience and expert opinion*

22. Other possible diagnoses or comorbidities should be considered, via history; for example, acquired brain injury, neurological condition or other DSM-IV diagnosis such as anxiety disorder or pervasive developmental disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

23. Adult presentations may occur in the context of problems encountered with work and study. In such instances, vocational/intellectual assessments may be useful, not for diagnostic purposes, but to clarify the functional consequences of the diagnosis.
✓*Recommended best practice based on clinical experience and expert opinion*

5.6.1 ADHD persistence into adulthood

Depending on the diagnostic criteria or thresholds used, as many as 67% of people with ADHD symptoms in childhood continue to have their disorder in adulthood (253). A systematic review and a meta-analysis of longitudinal studies of ADHD (137) found that about 15% of people who have ADHD in childhood will continue to have it as a full disorder into adulthood, and a further 40-60% experience partial remission, with persistence of some symptoms and significant clinical impairments.

5.6.2 Pathways to diagnosis

Adults presenting for assessment of ADHD do so in a variety of contexts including:

- as a planned transition from paediatric services for ongoing management of ADHD on reaching adulthood
- for reassessment following a variable gap in treatment for the childhood disorder
- for initial assessment following diagnosis in a child or other relative
- after identification of symptoms following assessment or treatment of another (comorbid) mental disorder

- *de novo* following concern about possible ADHD symptoms by the individual, family or primary care physician.

As with most psychiatric disorders, a diagnosis of Adult ADHD is made on clinical grounds. Case identification is based on systematic assessment of the symptom profile and exclusion of alternative psychiatric or medical causes. As ADHD symptoms (e.g. inattention, forgetfulness, motor restlessness) occur commonly in the community, a systematic and hierarchical approach to diagnosis is advocated.

5.6.3 Criteria for diagnosis

There are no universally accepted criteria for diagnosis of adult ADHD and further research is needed in the development of reliable and valid diagnostic criteria for adults.

The DSM-IV was the first set of criteria for ADHD to use wording applicable to both adults and children and it provides a useful guide for the clinician. The DSM-IV criteria, however, have not been validated in adults. They do not include developmentally appropriate symptoms and thresholds for adults and fail to identify some significantly impaired adults who may benefit from treatment.

ADHD symptoms generally undergo some diminution with age and it remains uncertain whether the DSM-IV "threshold" (i.e. number of symptoms endorsed) should be adjusted downward for adults to take into account this age-dependent reduction in symptoms. At present, this issue is dealt with in DSM-IV by labelling those adults with clinically significant sub-threshold symptoms as "ADHD in partial remission". The clinical status of this less severely affected group awaits clarification.

Diagnosis of adult ADHD according to DSM-IV requires onset of symptoms before the age of 7; however, this criterion may not be helpful. A study comparing 27 adults with full ADHD who met all DSM-IV criteria for childhood-onset ADHD with 79 adults with late-onset ADHD who met all the criteria except age of onset showed similar patterns of psychiatric comorbidity, functional impairment and familial transmission (158).

Clinicians therefore need to be flexible in applying current ADHD criteria to adults, and measures of functional impairment such as the Current Behaviour Scale should be used in conjunction with DSM-IV.

5.6.4 Steps in diagnosis

Steps in the diagnostic assessment of adults with possible ADHD include:

1. evaluation of presenting symptoms to determine whether they lie in the key domains affected by the disorder
2. exclusion on history, physical examination and laboratory testing of other disorders that could possibly mimic ADHD
3. evaluation of psychiatric factors contributing to or present in addition to ADHD symptoms
4. evaluation of the longitudinal course of symptoms, including verifying their presence or absence during childhood
5. evaluating the clinical impact of ADHD symptoms across a variety of settings.

Each of these steps is discussed below.

1. Evaluate presenting symptoms

The symptoms of ADHD in adults are an extension of those seen in children. As in childhood, symptoms may not be present across all domains. Furthermore, there may have been differential improvement in some symptoms (particularly

hyperactivity/impulsivity) with age. Individuals may have difficulty sustaining attention in a number of settings, particularly when performing demanding cognitive tasks. Hyperactivity manifests physically, but may also have a mental component (having accelerated thoughts or many thoughts simultaneously). Individuals may be verbally impulsive (e.g. making tactless comments or interrupting others), or may engage in impulsive behaviour or high-risk activities. Adults with ADHD often have poor organisational skills, and these may affect social or vocational performance. Adults with ADHD may not show marked external symptoms of ADHD (e.g. fidgeting, restlessness, poor attention span) during brief clinical assessment, although they may report such problems in their daily lives.

Many symptoms checklists and rating scales have been designed for adults to assess current symptoms of ADHD. None of the scales, however, are sufficient for diagnostic purposes when used alone. Although the reliability and sensitivity of the instruments are good, specificity can be low, which can give rise to false positive or false negative diagnosis. For example, individuals with disorders such as anxiety or depression are also likely to score high on measures of inattention using these instruments. The scales are most useful when used as part of a formal clinical assessment.

Symptoms checklists and rating scales for adult ADHD include:

- the Conners' Adult ADHD Rating Scales (CAARS) (261)
- the Wender-Reimherr Adult Attention Deficit Disorder Scale (WRAADS) (262)
- Wender Utah Rating Scales (WURS) (263)
- the Brown Attention Deficit Disorder Scale (BADDS) (264)
- the Copeland Symptom Checklist for Attention Deficit Disorders – Adult Version (265)
- the ADHD Rating Scale (266, 267)
- the Adult ADHD Self-Report Scale (ASRS). This 18-item self-report scale reflects DSM-IV emphasis on symptoms. It is widely used and has been validated in the National Comorbidity Replication Survey. Subsequently, a six-item ASRS screener has been shown to outperform the full version (246)
- the Barkley Adult ADHD Quick Screen based on the DSM-IV checklist for ADHD symptoms
- the Jasper/Goldberg Adult ADHD Screening Examination.

2. Exclude other medical conditions

Medical conditions that can mimic ADHD include, but are not limited to:

- past acquired brain injury (e.g. head injury, meningitis, cerebral anoxia)
- sleep disorders (e.g. sleep apnoea)
- non-acute effects of viral infection, including past encephalitis or HIV
- chronic medical illnesses such as renal or liver failure
- seizure disorders (e.g. complex partial seizures)
- some endocrine disorders (e.g. hypothyroidism, hyperthyroidism, hypoglycaemia)
- comorbid or previous substance abuse.

Exclusion of possible medical causes of symptoms is particularly important in a person presenting for the first time at a relatively late age (e.g. over 35 years). Assessment should be tailored to the person's needs and may require detailed history, physical examination (including assessment of baseline blood pressure) and

relevant investigations. Routine blood tests (urea, electrolyte, creatinine levels, a full blood count, liver and thyroid function tests) are of use only when the presentation suggests an underlying medical disorder. An electrocardiogram (ECG) is performed in older adults or those with a history or signs of cardiac disease, particularly when treatment with tricyclic antidepressants is being considered.

3. Evaluate other psychiatric factors

The symptomatology of ADHD overlaps with other psychiatric conditions including cluster B personality disorders (antisocial and borderline personality disorders) and bipolar mood disorders. Symptoms seen in all these conditions include mood instability, impulsivity and poor anger control. Chronic low self-esteem, volatile mood and poor frustration tolerance are commonly seen in adults with ADHD and should not exclude its diagnosis.

There is also a high incidence of comorbid psychiatric illnesses, particularly affective disorders, anxiety disorders and substance use disorders, in adults with ADHD. It is common for mood and anxiety disorders to be treated by a psychiatrist, sometimes for years, without diagnosis or treatment of the underlying ADHD.

Chronic use of illicit drugs (e.g. cannabis, cocaine, amphetamines) and alcohol should be considered as a possible cause of cognitive and behavioural symptoms. Where possible ADHD symptoms and drug misuse occur together, it is usually prudent to reassess for ADHD symptoms after treatment of the drug misuse. Random urinary drug screening may be performed to detect or monitor illicit drug use in selected patients.

4. Evaluate the longitudinal course of symptoms

Longitudinal assessment of symptoms usually reveals the consistent impact of symptoms across a variety of settings. The typically episodic nature of some conditions, such as bipolar disorder and major depression, can assist in distinguishing these disorders from ADHD.

Retrospective identification of childhood ADHD symptoms is a central component in the assessment of an adult presenting with ADHD symptoms. A retrospective assessment of childhood symptoms should be attempted regardless of whether a childhood diagnosis has been made in the past by a treating clinician. In addition to a retrospective self-report, a retrospective diagnosis needs to be supported by consistent reports by a parent/caregiver or other informant (e.g. an older sibling) of symptoms of ADHD in one or more settings, as well as objective accounts of aberrant behaviour recorded in past school or educational reports, or past documentation of symptoms from childhood clinical assessments (see section 5.10.2 Retrospective self-reports, page 50).

Use of a standardised rating scale for retrospective assessment of symptoms may aid in standardising the clinician's approach. A limited number of scales are available. These include:

- the self-report Wender Utah Rating Scale (WURS) (263)
- the informant-reported Conners' Abbreviated Symptoms Questionnaire (ASQ).

5. Evaluate the clinical impact of ADHD symptoms

Where a diagnosis of ADHD is being considered, careful evaluation of the impact of symptoms across a variety of settings is required. As with the childhood disorder, clinically significant symptoms will usually impact on functioning in several domains (work, family and/or social spheres).

Many adults presenting with ADHD symptoms have managed adequately through school, with their symptoms only causing functional difficulties for them in the more demanding contexts of further study or employment. While not required for diagnosis, in these instances it may be of assistance to the patient to undergo

vocational or cognitive assessments to identify areas of difficulty (e.g. poor organisational skills, difficulties taking in multi-step instructions) in order to understand the problem better and develop compensatory skills.

A subscale of the Current Behavior Scale (CBS) (see Appendix H) may be of use to identify adults at greater risk of functional impairments (268, 269) (see section 5.10.1 Measuring impairment, page 48).

If there are concerns that ADHD symptoms are progressive or that function has deteriorated, a neurological basis should be considered and this is best done by a neurologist.

5.7 Psychoeducational assessment

Recommendations

24. Most children with ADHD have intellectual development within the normal range. A significant proportion, however, present with cognitive deficits, learning difficulties and social adaptive difficulties, and in these individuals a comprehensive psychoeducational assessment is particularly necessary.
✓ *Recommended best practice based on clinical experience and expert opinion*

25. Psychoeducational assessment should cover all aspects of academic performance. At a minimum this should consist of an individually administered intelligence test such as the age-appropriate version of the Wechsler series.
✓ *Recommended best practice based on clinical experience and expert opinion*

26. Educational difficulties are common in people with ADHD. Where these problems are suspected (e.g. via parent/caregiver or teacher report, or national/State/Territory literacy and numeracy assessments), psychoeducational assessment should be conducted to assess learning potential and attainment.
✓ *Recommended best practice based on clinical experience and expert opinion*

27. Assessment of educational difficulties is important in people of all ages with suspected ADHD and/or suspected educational difficulties, to inform diagnosis and identify learning difficulties that should be targeted for intervention. Such assessments are not diagnostic of ADHD.
✓ *Recommended best practice based on clinical experience and expert opinion*

Educational difficulties are common in individuals with ADHD, with learning difficulties being one of the most common comorbidities documented. Where these problems are suspected (e.g. via parent/caregiver or teacher report, or NAPLAN results), psychoeducational assessment should be conducted to assess learning potential and attainment. Common avenues for such assessments include school psychologists and child psychologists.

Psychoeducational assessment should cover all aspects of academic performance and be interpreted in the context of educational opportunity and intellectual level.

At a minimum this should consist of an individually administered intelligence test such as the age-appropriate version of the Wechsler series. There are some subtests of the Wechsler which are sensitive to attentional or impulsivity problems (270), although these are not diagnostic of ADHD. ADHD symptoms may confound the accurate estimation of the person's IQ because of frequently encountered distrust of IQ testing, the difficulties in testing individuals with inattention and impulsivety, and the effects of ADHD on some specifc measures (e.g. digit memory span).

If learning difficulties are suspected, IQ and academic achievement testing should be supplemented with specific measures of cognitive aspects of attention (e.g.

vigilance), although such problems are not specific to ADHD and can be seen in many childhood disorders. Identification of such attention deficits is relevant in tailoring educational interventions and may also be useful in monitoring cognitive effects of medication.

As comorbid speech and language difficulties and auditory processing difficulties may also impact on learning, consideration should be given to allied health assessments in these areas (see section 5.7.1 Speech and language difficulties, page 46, and section 5.7.3 Auditory processing difficulties, page 47).

5.8 Allied health assessments

Recommendations

28. Allied health assessment may be helpful in many children and adolescents with suspected ADHD to identify comorbid speech and language difficulties, motor co-ordination and sensory difficulties that can be targeted with intervention.
    ✓ *Recommended best practice based on clinical experience and expert opinion*

29. The need for allied health assessment should be determined on a case-by-case basis.
    ✓ *Recommended best practice based on clinical experience and expert opinion*

Some children with ADHD present with normal development in other areas and will not require further evaluation and intervention. However, where there is concern about other aspects of a child's development, additional assessment may be helpful. There are a number of functional difficulties that are commonly identified for children with a diagnosis of ADHD:

- speech and language difficulties, including more subtle problems with effective communication (e.g. pragmatics, inference)
- gross and fine motor difficulties (e.g. developmental co-ordination disorder, deficits in attention, motor control and perception, subtle clumsiness and handwriting problems)
- auditory processing difficulties.

5.8.1 Speech and language difficulties

ADHD and language impairments frequently occur together (271), and speech pathology assessment is necessary for children with significant language difficulties. While traditionally perceived as an issue with younger children, a Western Australian study (Hagemann, unpublished PhD thesis, Curtin University) indicates that speech and language problems are still common in adolescents with ADHD. Children with comorbid speech sound disorder and specific language impairment have also been found to be at increased risk of ADHD (272).

5.8.2 Gross and fine motor difficulties

Occupational therapy and/or physiotherapy assessment is necessary, especially for younger children who have problems with motor function, handwriting and spatial and body awareness difficulties. Australian data (152) indicate that some 50% of children with ADHD may meet the criteria for developmental co-ordination disorder, while a further 30% may have some degree of motor problems. Occupational therapy may also have a role in providing support for classroom modification for children with attention issues.

Occupational therapy and/or physiotherapy assessment may also be considered for children with sensory processing difficulties. It has been suggested that poor sensory processing may contribute to the behavioural profile of children with ADHD and there is an overlap in behaviours described for sensory modulation disorders

and those of ADHD, such as inattention, poor impulse control and hyperactivity (273-275). Sensory modulation disorders arise from impairments in receiving, modulating and integrating sensory input (274). Accordingly, when sensory integration does not develop as efficiently as it should, the child may have resultant problems in learning, development or behaviour (276).

Research examining sensory processing difficulties in ADHD has been relatively rare. However, two studies have found that children with ADHD have different patterns of sensory processing compared to children without ADHD (273, 277), which may indicate that a subgroup of children with ADHD have sensory processing difficulties (273).

5.8.3 Auditory processing difficulties

Children who appear to have auditory problems may require additional comprehensive audiological assessment.

Auditory processing assessments, over and above basic hearing tests, may be helpful in order to describe a child's functional difficulties with processing auditory information. Of note, auditory processing disorder and ADHD overlap in diagnostic criteria and behavioural presentation, particularly in symptoms such as distractibility, inattentiveness and associated language and academic problems (278, 279). Auditory processing assessment alone should not be used to diagnose ADHD (280).

5.9 Issues in differential diagnosis

5.9.1 Pervasive developmental disorders

DSM-IV does not recognise the co-occurrence of ADHD and pervasive developmental disorders (PDD) such as autism spectrum disorders (ASD). However, it is well established that individuals with PDD/ASD may also have symptoms of inattention, hyperactivity and impulsivity (281). The symptoms of ADHD can cause significant impairment in individuals with PDD/ASD. The management of ADHD symptoms in the context of PDD/ASD is discussed in section 8.6 Medications for ADHD in children with a developmental disability (page 112).

5.9.2 Acquired brain injury and other neurological conditions

Recommendations

30. A thorough medical history and examination are required to identify any acquired brain injury or other neurological condition that may contribute to the presenting symptoms.
    ✓*Recommended best practice based on clinical experience and expert opinion*

31. Individuals with ADHD symptoms and a history of acquired brain injury and other neurological conditions should receive comprehensive neuropsychological evaluation.
    ✓*Recommended best practice based on clinical experience and expert opinion*

32. In consultation with the neurologist or neurosurgeon, ADHD medications may be one component of a comprehensive management plan.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Brain insult, particularly that which causes damage or disruption of areas of the brain reported to be involved in mediating attention (e.g. frontal regions, white matter, parietal lobes), increases the risk of ADHD-like symptoms, in particular, inattention and impulsivity. In fact, such attention impairments may be the hallmark features of such conditions. Specifically, children with traumatic brain injury, prematurity, cancers (treated with chemotherapy and radiotherapy), tumours, epilepsy, lead exposure, foetal alcohol syndrome and developmental

malformations are all at elevated risk of attentional difficulties. Of note, these difficulties usually exist in the context of broader cognitive and social problems that will need assessment and intervention.

While these conditions do not necessarily fit all the criteria for diagnosis of ADHD (e.g. age at onset of symptoms), they often receive the diagnosis, and early research is suggesting that they may benefit from similar medical/pharmacological management; see, for example, research on use of Ritalin in children with leukaemia (282) and traumatic brain injury (283). Where there is no medical contraindication, it may assist these individuals to trial such interventions.

5.10 ADHD measures and information sources

5.10.1 Measuring impairment

Research questions

- In individuals with ADHD does the inclusion of measures of impairment, in addition to DSM-IV/ICD10, further inform diagnosis and assessment?
- Sub-question: Can measures of impairment distinguish between impaired and unimpaired individuals with ADHD?

Evidence statements

- **Preschoolers:** One study found that the use of DSM-IV ADHD symptoms plus impairment in two situations predicted greater global, academic and social impairment (284). One study found that the Hillside Behaviour Rating Scale made an independent contribution to the prediction of functional impairment above parent and teacher ratings (285). (Level III-3 – diagnosis)
- **Children and adolescents:** Three studies found that the instruments utilised to measure impairment could discriminate impaired from non-impaired children above information on ADHD symptoms alone (286-288). (Level III-3 – diagnosis)
- **Adults:** Two studies found that the Current Behavior Scale (CBS) (269) or CBS subscale (268) could identify a subgroup of adults with ADHD who were at significantly higher risk of functional impairment. (Level III-3, III-1 – diagnosis)

Recommendations

33. While the DSM-IV diagnosis of ADHD does require impairment, impairment at home, school/work and in social relationships is poorly defined. Careful discussion is needed with the family as to the extent to which problems are specifically related to ADHD symptomatology.
    ✓ *Recommended best practice based on clinical experience and expert opinion*
34. Measures of impairment specific to ADHD for preschoolers, children and adolescents are not yet sufficiently robust for routine use. (Grade D)
35. The Current Behaviour Subscale could be used as a measure for functional impairment in adults with ADHD. (Grade C)

Background

The DSM-IV requires impairment as well as the presence of symptoms for the diagnosis of ADHD, but fails to define impairment clearly. Implicit in this requirement is that the construct of functional impairment is distinct from the ADHD symptoms. A recent review of impairment scales indicates that this is a general problem when diagnosing any psychiatric disorder (289).

While several measures of impairment specific to ADHD have been developed and appear promising, none is established and more research is required.

For many Australian children attending a Child and Adolescent Mental Health Service, the Health of the Nation Outcome Scales for Children and Adolescents (290) will be routinely completed (this varies across jurisdictions). This provides a basic measure of impairment that correlates well with parent and teacher reports on more extensive measures, such as the Strengths & Difficulties Questionnaire (291).

The Children's Global Assement Scale has been utilised to define impairment in ADHD and other psychological disorders, but has not gained wide acceptance as a clinical tool because of its subjectivity (292, 293)

A subscale of the Current Behavior Scale (CBS) (268) (see Appendix H) provides a short checklist of impairments associated specifically with adult ADHD.

Summary of research evidence

Preschoolers

Two studies met our inclusion criteria:

- One study looked at the validity, in preschoolers, of the requirement for cross-situation impairment in the diagnosis of ADHD (284). Children in this age group who met the full diagnostic criteria (DSM-IV ADHD plus impairment in two situations) showed significantly greater global, academic and social impairment in the three annual follow-up assessments, compared to either controls or the group that met DSM-IV symptom criteria but had impairment in only one situation. However, the group with impairment in one situation had significantly greater global and academic impairment at each follow-up than the no-ADHD control group, and 34% later met full diagnostic criteria for ADHD compared to 3.1% of the controls.
- The Hillside Behaviour Rating Scale (285) was found to make an independent contribution, above parent and teacher ratings, to the prediction of functional impairment.

Children and adolescents

Three studies conducted in children and adolescents met our inclusion criteria. Each assessed a different measure of impairment:

- One study (288) identified two algorithms generated from parent and teacher reports, which the researchers called "subtype ROC" and "ADHD ROC", that were more efficient than DSM-IV symptom counts in discriminating children with functional impairment from children who do not have functional impairment.
- Assessment of 6 individual measures of impairment and a combined measure termed Global Impairment Index (GII) (287) found low to moderate correlations with symptoms (Maternal SNAP-IV and CBCL Attention Subscale). The researchers also found that gender, CBCL Attention subscale, PPVT (Peabody Picture Vocabulary Test) score and maternal SNAP-IV symptom count were significant predictors of impairment. Altering the number and type of scales used in diagnosis dramatically altered the number of positive diagnoses. Inclusion of impairment (GII) and symptom scales reduced the number of positive diagnoses.
- The Parent and Teacher Impairment Rating Scale (IRS) was found to make an independent contribution to the prediction of impairment, beyond the prediction from ADHD symptoms alone (286).

Adults

Two studies conducted in adults with ADHD met our inclusion criteria:

- The Current Behavior Scale (CBS), using the cut-off of the 50th percentile, was able to identify adults with ADHD who were at significantly higher risk of functional impairment, including global functioning, social adjustment, number of comorbidities and socio-economic status (269).
- A short (8-item) scale derived from the CBS correlated well with the 99-item CBS and predicted poor functional outcomes in global functioning and social adjustment (268).

5.10.2 Retrospective self-reports

Research question

- In adolescents and adults with ADHD, are retrospective self-reports of symptoms in childhood accurate?

Evidence statement

- Four studies supported the validity of using adult self-reports of childhood symptoms for the diagnosis of ADHD (294-297). (Level III-3 – diagnosis)

Recommendation

36. The reports provided by adults with ADHD on the symptoms they had in childhood are accurate and valid for informing diagnosis and assessment. (Grade B)

Background

The diagnosis of adult ADHD requires that individuals meet both the childhood and the adult criteria for the disorder. Meeting those criteria ordinarily requires a retrospective report of ADHD symptoms, usually by the individuals.

Summary of research evidence

Four studies were identified that met our inclusion criteria:

- A longitudinal study found good agreement between self-reports of childhood symptoms collected at age 21 and again at age 30, despite the 9-year gap, suggesting stability in the way symptoms are recalled over time (294).
- Another longitudinal study found good agreement between retrospective diagnosis of childhood ADHD based on adult self-reports and the actual childhood diagnosis (295).
- In another longitudinal study, there was moderate agreement between self-reports of childhood ADHD in adulthood and the parent report at study entry in childhood (296).
- When adults with ADHD and their parents were asked to report on the ADHD symptoms that were seen in childhood, good agreement was found between the two (297).

5.10.3 Information from multiple informants

Research questions

- For preschoolers, school-aged children or adolescents with ADHD, is there consensus between parent and teacher reports of symptoms and classification of subtype?
- For individuals with ADHD, is there consensus between third-party reports and self-reports of ADHD symptoms when assessed with parallel instruments?
- For preschoolers, children or adolescents with ADHD, does the psychiatric status of the parent influence the content of parent/caregiver reports?

Evidence statements

- **Parent versus teacher reports**
  - **Preschoolers:** Two studies showed low agreement between parents and teachers for ADHD symptoms and the classification of subtypes (298, 299). (Level III-2 – diagnosis)
  - **Children:** Eleven studies showed low agreement between parents and teachers for ADHD symptoms and the identification of subtypes (266, 299-308). (Level II, III-2, III-3, IV – diagnosis)
- **Self-report versus third-party report**
  - **Adolescents:** Three studies in adolescents showed low to moderate agreement between self-reports and third-party (parent) reports (309-311). (Level III-2 – diagnosis)
  - **Adults:** Six out of seven studies showed low agreement between self-reports and third-party reports (parents, partners, friends, family members) (294, 296, 312-315), and one found good agreement between self-reports and third-party reports (parents, partners, friends) (297). (Level III-2 – diagnosis)
- **Parent psychiatric status**
  - One study of children with ADHD found that parental ADHD did not have an impact on maternal reports of ADHD symptoms (316). (Level IV – diagnosis)
  - Three studies found that, using the CBCL rating scale, mothers with a history of depression reported significantly more symptoms in their child, compared to mothers with no history of depression (317-319). (Level III-2, IV – diagnosis)
  - Two studies found that, when using the DBDRS, a history of depression in the mother was not significantly associated with maternal reports of symptoms (308, 319). (Level IV – diagnosis)

Recommendations

37. For diagnosis of ADHD in children and adolescents, input from multiple informants (e.g. parents/caregivers, teachers) should be considered in evaluating the chronicity and pervasiveness of impairment. (Grade B)

38. Diagnosis of ADHD should not solely rely on the use of parent or teacher information as this may lead to over-diagnosis. Information from both parents and teachers should be considered.
    ✓*Recommended best practice based on clinical experience and expert opinion*

39. For diagnosis of ADHD in adults, input from multiple informants (e.g. partners, family members) should be considered, where possible, in evaluating chronicity and pervasiveness of impairment. (Grade B)

40. When evaluating parent reports describing children with suspected ADHD, consideration should be given to the psychiatric status of the parent as maternal depression may have an impact on the mother's reporting of symptoms in her child. (Grade D)

41. There are insufficient research data to determine whether ADHD in the parent has an impact on their reporting of ADHD symptoms in their children. (Grade D)

Background

ICD-10 requires information from a second respondent, most often a teacher, when diagnosing ADHD in children and adolescents. DSM-IV does not, but it does ask the primary informant about whether the symptoms are present in a second situation such as school or, for adults, work.

The question of how to combine information from different sources remains unresolved, and the difficulties are exacerbated for children in secondary school, where there are multiple teachers. In some cases, teachers may be unwilling to provide information, or principals to allow information to be provided. With adults, it may be difficult to ask for information from employers or work colleagues. There are also sufficient data to show that teachers may assess a young person's behaviour on grounds other than just ADHD. For example, the teacher may also consider the child's academic performance or behaviour relative to the child's peers.

There is no consensus on how to integrate information from parents/caregivers and teachers. There is some argument in the UK to allow for an "or" decision, so symptoms reported by the parent/caregiver *or* the teacher count towards the final symptom number. This could lead to over-diagnosis; however an "and" approach might be equally unacceptable as it is restrictive and could result in under-diagnosis. Consequently, when parent *and* teacher information gives clear evidence of impairment in two settings, then diagnostic criteria for ADHD are obviously met. If impairment is seen in only one setting, clinical judgement is required to determine whether a diagnosis of ADHD should be made. The clinician could consider what level of functional impairment is present and whether any symptoms are seen in other domains.

It may be more appropriate to view the information from additional informants as a way of confirming the pervasiveness of impairment. The SKAMP Rating Scale (see Appendix H) provides a quick way for a teacher to indicate how a young person with ADHD is managing in the classroom.

A preferred instrument for gathering data from teachers is the Conners' Teacher Rating Scale – Revised (320, 321). This is formally classed by the Australian provider, the Australian Council of Educational Research, as a "specialised" measure only available to psychologists with advanced training in psychometrics. However, it is such a key measure for ADHD information from schools that it is now available to paediatricians and psychiatrists who can demonstrate sufficient experience in working with young people with ADHD.

Summary of research evidence

Agreement between parents and teachers on ADHD symptoms and on the identification of subtypes has been found to be low in preschoolers (298, 299) and children (266, 299-308). Only one study (305) included adolescents, with participants aged 5–17, but data were not presented separately and it is not possible to draw conclusions on parent–teacher agreement for adolescents.

The identified studies used a variety of different ADHD rating scales, including both narrow band and broadbrand scales. The majority of studies were in the USA, with the others carried out in Spain (299), Belgium (303), the Netherlands (308) and

Australia (300), providing some support that the low agreement between parent and teacher ratings holds true across different cultures. Many of the studies failed to include a measure of internal consistency to enable confidence in the parent and teacher ratings themselves before comparing them.

Three studies with adolescents (309-311) all demonstrated low to moderate agreement between self-reports and parent reports.

Six out of seven studies showed low agreement between self-reports and third-party reports (parents, partners, friends, family members) using a variety of rating scales (294, 296, 312-315). The seventh study found good agreement between self-reports and third-party reports (parents, partners, friends) (297). One possible reason for the difference is that participants in this last study (297) were recruited from the general community, rather than clinic samples as in the other six studies.

Discrepancies between self-report and third-party informants may also be influenced by factors such as conflict between the two over behaviour, communication problems or bias in partner choice (313).

Four studies were included that addressed the impact of maternal depression on maternal reports of child symptoms (308, 317-319). The studies used two rating scales: the CBCL, which is a broadband rating scale designed to screen for a variety of symptoms, including ADHD symptoms; and the DBDRS, which is more specific to ADHD and considers symptoms of inattention, hyperactivity/impulsivity and CD/ODD behaviour.

Using the CBCL, mothers with a history of depression reported significantly more symptoms in the child compared to mothers with no history of depression (317-319). Using the DBDRS, a history of depression in the mother was not significantly associated with maternal reports of symptoms (308, 319). One of the studies using the DBDRS (308) found that high levels of parent stress were significantly related to parents reporting higher levels of inattention, hyperactivity/impulsivity and ODD behaviour, compared to teachers' reports of this behaviour.

One study of children with ADHD found that parental ADHD did not have an impact on maternal reports of ADHD symptoms (316).

5.11 Specific populations

5.11.1 Culturally and linguistically diverse populations

Recommendation
42. Cultural differences in perceived levels of impulsivity, hyperactivity and inattention should be considered in the diagnosis of ADHD. ✓*Recommended best practice based on clinical experience and expert opinion*

While there is growing evidence that rates of ADHD are similar throughout the world, most data come from widely used "broad-based" assessments such as the CBCL, where there are only modest differences both in prevalence and in the factor structure, a measure that the tests are assessing the same constructs in different populations (322, 323).

A study has, however, shown significant differences in tolerance of ADHD symptoms between US and New Zealand teachers (324). The most extensive work on differences in how symptoms are perceived comes from a study in which Asian and Western mental health staff rated the same children based on videotapes (325). Asian staff were much more likely than Western staff to rate behaviours such as distractibility and fidgeting as signs of ADHD. As clinical thresholds can be socially and culturally influenced, it is important to consider each individual's level of functioning in relation to his or her usual social and cultural environment.

It is important that information on ADHD and related conditions is available in languages other than English.

5.11.2 Indigenous Australians

Recommendation
43. There is need for a culturally appropriate assessment of ADHD in Indigenous people. ✓ *Recommended best practice based on clinical experience and expert opinion*

No adequate data were identified on the incidence of ADHD in the Australian Indigenous population. The "broadband" Strengths and Difficulties Questionnaire was modified for use in the Western Australian Aboriginal Child Health Survey and, while it does have a hyperactivity scale, this is far removed from the DSM-IV standards for ADHD. There has been one study of Canadian Indigenous people using the standard version of the Conners' Rating Scale (326). While a slightly elevated rate of ADHD was found, the authors could not determine whether this was a real difference, an artefact of the inappropriateness of the scale or differences in what are acceptable behaviours. The last may apply in Australia, where, for example, it is culturally appropriate for Indigenous children to move around the classroom to check with each other (T Westerman, Indigenous Psychological Services, personal communication). Thus it is not a symptom of hyperactivity.

Given the high rate of suicide in Australia's Indigenous population and the association of impulsivity with suicidal ideation among Indigenous youth (Westerman, unpublished PhD thesis), there is an urgent need for culturally appropriate assessment of ADHD. The issue is compounded by two related issues:

- The recent Western Australian study showed differences in stimulant prescription rates for ADHD based on differences in socio-economic status and remoteness (327).
- People with ADHD are over-represented in the justice system (see Chapter 16. ADHD and Justice, page 195), and rates of incarceration are high among Indigenous peoples (328).

Any planning for ADHD assessment services for Indigenous Australians must be done with appropriate consultation with Indigenous elders, so that ADHD is not added to the list of problems used to stigmatise Indigenous populations. Assessment of ADHD in Aboriginal children should be performed through the Aboriginal Medical Service and involve Aboriginal healthcare workers (329).

5.11.3 The family with ADHD

The substantial genetic component to ADHD (64) (see section 2.1 Aetiology, page 14) and the disruption that ADHD can bring to a family (see Chapter 15. Issues for Families, Parents and Carers, page 183) mean that family functioning is frequently impaired. This can have significant implications for the contributions families can make to the management of ADHD. The General Scale of the Family Assessment, developed as part of the Ontario Child Health Study (330) and used extensively in Australia, including the Western Australian Child Health Survey, is provided in Appendix H.

5.12 Diagnostic tools

Laboratory measures such as neuropsychological testing, electrophysiological techniques and neuroimaging have been advocated to aid in the diagnosis of ADHD. It is important to consider how much is added to the accuracy of the diagnosis by

the incremental information generated by these measures (331). In some cases, some of these tests may help guide specific interventions.

5.12.1 Neuropsychological measures

Research question

- In individuals suspected of having ADHD, does the inclusion of neuropsychological measures in addition to DSM-IV/ICD-10 further inform assessment and diagnosis?

Evidence statements

- Fifteen studies were identified that addressed the use of individual neuropsychological measures for the diagnosis of ADHD compared to clinical diagnosis or rating scales (332-346). The resultant sensitivities and specificities were mixed (low, moderate and good). (Level III-3 – diagnosis)
- Seven studies were identified that combined multiple neuropsychological measures in a testing battery for the diagnosis of ADHD (347-353). Each looked at different combinations of measures, and the resultant sensitivities and specificities were mixed (low, moderate and good). (Level III-3 – diagnosis)
- No studies met the inclusion criteria that specifically addressed the use of neuropsychological measures alongside DSM-IV/ICD10 to further inform diagnosis.

Recommendations

44. There are insufficient research data to recommend the inclusion of neuropsychological measures in routine diagnostic assessment for ADHD. (Grade D)

45. Where functional difficulties persist in the context of ADHD (e.g. learning problems, organisational difficulties), despite initial educational, pharmacological and psychological strategies, neuropsychological assessment can provide information on cognitive strengths and weaknesses. This information can then be used by the person with ADHD, the teacher and/or parent/caregiver to develop compensatory approaches to learning and daily functions.
✓ *Recommended best practice based on clinical experience and expert opinion*

Background

Specified batteries of neuropsychological tests have been proposed as a basis for diagnosis of ADHD, with particular emphasis on tests of executive functioning and working memory. A number of laboratory tests of attention and executive control, such as the Continuous Performance Task (CPT), have been investigated in the diagnosis of ADHD. The Conners' Continuous Performance Test is quite sensitive to central nervous system dysfunction. A number of disorders can result in impaired performance on the CPT. Whether such testing has sufficient specificity and utility in diagnosing ADHD is open to question. The utility of available data is complicated by such measures usually being included with diagnostic assessment, so the additional information they provide is difficult to ascertain. A reliance on the CPT as a primary diagnostic tool in determining the presence of ADHD could result in an unacceptably high number of false positives (i.e. over-diagnosis of ADHD). The CPT provides a quick standardised method of assessing attention and executive control. It shows promise in the monitoring of treatment response of those with ADHD; however, further research is needed on its utility in this area.

To date, studies examining neuropsychological tests of executive functioning have not been able to demonstrate positive predictive power, and especially negative

predictive power, that is sufficiently high to recommend the use of these tests in clinical settings with children or adults. Neuropsychological testing has a value in the assessment of learning disabilities and other cognitive impairments but, despite widespread use, has no demonstrated value in the diagnosis of ADHD.

Experts consulted as part of the DSM-V Externalising Disorders Research Planning Conference (354) emphasised four key issues that apply to psychological, neuropsychological and also to the neurophysiological measures discussed below (page 57):

- Siblings of people with ADHD may share some of the same neuropsychological and neurophysiological impairments, so these difficulties are not diagnostic.
- There is growing recognition of heterogeneity, so that many people with ADHD will have no impairment on any of these measures.
- Sensitivity and specificity are very variable.
- Effects can be confounded by comorbidity.

Some studies have attempted to define ADHD subtypes (combined, predominately inattentive and hyperactive/impulsive) on the basis of neuropsychological patterns of performance. Neuropsychological distinctions between ADHD subtypes are few and highly dependent on which domain of executive functioning is assessed. The combined type has been associated with greater difficulty with inhibitory control (355-358), whereas the predominantly inattentive subtype has been associated with a greater deficit in processing speed on visual–motor or visual search tasks (355, 358, 359).

Notably, some studies (e.g. (355, 359)) have found similar patterns of neuropsychological impairment across all three subtype groups. Chhabildas et al (359) identified symptoms of inattention as the best predictor of performance across all neuropsychological measures and ADHD types. Consequently, individuals with symptoms of inattention may be more likely to warrant neuropsychological assessment.

Summary of research evidence

Fifteen studies were identified that addressed the use of individual neuropsychological measures for the diagnosis of ADHD compared to clinical diagnosis or rating scales (332-346). Both the sensitivities and specificities and the positive/negative predictive values found were mixed (low, moderate and good).

Among these studies were two systematic reviews which looked at the ability of neuropsychological measures to discriminate between individuals with ADHD and other clinical groups (339, 340). Review of use of the Wisconsin Card Sorting Test (WCST) (339) found that, compared to controls, groups with ADHD consistently performed poorly on this test. However, impairment on the WCST was not specific to ADHD, as other clinical groups such as those with learning disability were also impaired. The second review (340) found that the Stroop Colour Word Test could discriminate between individuals with ADHD and controls, but did not consistently discriminate between individuals with ADHD and other clinical groups.

Seven studies looked at combining multiple neuropsychological measures in a testing battery for the diagnosis of ADHD in preschoolers (347), children (348-351), adolescents (348) and adults (352, 353). Each looked at a different combination of measures, and the sensitivities and specificities found were mixed (low, moderate and good). Of particular note, in the two studies of adults (352, 353) the neuropsychological tests were examined in individuals with ADHD and individuals with other psychiatric disorders, and both studies found the ability of the tests to distinguish between the two groups was poor.

The majority of studies used clinic-referred samples; however, one (350) took a random sample of participants from a general school population. In this large and methodologically robust study, the neuropsychological tests could distinguish between ADHD and controls without ADHD at the group level, but at the individual level needed for diagnosis, specificity and sensitivity were low to moderate (48% and 72% respectively).

Overall, while the use of individual neuropsychological measures can discriminate between those with ADHD and those without ADHD at the group level, they do not perform consistently well at the individual level. The combination of neuropsychological measures appears to increase the diagnostic utility of these tests, but not to a reliable level. Importantly, both individual and combined measures appear to be very poor at distinguishing between individuals with ADHD and individuals with other psychiatric disorders.

5.12.2 Neurophysiological measures

Research question

- In individuals suspected of having ADHD, does the inclusion of neurophysiological techniques, in addition to DSM-IV/ICD-10, further inform assessment and diagnosis?

Evidence statements

- One study found that event-related potential (ERP) data distinguished between children and adolescents with and without ADHD with moderate accuracy when compared to clinical diagnosis (360). (Level III-3 – diagnosis)
- Six studies found that electro-encephalograph (EEG data) classified children, adolescents and adults with and without ADHD with moderate to good accuracy when compared to clinical diagnosis (361-366). (Level III-1, III-2, III-3 – diagnosis)
- No studies met the inclusion criteria that addressed the use of neurophysiological measures alongside DSM-IV/ICD-10 to inform diagnosis further.

Recommendation

46. There are insufficient research data to recommend the inclusion of neurophysiological measures in routine diagnostic assessment for ADHD. (Grade D)

Background

Electrophysiological measures such as event-related potentials (ERP) and electroencephalography (EEG) have been used to study brain process in children with ADHD for more than 3 decades (first reviewed in (367)). EEG measures the electrical activity of the brain, allowing researchers to map the level of electrical activity occurring in certain brain regions. ERPs provide information on electrical activity taking place in the brain in response to stimuli.

Electrophysiological measures as a diagnostic tool

The most consistent finding in the ADHD electrophysiological literature has been that clinical groups of children and adolescents with ADHD demonstrate increased low-frequency activity, primarily theta (or slow wave) power, when compared to healthy control groups (for review see (368-370)). The increase in theta activity has also been reported in adults with ADHD (371). The question remains, however, whether electrophysiological measures can be used as a diagnostic tool to identify correctly those individuals with ADHD and those without. It is also important to

consider whether EEG/ERP measures can discriminate between individuals with ADHD and individuals with other psychiatric disorders, and what impact the conditions that are comorbid with ADHD will have on EEG/ERP data. These questions were addressed in the systematic review and are discussed below.

Electrophysiological measures and response to stimulant medication

It has been asserted in the literature that EEG measures may be used to differentiate between individuals with ADHD who will respond well to stimulant medication and non-responders (for review see (370)). Children with ADHD who respond to medication have been reported to have specific EEG findings, in particular, excessive slow wave activity, which suggests that they are more cortically hypo-aroused (372). Further research and validation are required to establish the utility of these findings. In addition, stimulant medication has been reported to alter the EEG patterns and ERPs of children with ADHD such that the findings are similar to those of children without ADHD (reviewed in (370)). Although a number of studies have reported the correct identification of 70–80% of stimulant responders when using either electrophysiological measures alone or electrophysiological measures plus behavioural measures (373-375), it has been observed that this figure is no better than estimates solely based on clinical trials of stimulant medication which report that ~70% of children will respond to medication (370).

Summary of research evidence

One study, conducted in Australia, investigated the use of ERP data to classify children and adolescents relative to a clinical diagnosis of ADHD (360). For children aged 8–12, sensitivity was 71.4% and specificity 76.9%, but the values for adolescents aged 13–18 years were considerably lower (sensitivity 56.9%, specificity 62.5%).

Six studies investigated the utility of EEG measures in the diagnosis and assessment of ADHD in children, adolescents and adults (361-366). The studies varied in the actual EEG measures used and the components of the clinical diagnosis used as the reference test for comparison.

Four studies used theta–beta ratio as the EEG measure:

- One described a QEEG-derived attentional index that was based on mean theta–beta power ratio across 4 tasks (eyes open resting, reading, listening and drawing) (362). This yielded a sensitivity of 86% and specificity of 98% when tested in people aged 6–30 years against clinical interview and various behaviour scales and continuous performance tasks.
- The same researchers repeated this study in participants aged 6–20 years (363) and found a sensitivity of 90% and a specificity of 94%.
- The EEG theta–beta ratio yielded a sensitivity of 50% and specificity of 36% when measured against diagnosis based on an 18-item DSM-IV-based ADHD scale that is part of the parent-rated Coolidge Personality and Neuropsychology Inventory (361).
- The theta–beta ratio was compared to clinical diagnosis in people aged 6–21 years referred to a clinic for their ADHD symptoms (366). Of 26 participants, 16 were clinically diagnosed with ADHD and 10 with no ADHD. The sensitivity of the EEG measure was 94% and the specificity 100%. The accuracy of the ADHD Rating Scale–IV was included as a comparator in this study and a sensitivity of 81% and specificity of 22% were reported.

One study used a specific set of EEG measures to provide a "consistency index" (CI) and compared this with clinical diagnosis (365). Across all the participants, aged 6–25 years, the CI measure correctly classified 82% of the participants with

ADHD and 77% of controls. Among participants aged less than 16 years, overall accuracy increased from 80 to 90%.

One study found that total, absolute and relative power EEG measures in eyes-closed conditions yielded a sensitivity of 89.0% and specificity of 79.6% compared to clinical diagnosis (364).

Five studies were identified that showed that the presence of comorbidities (tics, learning disabilities, ODD and CD) does have an impact on EEG and ERP data in children with ADHD (376-380). No studies addressing the ability of ERP or EEG to discriminate between ADHD and other psychiatric disorders met the inclusion criteria.

Overall, these studies report good sensitivity (90–100%) and specificity (84–94%) for electrophysiological measures. However, the possibility of misdiagnosis when using these measures alone remains unacceptably high and there are several limitations in the research to date that must be addressed. In particular, there are few data on test-retest and inter-rater reliability, and rarely have studies been undertaken using blinded procedures (381). More recent studies (e.g. (366)) have begun to address these issues, but additional replication is required. Further, as it is clear that EEG and ERP profiles can vary when comorbidities are present, careful consideration must be given to how this will affect the ability to discriminate between individuals with ADHD and those without.

5.12.3 Neuroimaging

Research question

- In individuals suspected of having ADHD, does the inclusion of neuroimaging techniques, in addition to DSM-IV/ICD-10, further inform assessment and diagnosis?

Evidence statements

- Two meta-analyses have demonstrated the ability of neuroimaging techniques to distinguish between individuals with ADHD and those without ADHD at a group level (121, 122). (Level III-2 – diagnosis)
- No studies met the inclusion criteria that address the use of neuroimaging techniques for the diagnosis of individuals.

Recommendation

47. There are insufficient research data to recommend the inclusion of neuroimaging in routine diagnostic assessment for ADHD. (Grade D)

Background

The primary neuroimaging techniques are magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), positron emission tomography (PET) and single photon emission computed tomography (SPECT). Structural neuroimaging (MRI) can be used to assess differences in brain structure, such as total brain volume or the size of specific regions of the brain. Functional neuroimaging techniques (fMRI, SPECT and PET) can also look at differences in regional cerebral blood flow. For a review of these techniques and how they have been used in the research of ADHD see Bush et al 2005 (382).

To date, the research into the use of these techniques in relation to ADHD has been limited to comparisons of imaging data averaged across a group of individuals (e.g. a group with ADHD versus a group without ADHD). To be useful for diagnosis, it must be possible to differentiate between those with and without ADHD at the

individual level. Neuroimaging techniques are not yet robust enough to be used for diagnosis.

Summary of research evidence

Two meta-analyses have addressed neuroimaging for individuals with ADHD:

- One meta-analysis included 22 MRI studies in children and young adolescents (mean age 11 years) with and without ADHD (122). The inclusion of all brain regions measured across all studies found a significant difference between the participants with ADHD and the healthy controls. The heterogeneity across the regions assessed and the measures used was significant. The researchers also looked at individual brain areas and identified several regions that were significantly different between the ADHD and the control groups or in at least three studies. As the authors note, one of the key limitations of the research is that only children and young adolescents were studied, with no participants over 15 years. Only one small study was conducted in adults (383). Similarly, the study population was primarily male, with only half the studies including females. Another important limitation of this work is the variability in the MRI measures, as brain regions were not identically defined across studies.
- A specific meta-analysis technique, activation likelihood estimation (ALE), was used to compare brain activation between healthy controls and individuals with ADHD (121). The included studies used fMRI or PET and were conducted primarily in children and adolescents, with five studies in adults. A consistent pattern of decreased frontal activity was identified in the ADHD group compared to the control group. The limitations in research are similar to those for the MRI studies above. Variation in reporting and the inconsistent use of standardised measures make it difficult to compare the results of individual studies. Few studies have considered large numbers of females, and only 9 out of 16 make a direct comparison between the ADHD group and a control group.

No studies were identified addressing the positive and negative predictive power of brain imaging in diagnosing ADHD in children or adults in clinical settings. As such, the findings to date do not support the use of structural brain imaging in the diagnosis of ADHD.

PART III: MANAGEMENT

Key Messages

Management of ADHD

3. Individuals with ADHD and their families and carers should be provided with information and education about ADHD and its impact, and the advantages and disadvantages of potential treatment strategies.
4. Multimodal therapy is recommended for the treatment of ADHD in all age groups. This could include psychosocial management strategies, medication and educational interventions.
5. An individualised management plan should be drawn up in collaboration with the person with ADHD and their parents/carers and teachers Taking into account
   - the specific needs and expressed preferences of the person, and the circumstances of his or her family and culture.
   - the associated psychosocial problems, educational difficulties and comorbid conditions.
   - the suitability of the plan for the individual and their family, considering affordability, accessibility and acceptability.
6. Clinicians should be alert to the risk of depression or other psychiatric disorders in parents/caregivers of children or adolescents with ADHD. Parents/caregivers may need referral for support and treatment.
7. Medication and ADHD
   - Not all people with ADHD will require pharmacological management.
   - Medications should only be used when symptoms are pervasive across settings (eg. school and home) and causing significant impairment in academic, social or behavioural function, and after careful consideration of non-pharmacological approaches. Clearly defined goals should be identified prior to commencing a trial of medication treatment.
   - Medication should not be used as first-line treatment for ADHD in preschool-aged children.
   - Patients receiving treatment for ADHD should be reviewed regularly (at least 6-monthly) to ensure that the management strategies remain appropriate and effective.
8. Other therapies
   - Elimination and restriction diets are not supported as a general treatment for individuals with ADHD. A subset of children may be sensitive to certain foods or food additives and may benefit from careful exclusion diets. Assessment of food sensitivity and initiation of a special diet should be under the care and supervision of a medical specialist and an Accredited Practising Dietitian.
   - Alternative treatments (including fatty acid supplements, biofeedback, homeopathy or sensory integration diets) are not currently supported as treatments for individuals with ADHD.

CHAPTER 6. OVERALL MANAGEMENT

6.1 Access to services

6.1.1 Services for children and adolescents

There are differences across Australia in the ways in which medical services for ADHD are provided. A range of public and private sector practitioners deliver behavioural and supportive therapy, but these services are frequently thought to be difficult to access and are very limited in the public sector for adults with ADHD. Access to stimulant medication is controlled by legislation in all Australian jurisdictions, with requirements for registration of public and private sector prescribers and of stimulant prescription recipients. The ability to initiate a stimulant prescription is in general limited to specialists in the fields of paediatrics and psychiatry. In most jurisdictions there is provision for a co-prescriber, typically a general practitioner, who can issue prescriptions when the registered prescriber is unavailable, or in some instances as routine after an initial period of observation, but with periodic specialist review. Currently, New South Wales and Western Australia are the only two Australian jurisdictions with formal processes for auditing stimulant medication. Uniform national regulations should be established for the prescribing of stimulant medications. In addition, a uniform national system of recording prescribing information should be adopted.

Use of services

There are limited published data on use of services for the management of ADHD in Australia. Sawyer et al (234) studied a subset of the children and adolescents recruited for the National Survey of Mental Health and Wellbeing in Australia. This study was a representative, population-based survey that assessed the pattern and prevalence of ADHD symptoms, the type of help provided to these children and the factors associated with the use of services, including barriers to service access (234). Sawyer et al reported that 28.1% of children with ADHD symptoms had attended a health- or school-based service in the 6 months prior to the study (234). Of these children, 41.1% had attended both health and school services, 39.3% had attended only health services and 19.6% only school services. The most commonly utilised health services were paediatricians, followed by family doctors, and 12.6% had attended a mental health service (234).

Similarly, a 2005 school-based community survey of North Sydney found that the diagnosis of ADHD was made by a paediatrician in 73% of cases, by a psychiatrist in 9%, by a psychologist in 8% and by a combination of these in the remaining 10% (384). The distribution of service providers probably varies in different settings within Australia. In Western Australia, for children and adolescents under the age of 18 years, over 90% of those prescribed stimulants were treated by paediatricians and 8.2% by psychiatrists (385).

Sawyer et al found that counselling was the most frequently provided service by school services and by health services. Eighteen percent of children with ADHD symptoms were being treated with medication (stimulants, antidepressants and antipsychotics). Of those who had attended a health service in the preceding 6 months, 58.9% were receiving medication, comprising 25.6% receiving only medication and 33.3% receiving medication and counselling (234).

6.1.2 Transition of care from adolescent services to adult services

There are few examples within Australia of functioning transition programs for adolescents with ADHD moving into adult sector services. This is despite acknowledgement in the literature that this is a demanding time for young people with ADHD and wider acceptance that adolescents with ADHD need the types of supports recommended for all young people with a chronic condition (386-388). International experience confirms that management of ADHD during this transition period is important if young people with ADHD are to achieve optimal educational outcomes (387, 389). The lack of public sector services for adults with ADHD further compounds the difficulty of effecting a smooth transition between child and adult services. The approach taken in Western Australia is to have adolescent services available to individuals with ADHD up until the age of 25.

6.1.3 Services for adults

For adults, the assessment of ADHD and any initial prescribing of psychostimulants is limited to psychiatrists. Where the person has received treatment for ADHD before the age of 18, a neurologist or paediatrician may also have this role.

There are fewer Australian data on treatment of adults with ADHD than for children. For adults (>18 years of age) with ADHD in Western Australia during 2006, 49.3% of patients prescribed stimulants were treated by child and adolescent psychiatrists, 38.1% by adult psychiatrists and 12.1% by paediatricians. Overall, there were equal numbers of child and adult patients (385). The opportunity for a co-prescriber has proven especially important for patients living in rural and remote settings (385).

A US survey suggests that the majority of adult patients with ADHD are diagnosed outside the paediatric period and hence are likely to need specialist assessment services and then long-term follow-up (390). In Australia, the majority of services for adults exist within the private sector, with limited adult public mental health services willing or able to take on the management of these clients.

6.1.4 Differences in medication availability and usage across Australia

There are a number of differences in the systems governing regulation of stimulant prescriptions across Australia, including differences in the age criteria for prescription, the presence of criteria that allow prescription in special circumstances, the requirements for notification and the requirements for screening for drug use.

There are marked variations in the use of prescription medications for ADHD across Australia (391). In 2003 the rate of dispensed dexamphetamine (DEX) prescriptions ranged from 3.6 per 1,000 population in the Northern Territory to 44.2 per 1,000 population in Western Australia. Rates of DEX prescriptions dispensed under the PBS between 2001 and 2003 showed high rates of stimulant prescribing in outer metropolitan areas and low rates of prescription in rural Western Australia (391). The reasons for these differences are complex, but include lack of recognised expertise in some geographical areas, lack of availability of services in general and in some places lack of alternatives to medication prescription.

6.1.5 Predictors of referral for assessment of ADHD

Children are more likely to attend services if they have the ADHD combined subtype than if they have inattentive or hyperactive/impulsive symptoms (234). Other factors associated with attendance at school or health services are parental perception of need and the presence of comorbid symptoms (234).

6.1.6 Barriers to service access

Sawyer et al's study (discussed in section 6.1.1) found that, of the parents of children with ADHD symptoms who did not attend services, 20.3% reported that they felt they could manage their problems on their own, 14.7% claimed the cost of services was excessive, 14% did not know where to get help and 10.5% were inhibited by the length of waiting lists for treatment (234).

Indigenous Australians

There are differences in the rates of presentation of ADHD to medical services in Indigenous Australians compared to the rest of the population. In North Queensland (392) ADHD was diagnosed in only 0.19% of the Indigenous people assessed at rural outreach clinics, compared to 3.51% of those assessed from non-Indigenous communities, an 18-fold difference (392). This, however, does not reflect the real prevalence of symptoms of ADHD in Aboriginal and Torres Strait Islander children and adolescents. The Western Australian Aboriginal Child Health Survey identified that 15.3% of a broad community survey of Indigenous 4–17 year olds were at high risk of clinically significant hyperactivity, while a further 9.3% were at moderate risk (393). These figures were higher than in the non-Aboriginal population where 9.7% were at high risk of clinically significant hyperactivity. The risk was greatest in children aged 4–11 years, with 17.1% of this cohort identified as being at high risk of hyperactivity, and in males (18.1% compared with females 12.3%) (393). The degree to which hyperactivity is perceived as a problem in Aboriginal communities is not clear from these data. Symptoms of hyperactivity were reported more commonly amongst urban children in comparison with remote children (18.8% of children in Perth, 5.2% of children in extreme isolation) (393).

There may be a number of explanations for this discrepancy. For example, the prevalence of ADHD between the communities may be genuinely different. Alternatively, some Indigenous communities may have different beliefs about what constitutes normal behaviour and attention span, and to what extent any differences constitute a problem.

There is a need for improved understanding of how to deliver effective mental health services in Indigenous communities as well as for an increase in the mental health services provided. As noted in section 5.10.2 (page 54), as well as a need for the development of culturally acceptable assessment procedures, there is a need to tailor services so that they can be delivered through programs acceptable to Aboriginal communities, such as Aboriginal Medical Services, with elder endorsement.

Australians from culturally and linguistically diverse backgrounds

The rates of presentation of ADHD in populations throughout the world may not reflect the rate at which migrants present with ADHD in Australia. This may be due to language difficulties, migration stresses, and a lack of familiarity with Australian systems and behavioural norms. Research is needed to determine the prevalence of ADHD amongst CALD populations in Australia. It is also important that we improve our understanding of how to deliver effective mental health services for Australians from CALD backgrounds.

Place of residence and socio-economic status

Location of residence and socio-economic status influence access to services and the nature of services used, with rural residence being a particular disadvantage for individuals with ADHD and their families. The low rates of referral in rural Aboriginal communities is noted above. In Western Australia, people with ADHD living in major centres are 2.3 to 5.3 times more likely to be prescribed stimulant medications, compared to residents of remote areas (327). This is likely to reflect difficulty in accessing a paediatric or mental health practitioner. In some parts of the country there are no resident paediatric services, so that many communities are dependent upon visiting paediatricians. In Western Australia, socio-economic advantage is associated with a lower likelihood of use of stimulant medication for children, but an increased likelihood of stimulant prescription for adults (327). Geographic differences in rates of prescription have also been observed in South Australia (394, 395) where socio-economic disadvantage was associated with increased likelihood of children receiving stimulant medication (394, 395). Studies in Australia and the US indicate that the prevalence of ADHD is increased in families with social disadvantage (7, 396, 397).

In a Florida study, female gender, non-white status and rural residence were associated with lower probability of ADHD service use (398). The same group also identified poverty as a barrier to service utilisation (399).

Failure to recognise symptoms

Failure to recognise the nature of ADHD, by either parents or professionals, has been recognised as a service access barrier in Australia and elsewhere. Australian general practitioners have reported limitations to their willingness to be involved in aspects of the care of children with ADHD (248). A United Kingdom survey of children identified through the British Child and Adolescent Mental Health Survey found that, while 80% of parents recognised that their child had a problem, only 35% identified the problem as hyperactivity (235). Parents were more likely to seek educational services, and hence did not gain access to medical services (400). General practitioners' failure to recognise ADHD was identified as the main barrier to referral (400).

Service availability for children and adolescents

An important issue in Australia is the availability of comprehensive, multidisciplinary services for children with ADHD and their families. In Sawyer et al's study (234), parents of 68.5% of the children attending health services wanted more help, most commonly counselling. Of the group wanting more help, 53.6% of the parents requested additional counselling for their children, and 57.1% requested additional counselling for themselves (234). Analysis of data from the Western Australian Stimulant Register indicates that, despite the availability of some public sector clinics, the majority of prescriptions for stimulant medication are still generated by private practitioners.

The Western Australian Parliamentary Inquiry into ADHD (401) concluded that access to mental health services was a major issue, stating:

> The current arrangements in terms of state services lean toward the medication first model, largely due to difficulty of access to appropriate multidisciplinary treatment.
>
> In terms of education support, families cannot easily access services for children diagnosed with ADHD unless the child is also identified as having one of the major categories of disability. Provision is not specifically provided for a single diagnosis of ADHD.

They also identified the difficulty in accessing educational initiatives:

> The shortage of qualified health professionals who are approved to diagnose ADHD and to then administer stimulant medication was a common theme in submissions. This view was particularly evident in non-metropolitan submissions, where the shortage was thought to impact on the ability to gain a second opinion and to access the full range of treatment options. Often in regional areas, medication is seen as the only option for treatment. (401)

These issues are not unique to Australia. In the United Kingdom, attitudinal and skill barriers amongst primary carers are a potential limit to implementation of shared models of care (402). In the US, it is difficult to implement complex treatment guidelines in primary care, and there is a need for additional training of primary care physicians and improved access to resources if ADHD treatment guidelines are to be implemented (403, 404).

The Clinical Excellence Commission of the Government of New South Wales, in its 2007 report, identified on the basis of a questionnaire completed by clinicians treating individuals with ADHD major gaps in the services available in that state. Clinicians specifically identified deficiencies in educational support (62%), behavioural therapy (76%), family therapy (74%) and psychological services such as psychometric assessment (51%) (405).

Other barriers identified by health professionals in Australia, for children and their families, include a lack of consumer health education on ADHD, the stigma associated with seeking help and the duration of treatment.

Barriers for adults

Access is possibly more difficult for adult patients.

Some medications are only available under the Pharmaceutical Benefits Scheme to patients under the age of 18 years, so that adults with ADHD do not have ready access to medications other than DEX, or access is limited to sub-optimal dosage amounts.

In Western Australia it has been noted that not all adult psychiatrists are willing to treat patients with ADHD, so there may be excessive waiting times for treatment. These pressures are noted to lead sometimes to limited specialist review and excessive reliance on co-prescribers for follow-up.

There are also financial barriers because of the lack of public sector adult clinics and the resultant need to seek private treatment. In particular, the perceived high cost of non-medication treatment options in the private sector means that adults with ADHD may not pursue this option.

6.2 Requirements of ADHD services

The Australian geography and population distribution and the scarcity of health professionals in some of the disciplines relevant to ADHD provide challenges to health service administrators in developing workable models of care.

Important issues that have been identified as compromising access to services for ADHD in Australia are:

- failure of recognition of the features of ADHD by health professionals, including failure of recognition in Indigenous populations
- rural residence
- socio-economic disadvantage
- shortage of mental health professionals
- lack of services for adult ADHD
- lack of services for paediatric ADHD.

Considerations in planning services for people with ADHD include recognition of primary, secondary and tertiary tiers of care for both paediatric and adult services, acknowledgement that the competencies required for assessment and management of ADHD are not necessarily discipline-specific so that there is potential for workforce substitution in some areas, and the need for enhanced undergraduate and postgraduate health professional education regarding the recognition and management of ADHD.

6.2.1 Education and training

An understanding of ADHD by all medical, nursing and allied health professionals is the basis for improving access to appropriate healthcare for people with ADHD. Staged training should be routinely available for these professionals, starting in the undergraduate period, so that all health professionals are able to identify children, adolescents and adults who may have ADHD, and all have access to extra training should they wish to provide more intensive management of the condition. Similar education needs exist for other professional staff in the fields of education, social work, justice and law to help ameliorate the disadvantages experienced by individuals with ADHD.

6.2.2 Child-oriented ADHD services: skills and competencies

Primary care providers

Primary care service providers for children (community health agencies and general practitioners) should be able to recognise the core symptoms of ADHD and be aware that these are not situation-specific but can occur in all environments. They should be familiar with symptom checklists as an aid to diagnosis. They need to be aware of differential diagnosis and the potential for comorbid conditions to occur in conjunction with ADHD. General practitioners as the gatekeepers to other service levels need to be aware of the requirements for therapy and of the locally available options.

Secondary care providers

Secondary service providers need detailed knowledge and understanding of normal childhood development and the ability to differentiate these sequences from symptoms of ADHD and other neuro-developmental disorders, such as specific learning disorders, co-ordination disorders and autism, and mental health disorders such as anxiety, depression and obsessive compulsive disorder. They also need to be able to determine the contribution to behavioural disorders of neurological problems such as epilepsy and foetal alcohol spectrum disorder, and of family functioning and socio-economic background (244).

Service providers at this level will initiate stimulant medication and will be able to manage the medications, including recognising and managing side effects. They will also be able to access the behavioural and other therapies that are required.

Tertiary care providers

Tertiary care providers of paediatric care will work in multidisciplinary teams, providing detailed diagnostic assessments that delineate the problems outlined in the paragraph above and multimodal therapies for children with disabling, difficult-to-manage ADHD.

6.2.3 Adult-oriented services: skills and competencies

Primary care providers

Primary care providers of adult services for ADHD need to be aware of the natural history of childhood ADHD and the differences in symptoms that adults may manifest compared to children. Familiarity with screening tools is important.

Secondary care providers

Secondary-level care providers of adult services for ADHD need to be able to utilise diagnostic instruments and to differentiate adult ADHD from mental health disorders such as anxiety, bipolar disorder and obsessive compulsive disorder. They will be able to manage stimulant medication and its consequences. Secondary-level providers require skill in working with adolescents in order to be able to manage the transition from paediatric to adult services. The competencies for secondary-

level healthcare providers of services for adults are most likely to have been acquired through training in psychiatry or clinical psychology, but are potentially achievable by general practitioners.

Tertiary care providers

Tertiary adult services require multidisciplinary diagnostic and therapeutic skills to deal with complex ADHD, often in the setting of comorbid diagnoses.

6.3 Developing an individualised management plan

Recommendations

48. An individualised management plan should be drawn up in collaboration with person with ADHD and their parents/carers and teachers as appropriate. The management plan should take into account:
    - the specific needs and expressed preferences of the person and the circumstances of his or her family and culture
    - the associated psychosocial problems, educational difficulties and comorbid conditions
    - the suitability of the plan for the individual and their family, taking into account affordability, accessibility and acceptability.

    ✓ *Recommended best practice based on clinical experience and expert opinion*

49. People with ADHD and their families and carers should be provided with information and education about ADHD and its impact, and the advantages and disadvantages of potential treatment strategies.
    ✓ *Recommended best practice based on clinical experience and expert opinion*

ADHD is a persistent condition that requires ongoing management and monitoring in all age groups. A management plan for the care of a person with ADHD should be individualised and will vary from person to person. The choice of treatment strategy must be influenced by the specific needs and circumstances of the person with ADHD, their family and their culture. Consequently, a comprehensive assessment is essential.

In formulating an individualised management plan, the severity of the person's ADHD needs to be taken into account. In determining the severity, the symptoms of hyperactivity, impulsivity or inattention *and* the level of subsequent impairment in multiple settings must be assessed. Issues that should be considered include academic performance, self-esteem, personal distress from the symptoms, social interactions and relationships, behavioural problems, and the development of comorbid psychiatric syndromes.

In addition, there may be unique circumstances. For example, is the school considering suspension of the student unless there is a rapid improvement in their behaviour towards teachers or other students? Are the parents seriously considering separation because of their child's difficult behaviour? Or in the case of an adult with ADHD, is the person at risk of losing their employment as a result of disorganisation or disinhibited behaviour? After careful assessment by the clinician, such examples may be considered to be a severe impairment and may warrant the immediate start of medication for two reasons. Firstly, it may change the person's behaviour to the extent that behavioural intervention becomes more possible and more effective. Secondly, the consequences of not altering the behaviour immediately may be serious in terms of the impact of school suspension, the family separating or the adult losing their job, all of which would make subsequent behavioural intervention more difficult.

The individualised management plan should also take into account the person's global health and associated problems such as learning difficulties, peer relationships, low self-esteem and family problems. In addition, as described previously (section 3.2 Comorbidities, page 22), many individuals with ADHD will have comorbid disorders that may require specifically targeted management strategies. The management plan should be developed in accordance with the individual's/family's resources and their capacity to adhere to the plan.

Developing an effective management plan also involves educating the person with ADHD and his or her family and carers about the disorder and how it may affect behaviour, self-esteem, social skills, learning and functioning within the family. In addition, it is important to provide information on the

advantages and disadvantages of potential treatment strategies. The provision of written materials can be particularly helpful, as can contact with local and national support groups (see Appendix I: Australian ADHD Support and Education Groups).

Families should be advised not to stop and start interventions without the advice of their managing clinician.

6.4 Multimodal therapy

Recommendation
50. A multimodal approach is recommended for treatment of ADHD. This may include medication, psychosocial management strategies and, where appropriate, educational interventions. ✓ *Recommended best practice based on clinical experience and expert opinion*

Multimodal therapy is advocated for the management of ADHD in all age groups. Multimodal treatment strategies typically combine medication and psychosocial management strategies such as behaviour therapy, psychoeducation, counselling or support. For children and adolescents, educational interventions that are designed to help with learning difficulties should also be included. Multimodal therapy has been endorsed in other best practice guidelines for ADHD (241, 243, 406, 407), however there is little research that specifically addresses the efficacy of this approach.

As discussed in Chapter 9 (see page 137), the Multimodal Treatment Study of ADHD (MTA) is the largest trial of combined medication and psychosocial treatment for ADHD (408). The MTA study compared four treatment groups: medication management, behavioural management, combined treatment, and community care. After 14 months, the effects of medication (methylphenidate [MPH]) were found to be equivalent to combined treatment, and both were more effective than behavioural management alone or community care (408). Importantly, the dose of MPH utilised in the combined group was significantly lower than the dose used in the medication-only group to achieve the same impact on ADHD symptoms (408). There was no significant difference between the treatment groups in the longer term (24 and 36 months); however, it is difficult to compare between groups because, as the study progressed, the participants were followed up according to their original treatment allocation, regardless of what treatment they subsequently chose to use (409, 410).

6.5 Multidisciplinary care

The management of ADHD may be complex and time consuming and may require extensive collaboration between disciplines. Many agencies and professionals may need to be involved in delivering and supporting an individual management plan.

For children and adolescents, effective multidisciplinary care requires co-operation amongst health professionals as well as effective consultation and liaison with families, schools, early childhood settings and support services. It is important to establish a therapeutic alliance with the child's parents/caregivers and other significant caregivers (e.g. day care providers, school teachers), to promote consistent management between home and school and consistent implementation of interventions. Thought and planning must go into the transition of adolescents into adult services and supports.

For adults with ADHD, there is a paucity of adult mental health or psychologist services in Australia. The majority of adults receiving treatment and care for ADHD do so through adult psychiatrists working in private practice. Psychological support should be available, targeted at the particular problems related to ADHD and comorbid conditions.

6.6 Treatment monitoring and review

Recommendation
51. Patients receiving treatment for ADHD should be reviewed regularly (at least 6-monthly) to ensure that the management strategies remain appropriate and effective. ✓ *Recommended best practice based on clinical experience and expert opinion*

Regular review is important to ensure that the management strategies remain appropriate and effective. Frequency of review will depend on age, stage and complexity of treatment, as well as on educational, work and family factors. Review will be frequent early after initiation of therapy and less frequent with established therapy. At a minimum, patients receiving treatment for ADHD should be reviewed every 6 months by the physician initiating drug therapy. Comprehensive assessment is essential and information should be collected from a range of sources.

Children and adolescents

Many factors can influence symptoms in children and adolescents, such as normal developmental changes, greater academic demands, changes in the home environment and availability of resources. Review should cover medication and other interventions, educational progress, and behaviour in the home and other settings. Information should be sought from multiple sources (e.g. parents or other significant caregivers, teachers).

Adults

Factors that influence symptoms in adults can include changes in the home and family environment, marriage or a new partner, children, loss or change in employment and returning to study. Review should cover medication and other interventions, and work and home life. Again, information should be sought from multiple sources (e.g. partners, other family members).

6.7 Family support / intervention

Recommendations
52. Participation in support groups can be of benefit for parents/carers of children and adolescents with ADHD. ✓ *Recommended best practice based on clinical experience and expert opinion*
53. Participation in adult ADHD support groups can be of benefit to adults with ADHD. ✓ *Recommended best practice based on clinical experience and expert opinion*

Relationship and family issues are well documented for children with a diagnosis of ADHD and their families (see Chapter 15. Issues for Families, Parents and Carers, page 183). Parents/caregivers often feel that they are unable to manage the complexity of their child's difficulties and this places a strain on the parents themselves as well as the family members and siblings who do not have ADHD. Parents of all children with ADHD require education regarding the nature of ADHD, the progression of symptoms across the lifespan, the ways in which they can access services and support, and the need for parental self-care. This support and education should be initiated by the clinician when developing an individualised management plan.

Local support groups can provide peer support and an opportunity for parents to exchange experiences and advice about caring for a child or young person with ADHD on a day-to-day basis. Support groups can also let families know what services are available to them. For example, families may benefit from services such as respite programs which allow the child with ADHD and the parent/carer to have a short-term break from one another.

Adults with ADHD and their partners may benefit from having written information about ADHD, the services and support offered by local and national support groups, and other sources of advice and advocacy.

Contact details for local support groups should be provided by professionals to families. A list of ADHD support groups is provided in Appendix I.

CHAPTER 7. PSYCHOSOCIAL MANAGEMENT

7.1 Introduction

Psychosocial interventions used in the management of ADHD include cognitive behavioural therapy (CBT), behaviour modification and social skills training. The intervention used will depend on the specific needs of the person with ADHD and his or her family. The presentation of ADHD and the cognitive and psychosocial strengths and weaknesses of people with ADHD vary widely, and treatment planning always needs to be individualised.

As well as addressing the core ADHD symptoms of inattention, hyperactivity and impulsivity, psychosocial interventions for people with ADHD may focus on improving day-to-day functioning at home and at school or work. While many psychosocial interventions are directed solely at the individual with ADHD, interventions such as parenting programs and family therapy require the direct involvement of the parents/caregivers of children with ADHD and help parents/caregivers to develop strategies to cope with and manage their child's difficult behaviour. It is important to note that there is no research support for the use of traditional psychotherapeutic approaches for the treatment of ADHD (411).

Prior to recommending a particular psychosocial intervention, consideration should be given to the current needs of individual families and their ability to implement psychosocial management strategies. This is particularly important for families of children with ADHD who are considering parenting programs. As discussed in Chapter 14 Issues for Families, Parents and Carers, page 183, the parents of children with ADHD often face increased levels of stress, low parenting self-efficacy, low self-esteem, marital discord and depression. In many cases, practical supports for families such as respite, educational support or in-home support may be necessary before psychosocial management is implemented (412, 413).

7.1.1 Psychosocial interventions for preschoolers, school-aged children and adolescents

Psychoeducation

Psychoeducation regarding the nature, causes and natural history of ADHD is important in aiding parents and carers to cope with the behaviours associated with ADHD, to understand and implement management plans, and to anticipate difficulties.

Behaviour modification

Behaviour modification (also known as contingency management) uses strategies such as structured reward systems, response costs and discipline techniques to encourage behaviour change. Rewards can include social rewards such as approval and praise, concrete rewards such as extra recreation time, or more complex reward schemes that involve "tokens" (stars or points) that can be earned. Discipline techniques can include verbal reprimands or time-out from positive reinforcement strategies. The time-out strategies involve removing the individual from a reinforcing situation for a set period of time following inappropriate behaviour. Response-cost techniques involve the loss of a reward as a result of inappropriate behaviour. This can be a loss of earned rewards or a loss of rewards from an agreed set that have been given in advance.

Cognitive behavioural therapy

CBT combines cognitive therapy, which aims to modify or eliminate unwanted thoughts or beliefs, and behavioural therapy, which aims to bring about changes in behaviour. The goal of CBT is to enhance functioning at home and at school. Individual programs may focus on one or more of the following: problem-solving techniques, coping strategies, social skills, goal-directed approaches to tasks or cognitive restructuring. CBT can be conducted individually or within a group.

Social skills training

Children with ADHD can experience difficulties in their social competence, peer relationships and family interactions. The aim of social skills training is to develop and reinforce the use of appropriate social skills (414). Social skills training uses techniques from cognitive and behavioural approaches;

the actual content and procedures vary across programs. It is usually conducted within groups, in either an educational or a clinic setting.

Parenting programs

Parenting programs (often called parent-training programs) aim to teach parents/caregivers strategies for managing disruptive behaviour in their child and improving parent–child relationships. Parenting programs make use of behaviour modification techniques such as structured reward systems and discipline techniques. They also commonly involve cognitive behavioural techniques, which require identifying problem behaviours, analysing their cause, developing a consistent response and modifying it on the basis of feedback. Several different strategies are used in parenting programs, and they can be conducted with individual families or in group settings. Parenting programs have been developed as an intervention for ADHD and other disorders that have an impact on behaviour, such as ODD and CD. Parent-based approaches for treatment of ADHD are most successful in younger children, with little research support for this approach with adolescents (411).

Family therapy

The goal of family therapy is to bring about positive changes in the way families function. Family therapy can be used to help families learn how best to support a child with ADHD and how to avoid parenting practices and parent–child interactions that may intensify problems. The focus of family therapy may be conflict resolution, effective communication, reducing anger in family interactions, problem-solving strategies, or developing clear roles, rules and routines (415).

7.1.2 Psychosocial interventions for adults

Cognitive behavioural therapy

CBT for adults with ADHD is primarily focused on developing strategies to resolve the skills deficits and day-to-day problems associated with ADHD, such as low self-esteem, disorganisation and procrastination (416). CBT programs vary dramatically, but generally centre on teaching problem-solving skills, techniques to reduce distractibility and stress management skills. CBT can be delivered in individual or group formats or may be self-directed.

Psychoeducation

Psychoeducation is thought to be particularly important for individuals who have not received their diagnosis of ADHD until adulthood (388). Psychoeducation at the time of diagnosis should aim to deliver information on the nature of ADHD, its natural history and prognosis. The goal of psychoeducation is to provide support and knowledge that can assist individuals with ADHD in reframing how they see their symptoms. Psychoeducation may also be useful in improving self-esteem and preventing unrealistic expectations from treatment.

Coaching

While coaching has not yet been formally defined or studied (417), its aim is to help people with ADHD to identify strengths, negotiate problems and work on specific goals. Regular contact and the formation of a partnership with the coach provide a support framework and help to build confidence in taking on specific tasks (416).

7.2 Efficacy of psychosocial interventions

7.2.1 Psychosocial interventions for preschool-aged children

Research question

- For individuals with ADHD, do psychosocial interventions, compared to no intervention, affect outcomes?

Evidence statements

- **Parenting programs:**
  - Two trials found that structured parenting programs conducted by specialist therapists, compared to a wait-list control group, significantly improved behavioural symptoms in preschool-aged children with ADHD (418, 419). (Level II)
  - One trial found that a parenting program conducted by non-specialist nurses, compared to a wait-list control group, did not have an impact on ADHD symptoms in preschool-aged children with ADHD (420). (Level II)

Recommendations

54. Structured parenting programs with demonstrated effectiveness could be considered for preschoolers with ADHD and associated behavioural problems. (Grade B)

55. In considering the use of psychosocial interventions, availability, the family's resources and their capacity to adhere to the program should all be taken into account.
    ✓ *Recommended best practice based on clinical experience and expert opinion*

Background

Parenting programs comprise the only psychosocial approach for preschool-aged children with ADHD that have been rigorously investigated. Parenting programs use primarily cognitive behavioural techniques and are designed to teach parents/caregivers strategies for understanding and managing disruptive behaviour in their child and improving parent–child relationships.

A recent meta-analysis assessing the efficacy of the various components of parenting programs for children aged 0–7 years was conducted using studies on ADHD and other childhood behavioural disorders (421). Program components consistently associated with positive outcomes in behaviour and adjustment included increasing positive parent–child interactions and emotional communication skills, teaching parents/caregivers to use time out and the importance of parenting consistency, and requiring parents to practise new skills with their children during sessions (421).

This study also found that for child outcomes, parenting programs had a greater positive impact on internalising behaviours than externalising behaviours and cognitive or educational skills. The lowest effect was seen on social skills and prosocial behaviours (421).

Summary of research evidence

Parenting programs

Three RCTs looked specifically at parenting programs for preschool-aged children with ADHD. Two studies found that structured parenting programs delivered individually were effective in reducing child behavioural problems in preschool-aged children (418, 419). In a third study (420), where the parenting program described in the previous study (419) was conducted by non-specialist nurses rather than specialist therapists, no differences were found between the group that had undergone 8 weeks of structured parenting and the control group. These results highlight the importance of considering who is delivering the program.

Other psychosocial interventions

No studies were identified that addressed the use of psychosocial interventions other than parenting programs in preschool-aged children.

7.2.2 Psychosocial interventions for school-aged children

Research question

- For individuals with ADHD, do psychosocial interventions, compared to no intervention, affect outcomes?

Evidence statements

- **Parenting programs**
    - One meta-analysis (422) and three trials (423-425) favoured parenting programs over no intervention for the consistent improvement of child–family function, academic performance and behavioural symptoms, with moderate improvement in ADHD symptoms. (Level I and II)
- **Social skills training**
    - One meta-analysis supported social skills training over no treatment for improving some aspects of social skills in children with ADHD (426). (Level III-1)
- **Family therapy**
    - One systematic review concluded that more research was required to determine if family therapy was an effective treatment for children with ADHD (427). (Level I)
- **Cognitive behavioural therapy**
    - One trial reported more appropriate coping skills in children with ADHD following a stress management intervention, but no significant change in acquisition of coping skills compared to the control group (428). (Level II)
- **Multi-component behavioural interventions**
    - One study found that the multi-component behavioural intervention used in the summer treatment program improved behaviour, compared to no intervention (429). (Level 4)
    - One study found that the multi-component behavioural intervention used in the MTA study did not improve ADHD symptoms, compared to the community control group (408, 410, 430). (Level III-2)

Recommendations

56. Structured parenting programs with demonstrated effectiveness could be considered for children with ADHD and associated behavioural problems. (Grade B)
57. Used alone, clinic-based social skills training is not recommended for improving social skills in children with ADHD. (Grade D)
58. There are insufficient research data to recommend cognitive behavioural therapy (CBT) or family therapy for the treatment of ADHD. (Grade D)
59. Cognitive behavioural therapy (CBT) or family therapy may, however, be useful in addressing certain comorbidities, including anxiety, ODD and CD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Background

ADHD is often associated with behavioural problems and comorbid psychiatric disorders, such as depression or anxiety. Poor self-esteem, difficulty forming friendships with peers and learning problems are also common. Psychosocial interventions for ADHD aim to improve the daily functioning of the child by improving his or her behaviour and family and peer relationships. Strategies such as parenting programs or family therapy also involve parents/caregivers, to help them to develop sustainable skills to cope with and manage difficult behaviour.

Psychosocial interventions for children can consist of a single component, such as parenting programs, positive reinforcement, daily report cards, time-out procedures and social skills training, or can combine any number of behaviour modification strategies in a multi-component approach. A multi-component intervention strategy was adopted for the MTA study (408). Similar multi-component approaches have been used in programs such as the "summer treatment program", an outpatient program, developed in the USA, that runs for 8 weeks in the style of a school camp.

Summary of research evidence

Parenting programs

One meta-analysis and three RCTs were identified.

The well-conducted meta-analysis (422) combined data from 16 studies that addressed parent involvement in the treatment of ADHD. It was not limited specifically to parenting interventions, but included seven studies focused on parenting programs. The meta-analysis found that family-based interventions had a greater impact on child–family functioning and academic performance than on ADHD symptoms.

A small Australian RCT compared a parenting program (Triple P positive parenting program) with a wait-list control group in children aged 5–9 years (423). Parents in the parenting program reported lower levels of child disruptive behaviour compared to the control group, and these benefits were maintained when assessed at 3 months after the end of the trial. Teacher-rated measures were not different between the groups.

In another RCT (424), parenting programs formed part of a three-armed intervention that also included consultation with teachers and skills and knowledge training with the child. Children were aged 7–11 years and were diagnosed with ADHD inattentive type. A positive impact of the intervention on DSM-IV symptom numbers and severity was seen at the end of the treatment period and at the 3–5 month follow-up period. Other outcome measures showed improvement at the end of treatment, but this did not hold at the time of follow-up.

The third RCT (425) compared a behavioural parenting program plus routine clinical care to routine clinical care alone over 5 months. Both groups showed improvement over time in behavioural, internalising and ADHD symptoms, and parenting stress. Those in the parenting program showed significant improvement in behavioural and internalising symptoms compared to those receiving routine clinical care only. ADHD symptoms and parenting stress did not differ between the groups.

Parent-based approaches for treatment of ADHD are most successful in younger children, with little research support for this approach with adolescents (411).

Social skills training

A systematic review (426) examined the efficacy of social skills training (SST) programs. Four out of four studies reported that SST improved aspects of social functioning in children with ADHD. The content of the interventions and the duration varied in each of the studies. There were also methodological limitations with each of the studies, including the concurrent use of parent groups and/or stimulant medication. Overall, there was no clear support for the use of clinic-based social skills programs, which are usually held weekly, using group contexts, and tend to focus on discussion and role playing of various social skills.

Social skills training has also been studied as part of multi-component behavioural interventions as part of summer treatment programs or other recreational-based programs. Social skills training in these settings are thought to yield positive results in these settings (411). The time and financial commitments for recreational training (300–400 hours) are prohibitive compared to clinic-based social skills training interventions (10–20 hours).

Family therapy

One systematic review (427) has assessed the efficacy of family therapy (without medication) for ADHD symptoms. Only two studies met their inclusion criteria and the review concluded that more research was required to determine whether family therapy is an effective treatment for children with ADHD.

Cognitive behavioural therapy

One study compared a stress management program led by therapists, a parent-led program and a no-treatment control group (428). There were no significant differences between the three groups

for acquisition of coping skills. The therapist-led group reported more appropriate coping strategies. Also of note was that the parent-led group reported the greatest change in self-concept, although the difference was not significant.

Multi-component behavioural interventions

One study looked at behaviour modification as part of a multi-component psychosocial management strategy in a summer treatment program (429). It found that behaviour was improved when behaviour modification strategies were in use in the camp, compared to the two-day withdrawal period when the behaviour strategies were not in use. The study had several major limitations that make the results difficult to interpret, such as no assessment with standardised ADHD outcome measures.

The MTA study compared the use of multi-component psychosocial management with a community-care control group. At 9 months, when the behavioural management was still being intensively administered, no significant difference was found between the multimodal psychosocial management group and the community-care control group (430). At 14 months (408) and 24 months (409), the behavioural management group did not differ significantly from the community control group on any outcome, and both strategies were significantly less efficacious than medication management and combined management. At 36 months, there was no significant difference between any of the groups (410).

Changes in parenting behaviour have also been examined in the MTA study (431). When observed parenting skills were evaluated, behavioural management was found to enhance positive aspects of parenting significantly, compared to the other treatment groups (431). There was a greater use of proactive parenting strategies in the behavioural group and this was attributed to the parenting program component of the combined behavioural management strategy (431).

It is important to note that the community-care group is not necessarily relevant to the Australian setting as there are many differences between the healthcare settings in Australia and those in the USA. Further, although the multi-component interventions include elements of behavioural management and CBT, the study was not set up in a way that allows any judgement on the individual efficacy of these approaches.

7.2.3 Psychosocial interventions for adolescents

Research question

- For individuals with ADHD, do psychosocial interventions, compared to no intervention, affect outcomes?

Evidence statement

- No studies were identified that addressed the use of psychosocial interventions in adolescents.

Recommendations

60. The interventions described for children (with the exception of parenting programs) could be applied to young adolescents with ADHD.
    ✓*Recommended best practice based on clinical experience and expert opinion*

61. For older adolescents with functional impairments associated with ADHD, the cognitive behavioural therapy (CBT) strategies described for adults may prove beneficial.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Background

ADHD in adolescence can be particularly disruptive, both in school and social contexts, with increasing academic demands and the growing importance of peer relationships.

If difficulties with school curriculum are not identified, secondary behavioural symptoms can occur (e.g. school refusal, declining grades). However, if these problems are identified, behavioural interventions (e.g. contracts) may be employed to provide the young person with structure and support. Communication and consistency between home and school are important for the success of these interventions.

Summary of research evidence

No studies were identified that addressed the use of psychosocial interventions in adolescents.

7.2.4 Psychosocial interventions for adults

Research question

- For individuals with ADHD, do psychosocial interventions, compared to no intervention, affect outcomes?

Evidence statement

- Seven small trials support the use of CBT over no treatment for improving ADHD symptoms and daily functioning in adults with ADHD (383, 432-437). (Level II, II-2 and IV)

Recommendations

62. For adults whose ADHD has been stabilised on medication, a course of either group or individual cognitive behavioural therapy (CBT) could be considered to improve ADHD symptoms further and assist with daily functioning in areas such as organisational skills, self-esteem and social skills. (Grade B)

63. Psychoeducation, counselling, psychotherapy or coaching may benefit some adults with ADHD.
✓ *Recommended best practice based on clinical experience and expert opinion*

64. Consideration of the use of psychosocial interventions should take into account availability and the individual's resources and capacity to adhere to the program.
✓ *Recommended best practice based on clinical experience and expert opinion*

Background

At the time of first diagnosis with ADHD, adults go through a complex process of adjustment (438). Commonly, they have managed to cope with their symptoms through childhood, either because of a supportive environment or because they have developed a range of compensatory strategies. Diagnosis in adulthood often occurs when increasing demands of study or employment prompt the person to seek help. These issues may be coupled with psychological adjustment problems including low self-esteem, depression and anxiety.

General psychosocial support and psychoeducation are beneficial when the person first presents with these difficulties, when treatment is initiated and on regular review (388). Assessment of the person's particular needs and what coping strategies he or she has developed can guide the requirements for psychosocial interventions. For example, intervention may need to focus on the treatment of comorbid psychiatric disorders, psychological problems or skills deficits. Neuropsychological assessment may be of particular benefit in this age group, providing the person with an understanding of his or her cognitive strengths and weaknesses, which can be used to inform the provision of strategies and guidelines to manage these issues in a work or study context.

Counselling or client-based psychotherapies may have a role in helping some people with ADHD come to terms with the way the condition has affected their personal and emotional lives. Similarly, coaching interventions could be used to support people with ADHD in rehearsing newly learnt skills. Although there have been no formal studies of the effectiveness of psychoeducation, counselling, psychotherapy or coaching, clinical experience suggests that some adults with ADHD may benefit from these approaches. The psychosocial interventions for adults with ADHD that have been more rigorously assessed are primarily CBT-based.

Summary of research evidence

Seven small studies were identified that addressed different forms of CBT for adults with ADHD:

- Two RCTs were conducted in Australia. One compared a therapist-directed cognitive remediation program with an untreated control group (432). The program targeted attention problems, poor motivation, poor organisational skills, impulsivity, reduced anger control and low self-esteem. Significant improvements in ADHD symptoms were found following the treatment. In a second

study, comparison of a self-directed self-help program with a control group also found significant improvements in ADHD symptoms following the intervention (433).

- Comparison of a psychoeducational intervention with no treatment (434) showed benefits in the areas of disorganisation, inattention and self-concept/esteem for the group receiving a psychoeducational intervention.
- Two German studies using a CBT intervention based on dialectic behavioural therapy reported improvement in ADHD symptoms (383, 435).
- In a Finnish study of a group-based CBT intervention, there was improvement on self-reported symptoms of ADHD following treatment; however, reports from significant others showed no improvement (436).
- A group-based CBT intervention designed to target self-management skills resulted in improvements on self-reported symptoms of inattention, executive function skills and time management, and organisation and planning following treatment (437).

Overall, the studies of psychosocial interventions in adults with ADHD show benefits for the management of ADHD symptoms; however, all the studies were rated as poor quality and the results should be interpreted cautiously. Several studies included participants who were concurrently taking medications for ADHD, but did not necessarily conduct a separate analysis to take this potential confounder into account. Two studies did consider the impact of medication status on treatment outcome (432, 435) and both reported that medication had no significant impact on the outcomes of the psychosocial treatments under investigation.

7.3 Psychosocial interventions for ADHD when comorbidities are present

Research question

- For individuals with ADHD and comorbid disorders, do psychosocial interventions, compared to no intervention, affect outcomes?

Evidence statements

- One trial in adolescents with ADHD and comorbid ODD found no statistically significant improvement in ADHD or ODD symptoms when using psychosocial interventions (problem-solving communication training and/or behaviour management) (439). (Level III-3)
- One trial in children with ADHD and comorbid ODD or CD showed that behavioural management, compared to community care, did not significantly improve ADHD or ODD/CD symptoms (440). (Level III-2)
- One trial in children with ADHD and comorbid anxiety showed that behavioural management, compared to community care, significantly improved ADHD and anxiety symptoms and social skills (408, 440, 441). (Level III-2)
- No studies were found that addressed psychosocial interventions for ADHD and comorbid disorders in preschool-aged children or adults.

Recommendations

65. Psychosocial interventions should be considered for individuals with ADHD and comorbidities.
    ✓ *Recommended best practice based on clinical experience and expert opinion*

66. Psychosocial interventions can be particularly beneficial when the individual with ADHD has comorbid anxiety. (Grade C)

Background

There are high levels of comorbidity between ADHD and a number of other conditions, including anxiety, depression and disruptive behavioural disorders such as ODD and CD (see section 3.2 Comorbidities, page 22). However, research addressing the impact of psychosocial interventions for ADHD and comorbid conditions is very rare. The available research considers children and adolescents and no studies in preschool-aged children or adults met the inclusion criteria.

Summary of research evidence

Three studies were identified that investigated the efficacy of psychosocial interventions for ADHD when comorbid disorders are present.

One compared two intervention strategies: problem-solving communication training and behaviour management training plus problem-solving communication training (439). The participants were adolescents aged 12–18 years diagnosed with ADHD and ODD. At the 2-month follow-up, only 25% of the participants in either group showed improvement. There were no significant differences between the two intervention strategies.

The remaining two studies were derived from the MTA study. The original MTA study compared four treatment groups: medication management, behavioural management, combined treatment and community care (408). At 14 months, the behavioural management group did not differ significantly from the community control group on any outcome. Both behavioural management and community care were significantly less efficacious than medication management and combined management (408).

Analysis of the MTA study to consider the impact of comorbidities on treatment efficacy found that behaviour management, compared to community care, improved core ADHD symptoms and social skills outcomes for participants with ADHD plus anxiety, compared to those with ADHD only (440). Behaviour management also improved core ADHD symptoms in those with ADHD plus ODD/CD plus anxiety. There was no differential response to treatment for the ADHD plus ODD/CD group compared to the ADHD only group.

Further analysis of the MTA outcomes at 14 months found that, for children with ADHD and anxiety, behavioural treatment was significantly better than community care on parent-rated measures, irrespective of the presence or absence of comorbid conduct problems (441).

CHAPTER 8. MEDICATION

8.1 Introduction

Recommendations

67. Not all people with ADHD require pharmacological management.
✓ *Recommended best practice based on clinical experience and expert opinion*

68. Medications should only be used when symptoms are pervasive across settings (eg. school and home) and causing significant impairment in academic, social or behavioural function, and after careful consideration of non-pharmacological approaches. Clearly defined goals should be identified prior to commencing a trial of medication treatment.
✓ *Recommended best practice based on clinical experience and expert opinion*

69. A multimodal approach is recommended for treatment of ADHD. Psychosocial management strategies and, where appropriate, educational interventions should be used in conjunction with medication treatments.
✓ *Recommended best practice based on clinical experience and expert opinion*

Treatment with medication is not indicated for all individuals with ADHD. Medications should only be used when ADHD symptoms and impairments are considered severe or when individuals with moderate symptoms and impairments have refused non-pharmacological interventions or when their symptoms have not responded to psychosocial treatments.

As discussed above (see section 6.3 Developing an individualised management plan, page 68), the diagnosis of ADHD and the determination of severity takes into account the symptoms of hyperactivity, impulsivity or inattention *and* the level of subsequent impairment in multiple settings. Consideration must be given to the level of impairment in terms of academic performance, self-esteem, personal distress from the symptoms, social interactions and relationships, behavioural problems and the development of comorbid psychiatric syndromes. Circumstances unique to the individual and their family must also be evaluated.

Multimodal therapy is advocated for the management of ADHD in all age groups. Accordingly, when medication treatment is suggested it should be as part of a comprehensive management plan that includes psychosocial and educational management strategies.

The decision to use medication for the treatment of ADHD requires careful consideration of all the usual issues that must be weighed in a decision to initiate medication. These include the level of indication for drug therapy, the balance of benefit versus risk from use of medication, the legal requirements surrounding use of medications and the ability of the individual, family or community to afford the medication. The Therapeutic Goods Administration (TGA), a division of the Australian Government Department of Health and Ageing, is responsible for the assessment and monitoring of the quality, safety and efficacy of medicines marketed in Australia.

When granting marketing approval the TGA approves the use of medications for specific indications. These indications are listed in the approved Product Information document for each prescription medication.

Prescribing medications for indications other than those stated in the Product Information, while not illegal, is not endorsed by the sponsor of that medication or by the TGA. Nevertheless, it is recognised that clinical practice is not always consistent with the indications stated in the Product Information.

When prescribing medications outside the TGA-approved indications it is important that this is made clear to the patient and, where appropriate, their parent/carer. Informed consent should be obtained and documented. The clinician should discuss the reasons for using the medicine, possible side effects, possible alternative therapies and any additional information to address specific concerns (442).

8.1.1 Available medications

In Australia the medications that are registered for use in individuals over 6 years of age with ADHD are methylphenidate (MPH) in immediate-release (IR) (Ritalin 10 and Attenta) and extended-release (ER) formulations (Ritalin LA, Concerta); dexamphetamine sulphate (DEX); and atomoxetine (ATX) (Strattera).

Other medications that have been used or studied in the treatment of ADHD include clonidine, bupropion, selegiline, modafinil, imipramine, risperidone, tricyclic antidepressants and nicotine patches. These medications are available in Australia but are not currently licensed for the treatment of ADHD. Notably, the tricyclic antidepressants have had a diminishing role in the treatment of ADHD since the advent of other non-stimulant treatments. No research studies addressing the use of tricyclic antidepressants for the treatment of ADHD met our systematic review inclusion criteria. As a result, these medications have not been included in the Guidelines.

There are also several medications that are currently not available in Australia, but are commonly used to treat ADHD in other countries. These include mixed amphetamine salts (MAS) and guanfacine, which have both been approved by the FDA to treat ADHD in the USA.

In this review we have considered any medication that has been subject to a randomised controlled trial in individuals with ADHD that also meets the inclusion criteria of the systematic review.

Australian prescribing regulations

MPH and DEX are Schedule 8 controlled drugs for which additional prescribing restrictions apply in most Australian States and Territories. Statutory regulations vary; for example, in some States (e.g. New South Wales, Western Australia) prescribers need to apply for permission to prescribe MPH and DEX. The use of stimulant therapy in preschool-aged children in particular is heavily regulated under specific State and Territory legislation.

The relevant State or Territory department of health (Table 5) can provide details on compliance with the provisions of State or Territory law when prescribing MPH and DEX.

Table 5. State and Territory contacts for information of the regulation of stimulant prescribing

Australian Capital Territory ACT Department of Health & Community Care Pharmaceutical Services, Population Health Division
New South Wales Pharmaceutical Services Branch NSW Health
Northern Territory Poisons Control Department of Health and Community Services
Queensland Pharmaceutical Advisory Services Queensland Health
South Australia Public & Environmental Health Service Department of Human Services
Tasmania Pharmaceutical Services Branch Department of Health and Human Services
Victoria Drugs & Poisons Unit Department of Human Services
Western Australia Pharmaceutical Services Branch Department of Health

Monitoring of adverse drug reactions in Australia

Reports of suspected adverse reactions to prescription medicines should be submitted to the TGA Office of Medicines Safety Monitoring (http://www.tga.gov.au/adr). Reporting by Australian doctors, dentists and pharmacists is voluntary.

8.1.2 Variations from approved Product Information

In some instances, the Guideline recommendations differ from the relevant medication Product Information sheets. These differences are noted in the text under the sub-heading "Variations from approved Product Information". Where a variation exists, it has been made on the basis of scientific evidence and expert opinion and reflects current expert practice.

8.1.3 Limitations in the current research on ADHD medications

Efficacy

The vast majority of studies addressing the efficacy of medications for the treatment of ADHD are short-term studies of 3 months or less. The focus of the research has been on the impact of medications on the core symptoms of ADHD: inattention, impulsivity and hyperactivity. Few studies have looked at quality of life, school or work performance, or social function.

The majority of the identified studies on ADHD medications have been sponsored, at least in part, by the manufacturers of the medications.

Side effects

For the three most common medications used for ADHD – MPH, DEX and ATX – side effects were addressed in detail in the systematic literature review. In addition to the randomised controlled trials utilised to assess the efficacy of medications, published articles representing lower levels of evidence were included to give a greater overview of possible side effects.

There are a number of limitations in the reporting of side effects and adverse events in the literature. As highlighted in a review by King et al (443), many studies provide only limited information about adverse events, and standardised reporting between studies is lacking. Measures of adverse events vary widely. The most frequently used measures are open-ended questions and

rating scales that are limited to the most common side effects associated with the medication in question. When only one of these methods is used, there is considerable room for bias in reporting. In addition, younger children may not have the communication skills to convey side effects clearly. Finally, the long-term safety effects of ADHD medications are not clearly established, as long-term studies are rare.

Stimulants and Atomoxetine

The combining of stimulant medication (MPH or DEX) with ATX to treat ADHD has not been adequately researched. No studies were identified that allowed the assessment of the safety or efficacy of combining stimulant medication (MPH or DEX) with the non-stimulant medication ATX. One open pilot study of 25 children aged 6 to 12 years reported the safe combination of these drugs (444). In this small study 16% of participants withdrew because of side-effects. There have been a number of controlled trials describing the combination of MPH with other medications for treating ADHD when comorbidities are present. These individual studies are discussed below in Sections 8.5 and 8.6.

8.1.4 Mangement of medication

The approaches to the use of the different medications for different age groups are summarised in the table at the endof the medication section..

8.2 Stimulant medication (methylphenidate, dexamphetamine and mixed amphetamine salts)

Research questions

- For individuals with ADHD, do stimulant medications, compared with placebo, affect outcomes?
- For individuals with ADHD, does use of stimulants for 1 year or more, compared with placebo or no intervention, affect outcomes?
- For individuals with ADHD, does any stimulant medication confer an advantage over any other stimulant medications?
- For individuals with ADHD who are taking medication, what are the main side effects?

Evidence statements

- **Short-term (weeks/months) MPH**
    - **Preschoolers**
      Two RCTs (445, 446) have demonstrated benefit of MPH compared to placebo in reducing the symptoms of ADHD. (Level II)
    - **Children and adolescents**
      One systematic review (25 RCTs MPH; 5 RCTs DEX) has demonstrated benefit of MPH and DEX compared to placebo in reducing the symptoms of ADHD (443). (Level I)
    - **Adolescents**
      One RCT has demonstrated benefit of MPH-ER over placebo in reducing the symptoms of ADHD (447). (Level II)

      One RCT has demonstrated benefit of MAS over placebo in reducing the symptoms of ADHD (448). (Level II)
    - **Adults**
      One meta-analysis (6 RCTs) (449) and four RCTs (450-453) have demonstrated benefit of MPH over placebo in reducing ADHD symptoms . (Level II)

      Three RCTs have demonstrated benefit of DEX over placebo in reducing ADHD symptoms (454-456). (Level II)

      Two RCTs have demonstrated benefit of MAS over placebo in reducing ADHD symptoms (457, 458). (Level II)
- **Immediate-release versus extended-release stimulants**
    - **Children and adolescents**
      One systematic review (2 RCTs) found no difference in efficacy between immediate-release MPH and extended-release MPH for the improvement of ADHD symptoms (443). (Level I)
- **MPH versus DEX**
    - **Children and adolescents**
      One systematic review (2 RCTs) found no difference in efficacy between MPH and DEX for the improvement of ADHD symptoms (443). (Level I)
- **Long-term (>1 year) use of stimulants**
    - One study (MTA) found the use of stimulant medication (MPH) over placebo significantly improved ADHD symptoms when used for 14 months (408), but there was no significant difference in the longer term (at 24 and 36 months) (409, 410). (Level III-2)

Recommendations

- **Preschool-aged children (3–5 years of age)**

70. Medication should not be used as first-line treatment for ADHD in preschool-aged children.
    ✓*Recommended best practice based on clinical experience and expert opinion*

71. The use of medication should only be considered in preschool-aged children when there has been poor response to behavioural or psychosocial therapy and the ADHD symptoms are having a severe impact on the child and their family/carers. For preschool-aged children medication should only be initiated following specialist assessment and in the context of multidisciplinary care, preferably in a tertiary setting.
    ✓ Recommended best practice based on clinical experience and expert opinion

72. Where a decision is made to trial medication, MPH-IR should be used at low dose, in conjunction with appropriate behavioural intervention. (Grade C)

73. Preschool-aged children on medication need to be monitored closely because of the increased incidence of side effects in this age group. (Grade B)

74. Extended-release forms of stimulants should not be routinely used in preschool-aged children.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Note: Use of stimulant therapy in preschool-aged children is regulated under specific State and Territory legislation.

- **School-aged children**

75. Where severe, impairing ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

76. The choice of MPH-immediate release or MPH-extended-release depends on the symptom profile, as well as individual child and parent/caregiver preferences. (Grade A)

- **Adolescents**

77. Where severe ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

78. The choice of MPH-immediate-release or MPH-extended-release depends on the symptom profile, as well as the preference of the adolescent with ADHD. (Grade B)

- **Adults**

79. Where severe ADHD is present, treatment with MPH or DEX should be considered as a first-line pharmacological treatment. (Grade A)

80. The choice of MPH-immediate-release or MPH-extended-release depends on the symptom profile, as well as the preference of the person with ADHD. (Grade B)

- **All age groups**

81. When stimulant treatment is used, it should be continued for as long as it is of assistance to the person with ADHD and is not causing unacceptable side effects.
    ✓*Recommended best practice based on clinical experience and expert opinion*

82. All patients should be carefully monitored for side effects of medication.
    ✓*Recommended best practice based on clinical experience and expert opinion*

Stimulants not available in Australia

83. MAS may have a role in the pharmacological management of ADHD in

primary school-aged children, adolescents or adults. (Grade B)
Note: MAS is not currently available in Australia.

Immediate-release versus extended-release

84. Immediate-release forms should be the initial treatment, to titrate to the optimal dose, and they may be the preferred maintenance therapy for various reasons, for example, flexibility of dosing.
✓*Recommended best practice based on clinical experience and expert opinion*

85. If starting on immediate-release stimulants, consideration should be given to changing to an extended-release form once the optimal dose has been established. This can help to avoid the stigma and inconvenience of taking medication at school.
✓*Recommended best practice based on clinical experience and expert opinion*

86. In some cases the combined use of immediate-release and extended-release forms is required. This should only be considered if there is inadequate symptom control with the extended-release form.
✓*Recommended best practice based on clinical experience and expert opinion*

8.2.1 Background – stimulant medications

Stimulant medications are thought to influence ADHD symptoms because they alter the availability of dopamine and noradrenaline in the regions of the brain involved with behaviour inhibition, impulse control and attention. The precise mode of action on ADHD symptoms is not fully understood.

In Australia, the stimulant medications DEX and MPH are used for the treatment of ADHD.

MPH is available in both immediate-release (IR) and extended-release (ER) formulations. The immediate-release formulations (such as Ritalin 10 and Attenta) have a short half-life, and 2-3 daily doses are usually required. The extended-release formulations (such as Ritalin LA and Concerta (OROS MPH)) need only be taken once a day.

Ritalin LA was registered by the TGA in 2002 and listed on the Pharmaceutical Benefits Scheme (PBS) in April 2008. Ritalin LA is reimbursed for children and adolescents (6–18 years) who require continuous coverage over 8 hours. Concerta was approved by the TGA in 2003 and listed on the PBS in April 2007. Concerta is reimbursed for children and adolescents (6–18 years) who require continuous coverage over 12 hours. An MPH patch has been developed but has not yet been approved for use in Australia.

The PBS authority regulations require a successful trial of MPH-IR before approval will be given for ER forms. Anecdotal feedback from clinicians suggests that a higher dose of MPH is required when using an ER form of MPH. This is supported by Pelham et al's (2001) study (459), which showed when using OROS MPH, a 20% higher dose was required than when using MPH-IR.

Amphetamines are either a single-salt formulation (such as Dexadrine) or a mixed-salt formulation (such as Adderall and Adderall-XR). At this stage only an immediate-release form of DEX is available in Australia. The mixed-salt formulations, Adderall and Adderall-XR, are used to treat ADHD in the USA and Europe but are not available in Australia.

The issue of stimulant medication use in the preschool age group is contentious, although the numbers of children involved are very small. The recent NSW Department of Health Clinical Excellence Commission Review documents the following numbers of preschoolers on stimulant medication in 2007: 2 year olds – 1 (0.001%); 3 year olds – 7 (0.008%); 4 year olds – 56 (0.05%) (460). In addition, the 2007 NSW Department of Health review of prescribing practices in paediatricians and child psychiatrists showed that over 95% were adhering to the strict NSW Department of Health stimulant prescribing guidelines. In Western Australia, the following numbers of preschoolers were on stimulant medication in 2007: children under age 4 – 0; 4 year olds – 14 (0.2%).

There is, however, a very small group of preschool-aged children who do not respond to non-medical interventions. It is this group with severe symptoms who are suitable for a trial of stimulant medication. Such trials should only be considered in an expert, multidisciplinary tertiary setting. This

is consistent with other guidelines which recommend such children be referred to tertiary services (244).

Side effects of stimulant medications are discussed in detail in section 8.7 Side effects: special considerations, page 116. The abuse potential of ADHD medications is discussed in section 8.9 ADHD and substance misuse, page 124.

Variations from approved Product Information

The Product Information for MPH-IR (Attenta and Ritalin 10) states that MPH should not be used in children under 6 years of age as safety and efficacy in this age group have not been established. The Guidelines recommend that MPH-IR can be used in children under 6 years in conjunction with appropriate behavioural intervention when there has been poor response to behavioural or psychosocial therapy alone and the ADHD symptoms are having a severe impact on the child and their family/carers. It is also recommended that preschool-aged children on medication need to be monitored closely because of the increased incidence of side effects in this age group. Historically, DEX has been approved for the treatment of ADHD without age limits and as a result it is approved for use in preschoolers. However, there has been no research identified to support the use of DEX in preschool-aged children.

8.2.2 Summary of research evidence

Preschoolers

Two short-term studies were identified that addressed the use of MPH for ADHD in preschool-aged children:

- A poor-quality study (446) found improvement in core ADHD symptoms, but no significant improvement in measures of child compliance and attention tasks.
- A more recent study (445) found that 2.5, 5 and 7.5mg doses of MPH produced significant reductions in ADHD symptoms compared to placebo, although the number and type of side effects were greater, and the effect sizes smaller, than in older children. Several limitations in reporting signal a need for caution in interpreting these results.

No other types of stimulants have been tested in this population.

Children and adolescents

King et al (443) reviewed the efficacy of MPH and DEX in children and adolescents with ADHD. The quality of the included studies was mixed, with many being rated as poor quality. Based on 25 controlled trials of MPH and 5 of DEX, the overall conclusion was that stimulant medication may improve symptoms and quality of life in this population.

The vast majority of studies of stimulant medications in children and adolescents are of short to medium duration (less than 3 months) and the long-term impact of stimulants is not clear.

Two additional studies were included that addressed the use of stimulants in adolescents, one investigating extended-release mixed amphetamine salts (MAS-ER) (448), the other, extended-release methylphenidate (MPH-ER) (447). Both studies reported improvement in core ADHD symptoms compared to placebo, but both had limitations in methodology that signal caution in interpreting the results.

Adults

Five studies that investigated the use of MPH in adults with ADHD were included. Faraone et al (449) described a meta-analysis of 6 RCTs, which supported the conclusion that MPH was effective in reducing symptoms of ADHD in adults. Methodological limitations resulted in this study being rated as poor quality. Four primary studies (450-453) reported consistent improvement in core ADHD symptoms for adults treated with MPH but the results for quality of life measures were less clear.

Two studies (457, 458) reported benefit from MAS, in both the IR and ER formulations, in reducing ADHD symptoms compared to placebo.

Three studies comparing DEX to placebo reported improvement in core ADHD symptoms (454-456). Measures of the impact of medication on quality of life were not included.

Comparing stimulant medications

No studies were identified that compared stimulant medications in preschoolers or adults.

For children and adolescents with ADHD, King et al's (443) systematic review compared the efficacy of the immediate-release and extended-release stimulant medications. Two studies were discussed, both short term (4–8 weeks) and of poor quality. Both compared MPH-IR and MPH-ER and found no differences between the two in hyperactivity or quality of life measures. One study found a higher incidence of headaches in the group taking MPH-ER.

King et al (443) also compared MPH and DEX in children and adolescents with ADHD. Again, two studies were discussed. The first, which was rated as poor quality, looked at the impact of DEX and MPH on ADHD symptoms and found MPH to be superior on teacher ratings, but no difference between MPH and DEX in parent ratings was found. In addition, there were no differences in adverse events between the groups. The second study reported no differences between the two medications on hyperactivity measures. This study did not adequately report on adverse events. Neither study reported on quality of life measures.

Long-term use of stimulants

The long-term safety and efficacy of stimulant medication has not been established.

No studies addressing this issue in preschoolers or in adults met the inclusion criteria.

In primary school-aged children, the only study addressing this issue that met the inclusion criteria was the Multimodal Treatment Study of ADHD (MTA), which compared four treatment groups: medication management, behavioural management, combined treatment and community care. Data have now been analysed at 14 months (408), 24 months (409) and 36 months (410). At the 14-month and 24-month time points, medication management was superior to community control in improving core ADHD symptoms, but there were no significant differences between groups on measures of academic achievement or social skills (408, 409). At 36 months there was no significant difference between the medication group and the community control group on any measure.

The MTA study has two critical methodological limitations that make it difficult to draw clear conclusions: it was not placebo-controlled, and after the 14-month analysis participants were allowed to change treatment but continued to be followed up according to their initial treatment allocation. For example, a proportion of families whose children were initially assigned to the behavioural management group subsequently opted for stimulant medication, making the long-term outcome of the initial MTA treatment groups difficult to assess.

"Medication holidays", during which stimulant medication is ceased, are used by many practitioners, despite a lack of evidence to guide this practice. Potential benefits of medication holidays are the opportunity to determine continuing benefit of medication and minimisation of side effects. Regular weekend holidays have been shown to reduce side effects of insomnia and appetite suppression without a significant increase in ADHD symptoms (461). The long-term benefits of medication holidays on growth have been questioned (462).

Side effects

Preschoolers

Two clinical trials were identified that reported on adverse events in preschool-aged children receiving MPH. The first was a crossover trial of short duration (7–10 days each on placebo, low-dose MPH and high-dose MPH) (446, 463). The higher dose of MPH resulted in a significant increase in the number and severity of adverse events, including decreased appetite, nightmares, feeling sad/unhappy and social ratings such as "talks less with others", compared with both placebo and the lower dose of MPH. There were no significant differences between low-dose MPH and placebo. Wigal et al (464) described the adverse events identified in the PATS protocol, a 17-month study. Side effects that were significantly increased in the MPH group included decreased appetite, trouble sleeping, weight loss, emotional outbursts and social withdrawal.

In both studies the profile of unwanted side effects differed from those seen in school-aged children, where decreased appetite, delay of sleep onset, headaches and stomach ache were generally the most frequently reported side effects. Wigal et al (464) reported that 11% of the participants withdrew from the PATS study because of unwanted side effects. This figure is high compared with

the school-aged children in the MTA study, which reported less than 1% withdrawals because of unwanted side effects.

Children and adolescents

A thorough review of adverse events in children and adolescents was conducted by King et al (443) with the following conclusions:

- MPH-IR in higher dosages is associated with headache, loss of appetite, stomach ache and insomnia.
- MPH-ER is associated with loss of appetite and increased insomnia.
- DEX in high doses is associated with loss of appetite and sleeping problems.

Adults

MPH-IR in adults was investigated in two studies:

- In a trial involving medication for a total of 3 weeks (452) no participants withdrew because of adverse effects and the only side effect that was more common with MPH than placebo was loss of appetite.
- A 6-week trial (453) had a withdrawal rate due to adverse events of 13% for MPH-IR and 5% for placebo. High blood pressure was significantly increased in the MPH-IR group, and other common side effects were decreased: appetite, dry mouth and moodiness.

The increased side effects in the second study (453), compared to the first (452), may reflect the longer study duration and higher dose (1.1/mg/kg/day compared to 0.9mg/kg/day).

MPH-ER in adults was investigated in two studies:

- A 6-week study (450) found more tension/jitteriness, decreased appetite, gastrointestinal problems, sleep problems, dizziness, cardiovascular complaints, anxiety and weight loss with MPH-ER compared to placebo.
- Another extended-release formulation, multilayer-release methylphenidate (MPH-MLR), was examined in a 3-week RCT (451). Anxiety, nervousness, weight loss and anorexia, and the severity of these side effects, were increased with the MPH-MLR compared to placebo, but there were no withdrawals due to adverse events over the duration of the study (~7 months).

MAS in adults was investigated in two studies:

- In a crossover trial with 3 weeks on active medication (457), appetite suppression, weight loss and agitation were increased in the MAS group compared to placebo.
- In a 4-week RCT of MAS-ER (458), 24 of the 191 participants on active drug withdrew from this study as a result of side effects, which included dry mouth, anorexia/decreased appetite, insomnia, headache and weight loss.

Two studies on DEX in adults (454, 455) found no significant difference in the number of side effects with DEX compared to placebo. The most common side effects were insomnia, irritability and muscle tension (454, 455).

8.3 Atomoxetine (non-stimulant)

Research questions

- For individuals with ADHD, does ATX, compared to placebo, affect outcomes?
- For individuals with ADHD, does ATX confer an advantage over stimulant medications?
- For individuals with ADHD, does ATX for 1 year or more, compared to placebo or no intervention, affect outcomes?
- For individuals with ADHD who are taking medication, what are the main side effects?

Evidence statements

- **Atomoxetine (ATX)**
  - **Preschoolers:** No studies met the inclusion criteria.
  - **Children and adolescents:** One systematic review (3 RCTs) has demonstrated improvement in ADHD symptoms with ATX over placebo (443). (Level I)
  - **Adults:** Two RCTs have demonstrated benefit from ATX over placebo for ADHD symptoms (465). (Level II)
  - **Long-term use:** One study found that the use of ATX over placebo improved ADHD symptoms in children and adolescents when used long term (1 year or more) (466, 467). (Level II)
- **Comparison to stimulant medications**
  - **Children and adolescents, ATX versus MPH:** Five studies addressed this issue. Two reported no difference between MPH and ATX (443, 468), one reported ATX's superiority on behavioural symptoms and no other difference (469), and two reported MPH's superiority (443, 470). (Level II)
  - **Children and adolescents, ATX versus MAS-ER:** One study found that MAS was superior for teacher-rated symptoms and academic performance, but no other differences (471). (Level II)

Recommendations

87. **Preschoolers:** There is no published evidence to show benefit from ATX in treating ADHD in preschool-aged children.

88. **Children and adolescents:** ATX should be considered for children and adolescents with severe ADHD who do not respond to or are intolerant of stimulant medication, or in whom stimulant medication is contraindicated. (Grade B)

89. **Adults:** Treatment with ATX should be considered for adults with severe ADHD who do not respond to or are intolerant of stimulant medication, or in whom stimulant medication is contraindicated. (Grade B)

90. **ADHD and comorbidities:** ATX may be considered as the first-line medication if there is comorbid substance abuse, severe tic disorder or anxiety disorder.
    ✓*Recommended best practice based on clinical experience and expert opinion*

8.3.1 Background

ATX (Strattera) is a non-stimulant pharmacological agent which offers an alternative to stimulant medication where response to stimulants is poor, or where there are side effects that cannot be tolerated. ATX is classified as a "noradrenaline reuptake inhibitor". The mechanism of its impact on ADHD symptoms is not known. Atomoxetine was registered by the TGA for the treatment of ADHD in 2004 and became available on the PBS in Australia in July 2007 for the treatment of children, adolescents and adults with ADHD (472).

ATX is currently reimbursed for the treatment of ADHD (diagnosed at age 6–18) where (472):

- treatment with DEX or MPH poses an unacceptable medical risk because the patient has a history of substance abuse or misuse (other than alcohol) and/or comorbid motor tics or Tourette Syndrome and/or comorbid severe anxiety diagnosed according to the DSM-IV; or
- treatment with DEX or MPH has resulted in the development or worsening of a comorbid mood disorder (diagnosed according to the DSM-IV criteria, i.e. anxiety disorder, obsessive compulsive disorder, depressive disorder), either:
    - of a severity that necessitates permanent withdrawal of stimulant treatment; or
    - where the combination of stimulant treatment with another agent would pose an unacceptable medical risk; or
- treatment with DEX *and* MPH has resulted in adverse effects on growth and weight and/or sleep (including insomnia) and/or appetite (including anorexia) of a severity that necessitates permanent withdrawal of these treatments.

For prescribing ATX for patients, the PBS requires a diagnosis of ADHD made when the patient was aged 6–18 years. ADHD must be diagnosed by a paediatrician or psychiatrist according to the DSM-IV criteria, and psychostimulants (DEX and MPH) must pose an unacceptable medical risk.

Side effects of atomoxetine are discussed in detail in section 8.7 Side effects: special considerations, page 116. The abuse potential of ADHD medications are discussed in section 8.9 ADHD and substance misuse, page 124.

8.3.2 Summary of research evidence

Preschoolers

The safety and efficacy of ATX has not been established in children less than 6 years of age (473) and no studies were found that addressed its use in preschool-aged children.

Children and adolescents

King et al (443), reviewing the efficacy of ATX in children and adolescents with ADHD, found consistent support for the conclusion that ATX may reduce symptoms and improve quality of life. This conclusion is based on 9 placebo-controlled double-blind RCTs of short duration using either a low/medium dose (<1.5mg/kg/day – three studies) or a high dose (>1.5mg/kg/day – six studies). The quality of the included studies was mixed.

Adults

Two RCTs with adults (reported in one article (465)) met the inclusion criteria. These studies found that ATX was effective in reducing symptoms associated with ADHD; however, its effect on the Sheehan disability measures, such as work life, social life and family life, was less clear.

Long-term use

The long-term safety and efficacy of ATX have not been established.

One study has addressed the long-term use of ATX compared to placebo in children aged 6–15 years (466, 467). This study has two distinct parts. In the first part, participants who had responded to ATX in a 10-week open-label trial were then randomised to receive ATX or placebo for 9 months. Some, but not all, measures showed a benefit of ATX in improving core ADHD symptoms (466). In the second part of the study, participants who had completed 1 year of double-blind ATX treatment

were then randomly assigned to continued ATX or placebo for 6 months. At the end of this time, ATX was found to be effective compared to placebo for two outcomes measures of ADHD symptoms (467).

While this research provides some support for the long-term effectiveness of ATX for children and adolescents with ADHD, the study included only participants that initially responded to ATX and therefore the study design allowed for bias towards a favourable outcome for the ATX group compared to placebo.

Comparison with stimulant medications

Preschoolers

No studies meeting the inclusion criteria were identified.

Children and adolescents

MPH versus ATX

A systematic review of MPH, DEX and ATX in the treatment of ADHD (443) included two short-duration studies, of poor quality, comparing MPH with ATX. One found no significant differences in efficacy between MPH-IR and ATX; the other found that MPH-ER was superior to ATX on hyperactivity and quality of life measures.

Three additional studies compared MPH and ATX in children and adolescents. One found that ATX was superior to MPH in improving behaviour but there were no other significant differences in ADHD symptoms between the groups (469). Another found no significant difference between the ATX and MPH groups on any measure of ADHD symptoms (468). The third (470), with more than 500 participants, found that both MPH and ATX were superior to placebo, and MPH was superior to ATX.

Compared to placebo, those receiving MPH reported significantly higher rates of decreased appetite and insomnia (469, 470), increased heart rate and diastolic blood pressure, and decreased weight (470). Those receiving ATX reported higher rates of "any adverse event", decreased appetite and decreased weight (470), and increase in diastolic blood pressure and heart rate (469, 470).

In summary, the study results vary, with two out of five reporting no difference between MPH and ATX, one reporting ATX's superiority, and two reporting MPH's superiority. All studies have been short-term assessments of the two medications. Additional longer term studies are required.

MAS versus ATX

A study comparing ATX to MAS-ER in children (6–12 years) (471) found that MAS-ER was superior on teacher-rated and academic achievement measures, but there were no differences in parent-rated measures, quality of life measure or adverse events.

For MAS-ER, the most common adverse events were insomnia, appetite decrease, upper abdominal pain, anorexia and headache; and for ATX, the most common side effects were somnolence, appetite decrease, upper abdominal pain, vomiting and headache (471).

Side effects

Preschoolers

No studies were identified that met the inclusion criteria.

Children and adolescents

A review of adverse events in children and adolescents (443) concluded that ATX at any dose may reduce appetite.

Wilens et al (474) addressed the use of ATX in adolescents, reviewing 13 clinical trials of up to 2 years in length. Reporting of adverse events in this review was limited. The review reported that 31 out of 601 adolescents discontinued ATX use due to adverse events, most commonly headache, nasopharyngitis, nausea and upper abdominal pain.

Adults

The side effects of ATX in adults were investigated in two studies:

- In two identical RCTs conducted over 10 weeks (465), withdrawal due to adverse events was less than 10% overall. Adverse events including dry mouth, insomnia, nausea, decreased appetite and erection difficulties were significantly more common with ATX than placebo in one study only.
- A study of poor quality compared 80mg of ATX given either once or twice a day (475). The most frequent adverse events were headache, insomnia, nausea, dry mouth and appetite decrease. Nausea was more common with ATX once a day than twice a day. Men, but not women, from both groups showed a significant change in sexual dysfunction scores.

8.4 Other medications used in ADHD

8.4.1 Clonidine

Research questions

- For individuals with ADHD, does clonidine, compared with placebo, affect outcomes?
- For individuals with ADHD who are taking clonidine, what are the main side effects?
- For individuals with ADHD, does clonidine confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers:** No studies met the inclusion criteria.
- **Primary school-aged children:** One RCT found parents but not teachers reported that clonidine had some benefits in reducing ADHD symptoms compared to placebo (476). (Level II)
- **Adolescents, adults:** No studies met the inclusion criteria.
- **Long-term use:** No studies met the inclusion criteria.
- **MPH versus clonidine:**
    - **Children:** One RCT found no difference between MPH and clonidine for ADHD symptoms (476). (Level II)
    - **Adults:** No studies were identified.

Recommendation

91. Clonidine may provide some benefit in modifying ADHD symptoms in children, particularly in the home setting, used either alone or in combination with MPH. It could be trialled in the absence of clinical response to stimulants and ATX. (Grade D)

Background

Clonidine is an alpha-2 noradrenergic agonist which is used in the treatment of hypertension, migraine and menopausal flushing. It has also been used in the treatment of ADHD. The precise mechanism of its impact on ADHD symptoms has not been comprehensively studied, but it is thought to work by affecting noradrenaline transmission in the frontal cortex.

Common side effects include drowsiness, dry mouth, gastrointestinal upsets, hypotension and dizziness. There has been some controversy about potential cardiovascular risk, but safety data are limited to date.

Variations from approved Product Information

Clonidine is not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers

No studies that met the inclusion criteria were identified.

Children and adolescents

A 16-week RCT in children with ADHD compared MPH, clonidine, MPH and clonidine combined, and placebo (476). Comparison of clonidine to placebo found a significant improvement in parent-rated ADHD symptoms and the global assessment scale for the clonidine over placebo. However, there was no difference in teacher-rated ADHD symptoms.

Adults

No studies that met the inclusion criteria were identified.

MPH versus clonidine

A 16-week RCT in children with ADHD compared MPH, clonidine, MPH and clonidine combined, and placebo (476). Direct comparison between the MPH and clonidine groups found no significant differences on any scale. Those receiving MPH (combined or MPH) showed greater improvement in ADHD symptoms than those not receiving MPH (clonidine or placebo) on the Conners' ASQ – Teachers, while those receiving clonidine (clonidine or combined) showed greater improvement than those not receiving clonidine (MPH or placebo) on the Conners' ASQ – Parents and CGAS scales.

Participants receiving clonidine had a higher incidence of dull/tired/listless and drowsiness/sedation side effects (477). Bradycardia was also more frequent in the clonidine groups, but no other significant group differences were seen for electrocardiogram and other cardiovascular outcomes. Moderate or severe adverse events were more common in the clonidine group, but were not associated with higher rates of early study withdrawal.

8.4.2 Modafinil

Research questions

- For individuals with ADHD, does modafinil, compared with placebo, affect outcomes?
- For individuals with ADHD who are taking modafinil, what are the main side effects?
- For individuals with ADHD, does modafinil confer an advantage over any other pharmacological interventions?

Evidence statements

- **Modafinil versus placebo:**
    - **Children and adolescents:** Six double-blind RCTs showed benefit of modafinil for ADHD symptoms (478-483). (Level II)
    - **Adults:** One small RCT showed benefit of modafinil over placebo in reducing the symptoms of ADHD (454). (Level II)
    - **Long-term use:** No studies over 3 months have investigated the safety and efficacy of modafinil in the treatment of ADHD.
- **Modafinil versus MPH:**
    - **Children and adolescents:** One RCT found no difference in efficacy between MPH and modafinil in reducing the symptoms of ADHD (484). (Level II)
- **Modafinil versus DEX:**
    - **Adults:** One RCT found no difference in efficacy between DEX and modafinil in reducing the symptoms of ADHD (454). (Level II)

Recommendations

92. Modafinil is not recommended as an alternative medication in school-aged children and adolescents with ADHD due to concerns about the associated side effects in this age group. (Grade C)
93. Modafinil may be considered as an alternative medication in adults with ADHD who do not respond to stimulants or ATX. (Grade C)

Background

While modafinil is a stimulant medication, research in mice shows it to be unrelated in structure and function to central nervous system stimulants such as MPH and DEX that are commonly used in the treatment of ADHD (485, 486).

Modafinil is a wakefulness promoting medication. In Australia, it has been approved for use in sleep disorders such as narcolepsy, chronic shift work sleep disorder and obstructive sleep apnoea. Its use in psychiatry, including the treatment of ADHD symptoms, has also been investigated. Modafinil has been shown to affect the brain's catecholamine neurotransmitter systems, but the precise biochemical action of its impact on waking and behaviour is unknown (for review see (487)).

The FDA (August 2007, (488)) has not approved modafinil for use in any paediatric patients, as it found that safety and effectiveness in patients below age 16 have not been established, and that serious skin rashes, including erythema multiforme major (EMM) and Stevens-Johnson Syndrome (SJS), have been associated with its use in paediatric patients. An investigation of the abuse potential of modafinil (200, 400 and 800mg) relative to methylphenidate (45 and 90mg) with inpatients experienced with drugs of abuse, found that modafinil produced psychoactive and euphoric effects and feelings consistent with other scheduled central nervous system stimulants (methylphenidate).

For discussion of the abuse potential of modafinil, see section 8.9 ADHD and substance misuse, page 124.

Variations from approved Product Information

Modafinil is not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers

The safety and efficacy of modafinil has not been examined in preschool-aged children.

Children and adolescents

Six double-blind RCTs of short duration (4–9 weeks) found that modafinil reduced the number and severity of ADHD symptoms in children and adolescents with ADHD, compared to placebo (478-483). The most common side effects in the modafinil group were insomnia, headache, loss of appetite and weight loss.

Adults

One RCT (454) met the inclusion criteria. This small study, with 22 participants over 2 weeks, found that modafinil reduced the symptoms associated with ADHD as measured by self-report. The most common side effects were insomnia, muscle tension and irritability.

Modafinil versus stimulant medications

Modafinil was compared with MPH in children and adolescents with ADHD in a 6-week, parallel-design RCT (484). Both the MPH and the modafinil groups showed a significant improvement in ADHD symptoms over time. There were no differences between the groups in parent- or teacher-rated ADHD symptoms. The incidence of decreased appetite and difficulty falling asleep was increased in the group taking MPH.

Modafinil was compared with DEX in adults in a 6-week crossover RCT (454). Both medications were effective compared to placebo in reducing ADHD symptoms and there was no significant difference between the treatment outcomes for modafinil and DEX. There was no significant difference in the frequency of side effects between either of the medications and placebo.

General comments

The long-term safety and efficacy of modafinil has not been established for the treatment of individuals with ADHD in any population group, as no clinical trials of longer than 3 months have been reported. The outcome measures in trials to date have focused exclusively on ADHD symptoms, with no attempt to evaluate the impact on quality of life or social or school/work functioning.

8.4.3 Selegiline

Research questions

- For individuals with ADHD, does selegiline, compared with placebo, affect outcomes?
- For individuals with ADHD who are taking selegiline, what are the main side effects?
- For individuals with ADHD, does selegiline confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers**: No studies met the inclusion criteria.
- **Children and adolescents**: One small study demonstrated benefit of selegiline over placebo for ADHD symptoms of inattention and hyperactivity but not impulsivity (489). (Level II)
- **Adults**: No studies met the inclusion criteria.
- **MPH versus selegiline:**
    - **Children and adolescents**: Two studies in children (490, 491) and one in adolescents (490) found no significant difference in efficacy between MPH and selegiline MPH versus selegiline. (Level II)

Recommendation

94. There are insufficient research data to recommend selegiline for the treatment of ADHD. (Grade D)

Background

Selegiline is a monoamine oxidase type B inhibitor which is used alone or in combination with levodopa to help control the symptoms of Parkinson's disease. It is metabolised to amphetamine and methamphetamine stimulant compounds, which may be useful in the treatment of ADHD by inhibiting the breakdown of dopamine and increasing synaptic dopamine levels.

Side effects can include stomach upset, loss of appetite, nausea, heartburn, dry mouth, dizziness, weakness, insomnia, back pain and constipation.

Variations from approved Product Information

Selegiline is not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers

No studies that met the inclusion criteria were identified.

Children and adolescents

One study, a 4-week crossover RCT with 11 participants (489), compared selegiline to placebo in children with ADHD. Selegiline significantly improved symptoms of inattention and hyperactivity (parent and teacher rated) but not impulsivity. Reporting of side effects was limited, but there was no significant difference in numbers of side effects for selegiline compared to placebo.

Adults

No studies that met the inclusion criteria were identified.

MPH versus selegiline

Two short-term RCTs compared selegiline with MPH in children (490, 491) and adolescents (490) with ADHD. Both studies found that both medications improved ADHD symptoms, with no significant difference in treatment efficacy between the medication groups. Those on MPH experienced decreased appetite, difficulty falling asleep and headaches more frequently than those on selegiline

(491). Neither study used a placebo control group, so it is not possible to draw direct conclusions regarding medication efficacy.

8.4.4 Guanfacine

Research questions

- For individuals with ADHD, does guanfacine, compared with placebo, affect outcomes?
- For individuals with ADHD who are taking guanfacine, what are the main side effects?
- For individuals with ADHD, does guanfacine confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers:** No studies met the inclusion criteria.
- **Children and adolescents:** One study demonstrated benefit of guanfacine over placebo for the improvement of ADHD symptoms (492). (Level II)
- **Adults:** One study demonstrated benefit of guanfacine over placebo for the improvement of ADHD symptoms (455). (Level II)
- **Guanfacine versus DEX:**
    - **Adults:** One study found no difference in efficacy between DEX and guanfacine for improvement of ADHD symptoms (455). (Level II)

Recommendation

95. Guanfacine may have a role in the pharmacological management of ADHD. (Grade C)

Note: Guanfacine is not currently available in Australia.

Background

Guanfacine is an alpha-2 adrenoreceptor agonist, and is most commonly used as an antihypertensive. It activates an inhibitory neuron, reducing sympathetic outflow and producing a decrease in vasomotor tone and heart rate.

Guanfacine is also used in the treatment of ADHD, and exists in both IR and ER forms.

Side effects include dry mouth, sedation, headache, dizziness, gastrointestinal effects, constipation, xerostomia and impotence.

Note: Guanfacine it is not currently available in Australia.

Summary of research evidence

Preschoolers

No studies that met the inclusion criteria were identified.

Children and adolescents

An 8-week, parallel-design RCT (492) compared 3 doses of guanfacine-ER (2, 3 and 4mg/day) to placebo. There was a significant improvement in ADHD symptoms with all guanfacine doses, compared to placebo. Adverse event reporting was limited, with no tests of significance conducted, but the most frequently reported side effects in the guanfacine group were somnolence, fatigue, upper abdominal pain and sedation. There was a dose-related increase in mean blood pressure and pulse rate.

Adults

In a 6-week crossover RCT (455), adults with ADHD received guanfacine, DEX and placebo for 2 weeks each. Guanfacine was effective compared to placebo in reducing ADHD symptoms, with no significant difference in the number of side effects.

Guanfacine versus DEX

In a 6-week crossover RCT (455), adults with ADHD received guanfacine, DEX and placebo for 2 weeks each. Both medications were effective compared to placebo in reducing ADHD symptoms, and there was no significant difference between the treatment outcomes for guanfacine and DEX. Numbers of side effects were similar for guanfacine and DEX, and there was no significant difference in the frequency of adverse events between either of the medications and placebo.

8.4.5 Nicotine patch

Research questions

- For individuals with ADHD, do nicotine patches, compared with placebo, affect outcomes?
- For individuals with ADHD who are using nicotine patches, what are the main side effects?
- For individuals with ADHD, do nicotine patches confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers:** No studies met the inclusion criteria.
- **Children and adolescents:** One small study demonstrated benefit of nicotine patches compared to placebo for the improvement of ADHD symptoms (493). (Level II)
- **Adults:** No studies met the inclusion criteria.

Recommendation

96. There are insufficient research data to recommend nicotine patches for the treatment of ADHD in school-aged children and adolescents. (Grade D)

Background

Nicotine patches are widely used by people attempting to quit smoking, and they have recently been examined for their ability to relieve ADHD symptoms.

It has been hypothesised that nicotinic receptor stimulation may be useful in treating ADHD, and this is supported by evidence that activation of these receptors enhances dopaminergic neurotransmission (493).

Side effects may include dizziness, headache, nausea and sleep disturbances. The patch can also cause skin irritation.

Variations from approved Production Information

Nicotine patches are not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers

No studies that met the inclusion criteria were identified.

Children and adolescents

Use of a nicotine patch was compared to placebo in a 7-day pilot parallel-design RCT with 10 participants (493). The learning problems and hyperactivity subscale of the Conners' Parent Rating Scale (CPRS) was significantly improved in the nicotine group compared to placebo, with no other significant differences between groups (e.g. CPRS impulsivity, conduct and anxiety, and the Clinical Global Impressions of Severity scale). Reporting of adverse events was limited, but the most common side effects were nausea, stomach ache, itching under the patch and dizziness.

The nicotine patch was compared to placebo in a 7-day pilot parallel-design RCT with 10 participants (493). Only the learning problems subscale of CPRS was significantly improved in the nicotine group over placebo, with no other significant differences between groups (e.g. CPRS impulsivity,

hyperactivity, conduct and anxiety and CGI). Reporting of adverse events was limited, but the most common side effects were nausea, stomach ache, itching under the patch and dizziness.

Adults

No studies that met the inclusion criteria were identified.

8.4.6 Bupropion

Research questions

- For individuals with ADHD, does bupropion, compared with placebo, affect outcomes in the short term (weeks/months)?
- For individuals with ADHD who are taking bupropion, what are the main side effects?
- For individuals with ADHD, does bupropion confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers, children, adolescents:** No studies met the inclusion criteria.
- **Adults**: Two studies demonstrated benefit of bupropion compared to placebo for the improvement of ADHD symptoms (494, 495). Two studies demonstrated no difference in efficacy between bupropion and placebo (496, 497) (Level II)
- **Bupropion versus MPH:**
    - **Adults:** One study found no difference in efficacy between MPH and bupropion for the improvement of ADHD symptoms (496). (Level II)

Recommendation

97. Bupropion may provide some benefit in treating ADHD symptoms in adults. It could be trialled in the absence of clinical response to stimulants and ATX. (Grade D)

Background

Bupropion was first marketed in Australia late in 2000 as a short-term aid to giving up smoking. It was initially developed as an antidepressant. It is a selective inhibitor of the neuronal reuptake of catecholamines (noradrenaline and dopamine) in the brain; however, the precise mechanism is unknown.

Several side effects, some of which may be severe, have been reported. The more commonly reported problems were skin reactions, neurological effects (headache, dizziness/ataxia, convulsions/twitching, tremor, paraesthesia/hypoesthesia), psychiatric effects (insomnia, agitation, depression, anxiety) and gastrointestinal effects (nausea, vomiting). Facial oedema, chest pain, serum sickness, shortness of breath and increased sweating were also reported. Bupropion is contraindicated in patients with epilepsy, and should be used with great caution in those with a predisposition to seizures. Care is also needed in prescribing bupropion for patients with a history of psychiatric conditions, and especially those utilising medication therapy.

Variations from approved Product Information

Bupropion is not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers, children and adolescents

No studies that met the inclusion criteria were identified.

Adults

Four trials compared the use of bupropion-ER to placebo in adults with ADHD. Two of these studies (494, 495) reported that bupropion improved symptoms of ADHD compared to placebo, and two (496, 497) reported no difference between the two groups. All were short-term assessments (6–8

weeks) with relatively small numbers of participants. Reporting of adverse events was limited, but side effects reported included headache, gastrointestinal problems, insomnia, aches or pains, dry mouth, chest pain, nausea and nasopharyngitis. One of the studies (495) also reported a significant increase in pulse over the course of bupropion treatment and a significant decrease in weight, while another (497) reported no significant difference in side effects between bupropion and placebo.

MPH versus bupropion

Bupropion-ER was compared to MPH and placebo in adults with ADHD (496). In this 8-week, parallel-design RCT, no significant difference was found between bupropion or MPH over placebo for either of the ADHD symptom measures used. There was no direct statistical comparison of bupropion and MPH. Reporting of adverse events was very limited, but the most common were: for bupropion, dry mouth, headache and insomnia; for MPH, appetite suppression and insomnia, tremor, sweats, jitteriness; and for placebo, tiredness.

8.4.7 Risperidone

Research questions

- For individuals with ADHD, does risperidone, compared with placebo, affect outcomes in the short term (weeks/months)?
- For individuals with ADHD who are taking risperidone, what are the main side effects?
- For individuals with ADHD, does risperidone confer an advantage over any other pharmacological interventions?

Evidence statements

- **Preschoolers, children, adolescents and adults:** No studies met the inclusion criteria.

Recommendation

98. There are insufficient research data to recommend the use of risperidone for the treatment of ADHD symptoms. (Grade D)

Background

Risperidone is an atypical antipsychotic from the chemical class of benzisoxazole derivatives. Risperidone has TGA approval for the following indications: schizophrenia and related psychoses; acute mania associated with bipolar I disorder; behavioural disturbances in dementia; conduct and other disruptive disorders in children (over 5 years), adolescents and adults; and behavioural disorders associated with autism in children and adolescents.

Several side effects are commonly reported, including restlessness, increased appetite, weight gain and metabolic disturbances.

With respect to ADHD, risperidone is usually considered for use in conjunction with stimulants when treatment-resistant aggression (498) or other disruptive behaviour disorders (499) are comorbid. For a discussion of the use of risperidone with ADHD and comorbid disruptive behaviour disorders see section 8.5.3, page 104.

Variations from approved Product Information

Risperidone is not currently licensed for the treatment of ADHD in Australia.

Summary of research evidence

Preschoolers, children, adolescents and adults

No studies that met the inclusion criteria were identified.

8.5 Medication management of ADHD when comorbidities are present

8.5.1 Introduction

As described in section 3.2, there are high levels of comorbidity between ADHD and a number of other conditions, including anxiety, tic disorders and disruptive behavioural disorders such as ODD and CD. For many comorbidities, psychosocial management will be indicated (see section 7.3 Psychosocial interventions for ADHD when comorbidities are present, page 78).

Pharmacological research has focused on children and adolescents, and no studies that addressed the efficacy of medications in adults with ADHD and comorbid disorders met the inclusion criteria.

Decisions about the best medication for a given patient will depend on:

- full assessment and consideration of the individual's impairing symptoms
- the effect size of the medication on the symptoms of the comorbidity
- the relative merits of medication use in relation to side effects.

Antidepressant medications

Recommendation
99. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants. There are no antidepressant medications with TGA-approved indications for treatment of children and adolescents with depressive symptomatology or major depressive disorder. There are significant concerns about serious adverse reactions (increased suicidality and thoughts of self-harm) in a small percentage of this patient group. ✓ *Recommended best practice based on clinical experience and expert opinion*

Psychiatric disorders such as depression and anxiety are often comorbid with ADHD. In 2004 the ADRAC reviewed data on the safety and efficacy of selective serotonin reuptake inhibitors (SSRIs) (citalopram, escitalopram, fluoxetine, fluvoxamine, paroxetine and sertraline, and the related medicine, venlafaxine) in the treatment of major depressive disorder (MDD) and other psychiatric disorders in children and adolescents (500). In 2005, the RANZCP, RACGP and RACP provided clinical guidance on the use of antidepressant medications in children and adolescents that endorsed the ADRAC recommendations (501).

The published and unpublished data available for SSRI use in children and adolescents indicate that there is evidence of an increased risk of suicidality, including suicidal ideation, suicide attempts and self-harm events, associated with each of the SSRIs.

None of the SSRIs, and indeed no antidepressant, currently has any indication in its Product Information (i.e. is approved) in Australia for the treatment of depressive symptomatology or MDD in children and adolescents (persons aged less than 18 years). The recommendations of the ADRAC are that:

1. Any use of SSRIs in children and adolescents with MDD and other psychiatric conditions should be undertaken only within the context of comprehensive management of the patient. Management should include careful monitoring for the emergence of suicidal ideation and behaviour which may particularly develop early in therapy, or if therapy is interrupted or irregular because of poor compliance. Cognitive behaviour therapy, if it is available, may enhance the outcome in MDD.
2. The choice of an SSRI for a child or adolescent with MDD or other psychiatric condition should be made only after taking into account the recent evaluations of clinical trial data and the Australian Product Information. Prescribers should be aware that the marketers of fluvoxamine and sertraline (indicated for OCD) advise against use in children and adolescents with MDD, and marketers of citalopram, escitalopram, paroxetine, venlafaxine and fluoxetine warn or caution against use in patients aged less than 18 years for any indication.

3. Children and adolescents being treated for MDD with an SSRI should not have their medication ceased abruptly.

8.5.2 Anxiety

Research question

- When anxiety is present in individuals with ADHD, do pharmacological interventions for ADHD, compared to placebo, affect outcomes?

Evidence statements

- **Preschoolers:** No studies met the inclusion criteria.
- **Children and adolescents:**
    - **MPH:** One study, comparing two groups with ADHD, with and without anxiety, found no significant differences in treatment response to MPH or adverse events between the groups (502). (Level II)
    - **ATX:** One study found a statistically significant reduction in all ADHD and anxiety measures with ATX compared to placebo (503). (Level II)
- **Adults:** No studies met the inclusion criteria.

Recommendations

100. Psychosocial management of comorbid anxiety should always be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

101. In people with ADHD and anxiety, treatment with stimulant medication or ATX should still be considered to treat the ADHD symptoms. (Grade C)

102. If anxiety symptoms do not respond to psychosocial interventions, the use of selective serotonin reuptake inhibitors (SSRI) could be considered, either alone or in combination with a medication to treat the ADHD. Antidepressant medication should only be used in the context of comprehensive patient management and should be combined with psychological interventions. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants.
✓*Recommended best practice based on clinical experience and expert opinion*

Variations from approved Product Information

None of the SSRIs, and indeed no antidepressant, currently has any indication in its Product Information (i.e. is approved) in Australia for the treatment of anxiety in children and adolescents (persons aged less than 18 years). Also see "Antidepressant medications" above (page 102).

Summary of research evidence

There are gaps in the evidence regarding long-term efficacy and side effects, relative benefits in anxiety subtypes and the impact of conjunctive non-pharmacological management of anxiety.

Preschoolers

No studies met the inclusion criteria.

Children and adolescents

Two RCTs have looked at the treatment of ADHD and comorbid anxiety disorder.

- In a four-month trial of MPH (502), the presence of anxiety did not influence the response to the medication or the numbers of adverse events.
- In a 12-week trial of ATX in the treatment of ADHD and comorbid anxiety (503), there was a reduction in symptoms of both ADHD and anxiety, but ATX treatment was associated with significantly more reports of decreased appetite and weight loss compared to placebo.

Adults

No studies met the inclusion criteria.

8.5.3 Other disruptive behaviour disorders (ODD, CD)

Research question

- When disruptive behaviour disorders are present in individuals with ADHD, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statements

- **Preschoolers:** No studies met the inclusion criteria.
- **Children and adolescents:**
  - **MPH:** One study demonstrated benefit of MPH compared to placebo in reducing ADHD symptoms in children and adolescents with comorbid ODD (504). (Level II)
  - **MPH plus clonidine:** One study found that MPH plus clonidine reduced ADHD symptoms and mildly reduced ODD symptoms compared to placebo in children and young adolescents with ADHD and ODD or CD (505). (Level II)
  - **MPH plus risperidone:** In one short-term study in children, the addition of risperidone to MPH led to further reductions in ADHD symptoms and reduced some symptoms of conduct disorder (499). (Level II)
  - **ATX:** One meta-analysis (three RCTs) (506) and two RCTs (507, 508) found that ATX reduced ADHD symptoms in children and adolescents with comorbid ODD compared to placebo. (Level II)

Recommendations

103. Non-pharmacological management of comorbid disruptive behaviour disorders should always be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

104. In children and adolescents with ADHD and comorbid ODD, MPH or ATX should be considered to treat the ADHD symptoms. (Grade B)

105. In children and adolescents with ADHD and comorbid ODD or CD, MPH plus clonidine could be considered to treat the ADHD symptoms. (Grade C).

106. In children with ADHD and comorbid CD, MPH plus risperidone could be considered to treat the ADHD symptoms. (Grade C)

Summary of the evidence

There are gaps in evidence regarding long-term efficacy and side effects and the impact of conjunctive non-pharmacological management of other disruptive behaviour disorders such as ODD and CD.

Preschoolers

No studies met the inclusion criteria.

Children and adolescents

Six studies were identified that addressed the use of various medications for the treatment of children and adolescents with ADHD and comorbid disruptive behaviour disorders – ODD or CD.

A 9-week crossover RCT (504) investigated use of MPH to treat children (boys only) with ADHD plus ODD or CD. ADHD symptoms and conduct improved with both high and low doses of MPH, compared to placebo. Two participants withdrew due to side effects.

An Australian RCT conducted over 6 weeks (505) compared the addition of clonidine or placebo to ongoing stimulant treatment in children and young adolescents with ADHD plus CD or ODD. For children taking clonidine, compared to placebo, there was a significant reduction in parent- but not teacher-reported conduct and hyperactive symptoms. Improvement in symptoms became significant

in the clonidine group in weeks 5 and 6 of the trial. Side effects with clonidine included decreased pulse rate and systolic blood pressure, and increases in parent-reported drowsiness and dizziness.

Post-study analysis of two 6-week RCTs comparing the use of risperidone to placebo (either alone or with concurrent stimulant therapy) in children with ADHD and comorbid CD or other disruptive behaviour disorders (499) found that risperidone was more effective than placebo for measures of conduct, hyperactivity and irritability. The impact of risperidone did not vary with the presence or absence of stimulants. The most common adverse events in risperidone-treated patients were somnolence, headache, dyspepsia, rhinitis and vomiting. Increase in weight and BMI was also reported in the risperidone groups compared to placebo.

Three studies addressed the use of ATX compared to placebo in the treatment of children and adolescents with ADHD and ODD:

- Meta-analysis of three RCTs of children and adolescents with ADHD, with and without comorbid ODD (506), found that ATX significantly reduced ADHD symptoms, regardless of the presence or absence of ODD. There was no change in ODD symptoms. Adverse events were not described.
- For children and adolescents with ADHD plus ODD, there was a significant improvement in ADHD symptoms with ATX at 1.3mg/kg/day, and children with ADHD but not ODD experienced significant improvement with ATX at 1.2mg/kg/day (507). When ODD was present, treatment with all ATX doses reduced ODD symptoms compared to placebo.
- A 42-week RCT looked at the risk of relapse in children and adolescents with ADHD, with and without ODD, treated with ATX (508). Participants had previously shown improvement in ADHD symptoms in an 8-week open-label trial with ATX. ATX compared to placebo was effective in maintaining decreased ADHD symptoms, whether ODD was present or absent. In addition, ODD had no impact on the rate of relapse in ADHD symptoms during treatment. The main limitation of this study is that, at the start, participants were known responders to ATX treatment.

Adults

No studies met the inclusion criteria.

8.5.4 Depression

Research question

- When depression is present in individuals with ADHD, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statement

- In one 9-week study there was significant improvement with ATX compared to placebo for global rating and parental ADHD rating, but there was no significant improvement in depression symptoms (509). (Level II)

Recommendations

107. If major depression is suspected in a person with ADHD, consultation with a psychiatrist should be considered to review diagnosis and assist in management.
✓*Recommended best practice based on clinical experience and expert opinion*

108. Non-pharmacological management of comorbid depression should always be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

109. The relative contribution of any currently prescribed stimulant medication to the onset of depression should be reviewed. Trials off stimulant medication may be appropriate.
✓*Recommended best practice based on clinical experience and expert opinion*

110. Where depression is identified in an adolescent or adult with ADHD, the potential contribution of illicit drugs to the onset of the depression should be considered.
✓*Recommended best practice based on clinical experience and expert opinion*

111. In people with ADHD and comorbid major depressive disorder, use of ATX could be considered to treat the ADHD symptoms. (Grade C)

112. The use of stimulant medication could be considered to treat ADHD symptoms in people with ADHD and comorbid major depressive disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

113. Antidepressant medication may be considered to treat ADHD symptoms in adults with ADHD and comorbid moderate to severe depression.
✓*Recommended best practice based on clinical experience and expert opinion*

114. Antidepressant medication could be considered for adolescents with ADHD and comorbid moderate to severe depression. Antidepressant medication should only be used in the context of comprehensive patient management and should be combined with psychological interventions. The RANZCP, RACGP and RACP Clinical Guidance and the Adverse Drug Reactions Advisory Committee (ADRAC) recommendations on the use of antidepressants in children and adolescents must be considered by the physician before prescribing antidepressants.
✓*Recommended best practice based on clinical experience and expert opinion*

Variations from approved Product Information

None of the SSRIs, and indeed no antidepressant, currently has any indication in its Product Information (i.e. is approved) in Australia for the treatment of MDD in children and adolescents (persons aged less than 18 years). Also see "Antidepressant medications" above (page 102).

Summary of research evidence

There are gaps in the evidence regarding the long-term efficacy, side effects and impact of conjunctive non-pharmacological management of depression.

Preschoolers

No studies met the inclusion criteria.

Children and adolescents

A 9-week, parallel-design RCT compared ATX to placebo in the treatment of ADHD and comorbid major depression. With ATX, compared to placebo, there was a significant improvement in ADHD symptoms, but not in depression symptoms, but ATX treatment was associated with significantly more nausea and decreased appetite.

Adults

No studies met the inclusion criteria.

8.5.5 Bipolar disorder

Research question

- When bipolar disorder is present in individuals with ADHD, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statements

- In one 4-week study there was significantly greater improvement in ADHD and bipolar symptoms with MPH, compared to placebo, for most outcomes (510). (Level II)
- In one 4-week study, following stabilisation with valproate, the addition of MAS was found to decrease ADHD symptoms (511). (Level II)

Recommendations

115. If bipolar disorder is suspected in a child or adolescent with a diagnosis of ADHD, consultation with a child and adolescent psychiatrist should be considered to review diagnosis and assist in management.
✓ *Recommended best practice based on clinical experience and expert opinion*

116. In adults with ADHD and non-psychotic comorbid bipolar disorder, use of low-dose stimulant medication, in addition to mood-stabilising medication, may be considered. (Grade C)

Background

At the time of writing, bipolar disorder of childhood has emerged as a possible comorbidity of ADHD, but there is controversy about the validity of this diagnosis in children.

Bipolar disorder in adolescents and adults is a well-established diagnostic entity.

Summary of research evidence

There are gaps in evidence regarding the long-term efficacy, side effects and impact of conjunctive non-pharmacological management of bipolar disorder.

Preschoolers

No studies met the inclusion criteria.

Children and adolescents

Two studies addressed the treatment of ADHD and comorbid bipolar disorder in children and adolescents:

- In a 4-week crossover RCT trialling MPH in 16 participants (510), symptoms of both ADHD and bipolar disorder improved with MPH compared to placebo. Side effects occurring more frequently with MPH than placebo were insomnia, decreased appetite and stomach ache.
- An initial 8-week open-label treatment with divalproex sodium to stabilise mania symptoms was followed by a 4-week crossover RCT comparing MAS to placebo in children and adolescents with ADHD and comorbid bipolar disorder (511). ADHD symptoms improved with MAS compared to placebo. Reporting of adverse events was poor.

Adults

No studies met the inclusion criteria.

8.5.6 Epilepsy

Research question

- When epilepsy is present in individuals with ADHD, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statement

- **Preschoolers, children, adolescents and adults:** No studies met the inclusion criteria.

Recommendations

117. In individuals with ADHD and well-controlled epilepsy, stimulant medication or ATX should be considered to treat the ADHD.
✓*Recommended best practice based on clinical experience and expert opinion.*

118. The impact of ADHD medication on seizure frequency should be monitored, especially in the initial medication trial period.
✓*Recommended best practice based on clinical experience and expert opinion.*

Background

The rate of ADHD in children with epilepsy is 3–5 times that of the general population (512). No double-blind, placebo-controlled studies have been reported that address the efficacy of medications for ADHD in this population. However, the available open-label and pre-clinical trials suggest that both MPH and ATX may be safe and efficacious for ADHD symptoms in children with epilepsy (for review see (512, 513)).

There has been some concern that stimulant medication could precipitate seizures or increase the number of seizures. The supporting information for this claim is limited, and data from several open-label trials in children with ADHD and well-controlled epilepsy suggest that the risk of stimulant-induced seizures in people with stable epilepsy is minimal at therapeutic doses (514-517). Similarly, initial studies with ATX report improvement in ADHD symptoms and no elevated risk of seizures (518, 519). However, gaps in knowledge regarding long-term efficacy and side effects remain and larger double-blind placebo controlled trials are needed to establish safety and efficacy conclusively. Bupropion and some of the tricyclic antidepressants are contraindicated for individuals with epilepsy as they may lower seizure threshold (for review see (512, 513))

Variations from approved Product Information

The Product Information for MPH (Attenta, Ritalin 10, Ritalin LA and Concerta) states that there is some clinical evidence that MPH may lower the convulsive threshold in patients with prior history of seizures, in patients with prior EEG abnormalities in absence of seizures, and very rarely in absence of history of seizures and no prior EEG evidence of seizures. Safe concomitant use of anticonvulsants and MPH has not been established. In the presence of seizures, the drug should be discontinued. The Product Information for DEX states that DEX should not be taken by individuals with epilepsy. The Guidelines recommend that in individuals with ADHD and well-controlled epilepsy, stimulant medication should be considered to treat the ADHD. In other situations the clinician may need to make a judgement, in conjunction with the patient and/or carers regarding the risks and benefits of treating an individual who is severely disabled by ADHD in the presence of seizure risk.

Summary of research evidence

No studies met the inclusion criteria.

8.5.7 Tic disorders and Tourette syndrome

Research questions

- When tic disorders or Tourette syndrome are present in individuals with ADHD, do pharmacological interventions, compared to placebo, affect outcomes?
- For individuals with ADHD who are taking medication, what is the risk of developing first-onset tics or worsening existing tics?

Evidence statements: Efficacy for ADHD symptoms and tic severity

- **Preschoolers:** No studies met the inclusion criteria.
- **Children and adolescents:**
    - **MPH:** One study demonstrated benefit of MPH over placebo for the improvement of ADHD symptoms but not tic severity in children and adolescents with ADHD and comorbid tics or Tourette syndrome (520). (Level II)
    - **ATX:** One study demonstrated benefit of ATX over placebo for the improvement of ADHD symptoms but not tic severity in children and adolescents with ADHD and comorbid tics or Tourette syndrome (521). (Level II)
    - **ATX:** One study demonstrated benefit of ATX over placebo for the improvement of ADHD symptoms and tic severity in children and adolescents with ADHD and comorbid Tourette syndrome (521). (Level II)
    - **Clonidine and MPH plus clonidine:** One study demonstrated benefit of clonidine and MPH plus clonidine over placebo for the improvement of ADHD symptoms and tic severity in children and adolescents with ADHD and comorbid tics or Tourette syndrome (522). (Level II)

Evidence statements: First-onset tics or tic worsening

- **Preschoolers:**
    - **MPH:** One study found that MPH compared to placebo did not result in the worsening of existing tics in preschool-aged children with ADHD (446, 463). (Level II)
- **Children and adolescents:**
    - **MPH:** Data from five studies showed that treatment with MPH compared to placebo did not increase the risk of first-onset tics or worsening of existing tics in children and adolescents with ADHD (502, 523-526). (Level II (4 trials) and III-1 (1 trial))
    - **MPH:** Two studies found that treatment with MPH, compared to placebo, did not result in the worsening of existing tics in children and adolescents with ADHD and comorbid tic disorders or Tourette syndrome (520, 522). (Level II)
    - **ATX:** Two studies found that treatment with ATX, compared to placebo, did not result in worsening of existing tics in children and adolescents with ADHD and comorbid tic disorders or Tourette syndrome (521, 527). (Level II)
    - **Clonidine and clonidine plus MPH:** One study found that treatment with clonidine or clonidine plus MPH, compared to placebo, did not result in the worsening of existing tics in children and adolescents with ADHD and comorbid tic disorders or Tourette syndrome (522). (Level II)

Recommendations

119. In people with ADHD and a comorbid tic disorder or Tourette syndrome, stimulant medication is not necessarily clinically contraindicated and should

be considered to treat ADHD symptoms. (Grade C)

120. In people with ADHD and comorbid tic disorder or Tourette syndrome, use of ATX should be considered to treat the ADHD. (Grade C)

121. In children and adolescents with ADHD and a comorbid tic disorder / Tourette syndrome, clonidine should be considered if ADHD symptoms show poor response to stimulants or ATX. (Grade C)

122. If a tic occurs or becomes worse after commencing an ADHD medication, a clinical decision should be made in collaboration with the person with ADHD and/or the parents/caregivers on whether to:

    - continue the ADHD medication alone
    - add an anti-tic medication, or
    - trial another ADHD medication.

    The decision will be informed by the degree of response to the stimulant and the severity of the tics. (Grade C)

Background

ADHD and tic disorders / Tourette syndrome frequently co-occur in children and adolescents. There has been ongoing debate about whether stimulant medications increase the risk of first-onset tics or worsen pre-existing tics (for review see (528)). In Product Information, stimulant medication is contraindicated in patients with motor tics, when siblings have tics or when there is a family history or diagnosis of Tourette syndrome (see below "Variations from approved Product Information"). In more recent expert clinical practice, if a tic disorder is comorbid with significant ADHD, stimulant medication may be used judiciously. The ability of stimulant medications to induce tics is widely known. Early concerns that stimulants were highly likely to induce tics (529, 530) have been shown to be generally unfounded (531). Emergent tics are seen in less than 10% of children treated with stimulant medication, with the vast majority being transient in nature (532). Short-term trials of stimulant medication in children with comorbid tic disorder indicate that the risk of exacerbation of tics is low (533, 534). Long-term follow-up of children with comorbid ADHD and tic disorder also suggest that chronic low-dose stimulant treatment does not exacerbate tic disorder (524, 535). It remains unknown whether the ability of stimulants to induce such tics is dose dependent. Given that the onset of tic disorder usually occurs in early childhood, there is low likelihood of inducing first ever tics in adults commenced on stimulant medication. There is a theoretical risk of exacerbating pre-existing tics or unmasking latent tics. Where severe ADHD and tic disorder co-exist, low-dose stimulant treatment remains the most prudent measure, with appropriate clinical monitoring for exacerbation of tics.

Variations from approved Product Information

The Product Information for Attenta, Ritalin 10 and Ritalin LA (MPH) states that these medications are contraindicated in patients with tics, tics in siblings or a family history or diagnosis of Tourette syndrome. The Product Information for Concerta states that Concerta is contraindicated in patients with a family history or diagnosis of Tourette syndrome. The Product Information for DEX states that DEX is contraindicated in patients with tics, a diagnosis of Tourette syndrome or a family history of Tourette syndrome. The Guidelines recommend that in people with ADHD and a comorbid tic disorder or Tourette syndrome, stimulant medication is not necessarily contraindicated and can be considered to treat ADHD symptoms.

Summary of research evidence: efficacy for ADHD symptoms and tic severity

Six studies were identified that addressed the use of various medications for the treatment of children and adolescents with ADHD and comorbid tic disorder or Tourette syndrome.

Clonidine, MPH, and clonidine + MPH were trialled in a 16-week, parallel-design RCT with children and adolescents with ADHD and comorbid Tourette syndrome, chronic motor tics disorder, or chronic vocal tics disorder (522). Compared to placebo, all medication groups showed significant improvement in ADHD symptoms, tic severity and global functioning, but the greatest benefit was

with clonidine plus MPH. Medication did not worsen tics. Clonidine increased sedation, but there was no cardiac toxicity with any medication.

Three doses of MPH-IR were trialled in children with ADHD and comorbid Tourette syndrome or chronic motor tics disorder in an 8-week, crossover-design RCT (520). Compared to placebo, all doses of MPH produced significant improvements in ADHD symptoms, but there was no impact on tic severity. Adverse events with MPH-IR included impact on sleep, appetite, headache, upset stomach, dizziness, increased heart rate and diastolic blood pressure, and decreased body weight.

ATX was trialled in children and adolescents with ADHD and comorbid Tourette syndrome or chronic motor tics disorder in a 20-week, parallel-design RCT (521). Compared to placebo, ATX improved ADHD symptoms but not tic severity. Adverse events with ATX included decreased appetite, nausea and decreased body weight. In the group with ADHD and comorbid Tourette syndrome, a subgroup analysis (527) found that, compared to placebo, ATX improved ADHD symptoms and reduced tic severity on most measures other than self-report. Adverse events with ATX included increased mean pulse rate, nausea, and decreased appetite and body weight.

Guanfacine was trialled in children and adolescents with ADHD and comorbid tics in an 8-week, parallel-design RCT (536). Compared to placebo, guanfacine improved tic severity and, on most measures, ADHD symptoms. Adverse events did not differ between groups; however, a relative decrease in heart rate and blood pressure was reported in the guanfacine group.

Summary of research evidence: first-onset tics or tic worsening

Stimulant medication: Preschoolers

One clinical trial, a crossover trial of short duration and rated as poor quality, reported on tics in preschool-aged children receiving MPH (446, 463). The trial found no significant difference between high- and low-dose MPH (0.5mg/kg and 0.3mg/kg) and placebo for the number of participants displaying "tics or nervous movements".

Stimulant medication: Children and adolescents

None of the studies identified considered adolescents older than 14 years.

Five placebo controlled studies addressed the incidence of tics in children with ADHD receiving MPH:

- In a parallel-design RCT over 28 days, comparing OROS MPH, MPH-IR and placebo (526), 4 participants on placebo and 1 on MPH-IR (out of 277 total) reported either the first onset of tics or an increase in pre-existing tics.
- A 6-week crossover RCT that compared three doses of MPH (10, 20 and 30mg) (525) found that the number of participants with moderate or severe tics on at least 1 day was greatest in the placebo group and decreased with increasing doses of MPH.
- A 4-month crossover trial (502) found that there was no significant difference in the reporting of tics for those on MPH compared to placebo.
- In a 12-month clinical trial (524) there was no significant difference between the MPH and placebo in the number of participants reporting the first-onset of tics, or for those with pre-existing tics, in the number reporting worsening tics. The main limitation of this study was that, although initially randomised into even-sized groups, participants were allowed to change "medication" over the course of the trial.
- Pooled data from three short trials (1–4 weeks) comparing MPH-IR, OROS MPH and placebo (523) showed that the percentage of participants experiencing tics was not significantly different between either of the MPH formulations and placebo.

Two studies specifically looked at the use of tic worsening in children and adolescents with ADHD and comorbid tics or Tourette syndrome:

- A 16-week RCT (522) compared clonidine, MPH, or clonidine plus MPH with placebo. Compared to placebo, tic symptoms significantly improved in the MPH groups compared to placebo and there was no worsening of tics in the MPH groups.
- An 8-week crossover design RCT (520) compared 3 doses of MPH-IR to placebo. There were no differences in tic severity between any of the MPH-IR doses and placebo on physician and parent ratings, and improvement in tic severity on teacher ratings. The only scale showing a significant

increase in tics in the MPH group compared to placebo was the simple motor movements on the 2-Minute Tic/Habit Count.

Non-stimulant medication: Preschoolers

No studies were identified that met the inclusion criteria.

Non-stimulant medication: Children and adolescents

Two primary studies addressed the impact of ATX in children and adolescents with ADHD and comorbid tic disorders or Tourette syndrome:

- An 18-week, parallel-design RCT (521) found no increase in tic severity in participants receiving ATX compared to placebo, and on one of the three scales used to measure tic severity, there was a decrease in tic severity with ATX compared to placebo.
- The findings of a 20-week, parallel-design RCT (527) were similar: no increase in tic severity with ATX compared to placebo, and a decrease in tic severity on two of the three outcome measures that favoured ATX over placebo.

One primary study addressed the impact of clonidine in children and adolescents with ADHD and comorbid tic disorders or Tourette syndrome. A 16-week RCT (522) compared use of clonidine, MPH, clonidine plus MPH, and placebo. In the clonidine group, compared to placebo, tic severity improved and there was no worsening of tics.

Adults

No studies were identified that met the inclusion criteria.

8.6 Medications for ADHD in children with a developmental disability

8.6.1 Introduction

Developmental disabilities include pervasive developmental disorders (autism spectrum disorders), learning disabilities and intellectual disability. As discussed in section 3.2.1 Comorbidities in children and adolescents, current diagnostic criteria preclude these disorders being considered as comorbidities of ADHD. DSM-IV suggests, for example, that ADHD should not be diagnosed in the presence of an autism spectrum disorder. However, ADHD symptoms are commonly comorbid to these developmental disorders and these symptoms may cause significant impairment. There is considerable overlap between symptomatology of ADHD and these developmental disorders. The clinician must distinguish the impact and primary source of these symptoms. For example, when considering ADHD symptoms in a patient with intellectual disability, the clinician must consider whether ADHD symptoms are disproportionate to the level of intellectual disability and the relative merits and disadvantages of managing the ADHD symptoms. The management of ADHD symptoms comorbid to these developmental disorders needs to be considered in the context of overall management.

Although a formal comorbid diagnosis of ADHD is precluded, it is clear that children with developmental disabilities often have additional psychiatric disorders and behavioural problems.

When considering treatments for ADHD symptoms in individuals with autism or learning disabilities, careful assessment is required due to the increased risk of medical issues in this group. Treatment may need to be more cautious if there are significant neurological problems due to the increased risk of side effects. Of particular concern is finding a way to enable inclusive discussions about the medication and the occurrence of side effects with individuals who have difficulty communicating. Carers will need to be actively involved in watching for evidence of side effects.

8.6.2 Learning disabilities

Research question

- When ADHD is present in individuals with learning disabilities, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statement

- In one small study treatment with MPH had a lesser efficacy in treating children with ADHD and a learning disability, particularly in maths, than children with ADHD alone (537). (Level II)

Recommendations

123. Where a person with a learning disability also has ADHD, management of the learning disability should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

124. Stimulant medication or ATX should be considered to improve the ADHD symptoms.
✓*Recommended best practice based on clinical experience and expert opinion*

Background

Learning disorders are common in individuals with ADHD. However, research into the impact of ADHD medications in people with ADHD and a comorbid learning disorder is rare.

There have been some preliminary studies that have looked at the impact of medication on very specific components of learning such as comprehension skills in children with ADHD. In a placebo controlled crossover trial of 16 children aged 7–12 years, MPH improved the child's ability to make inferences from complex explanations (538). However, medication did not impact upon comprehension of basic sentences or factual information (538). MPH has also been found to improve some aspects of story retelling in children with ADHD such as sensitivity to emotional information and actions taken by the characters, but not in retelling errors or grammar or comprehension (539). In a small trial of MPH in children with ADHD and comorbid dyslexia (540), improvement was seen in the number of correctly read words; however, reading level remained below average.

Summary of research evidence

One study was identified that looked at the clinical efficacy of MPH in children with ADHD and a comorbid learning disorder (537). This 2-week, crossover-design RCT, compared children with ADHD only and ADHD plus a learning disorder. Significantly fewer children with ADHD and a learning disorder were classified as clinical responders to MPH (55%) compared to children with ADHD alone (75%). Notably, children with a disability in mathematics responded less well than those with reading disability only (537). Adverse events were not reported.

8.6.3 Intellectual disability

Research question

- When ADHD symptoms are present in individuals with intellectual disabilities, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statements

- **Preschoolers, adolescents and adults:** No studies were found that met the inclusion criteria.
- **Children:** In two short-term studies, medium-dose MPH decreased ADHD symptoms in children with intellectual disability (541, 542). (Level II)

Recommendations

125. Where a person with an intellectual disability also has ADHD, management of the intellectual disability should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

126. In people with an intellectual disability and ADHD, use of MPH should be considered. (Grade C)

Summary of research evidence

Two studies were identified that addressed the use of MPH in children and adolescents with ADHD and intellectual disability:

- A 4-week, crossover-design RCT compared three doses of MPH (541). Children with ADHD and intellectual disability showed improvement in ADHD symptoms, as rated by teachers but not by parents, for the highest MPH dose, compared to placebo. There were significant increases in loss of appetite and sleeping problems with MPH.
- In three 2–4-week, crossover-design RCTs (542) in children and adolescents with ADHD and intellectual disability, low-dose MPH improved ADHD symptoms significantly compared to placebo. The authors noted, however, that the effect sizes were moderate and not as high (~half) as those seen in studies of children with a normal IQ. Adverse events were not reported.

8.6.4 Autism spectrum disorders

Research question

- When ADHD symptoms are present in individuals with an autism spectrum disorder, do pharmacological interventions, compared to placebo, affect outcomes?

Evidence statements

- **Children and adolescents**
    - Three RCTs have demonstrated benefit of MPH over placebo in reducing hyperactivity, inattention and impulsivity symptoms in children and young adolescents with an autism spectrum disorder (543-545). (Level II)
    - One RCT has demonstrated benefit of ATX over placebo in reducing hyperactive/impulsive, but not inattentive, symptoms in children and young adolescents with autism spectrum disorders (546). (Level II)

Recommendations

127. Where a person with an autism spectrum disorder also has disabling ADHD symptoms, management of that disorder should be an integral part of overall management.
✓*Recommended best practice based on clinical experience and expert opinion*

128. In children with an autism spectrum disorder and disabling symptoms of ADHD, use of stimulant medication or ATX should be considered to treat ADHD symptoms. (Grade C)

129. Careful monitoring is required due to the possibility of exacerbating ritualistic behaviours and stereotypies.
✓*Recommended best practice based on clinical experience and expert opinion*

Background

Symptoms of inattention, hyperactivity and impulsivity are frequently observed in children with pervasive developmental disorders, including autistic disorder (autism), Asperger's disorder, and pervasive developmental disorders not otherwise specified (PDD NOS). For example, in a survey of 487 non-clinically referred young people with pervasive developmental disorders, over 50% were found to have moderate to severe problems in areas such as distractibility, attention, hyperactivity and excitability (281). In addition to the RCTs reviewed here, there have been several clinical trials of pharmacological treatments of individuals with autism spectrum disorders and symptoms of inattention, hyperactivity and impulsivity (for review see (547)).

There is some overlap in the symptomatology of autism spectrum disorders and ADHD. As discussed in section 3.2 Comorbidities, the clinician must distinguish the primary source of symptoms and consider the management of ADHD symptoms in the context of overall management of the patient.

The commonly utilised ADHD medications, MPH and ATX, are discussed below. Lofexidine has also been examined in one small study, in boys with autistic disorder and ADHD symptoms (546). While parent and teacher ratings for hyperactivity, irritability, stereotypy and inappropriate speech showed significant improvement, compared to placebo, no clinician ratings were significant. Drowsiness and decreased activity were more frequent side effects seen for lofexidine compared to placebo.

Variations from approved Production Information

MPH, DEX and ATX are not currently licensed for the treatment of individuals with autism spectrum disorders in Australia. The Guidelines recommend that in children with an autism spectrum disorder, use of stimulant medication or ATX should be considered to treat disabling ADHD symptoms.

Summary of research evidence

Three crossover RCTs of short duration (3–14 weeks) were identified that considered the impact of stimulant medication (MPH) on ADHD symptoms in children and adolescents with autism spectrum

disorders (543-545). The three studies found improvements in symptoms of hyperactivity, inattention and impulsivity with MPH compared to placebo (543-545). Significant side effects were reported with MPH compared to placebo; these included social withdrawal, dullness, sadness and irritability (543) and appetite decrease, difficulty falling asleep, irritability and emotional outburst (544, 545). One study reported benefits in hyperactive/impulsive, but not inattentive, symptoms with ATX compared to placebo (546). Side effects of mild upset stomach and/or nausea/vomiting occurred in all participants taking ATX compared to five on placebo. Fatigue and racing heart rate also occurred significantly more often when children were treated with ATX compared to control.

8.7 Side effects: special considerations

8.7.1 Introduction

When considering prescribing medications for ADHD the physician should consider the side effects associated with the medication and consult the relevant approved Product Information documents. In addition to the common side effects and contraindications listed below, special consideration is given to the impact of ADHD medications on growth (section 8.7.2), cardiac events (section 8.7.3) and psychiatric disturbance (section 8.7.3)

Common side effects and contraindications – stimulant medications

The common side effects of stimulant medications include decreased appetite, sleep problems, headaches and irritability/nervousness (548). Less common side effects include stomach aches, nausea, abdominal discomfort, weight loss, tearfulness, stuttering, dizziness, and increased heart rate and blood pressure. Rare but more severe side effects can include psychotic symptoms and sensitivity reactions that will require discontinuation of the medication.

Stimulants are generally contraindicated in individuals with hyperthyroidism, phaeochromocytoma, glaucoma, known hypersensitivity or idiosyncrasy to the sympathetic amines and concurrent treatment (or treatment within 14 days) with monoamine oxidase inhibitors (MAO) Stimulants are contraindicated in people with significant cardiovascular disorders as they increase heart rate and blood pressure and therefore have the potential to increase the risk of sudden cardiac death.

Common side effects and contraindications – atomoxetine

The common adverse effects associated with ATX include decreased appetite, drowsiness, abdominal pain, nausea and vomiting, dizziness, and increased heart rate and blood pressure (548). Less common side effects include dyspepsia and mood swings. There have been 3 published case reports of severe liver injury in children and adults using ATX (549, 550). These individuals recovered when the drug was discontinued. Suicide-related behaviour (suicide attempts and suicidal ideation) has been reported in patients treated with atomoxetine (see section 8.7.4).

Atomoxetine is contraindicated for people with narrow-angle glaucoma and concurrent treatment (or treatment within 14 days) with monoamine oxidase inhibitors (MAO). It is also contraindicated in people with structural cardiac abnormalities, symptomatic cardiovascular disease or other serious heart problems as it increases heart rate and blood pressure and therefore has the potential to increase the risk of sudden cardiac death.

8.7.2 Growth

Research question

- For preschoolers, children and adolescents with ADHD who are taking medication, what is the risk of impaired growth?

Evidence statements: MPH, DEX and MAS

- **Preschoolers:**
    - One study reported significant decreases in expected gain in height and/or weight following stimulant treatment (551). (Level II)
- **Children:**
    - Eight of 10 studies reported a significant decrease in growth rate in height and/or weight during stimulant treatment (552-559). (Level III-2 – aetiology)
    - Four of five studies found increased dose was linked to a decrease in growth rate for height but not weight (462, 553, 554, 556). (Level III-2 – aetiology) One study found increased dose was linked to a decrease in growth rate for weight but not height (559). (Level III-2 – aetiology)
    - Four studies reported that the impact of stimulant treatment on growth was greatest at the start of the treatment period, when children are stimulant naïve (462, 556-558). (Level III-2 – aetiology)
    - Two studies showed that the risk of impaired growth is greater in younger children (462, 556). (Level III-2 – aetiology)
    - One study found no difference in adult height between individuals treated with stimulant medication in childhood (3 years) and untreated controls (560). (Level III-2 – aetiology)

Evidence statements: ATX

- **Children and adolescents:**
    - Three studies (2 pooled analyses) reported impaired height and weight gain in children following treatment with ATX (561-563). (Level III-2 – aetiology)
    - One study that considered children and adolescents showed that the risk is greater in children under 9 years (563). (Level III-2 – aetiology)

Recommendations

130. If a child is prescribed stimulant medication or ATX, growth parameters should be assessed at baseline and monitored every 3–6 months. (Grade B)
131. Monitoring should include plotting of growth parameters (weight, height, growth velocity) on appropriate charts.
    ✓*Recommended best practice based on clinical experience and expert opinion*
132. For children most at risk of growth attenuation (younger age, higher dose), medication at low doses only and/or other intervention strategies should be considered. (Grade C)
133. Where there are concerns about reduced growth velocity (crossing centiles or inadequate weight gain), intervention strategies might include medication "holidays" (dose reduction or cessation during weekend and vacation periods).
    ✓*Recommended best practice based on clinical experience and expert opinion*

Variations from approved Product Information

Please note: In relation to the issue of growth suppression, the TGA has recently (April 2009) added the following precautionary statement to the Product Information for all products containing methylphenidate:

Careful follow up of weight and height in children aged 7 to 10 years of age who were randomised to either methylphenidate or non-medication treatment groups over 14months, as well as in naturalistic subgroups of newly methylphenidate-treated and non-medication treated children over 36 months (ie to the ages of 10 to 13 years), suggests that consistently medicated children (ie treatment for 7 days per week throughout the year) have a temporary slowing in growth rate (on average, a total of about 2cm less growth in height and 2.7 kg less growth in weight over 3 years), without evidence of growth rebound during this period of development.

Published data are inadequate to determine whether chronic use of amphetamines may cause similar suppression of growth, however it is anticipated that they likely have this effect well. Therefore, growth should be monitored during treatment with stimulants, and patients who are not growing or gaining height or weight as expected may need to have their treatment interrupted.

Background

For all medications, the clinician needs to consider the relative risk of side effects compared to the benefits. The effect of stimulant medications on growth has been a concern for many years and the impact of ADHD medication on growth has been the subject of ongoing debate in the literature (for review see (564)). While there are many studies considering the impact of ADHD medications on growth, most have considerable limitations. Few use concurrent controls of either children with ADHD not taking medication or children without ADHD; instead, the majority use normative data as their controls, but these normative controls are not necessarily well matched with the study population. In several cases, at study inception participants were significantly larger than the normative controls. In addition, many of the studies were conducted retrospectively, analysing data from medical records or clinical trials; however, in retrospective analysis, it may not be possible to consider potential confounding variables such as adherence with medication.

Summary of research evidence

There are gaps in the body of evidence in regard to the effect of medications on ultimate adult height.

Preschoolers and stimulants

The one study identified found that after 1 year of MPH treatment, both height and weight of participants were lower than expected based on predictions from baseline height and weight (551).

School-aged children and stimulants

Ten studies addressed the impact of stimulant treatment on growth in children. Two studies utilised concurrent control groups (552, 554). However, the majority used population-based normative data as a control (462, 535, 553, 555-559).

- A retrospective review of medical records of children with ADHD, using matched siblings as controls, found the height and weight of children with ADHD to be significantly lower than the controls after 3 years of treatment with MPH (552).
- Analysis of height and weight data for children in the MTA study who had been treated with stimulants found the gain in height after 3 years on MPH to be significantly less than in the two control groups (children with ADHD who had never taken stimulant medication and matched classmates) (554). Medication dose was significantly related to deficit in height, but not in weight.
- An Australian group conducted a retrospective review of 3.5 years of medical records of children receiving either MPH or DEX (557). The study reported a significant slowing of growth in both height and weight after 6 months of stimulant treatment, which remained significant at 30 months. Increase in height was slowest in the first 6 months of stimulant medication.
- A retrospective review of medical records found that children receiving MAS, MPH or DEX for 3 years had significant slowing of growth in weight over the first 24 months of treatment, which was no longer significant at 36 months (558). BMI was significantly affected at 3 months and height at 6 months.

- A data model based on retrospective analysis of annual height and weight measures over 5 years of treatment with MPH or DEX predicted a significant slowing of growth in weight after 1 year of treatment at doses over 1.5mg/kg/day, and a significant slowing of growth in height after 4 years at doses over 2.5mg/kg/day (555).
- Children with ADHD and comorbid tics or Tourette syndrome who received MPH treatment for 2 years showed a non-significant slowing of growth in height and weight (535).
- Retrospective analysis of growth measures in children receiving MPH-ER for 3.5 years showed a non-significant slowing of growth in height, weight and BMI (462). Subgroup analysis revealed that children who were stimulant naïve at the start of the study had a significant slowing of growth in weight, and younger children had a significant slowing in both height and weight gain. Dose was significantly related to the deficit in height but not in weight. The quality of this study was rated as poor.
- Among children treated with MPH or MAS for 1–3 years, gains in weight and BMI were significantly decreased, while the slowing in height gain was not significant. After 3 years' treatment, children receiving MAS showed a greater slowing in weight and BMI gain, but not height, than children on MPH (553). The quality of the study was rated as poor.
- In children on MAS-ER for 6–30 months (556), decreases in rate of growth in height and weight were significant at 14 months, but not in the second year of treatment. Medication dose was significantly related to the deficit in height but not in weight. Larger weight and height deficits were seen in the younger children when results were stratified for age. The quality of the study was poor.
- Among children on MPH-transdermal for 6–36 months, there was significant slowing of growth in height, weight and BMI (559). Medication dose was significantly related to the weight and BMI deficits but not height. Larger weight and BMI deficits were seen in children when they were stimulant naïve.

Although the studies are disparate in methodology, and so difficult to compare, there do appear to be several trends emerging. Eight of the ten studies reported significant deficits in height and/or weight following stimulant treatment (552-559). The remaining two studies reported a non-significant deficit in height and weight (462, 535). In the four out of five studies that considered the impact of dose, increased dose was linked to a deficit in height but not weight (462, 553, 554, 556). The fifth study found that dose was related to a deficit in weight but not height (559). When results were analysed by age, the impact of treatment on growth was found to be greatest in younger children (462, 556). Four studies reported that the impact of stimulant treatment on growth was greatest at the start of the treatment period (462, 556-558).

Adults

One study addressed the impact of ADHD medications on ultimate late adolescent or adult height (560). The study found no significant difference between individuals treated with stimulants in childhood and the untreated control group; 4.4% of variation in height was attributable to medication side effects such as nausea and vomiting, and 3.2% of variation in weight, to medication dose.

Non-stimulant medication

Three studies addressed the impact of the non-stimulant medication ATX on growth, using normative control data:

- A meta-analysis of weight and height data drew on 13 clinical trials involving children aged 6 and 7 who had received treatment with ATX for 2 years or more (561). Both height and weight were lower than expected. The growth rate differences primarily occurred in the first 18 months of treatment.
- Weight and height data were assessed from 13 clinical trials involving children and adolescents aged 6–16 who had received treatment with ATX for 2 years or more (563). Overall, there was a reduction in expected weight and height. The impact was greater in children starting treatment before 9 years of age.
- In a long-term open-label trial with 61 participants who had received ATX continuously for 5 years (562), significant deficits in height and weight were seen in the first 2 years of the study,

but there were no significant differences between participants and the control normative data set at the 5-year time point.

8.7.3 Cardiac events

Research question

- For individuals with ADHD who are taking medication, what is the risk of cardiovascular adverse events?

Evidence statements

- The research data do not support a clear relationship between sudden death, cardiovascular and cerebrovascular events and use of pharmacological agents to treat ADHD in children with no pre-existing cardiac risk factors (565, 566). (Level III-3 – prognosis)
- There is a significant risk of mildly increased heart rate and systolic and diastolic blood pressure in patients treated with stimulants (567-571) or atomoxetine (572). (Level II, IV)
- The short-term and long-term clinical significance of these changes is uncertain in most patients.
- One retrospective study found current stimulant use was associated with an increase in risk of hospital admission for cardiac causes (573). (Level III-2 – aetiology)

Recommendations

134. Before initiating pharmacological treatment for ADHD, cardiac risk factors should be assessed, including:
    - history of congenital heart disease or arrhythmias, palpitations, exercise intolerance or chest pain
    - family history of early cardiac disease (<50 years) or unexplained sudden death
    - cardiovascular examination. (Grade B)
135. Routine monitoring at review appointments should include heart rate and blood pressure, and recent history of palpitations, exercise intolerance and chest pain. (Grade B)
136. Specialist cardiologist advice is recommended for people with cardiovascular risk factors (congenital heart disease, arrhythmias, family history) and in whom blood pressure or heart rate exceeds normal limits. (Grade B)

Background

The risk of adverse cardiovascular effects of medication, and the modifying factors in relation to this risk, require particular vigilance by the clinician.

The American Academy of Pediatrics and the American Heart Association have recently released a joint statement on the cardiovascular evaluation and monitoring of children and adolescents with heart disease who are also receiving medications for ADHD (574). This statement is consistent with the recommendations above. It should be noted that further assessment and an FDA review is awaited at the time of publication.

Summary of research evidence

ADHD medications and sudden death

The USA Food and Drug Administration (FDA) has conducted two post-marketing safety reviews of sudden deaths during treatment with ADHD medications (565, 566). The reviews include episodes of sudden death, non-fatal cardiovascular events and cerebrovascular events which have been submitted to the FDA. Cases of sudden death are rare and in many cases structural cardiovascular

abnormalities or predisposing factors for sudden death were present prior to commencing medication. The authors point out that the review is limited by a number of factors (565). First, the adverse event reporting system involves unsolicited reporting which can produce incomplete reporting, under-reporting or greater reporting with recently approved drugs (565). Second, medication exposure is estimated, based on prescription rates, and is not true exposure (565).

MPH, DEX and MAS and cardiovascular function

Five studies directly addressed the impact of stimulant medication (MPH, MAS and DEX) on cardiovascular function (567-571). Three were conducted with children, one with adolescents and one with adults. All studies reported increases in heart rate and blood pressure when taking stimulant medications compared to placebo.

A retrospective cohort analysis looked at Medicaid data over a 10-year period for children and adolescents with ADHD (573). Current stimulant use was associated with a 20% increase in risk of emergency department admissions for cardiac-related incidents and a 21% increase in risk for hospital admissions for cardiac causes. The stimulants considered were MPH, amphetamines and pemoline (pemoline is no longer used due to concerns about liver toxicity). Data were not stratified by stimulant type.

There is no information on the long-term effects of stimulant medication on cardiovascular function.

ATX and cardiovascular function

Combined data from 5 RCTs in children, adolescents (3 trials) and adults (2 trials) with ATX showed statistically significant increases in mean pulse rate for all groups, mean systolic blood pressure in adults, and diastolic blood pressure in children and adolescents. Cardiac adverse events led to withdrawal of 4 out of 258 adults, but no children or adolescents (n = 335) (572). The longest trial included in this study was 10 weeks.

There is no information on the long-term effects of ATX on cardiovascular function.

8.7.4 Psychiatric disturbance

Recommendations

137. For individuals taking ADHD medications there is a rare but serious risk of psychiatric adverse events. Before prescribing ADHD medication, the person with ADHD and/or their caregiver should be specifically told of the risk of emergent psychiatric adverse effects, including aggression, anxiety, mania and psychosis. (Grade B)

138. As part of ADHD medication management, the person with ADHD and/or their caregiver should be specifically asked about emergent psychiatric adverse effects. (Grade B)

139. This is especially important for people who are receiving both ADHD medications and other psychotropic medications, have significant psychiatric co-morbidities and/or have a family history of psychiatric illness. (Grade B)

Background

Safety concerns relating to ADHD medications include the rare but serious risk of psychiatric adverse events such as suicidal thoughts and behaviours, aggression, unusual thoughts, changes in mood and depression (472, 575). The risk of adverse psychiatric effects of medication, and the factors that modify this risk, will need to be monitored by the clinician.

Psychiatric adverse events such as suicidal ideation are rare, but irrespective of medication use, children and adolescents with mental health problems are at increased risk of suicidal ideation and behaviours. For example, the Australian National Survey of Mental Health and Well-Being found a strong association between mental health problems and suicidal ideation and behaviour in adolescents (576). Other Australian studies have reported high levels of suicidal ideation and suicidal behaviours in a range of population groups. A study of 140 young people referred to psychiatric services found that up to 57% reported considering suicide and 39% reported attempting suicide in the 12 months prior to referral (577). In a general practice population of 15 to 24 year olds, 22% of 3,242 consecutive patients presenting to participating general practitioners during a

specified 6-week period had clinically significant levels of suicidal ideation (578). Finally, in a survey of 91 adolescents (13–17 years old) in home-based foster care, 6.7% reported suicide attempts requiring treatment (579).

There is one published Australian case report of an 11-year-old boy who developed acute agitation and suicidal ideation when taking ATX (580). As of 18 April 2008, the TGA had received reports of 13 incidents of suicidal ideation and 2 suicide attempts in individuals receiving ATX, 2 incidents of suicidal ideation in individuals receiving DEX, and 2 incidents of suicidal ideation and 2 suicide attempts in individuals receiving MPH. This is a cumulative listing of all reactions to these medications reported to the TGA since their approval for use in Australia. It is difficult to put these figures into perspective for several reasons. Incidence is considered unreliable, as reporting is primarily voluntary and accurate data on the numbers of patients receiving these medications and the number of days the medications have been used cannot be calculated from Australia's current systems of prescription and adverse event monitoring. Further, as noted above, the prevalence of suicidal ideation in the population of young people prescribed medication for ADHD is likely to be higher than in the general population and it is difficult to differentiate background risk from medication side effects.

Atomoxetine

Research question

- For individuals with ADHD who are taking ATX, what is the risk of psychiatric adverse events?

Evidence statements

- One review found that psychosis and mania events, suicidal ideation and aggression events were more frequent in children with ATX treatment than with placebo, but the difference did not reach statistical significance. There were no suicides in ADHD trials (581). (Level I – aetiology)
- Two reviews (14 RCTs) found incidence of suicidal ideation was significantly greater in ATX-treated paediatric patients compared with placebo (582, 583). (Level I – aetiology)
- No suicidal ideation or behaviour was identified in three trials of adults taking ATX for ADHD (583). (Level I – aetiology)

Recommendation

140. All people for whom ATX is being considered should be told of the possibility of suicidal ideation, and people on ATX should be monitored for this side effect with extra vigilance. (Grade B)

Summary of research evidence

Three meta-analyses address the association of psychiatric adverse events with the ADHD medication ATX.

A review by the FDA of the ADHD medication clinical trial data (581) included trials of preschoolers, children, adolescents and adults. Psychosis and mania events occurred with every compound. The numbers of such events with medication treatment were small; however, no psychosis or mania events have been reported in the placebo groups (581).

Psychosis/mania events (16/7729), suicidal events (153/7729) and aggression events (247/7729) were reported in double-blind and open-label trials of ATX (Strattera). In the double-blind trials these events were considered to be more frequent with ATX treatment than with placebo. The difference did not reach statistical significance. There were no suicides in these trials.

Meta-analysis of available ATX clinical trial data in children drew on 14 RCTs for either ADHD or nocturnal enuresis (582, 583). The incidence of suicidal ideation was significantly greater in ATX-treated paediatric patients (6/1357) compared with placebo (0/851). There was no difference in the frequency of suicidal ideation or behaviour between participants receiving ATX (1/588) or MPH (1/464) (582).

No suicidal ideation or behaviour was identified in three trials of adults taking ATX for ADHD (583).

The available clinical trial data are of short- to medium-term duration. Long-term effects are not known.

Stimulant medication

Research question

- For individuals with ADHD who are taking stimulant medication, what is the risk of psychiatric adverse events?

Evidence statements

- Most RCTs do not show enhanced risk of these outcomes with regard to stimulant medication. Some RCTS, and some open-label and post-marketing information, have reported rare events in relation to stimulant medications. However, the events are of significant impact (581). (Level I – aetiology).
- One study in children and adolescents (582) reported risk of suicidal ideation with MPH was equivalent to the risk with ATX. (Level I – aetiology)

Recommendation

141. All people for whom stimulant medication is being considered should be told of the possibility of suicidal ideation, and people on stimulant medication should be monitored for this side effect with extra vigilance. (Grade B)

Summary of research evidence

A review by the FDA of the ADHD medication clinical trial data (581) included trials of preschoolers, children, adolescents and adults. The numbers of psychosis and mania events with medication treatment were small; however, no psychosis or mania events have been reported in the placebo groups (581).

There were no psychiatric adverse events in double-blind trials of 321 participants receiving MPH-ER (Concerta) and 317 participants receiving placebo. Psychosis/mania (8/284), suicidal events (5/284) and aggression events (52/284) were reported in open-label trials. There were no suicides in these trials.

In double-blind and open-label trials of MPH-ER (Ritalin), psychosis/mania (2/508), suicidal events (1/508) and aggression events (2/508) were reported. There were no suicides in these trials.

Comparison of MPH and ATX found no difference in the frequency of suicidal ideation or behaviour between participants receiving ATX (1/588) or MPH (1/464) (582).

The available clinical trial data are of short- to medium-term duration. Long-term effects are not known.

8.8 Monitoring of medication effectiveness and side effects

Recommendations

142. Individuals on medication for ADHD should be monitored by their treating doctor for medication effectiveness and side effects. This should occur frequently in the early phase of treatment, and thereafter at intervals of 3–6 months.
✓ *Recommended best practice based on clinical experience and expert opinion*

143. Monitoring should include reports from caregivers, partners and/or teachers (as applicable). Brief parent and teacher behaviour rating scales can also contribute to monitoring of behaviour or performance at home or at school.
✓ *Recommended best practice based on clinical experience and expert opinion*

144. Monitoring at each visit should include height, weight and growth in children/adolescents and psychiatric disturbance, heart rate and blood pressure in all age groups. (Grade B)

145. Trials off medication should be conducted to evaluate whether the medication is still clinically indicated.
✓ *Recommended best practice based on clinical experience and expert opinion*

8.9 ADHD and substance misuse

8.9.1 Diversion and misuse of prescription medications for ADHD

There is a risk that a person prescribed medication for ADHD might misuse the drug/s prescribed and/or distribute them for illicit use by others.

A systematic review published in 2008 considered 21 studies addressing these issues (584). Two studies were included that addressed the diversion of medication from those with ADHD to others (584). The review found that:

- 5–9% of school students and 5–35% of college students had used a non-prescribed stimulant over the previous 12 months.
- Between 16 and 29% of students with stimulant prescriptions had at some time been asked to give, sell or trade their medications.
- The reasons individuals reported for misusing stimulants were to enhance performance, self-medicate for ADHD symptoms (IR and ER stimulants) and for their euphorogenic effects (IR stimulants only).

Australian data on the misuse and diversion of ADHD medications are limited. A review by the Queensland Crime and Misconduct Commission found that the evidence was primarily anecdotal, and concluded that illicit diversion and abuse of ADHD prescription medications constituted a minor problem (585). The triannual Australian School Students' Alcohol & Drug Survey included questions about the use of prescription stimulants for the first time in 2005 in Western Australia only (586). The survey found that 8% of students had ever used DEX or Ritalin without a doctor's prescription, and students who were not prescribed these medications by their doctor reported that they were given them, bought them or traded something for them (586). The results of the survey are consistent with the findings of the 2008 systematic review discussed above (584).

The stimulant prescription notification system established by the Western Australian Stimulants Regulatory Scheme is designed to detect deliberate excessive access to stimulant medication (587). Recently, a discrepancy was identified between the notified and the dispensed dose of stimulants that had been prescribed for ADHD treatment in Western Australia (588). As the authors point out, this discrepancy could be ascribed to stimulant misuse and diversion; however, it might also reflect poor compliance by prescribers in renotifying dose increases or prescriptions dispensed before the full amount of the previous prescription was consumed (587).

8.9.2 Alcohol and tobacco use

ADHD may predict early use of alcohol and cigarettes. In the MTA study, for example, at 36 months when the participants were aged 11–13 years, alcohol and tobacco use were more prevalent amongst the group with ADHD than the control group (202).

It is less clear whether ADHD predicts the development of alcohol use disorders. One recent study found that childhood ADHD predicts heavy drinking, symptoms of alcohol use disorders, and alcohol use disorders for 15–17 year olds, but not 11–14 or 18–25 year olds (589). Long-term follow-up studies conducted in adolescents and young adults found no increased risk for alcohol use disorders in individuals with ADHD (205, 208, 590).

Studies in both adults and adolescents have found ADHD to be associated with earlier initiation of regular cigarette smoking and higher rates of lifetime smoking (203, 591-593). Current ADHD symptom levels may influence smoking (592, 594). One study, for example, found a significant association between clinically significant ADHD inattention symptoms and rates of both current smoking and lifetime smoking (592). A subgroup of individuals with ADHD are likely to be self-medicating with cigarettes, and in fact nicotine is being trialled as an intervention for ADHD (493, 595) (see section 8.4.5 Nicotine patch, page 99).

8.9.3 Abuse liability of prescription medications for ADHD

"Abuse liability" or "abuse potential" is a measure of the likelihood that a medication could be abused, that is, self-administered for non-medical reasons. To determine abuse liability, preclinical studies are conducted in animals, followed by human trials to evaluate the following: 1) Discriminate-stimulus effects – can the medication be used to substitute for drugs of abuse? 2) Reinforcing effects – is the medication used preferentially over placebo? 3) Subjective effects – what are the self-reported effects of the medication?

Studies in both animals and humans have found that IR stimulants and injected stimulants can generate physiological profiles consistent with abuse liability, as they produce both reinforcing effects and subjective effects and can substitute for cocaine in drug discrimination studies (for review see (596, 597)). The abuse liability of ER stimulants has not been as well studied, but findings in people without ADHD suggest that the slower rate of delivery associated with these formulations may reduce abuse potential (598). Stimulants have also been shown to be potentially addictive in animals; however, there are few documented cases of addiction to stimulant medication in humans (for review see (597)).

The abuse potential for other medications used in ADHD has been assessed and compared to stimulant medication. Both human (599) and primate (600) studies have shown ATX to have different physiological effects to MPH and it has thus been suggested that ATX has limited potential for abuse (601). Similarly, the physiological effects of modafinil differ from those of MPH and the abuse potential is considered to be limited (for review see (602))

8.9.4 ADHD as a risk factor for substance use disorders

Prevalence of substance use disorders in people with ADHD

Substance abuse disorders (SUDs) are more common among people with ADHD than in the general population. A higher prevalence has been demonstrated both in population-based cross-sectional surveys, and in prospective studies following children with ADHD and matched controls.

A recent community survey conducted in US adults that screened for ADHD and other DSM-IV disorders found significant comorbidity between ADHD and SUDs (138). In addition, a community-wide survey of Brazilian adolescents established that those with ADHD were more likely than those without the condition to have comorbid SUD (603). Several prospective longitudinal studies of children and adolescents with ADHD have also shown that those with ADHD are at greater risk of developing SUD than matched controls (205-208).

While ADHD alone increases the risk of developing SUD, the risk increases further when CD (205, 208-210) and bipolar disorder (205) are also present.

Prevalence of ADHD in people with substance use disorders

It is well documented that the prevalence of ADHD is high among adolescents and adults with SUD who are seeking treatment (604-611). Notably, the co-occurrence of SUD and ADHD has generally been found to be higher in these clinical samples than in community samples such as the US community survey described above (138).

An Australian study found high rates of ADHD in a sample of 95 male drug users: 46% met criteria for adult ADHD and 36% reported childhood ADHD. Also prevalent was CD, which was reported in 68% of participants, but there were significant effects of ADHD on drug use, over and above the effects of CD (611).

8.9.5 Effect of ADHD management on risk of developing substance use disorders

Research question

- In individuals with ADHD, does the use of pharmacological interventions, compared to no intervention, alter the risk for later substance use or the development of substance use disorders?

Evidence statements

- **Substance use disorders:**
    - One meta-analysis (612) (six studies) and four primary studies (613-616)found that among people with ADHD, those treated with stimulants in childhood and/or adolescence have an equivalent or lower incidence of substance use disorders compared to those who did not receive treatment with stimulant medications. (Level III-2 – aetiology)
- **Substance use:**
    - Two prospective follow-up studies showed that children diagnosed with ADHD had significantly higher rates of substance use than children without ADHD (202, 617). (Level III-2 – aetiology)
    - Two prospective follow-up studies showed that the rates of substance use did not differ between children with ADHD treated with stimulant medication and children with ADHD who were untreated (202, 617). (Level III-2 – aetiology)

Recommendation

146. The use of stimulant medication to treat people with ADHD does not increase the risk of developing substance use disorder. (Grade B)

Substance abuse

One meta-analysis and four primary studies were identified that addressed the question of whether treatment with medications could alter the risk for substance use disorders in individuals with ADHD.

The meta-analysis (612), using data from six studies, indicated a 1.9-fold reduction in risk for SUD in people with ADHD who have taken stimulant medication, compared to those with ADHD without stimulant medication. The risk reduction was greater in adolescents than in young adults. However, the range of odds ratios suggests that there is no single treatment effect across the studies. The meta-analysis had several limitations, including the small number of studies available and inherent confounding factors. The quality of this study was rated as poor.

The primary studies support the finding that stimulant use in childhood or adolescence does not increase the risk of developing substance use disorders but do not confirm the suggestion of risk reduction:

- A small retrospective study of poor quality found that adults with ADHD who had been treated with stimulants in childhood and/or adolescence had a significantly lower incidence of substance abuse than those not treated (614).
- Another, again a retrospective study of poor quality, found a significant reduction in substance abuse among boys, but not girls, who had been treated with stimulant medication (615).

- A retrospective cohort study found that stimulant medication had no significant effect on the development of substance use disorders (613).
- A prospective cohort study found no significant difference in the risk of substance abuse for individuals with ADHD who had been treated with stimulant medication compared to individuals with ADHD who were untreated, and no significant association between the age of starting stimulant treatment, or the duration of that treatment, and the risk for subsequent substance use disorder (616).

Substance use

Two studies on the impact of medication treatment for ADHD on the risk for substance use met the inclusion criteria. Both also considered the prevalence of substance use in individuals with ADHD, compared to a matched control group:

- Children with ADHD enrolled in the MTA study were compared with a control group without ADHD (202). At the 24- and 36-month time points, the ADHD group had significantly higher rates of substance use than the controls, but there was no significant link between substance use and days of prescription medication. At the 36-month time point, the children in the MTA study were aged between 11 and 13.
- A study rated as poor quality described a birth cohort followed up at age 6 and 11 (617). At 11, those diagnosed with ADHD had significantly higher rates of substance use than the group without ADHD. Within the ADHD group, there was no significant link between treatment with stimulants and substance use.

8.9.6 Treatments for ADHD when comorbid substance use disorder is present

Research question

- For individuals with ADHD and substance use disorders, do pharmacological or psychosocial interventions affect outcomes?

Evidence statements

- **MPH:** Four trials showed no statistically significant difference in the efficacy of MPH compared to placebo for ADHD symptom severity in adults with ADHD and comorbid SUD (618-621). (Level II)
- **MPH:** Two out of three trials showed no statistically significant difference in the efficacy of MPH compared to placebo for the frequency of illicit drug use in adults with ADHD and comorbid SUD (618, 620). The third trial showed a decrease in the probability of illicit drug use in the MPH group compared to placebo (621). (Level II)
- **Bupropion:** One trial showed no statistically significant difference in the efficacy of bupropion compared to placebo for ADHD symptom severity or frequency of illicit drug use in adults with ADHD and comorbid SUD (620). (Level II)

NB: No studies of psychosocial interventions were identified.

Recommendations

147. A history of substance abuse and previous treatments should be included in the evaluation of patients.
✓*Recommended best practice based on clinical experience and expert opinion*

148. If the substance use disorder is active the symptoms of substance use disorder should be addressed prior to attending to the symptoms of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

149. Medication treatment for ADHD comorbid with substance use disorder should only be provided by a medical practitioner with expertise in both conditions.
✓*Recommended best practice based on clinical experience and expert opinion*

150. ATX should be the first medication trialled if the person with ADHD has a comorbid substance use disorder.
✓*Recommended best practice based on clinical experience and expert opinion*

151. Relapse or worsening of substance use should necessitate reassessing the appropriateness of stimulant treatment.
✓*Recommended best practice based on clinical experience and expert opinion*

The treatment of ADHD with comorbid SUD is complicated by the fact that the presence of ADHD influences the characteristics of SUD in numerous ways. In people with ADHD, SUD may have an earlier onset (622) and it may be more severe (610, 623) and harder to treat (624, 625). The duration of SUD may be longer (625-627) and the rate of remission from substance use may be slower. In addition, individuals with comorbid ADHD and SUD may be at increased risk for other psychiatric disorders, compared to individuals with either condition alone (628).

Best practice in the treatment of ADHD and comorbid SUD is summarised as follows (629, 630):

- Careful evaluation and assessment should include a history of substance abuse and previous treatments.
- Abstinence from the drug of abuse is required to evaluate the ADHD symptoms properly.
- If the SUD is active, the symptoms of SUD should be addressed prior to attending to the symptoms of ADHD.
- Education on ADHD should be provided to the individual and family.

- There are no research data to show that ADHD medications are effective in the treatment of ADHD when comorbid with SUD, and no studies have been conducted that consider the use of psychosocial interventions.
- Non-stimulants, long-acting stimulants or antidepressants are preferred methods of treatment as they have lower abuse liability and abuse potential.
- Pharmacotherapy should be trialled for effectiveness in individual patients, carefully monitored for benefits and adverse effects, and modified as necessary.
- Urine tests should be used to monitor adherence to treatment.
- Relapse or worsening of substance use may necessitate reassessing the appropriateness of stimulant treatment.

Summary of research evidence

Psychosocial intervention

No studies of psychosocial interventions were identified.

MPH

Four studies were identified that addressed the efficacy of MPH treatment in adults with ADHD and comorbid SUD (618-621). All four studies recruited participants from treatment centres, so the results may not be representative of the general community. Reporting of side effects was very limited. The study time ranged from 8 to 14 weeks, and participants were being treated for various substance use disorders.

The studies suggest that MPH treatment is not effective for the treatment of ADHD when SUD is comorbid. All four found no significant difference in ADHD symptoms with MPH treatment compared to placebo, although in one study (618), physician- and self-ratings taken at various times showed a significant improvement in ADHD symptoms in the MPH group compared to placebo in some but not all ADHD symptom ratings.

Regarding the impact of MPH on substance use, one study (619) did not address the question; two ((618, 620)) found no significant differences in SUD outcomes between MPH and placebo groups; and the fourth found a significant decrease in the probability of cocaine-positive urine samples with MPH compared to placebo (621).

One study (619) noted that there were significantly more side effects for MPH compared to placebo; one (618) found that insomnia or trouble sleeping were more frequent with MPH compared to placebo; and two ((620, 621)) found no significant differences in side effects between groups.

Bupropion

The one RCT identified that looked at the efficacy of bupropion treatment for ADHD and comorbid SUD (620) found no significant improvement in ADHD symptoms and no differences in cocaine (or other drug) use, compared to placebo. There was also no difference in the number of side effects between the two groups.

8.10 Athletes with ADHD receiving stimulant medication

8.10.1 Current regulations on stimulant use in high performance athletes

Stimulants are banned in elite sport (631), and people with ADHD are currently required to stop their stimulant medication several days before competing (632). The reasons for this ban are that:

- stimulants in high doses are performance enhancing and may be harmful
- in the view of the International Anti-Doping Agency (IADA) there are no objective tests to confirm the presence of ADHD.

At present, it is possible that individuals with ADHD taking stimulant medication may be granted an exemption by a standing committee of the Therapeutic Use Exemption (TUE) committee. This process requires extensive documentation regarding the diagnosis of ADHD from a young age, supported by an assessment using validated instruments; documented improvement on stimulant therapy and worsening without it; regular documented supervision by a doctor with a specific interest in the condition; consideration and exclusion of alternative causes of the symptoms; and

regular updating to the committee of any changes in the patient's circumstances relative to the condition (633).

Clonidine, antidepressants and antipsychotic agents are not banned substances.

Full documentation of the requirements of drugs in sport and the TUE scheme are available at the IADA website, http://www.wada-ama.org.

8.10.2 Impact of stimulants and other pharmacological treatments on athletic performance

There has only been one RCT on the effects of stimulants on sporting performance (634). This showed that stimulant therapy improved the ability of boys with ADHD playing softball to pay attention to the state of the game, but did not improve their batting skills.

A second trial compared children with ADHD and age-matched controls, to test the effect of stimulants on the ability to track a ping pong ball and hit it to a designated target (635). Stimulants improved the ability of subjects to track the ball and accurately aim for the target, but not to hit a target if the target was announced in a short time frame (½ second after the ball was served from the opposite end of the table), compared to 2 seconds before the ball was served. There was no difference in arm movement between participants with ADHD and the control group, and stimulants made no difference to arm movement.

8.11 Summary of appraches to management of medication in ADHD

Dosing guidelines for first-line medications

Issues:
Stimulant medications (MPH and DEX) are S8 classed medications. Therefore, state health regulations are applied. Unfortunately different states in Australia have different requirements in relation to prescription authorisation, patient notification, patient age restrictions, and dosage guidelines. Some states also require notification of each individual patient. Clinicians must be observant and compliant with the statutory guidelines within their state.

In addition, the clinician must be aware of PBS prescribing information, which is sometimes different to state guidelines and different to the clinical recommendations made in this document.

International consensus statements and other national guidelines have been consulted in order to prepare this brief guideline to the practical use of the first-line medications in treatment of impairing ADHD.

General Principles for use of all medications in the treatment of ADHD

- Medical practitioners need to be aware of pharmacokinetics of medication.
- Measure and document possible adverse family or patient medical history; height, weight, resting heart-rate and blood pressure (see recommendations 134 and 135).
- Consider further investigations or specialist assessment in children less than 6 years of age, in the presence of adverse family or patient medical history and adverse physical findings.
- Informed patient and family decision making – concerning benefits and side-effects, controversies, uncertainties.
- Emphasise potentially life-threatening or severe side-effects.
- Consider the impact of comorbidities and adjust medication dose and expectations of efficacy.
- Seek child assent for medication treatmentthrough a discussion at a developmentally appropriate level.
- Provide written information about medication effects and side-effects, and direct family to further resource material eg. books, websites, support groups.
- Consider initiating medication during school holidays or weekend in order to permit parents/carers to make observations.

- Consider drug interactions and impact of use of complementary and alternative treatments.
- Use mono-therapy where possible.
- At each medical review re-consider the diagnosis, co-morbidities, necessity for medication and overall management of the patient.
- Start medication at a low dose and aim for lowest total daily dose to provide optimal response considering side-effects.
- Monitor efficacy and side-effects in multiple settings closely in initiation phase (weekly to second-weekly).
- Consider use of standard rating scales for behavioural efficacy, side-effects and overall benefit.
- Recommend additional ongoing non-medicational management of behavioural, educational, social problems.

Table 6. Dosing guidelines for first-line medications.
REFER TO GENERAL PRINCIPLES BEFORE COMMENCING MEDICATION

Medication	Age Group	Initiation	Titration and Dose	Monitoring
Methylphenidate	Preschool-aged children <6 years	Refer to text for specific recommendations in this age group. NOTE: State variations	Refer to text for specific recommendations in this age group. NOTE: State variations	Refer to text for specific recommendations in this age group. NOTE: State variations
	Children 6-12 years (20-40kg)	• Start low in simple fractions or multiples of dose • Begin at 5mg morning, 5 mg lunch-time for one week	• Increase to 10mg morning, 5 mg lunch-time for one week • Consider further increase to 10mg morning and 10 mg lunch-time • Consider further dose increases with aim to stablise at 4-6 weeks after initiation • Total daily dose typically varies between 0.5-2.0 mg/kg/day, to maximum 80mg daily – it is uncommon to require larger doses (NOTE: refer to specific State guidelines with regards to maximum dose)	• Monitor heart rate, blood pressure and growth • Consider compliance • Consider further dose decreases or increases • Consider transition to longer-acting MPH after 1-2 months to approximate daily dose equivalent • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adolescents 13-18 years (40-70kg)	• Start low in simple fractions or multiples of dose • Begin at 10mg morning, 10mg lunch-time for one week	• Increase to 15-20mg morning, 15-20mg lunchtime for one week • Consider further dose increases with aim to stablise at 4-6 weeks after initiation • Total daily dose typically varies between 0.5-2.0mg/kg/day, to maximum 100mg daily – it is uncommon to require larger doses (NOTE: refer to specific State guidelines with regards to maximum dose)	• Monitor heart rate, blood pressure and growth • Consider compliance • Consider further dose decreases or increases • Consider transition to longer-acting MPH after 1-2 months to approximate daily dose equivalent • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adults	• Start at 5mg-10mg morning on day 1, then begin 5mg-10mg morning, 5mg-10mg lunchtime for one week.	• Thereafter consider further stepwise increases in dosage with aim to stabilise at 4-6 weeks after initiation • Total daily dose typically varies between 10mg and 60mg a day • It is uncommon to require dosages larger than 80mg a day. A second opinion from an independent clinician should be sought if dosages above 60mg are thought to be necessary.	• Monitor heart rate, blood pressure and weight • Consider compliance • Consider transition to longer acting MPH after 1-2 months to approximate daily dose equivalent • Review medication effectiveness and monitor for emergent side effects paying particular attention to sleep, appetite and mood • Consider ongoing need for medication at each review

Medication	Age Group	Initiation	Titration and Dose	Monitoring
Dexamphetamine	Preschool-aged children <6 years	Refer to text for specific recommendations in this age group. NOTE: State variations	Refer to text for specific recommendations in this age group. NOTE: State variations	Refer to text for specific recommendations in this age group. NOTE: State variations
	Children 6-12 years (20-40kg)	• Start low in simple fractions or multiples of dose • Begin at 2.5mg morning, for one week	• Increase to 5 mg morning for one week • Increase to 10mg morning • Consider further dose increases with aim to stabilise at 4-6 weeks after initiation • Typical total daily dose 0.5-1mg/kg/day, to maximum 40mg daily – it is uncommon to require larger doses (NOTE: refer to specific State guidelines with regards to maximum dose)	• Monitor heart rate, blood pressure and growth • Consider compliance • Consider further dose decreases or increases • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adolescents 13-18 years (40-70kg)	• Start low in simple fractions or multiples of dose • Begin at 5mg morning, for one week	• Increase to 5 mg morning for one week • Increase to 10mg morning • Consider further dose increases with aim to stabilise at 4-6 weeks after initiation • Typical total daily dose 0.5-1mg/kg/day, up to 40mg daily – it is uncommon to require larger doses (NOTE: refer to specific State guidelines with regards to maximum dose)	• Monitor heart rate, blood pressure and growth • Consider compliance • Consider further dose decreases or increases • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adults	• Start at 2.5mg -5.0mg morning on day 1, then 2.5mg-5.0mg morning, 2.5mg-5.0mg lunch-time for one week	• Thereafter consider stepwise increases in dosage with aim to stabilise at 4-6 weeks after initiation • Total daily dose typically varies between 5mg and 30mg a day • It is uncommon to require dosages larger than 40mg a day • A second opinion from an independent clinician should be sought if dosages above 30mg a day are thought to be necessary	• Monitor heart rate, blood pressure and weight • Review compliance • Consider further dosage increases or decreases. • Review medication effectiveness and emergent side-effects, paying particular attention to sleep, appetite and mood • Consider ongoing need for medication at each review

Medication	Age Group	Initiation	Titration and Dose	Monitoring
Atomoxetine	Preschool-aged children <6 years	Atomoxetine not approved for use in children < 6years	Atomoxetine not approved for use in children < 6years	Atomoxetine not approved for use in children < 6years
	Children 6-12 years (20-40kg)	• Start at nearest capsule size to approximate 0.5mg/kg/day, morning	• Increase to approximately 1.2mg/kg/day morning after one week	• Efficacy may not be established till 5-6 weeks after initiation • Place particular emphasis at review on possibility of self-harm and liver dysfunction • Monitor heart rate, blood pressure and growth • Consider compliance • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adolescents 13-18 yrs (40-70kg)	• Start at nearest capsule size to approximate 0.5mg/kg/day, morning	• Increase to approximately 1.2mg/kg/day morning after one week	• Efficacy may not be established till 5-6 weeks after initiation • Place particular emphasis at review on possibility of self-harm and liver dysfunction • Monitor heart rate, blood pressure and growth • Consider compliance • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review
	Adults	• Start at 25-40mg a day for a minimum of 7 days.	• Increase thereafter to a target dose of 60-80mg a day • Maximum dosage 100mg a day	• Efficacy may not be established until 5-6 weeks after initiation • Place particular emphasis at review on possibility of mood disturbance, genitourinary symptoms and liver dysfunction • Monitor heart rate, blood pressure and weight • Consider compliance • Review medication effectiveness and emergent side-effects • Consider ongoing need for medication at each review

CHAPTER 9. MEDICATION COMPARED TO AND COMBINED WITH PSYCHOSOCIAL INTERVENTIONS

9.1 Introduction

An individual treatment and care plan may typically combine medication and psychosocial interventions. The potential benefits of a combined intervention approach include the possibility of:

- increasing the impact and duration of treatment effects by using multiple interventions
- lowering the dose of medication required to have a clinical impact, which minimises the side effects of medication
- targeting both the core symptoms of ADHD through medication and specifically intervening to improve daily functioning with psychosocial interventions.

9.2 Comparing psychosocial and pharmacological interventions

Research question

- For individuals with ADHD, do psychosocial interventions, compared to pharmacological interventions, affect outcomes?

Evidence statements

- One systematic review comparing MPH to psychosocial treatments identified three studies that reported a significant benefit of MPH over psychosocial interventions for symptoms of hyperactivity (443). (Level I)
- One study found that medication management was superior to behavioural treatment for ADHD core symptoms, but not for academic achievement or social skills, at 9 months (430) and 14 months (408). At 24 months (409) and 36 months (410), the difference was not significant. (Level III-2)
- Another study found that behaviour modification and medication management were equivalent for classroom behaviours (rule violations and seat-work completion) (636). (Level II)
- One meta-analysis (637) found:
    - For ADHD symptoms, psychosocial interventions yielded smaller effect sizes than either MPH or combined treatment.
    - For ODD symptoms, MPH was significantly more effective than the psychosocial interventions.
    - For social behaviour, the psychosocial, MPH and combined interventions were equally effective.
    - For academic functioning, no treatment was clearly effective. (Level I)
- No studies were found that compared psychosocial interventions to pharmacological interventions in preschool-aged children or adults.

Recommendations

152. Although the evidence suggests that ADHD symptoms improve more in the short to medium term with pharmacological management than with psychosocial interventions, it is not possible to draw conclusions about the best management of ADHD symptoms in the long term. The likely presence of modifying factors, including comorbidities and the age of the child, warrant the use of psychosocial interventions. (Grade D)

153. Psychosocial interventions should be considered in the long-term management of children and adolescents with uncomplicated ADHD, with or without medication.
✓*Recommended best practice based on clinical experience and expert opinion*

154. Psychosocial interventions should be considered, in addition to pharmacological management, in people with ADHD associated with ODD or CD.
✓*Recommended best practice based on clinical experience and expert opinion*

9.2.1 Summary of research evidence

Very few studies have compared pharmacological interventions with psychosocial interventions in the treatment of ADHD in children, and no studies were identified that considered preschool-aged children, adolescents or adults.

A systematic review identified eight studies comparing various psychosocial treatments with MPH in children (443). Only three reported on hyperactivity or quality of life. Different psychosocial interventions were utilised in each of the studies: parenting programs, cognitive therapy and child behaviour modification, plus parenting programs and teacher training. Three studies found that MPH was superior to psychosocial intervention for symptoms of hyperactivity. One study demonstrated variable results depending on the scale used to measure outcomes. None of the studies compared DEX or ATX to psychosocial interventions.

The MTA study compared the use of medication with multimodal psychosocial management. At 14 months, medication management was superior to behavioural treatment in improving ADHD core symptoms, but not academic achievement or social skills (408). Analysis of measures at 9 months, when the behavioural management was still being intensively administered, also showed equivalent findings (430). At 24 months the difference between the medication group and the combined group was still evident, although not as great (409). In the most recent assessment, at 36 months, there was no significant difference between the effectiveness of psychosocial interventions and medication (410). It is, however, difficult to compare between groups because, as the study has progressed, the participants have been followed up according to their original treatment allocation, regardless of which treatment they subsequently chose to use.

A study based on the summer treatment program (636) reported on classroom behaviours in a comparison between behaviour modification and MPH. Behaviour modification was equivalent to MPH on measures of classroom rule violations and seat-work completion.

A meta-analysis of RCTs compared effect sizes between MPH, psychosocial interventions and a combination of the two (637). Studies of psychosocial interventions were much fewer in number than those investigating MPH. The meta-analysis found that:

- Both MPH and psychosocial treatments were effective in reducing ADHD symptoms, but psychosocial treatment yielded smaller effect sizes than either MPH or combined treatment.
- For ODD symptoms, both psychosocial interventions and MPH generated significant improvements; however, MPH was significantly more effective than the psychosocial interventions.
- For social behaviour, the psychosocial, MPH and combined interventions were equally effective.
- For academic functioning, the psychosocial interventions generated a marginally significant improvement, with no observed improvement when MPH or combined treatments were employed. The authors concluded that no treatment was effective in improving academic function.

9.3 Combining psychosocial and pharmacological interventions

9.3.1 Combined interventions for preschool-aged children, children and adolescents

Research question

- For individuals with ADHD, do psychosocial interventions used alongside pharmacological interventions, compared with pharmacological interventions alone, affect outcomes?

Evidence statements

- **Children:**
    - One meta-analysis of studies conducted in children aged 6–12 years found that combined treatment did not improve outcomes (ADHD and ODD symptoms and social behaviour) over those achieved with stimulant medication alone. Neither combined treatment nor MPH was effective for improving academic function (637). (Level I)
    - One study in children aged 6–12 years in a summer treatment program found that combined treatment was superior to MPH alone for reducing ADHD symptoms (638). (Level II)
    - One poor-quality study in children aged 6–7 years in a summer treatment program found that combined treatment was equivalent to MPH alone for point system measures (ADHD symptoms were not directly assessed) (639). (Level II)
    - One study in children aged 5–12 years in a summer treatment program found that behaviour modification plus low-dose MPH was equivalent to a higher dose of MPH alone for classroom rule violations and seat-work completion (ADHD symptoms were not directly assessed) (636). (Level II)
    - One study found no significant difference between combined treatment compared to medication alone in reducing ADHD symptoms at 14 months (408), 24 months (409) and 36 months (410). (Level III-2)
    - One study found no significant difference between combined treatment compared to medication alone in reducing ADHD symptoms or improving social behaviour over a 2-year period (640-642). (Level III-2)
    - One poor-quality meta-analysis found that the calculated effect sizes for combined treatment were greater than those previously reported in the literature for treatment with medication alone (643). (Level III-2)
    - No studies were found that compared psychosocial interventions to pharmacological interventions in preschool-aged children or adolescents.

Recommendation

155. Although the evidence suggests that ADHD symptoms are most improved in the short to medium term with pharmacological management alone, it is not possible to draw conclusions about the best management of ADHD symptoms in the long term. The likely presence of modifying factors, including comorbidities and the age of the child, warrant the inclusion of psychosocial interventions. (Grade D)

Summary of research evidence

Six primary studies were identified that directly compared the use of a combined intervention to medication alone in children with ADHD.

Comparison of a multi-component psychosocial intervention plus MPH to MPH alone found significant improvements within both the combined treatment and medication only groups (644). Combined treatment did not appear to affect outcomes over those achieved with stimulant medication alone.

A summer treatment program study conducted in children 6–12 years of age found that combined treatment was superior to MPH alone for improvement of ADHD symptoms (638). A second summer treatment program study in younger children (6–7 years) found a significant difference between the two MPH groups (MPH alone and MPH plus behavioural interventions) and placebo in all point system measures and 2 of 3 classroom measures (639). These results suggest that the behavioural intervention added little benefit. The direct impact on ADHD symptoms as measured via DSM-IV criteria or related scales was not assessed. More recently, a summer treatment program study reported on classroom behaviours following treatment with either behaviour modification (low or high intensity) alone or in combination with MPH at three doses (0.15, 0.3 or 0.6mg/kg) (636). Behaviour modification plus low doses of MPH (0.15mg/kg) was equivalent to a high dose of MPH (0.60mg/kg) alone on measures of classroom rule violations and seat-work completion.

Three assessments were derived from the MTA study, which included a combined intervention arm of medication and multimodal psychosocial management, and a medication only arm. Over the course of the study, the reports at 14 months (408), 24 months (409) and 36 months (410) found no significant difference in the effectiveness of combined treatment compared to medication alone in any of the five ADHD symptom domains they assessed. It is, however, difficult to compare between groups because, as the study has progressed, the participants have been followed up according to their original treatment allocation, regardless of which treatment they chose to use.

A multimodal psychosocial treatment study was conducted over 2 years in children aged 7–9 years with ADHD (640-642). Entry was restricted to children who responded to MPH in a 5-week open-label treatment period. Three groups were compared: MPH alone, MPH plus multimodal psychosocial treatment, and MPH plus a psychosocial treatment control. While significant improvement in ADHD symptoms and social behaviour occurred in all treatment groups and continued over 2 years, there were no differences between groups. The biggest limitation of this study is that the included children were known responders to MPH, so the results cannot be assumed to reflect accurately a more general population of children.

A meta-analysis of eight studies using combined treatments found that the calculated effect sizes for combined treatment were greater than those previously reported in the literature for treatment with medication alone (643). This review included both RCTs and studies with lower levels of evidence, and was rated poor in quality.

Another meta-analysis compared effect sizes between MPH, psychosocial interventions and a combination of the two, drawing on results of 26 RCTs (637). There were very few studies addressing combined interventions. MPH and combined treatment were equally effective in reducing ADHD symptoms and ODD symptoms and improving social behaviour. Neither combined treatment nor MPH was effective for improving academic function. Effect sizes of MPH and combined treatment were not significantly different, suggesting no additive effect of psychosocial interventions.

9.3.2 Combined interventions for adults

Research question

- For individuals with ADHD, do psychosocial interventions used alongside pharmacological interventions, compared with pharmacological interventions alone, affect outcomes?

Evidence statement

- Two studies of poor quality support the use of combined psychosocial and medication interventions compared to medication alone (645, 646). (Level II and IV)

Recommendation

156. The likely presence of comorbidities in adults with ADHD favours the inclusion of psychosocial interventions alongside pharmacological interventions. (Grade D)

Summary of research evidence

Two primary studies met our inclusion criteria, and both found in favour of the use of combined interventions for adults with ADHD compared to medication alone:

- A parallel RCT found that the combination of medication and cognitive behavioural therapy was superior to medication alone (645). The quality rating of the study was poor as blinding was not used due to the difficulty of blinding of participants to this behavioural intervention.
- A retrospective study found that the combined intervention of medication and cognitive therapy was greater than the use of medication alone (646). This study had major methodological limitations, with no clear comparator or control group.

9.4 Moderators and mediators of outcomes from psychosocial interventions and combined interventions

Research question

- For individuals with ADHD, what are the moderators and mediators of treatment response with psychosocial interventions?

Evidence statements

- One study demonstrated that children with ADHD plus anxiety showed particular benefit from psychosocial interventions (647) irrespective of the presence of comorbid CD (441). (Level III-2)
- One study found that parental depressive symptoms, high severity of child ADHD and below-average child IQ were associated with a poorer response to medication or combined treatment (648). (Level III-2)
- One study found that both parent education and parent occupation had an impact on treatment outcomes (649). (Level III-2)
- No studies were found that addressed moderators and mediators of outcomes in preschool-aged children, adolescents or adults.

Recommendations

157. Psychosocial interventions can be particularly beneficial in a person with ADHD and comorbid anxiety. (Grade C)

158. Individualised treatment strategies should be developed. When variables such as parental depression, severe ADHD symptoms or below-average IQ are present, additional intervention strategies may be required. (Grade C)

Background

A number of factors may influence treatment outcomes:

- Mediator variables have the potential to influence outcomes after a treatment has been initiated. They include treatment intensity, treatment duration, adherence to medication and parenting style.
- Moderator variables are factors that are in place before treatment is initiated. They include gender, age, ADHD subtype, comorbid conditions, race/ethnic factors, education levels and socio-economic status.

Research into these variables can help to guide clinicians' decisions about what type of treatment is best for each individual.

Summary of research evidence

Four primary studies were identified that investigated the moderators and mediators of outcomes for psychosocial interventions. All were derived from the MTA study. The original MTA study compared four treatment groups: medication management, behavioural management, combined treatment, and community care (408). At 14 months, the behavioural management group did not differ significantly from the community control group on any outcome. Both behavioural management and community care were significantly less efficacious than medication management and combined management (408).

The MTA Cooperative Group initially assessed five potential moderator variables (gender, prior medication, comorbid ODD or CD, comorbid anxiety and public assistance (financial support for low-income families)) to determine whether these factors would have an impact on treatment response (647). The study found that for children with anxiety disorders, behavioural treatment was significantly better

than community care, and was no longer statistically different from medication management or combined treatment. In other words, children with both ADHD and anxiety responded equally well to behavioural management, medication management or combined treatment.

A further analysis of the MTA results looked at whether the presence or absence of CDs in addition to anxiety would alter the impact of anxiety as a moderator variable (441). For children with anxiety disorders, behavioural treatment was significantly better than community care for parent-rated measures, irrespective of the presence or absence of comorbid conduct problems.

Analysis of treatment outcomes in the behavioural management group showed that none of the potential variables examined (public assistance, gender, anxiety, CD/ODD, maternal education, parental depressive symptoms, initial child ADHD severity and child IQ) had an impact on the treatment response (648). These results contradict the two studies reported above (441, 647), which found that comorbid anxiety moderated the treatment response. It is not clear whether the findings of those two studies were not robust enough when considering optimal treatment response, or whether the inconsistency relates to a difference in how the analysis was conducted.

Notably, parental depressive symptoms, high severity of child ADHD and below-average child IQ were associated with a less efficacious response in the medication management and combined treatment groups (648).

Analysis of the impact of parent education and occupation found that both affected treatment outcomes (649). Children from more educated families showed greater reduction of ADHD symptoms with combined treatment, while children from less educated homes showed no differential treatment response. For oppositional-aggressive symptoms, children from blue-collar households benefited most from the combined treatment, while children from white-collar homes generally showed no differential treatment response. Variables such as household income and marital status did not have an impact.

While not assessed as a moderator of ADHD in the same ways in which the above factors have been analysed, it is clear that the effect of parental ADHD can effect the management of children with ADHD, including the ability to implement treatment plans (see section 15.2.2 Adult ADHD and parenting)

CHAPTER 10. EDUCATIONAL MANAGEMENT

10.1 Educational research

As a result of the complex socio-political nature of the educational enterprise, the field has yet to establish systematic guidelines for evaluating research practices (650). The What Works Clearinghouse (WWC), established by the US Department of Education's Institute of Education Science, applies a gold standard of fully randomised research with a control group (651), but as Carter and Wheldall (652) observe, such research is rare in education, and there is controversy over some of the research accepted by the WWC (651).

The ongoing concern about the quality of research in education (653) is articulated by those who challenge the validity of qualitative research (654-656). The April 2008 issue of *The Australasian Journal of Special Education*, for example, is devoted to such criticism.

The complexity and variability of schools, children and teachers, and the interactions among them, however, prevent educational researchers from applying the usual scientific principles. In medicine, researchers are able to quantify and control variables and isolate data from contexts in order to predict, generalise and control their studies with precision and accuracy. It is much more difficult to do so when studying teachers and children in classrooms, with multiple variables and contexts which cannot be controlled or manipulated. The researcher must not only determine whether a practice is effective, but for whom and in what circumstances, and this prevents findings from being generalised (650).

The US National Academy of Sciences identified three types of scientific research questions in education: (1) description; (2) cause; and (3) process (650). The Academy concluded that experimental group, correlational, mixed methodology, RCT, large scale and single subject and qualitative designs are all valid as long as the research methodology matches the design question, and the research is rigorously, ethically and empirically applied (650).

In contrast to the research in health management, medicine and other fields, which is dominated by a positivist ontology, objective epistemology and quantitative methodology, much of the research in education has a relativist ontology, subjective epistemology and qualitative methodology (657). Qualitative methods are ideally suited to providing an understanding of the complex context in the classroom and school, and a detailed description of how practices actually work (657). A key contribution of qualitative research is the development of theories and concepts that can aid understanding of education and disability (657). For example, numerous promising approaches have emerged in recent years to contribute to the education of people with severe disabilities, such as curriculum adaptations, inclusive education, positive behaviour supports, supported employment and community-based instruction (657).

An additional problem is the very limited funding for educational research and the publication and distribution of research findings. Peer-reviewed education journals, therefore, accept position papers, studies from a wide range of methodological categories, including single-subject experimental research, descriptive research (e.g. quantitative surveys, qualitative studies based on interviews, observations or document analysis), and evaluation research that relies on both quantitative and qualitative data (657). Many available studies, therefore, are marked by small sample sizes, lack of controls or inadequate description of methodology or interventions, which prevent them from being included in any quantitative collection.

10.2 Inclusion: a legal requirement

Recommendation

159. All professionals supporting students with ADHD should be familiar with their legal responsibilities under the 1992 Disability Discrimination Act (DDA) and Disability Standards for Education (2005). ADHD is recognised as a disability under the DDA. As such, schools are responsible for explicit planning and review of support strategies and services for students with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Students with ADHD have a legal right to access schools and the curriculum, as ADHD meets the criteria for disability under the *Disability Discrimination Act 1992* (Cth). The Act makes it unlawful to discriminate directly or indirectly against a person with a disability. It is unlawful to treat a person with a disability less favourably than one without the disability, on the basis of that disability, and in circumstances that are the same or not materially different. A need for additional services or facilities does not make circumstances materially different.

In relation to education, it is unlawful for an educational authority to discriminate against a person on the ground of disability by refusing or failing to accept an application for admission as a student or, in the terms or conditions of admission, by denying or limiting access to any benefit provided by the authority, or by expelling the student or subjecting the student to any other detriment. These provisions are qualified by the exception provided via the defence of *unjustifiable hardship*. There have been cases when the rights of the majority of students outweigh the right of the individual student with a disability, particularly when extreme violence has been involved, but these are rare.

The Disability Standards for Education (2005) provide guidance to education providers on their obligations under the DDA. The standards specifically address the areas of enrolment, participation, curriculum development, accreditation and delivery, student support services, and the elimination of harassment and victimisation. The Disability Standards emphasise the right to curriculum access through differentiation of curriculum, teaching and assessment.

Schools thus have a legal obligation to ensure the inclusion of students with a disability, and teachers are legally required to adapt their teaching as necessary to meet the needs of children with ADHD. Examples of cases involving students with ADHD brought before the Human Rights and Equal Opportunity Commission (HREOC) can be located on the HREOC website (http://www.hreoc.gov.au/disability_rights/dda_guide.htm). For educational systems to meet their legal obligations, however, schools and teachers must have the capacity to support and effectively teach and accommodate students with ADHD.

10.3 Inclusive educational strategies

Inclusion in the educational setting means equality of treatment for all students, regardless of ability or disability, as well as equity (specific measures such as making reasonable accommodations) for those with additional needs. An inclusive school is one that caters for the needs of all learners, and where all learners are valued and respected. ADHD is just one of many conditions in children and adults in education which must be considered and supported in diverse teaching environments.

Shaddock et al (658) define inclusive practice as:

> any and all efforts made by a school and its community to make students and their parents feel welcome. Inclusive practice implies that if participation becomes an issue for any student, whether arising from disability, gender, behaviour, poverty,

> culture, refugee status or any other reason, then the desirable approach is not to establish special programs for the newly identified individual or group need, but to expand mainstream thinking, structures and practices so that all students are accommodated. (p. 4)

In this, the largest study of teaching practices for students with disabilities in mainstream classrooms in Australia, the researchers found that the teaching techniques, classroom adaptations and curricular differentiations effective for students with disabilities tend to be effective for other students. Furthermore, they found that principals played a pivotal role in supporting inclusive practices and that learning outcomes for students with disabilities were dependent on the cultures and policies of mainstream schools and school systems.

Shaddock et al (658) also reported that successful teachers tended to view all their students as having individual needs, and capitalised on the strengths and interests of each student. The study found that:

- In facilitating curriculum access for their students, inclusive teachers adopted a wide range of strategies that involved whole-school, paired-class, within-class and individual student strategies, i.e. they routinely involved colleagues, parents and other students in assisting them to deliver a differentiated curriculum.
- Inclusive teachers preferred to assist students to participate in the work of the class rather than to work on individually tailored programs or modified curriculum.
- The teachers "experimented", tested hunches about what might work, and took a reflective and problem-solving approach to their teaching.
- The teachers planned thoroughly and extensively and wanted more time for essential consultation.
- School culture and flexible school policies were strong influences on the success and ease of curriculum differentiation.
- Inclusive teachers capitalised on the strengths and interests of each student, and viewed all of their students as having individual needs – not just those with a disability.
- Schools that utilised teaching aides / classroom assistants provided clear and effective guidance on roles and responsibilities and ensured that the teacher directed the teaching assistant. They facilitated joint professional development for teachers and teaching assistants, and arranged workloads to allow teachers and teaching assistants time to build their relationship, to plan, and to reflect on and evaluate their work.
- Literacy and numeracy outcomes were enhanced by early identification, early intervention and the use of a variety of teaching methods.

Shaddock et al (658) also found that there was a range of research-based approaches used in effective classroom practice to accommodate students with ADHD. Such approaches usually involved planning instruction around differentiations to (a) curriculum content; (b) classroom processes (including teaching techniques and student groupings); (c) learning products and outcomes; and (d) the learning environment.

The study found that effective practitioners universally believed that there is no single "best model" for including students with disabilities in the mainstream. Schools need to use the available evidence-based strategies, adapting them for their unique contexts to serve the complex and often unique needs of learners with additional needs such as ADHD (658).

It also should be recognised that students with ADHD may not have special needs in all areas of learning. For example, ADHD is considered a valid diagnosis in children who have a high IQ (659). Therefore, individuals with ADHD may be gifted in one area of performance but have a learning disability in other areas of performance.

10.4 Teacher knowledge

Recommendation

160. Pre-service and in-service teacher preparation courses should be designed to prepare all teachers with the knowledge and skills to accommodate students with specific learning needs and to manage students in need of additional support for their learning, behaviour, organisation and concentration difficulties.
✓*Recommended best practice based on clinical experience and expert opinion*

With the current prevalence of ADHD in Australia, it is likely that there are students with ADHD in every school and educational facility, and that teachers interact with students with ADHD in their classes and the playground, during sport, on excursions or during extracurricular activities. It is imperative, therefore, that teachers have a sound understanding of ADHD.

Research suggests that teachers have some knowledge about ADHD, but there are gaps in their knowledge and some misconceptions (660-662). The technical nature of medical research, the proliferation of alternative remedies and the focus on controversial aspects of ADHD in the media are as confusing to teachers as they are to parents. In one study, teachers were found to know significantly more about the symptoms and diagnosis of ADHD than about its nature, course and treatment (663). ADHD knowledge was related to teacher self-efficacy, prior exposure to a child with ADHD and years of teaching experience (663). Another study found that teachers and parents knew significantly more about the causes of ADHD than its characteristics, and their knowledge of its characteristics was significantly higher than their knowledge of ADHD treatment (662). Parents knew more than teachers about the cause and treatment of ADHD. A review of the literature on children with ADHD and their teachers found that teachers tend to hold negative beliefs about externalising behaviour problems such as CD in students with ADHD. They tend to be pessimistic about teaching these children, and feel that this requires extra time and effort (664).

In general, teachers regard ADHD as a valid diagnosis that has implications for the school setting, and they express a desire for comprehensive training but complain that their training is inadequate for addressing the needs of many students with disabilities, especially those with challenging behaviours (665-670).

A major area of concern for students with ADHD and their parents/caregivers is the high school sector because the organisational structure of schools often impedes communication regarding vulnerable learners (671). As well, there can be a lack of communication and collaboration amongst parents/caregivers, school personnel and medical professionals (672), which can prevent teachers acquiring critical student knowledge about their students with ADHD.

Teachers of students with learning disabilities or emotional/behavioural disorders have reported that "research-based" was not important to them as a criterion for their selection of interventions with students (673). Rather, teachers sought instructional practices that were feasible, appropriate for their students, accompanied by all necessary materials and professional development support, and that could be individualised for multilevel classrooms (674).

10.5 Resources

Recommendations

161. Resource allocations to schools should be accessible to teachers and school-based personnel for professional development in areas where established and emerging empirical scientific evidence about academic and social learning in children can inform more effective pedagogical practice. Such upgrading of skills should have an emphasis on practical school-based interventions.
✓ *Recommended best practice based on clinical experience and expert opinion*

Shaddock et al (658) found that teachers' capacity to implement effective differentiation strategies necessary for supporting learners with special needs depended to a large extent on school cultures, policies, resources and support. When inclusive practice was facilitated by system or whole-school change and support, individual teachers and groups of teachers could have a positive impact on school practices. The time and support allocated to teachers for planning, collaboration and professional development was shown to contribute significantly to positive student outcomes.

In their review of the literature, however, Shaddock et al (658) found that teachers generally said they did not have the time or the resources to make adaptations for students with significant individual needs and that these concerns had been expressed for many years. This finding was confirmed in their own study of classroom teaching practices across Australia. The authors found that students with complex needs did not meet funding eligibility criteria or attract additional resources. Further, the needs of some students could not be adequately met with the level of resourcing provided. Some traditional funding arrangements, such as allocating classroom support on the basis of teacher assistant hours, "lock in" practices and discourage flexible and creative use of resources. Teachers' participation in necessary professional development was also hampered by lack of funds.

10.6 Educational challenges for students with ADHD

10.6.1 Early years

During the preschool years, children acquire the social, behavioural and academic skills that allow them to navigate successfully through primary school (675). They learn how to focus their attention on teacher-directed activities, regulate their actions and inhibit inappropriate responses, interact appropriately with peers and authority figures, and follow spoken and unspoken rules in the classroom, gradually gaining the skills they will need to function in a formal classroom setting (675). In addition, they acquire the basic building blocks for later academic success in literacy, maths and communication skills. Difficulties with impulse control, attentional capacity and hyperactivity hinder this complex, essential learning (675).

Longitudinal studies have found that children who are inattentive, impulsive and hyperactive in preschool are more likely than other children to experience continuous problems through primary school and into adolescence (675). A significant percentage of children with these behaviours are eventually diagnosed with ADHD; however, the studies generally show that preschool children are at risk for the development of a range of disorders, ADHD being only one possible diagnosis (675).

Research also shows that problems with disinhibition (hyperactivity/impulsivity) become evident around 3–4 years of age, and problems related to inattention emerge later, around 5–7 years of age, with entry to formal schooling (143). The rapid developmental changes occurring between the ages of 2 and 6 years, however, make it difficult to determine when hyperactivity, inattentiveness and

impulsivity are developmentally appropriate and when a diagnosis of ADHD should be considered (675).

For many children with behaviour problems in preschool, clinically significant behaviour problems do not persist into later life. Factors that are associated with persistence include poor cognitive and language skills, adaptive disability, comorbid conduct problems, family stress and maternal depression (675).

Skilled observers rating the behaviour of 571 low-birthweight children aged 30 months, based on a 10-minute video, found that high scores on inattentiveness predicted a physician's diagnosis of ADHD and school difficulties at 8 years (676). These findings suggest the possibility of earlier intervention, perhaps before the behaviours begin to affect other areas of development and family dynamics.

The mechanisms that lead preschool children with ADHD-type symptoms to become academic underachievers years later are not clear; however, studies have shown that there are multiple pathways to the development of related learning and behavioural problems (675).

10.6.2 Primary years

Although there is an increased likelihood of medical diagnosis as children with ADHD symptoms engage with the formal settings for learning, the problems that children with ADHD experience in the early years continue to compound as they move through primary school. As many as 80% of students with ADHD have been found to exhibit academic performance problems (677) and about 20–30% have been classified as having learning disabilities due to deficits in the acquisition of specific academic skills (678). Learning difficulties can exacerbate behavioural problems and affect the social and emotional wellbeing of the student, resulting in underachievement, antisocial behaviour, a sense of failure, alienation from peers, and school and social exclusion (679, 680).

The structure of the primary classroom is at odds with the behaviours of many students with ADHD (671). Students are expected to be organised, attentive, quiet and compliant, and to sit still for long periods of time, complete multi-step tasks, and work independently and co-operatively – behaviours that students with ADHD typically lack (679).

Students vary in the type of symptoms they display, from dreamy and inattentive to impulsive, loud and constantly in motion, and some will show both inattentive and hyperactive/impulsive behaviour. Their behaviours vary day to day, minute to minute, and across different learning contexts (679).

Cognitive difficulties underpin both inattentive behaviour and underachievement (681). In particular, poor working memory is impaired by ADHD, and is linked with inattentive behaviours (681). Working memory is the ability to hold and manipulate information temporarily (for a few seconds only), despite ongoing distractions such as conversation or other classroom activities (682).

Working memory is necessary for performing complex tasks such as mental arithmetic, listening and reading comprehension, and reasoning, and the quality of working memory predicts future academic achievement in literacy, maths and science (683-685). For example, in three separate studies of primary school children of different ages, the expressive writing of children who exhibited symptoms of ADHD was worse than that of the control groups in adequacy, structure, grammar and lexicon (686). Students with ADHD wrote less, their texts were disorganised, their vocabulary was limited and they made more errors than their peers (686).

Inattentive behaviours, poor working memory and poor academic achievement have been described as an interrelated "risk triad" for learning, and intervention

that aims either to reduce inattentive behaviour or to improve cognitive function would be expected to enhance a child's academic outcomes (681).

Poor self-regulation is a major contributor to academic and behavioural problems in children with ADHD. Self-regulation has three components: an attentional component, an inhibitory component, and an organisational, strategic component, which directs cognitive processing – notably preparation and planning, working memory and "set-shifting" (687).

Children with a reduced capacity for self-regulation of affect have a low tolerance of frustration, and a tendency to emotional outbursts and to view things in personal terms. They cannot use everyday language effectively as a cognitive and social tool for passing on information and resolving conflicts (688).

Lack of social skills, such as forming friendships and relating to peers, creates increasingly significant problems for children in the primary school years. Hyperactive and impulsive behaviours contribute to unrestrained and overbearing behaviours that make children with ADHD unpopular with their peers, while inattention may mean that children do not pick up subtle and obvious social cues and fail to learn social skills through observation alone (186).

A recent review of the research (186) indicates that:

- having positive peer relationships is developmentally important for all children
- low acceptance or rejection by peers places children at risk for a host of negative outcomes
- both boys and girls with ADHD have difficulty relating to peers
- once rejected, overcoming a negative reputation with peers is extremely difficult, and the label of "ADHD" exacerbates the problem
- addressing relationships with peers with children with ADHD is extremely difficult and it may be more beneficial to address relationships with peers directly.

A study of 133 male and 42 female primary school students with ADHD (689) confirmed results of earlier research in finding relatively few gender differences in impairment in school functioning across the academic, behavioural and social domains. Although girls are less likely than boys to have ADHD, their impairments are as severe, and in some cases even more severe, than for boys. The authors noted that the referral rate for boys with ADHD is higher than for girls (143), maybe because boys exhibit more disruptive and aggressive behaviour; but they emphasised the importance of early identification and treatment for all children with ADHD (689).

10.6.3 Secondary years

Evans et al (690) described the problems faced by adolescents with ADHD that have been identified in research. In adolescence, the problems experienced at younger ages – academic difficulties, discipline problems at school and at home, conflict with peers – often have more serious consequences, such as school dropout and entering the juvenile justice system. Physical and social maturation may also bring new problems such as car accidents, driving infringements, difficulty in relationships, vocational problems and substance abuse. Although medication can provide short-term benefits for adolescents with ADHD, use of medication drops steeply throughout adolescence (690).

Furthermore, the school setting, routines and expectations change as students move from primary to secondary school. Students are expected to be independent learners and they move from the security of one teacher and one class to many (671). Many adolescents with ADHD have significant problems related to homework

completion and class preparation (678, 685, 691). They often come to class unprepared, fail to record or recall assignments, and rush through schoolwork making careless mistakes. They may not begin tasks in a timely manner, make prompt decisions, maintain effort, remember responsibilities, organise materials and manage time efficiently. Students with ADHD can also struggle to apply and review the material they have learned. They find it difficult to understand material covered, and often do not allow sufficient time for test preparation (691).

10.6.4 Tertiary/post-school years

Recommendation
162. Australian research into the impact of learning and behaviour challenges for adults pursuing tertiary qualifications is needed to identify what reasonable accommodations can be made to enhance their chances of success. ✓ *Recommended best practice based on clinical experience and expert opinion*

In adults with ADHD, symptoms of inattention, impulsivity, disorganisation and a lack of self-regulation can make progression through higher levels of education difficult. ADHD continues to be associated with problems in academic functioning at the college level (692). College students with ADHD are easily distracted, restless and prone to act impulsively without regard to consequences. These symptoms often interfere with a student's ability to perform in an academic setting that requires sustained attention, behaviour self-regulation and impulse inhibition (693).

The symptoms of ADHD can manifest differently in adulthood compared to childhood (see Chapter 4. Consequences of ADHD, page 25). For example, it has been reported that the hyperactivity component improves dramatically as children increase in age, and that adults with ADHD have greater difficulty with internal distractions such as daydreaming and a constant flow of irrelevant ideas. This has been described as "mental restlessness", and individuals with diagnosed ADHD consistently endorsed significantly higher ratings on the *Mental Restlessness Scale* than people without ADHD (694). Mental restlessness may involve different components: internal distractibility, internal restlessness, internal impulsivity and internal disorganisation (694). Collectively, these symptoms appear to reflect problems with cognitive disinhibition, which is consistent with the large body of research that suggests that ADHD is characterised by deficits in executive function (695).

Anecdotal evidence suggests that unless students have strong family support throughout their studies, it is likely that many will fail to complete tertiary training. Support organisations such as ADDults with ADHD (NSW) Inc. suggest the following:

- the provision of mentors or coaches for students with ADHD
- training for tertiary education counsellors on ADHD so they know how to support adults with ADHD
- varying presentations and novel ways of presenting material, to assist recall (180)
- seating to minimise sound and visual distractions, preferably close to the front
- Behaviour Management Contracts to moderate difficult classroom behaviours
- a dependable classroom environment with a well-displayed schedule
- workshops for students with ADHD to teach them skills for studying, including note-taking, memorising, how to access support, organisational skills such as prioritising and arranging special exam provisions

- ADHD listed as a separate "condition" on any tertiary institution website, so that students can more easily locate appropriate available support.

10.7 Collaborative approaches

Recommendation

163. Medical and education personnel should engage in high-level collaboration (e.g. with Wraparound teams or Positive Behavioural Intervention Support teams, exchange of information, completion of surveys/questionnaires, joint meeting with family, with Wraparound teams or with Positive Behavioural Intervention Support teams) when a student presents with the characteristics of ADHD, to effect the best possible support for both student and family.
✓ *Recommended best practice based on clinical experience and expert opinion*

Shaddock et al (658) found that student learning is enhanced by a) good communication among teachers, students, parents/caregivers and the school community, and b) by teachers having specific knowledge (often gained directly from parents and students) about how each student's learning can be facilitated. Knowledge of their students assists teachers in delivering a differentiated curriculum, for example.

"Student knowledge" is defined as knowing the student personally, and having detailed information on the student's academic profile and awareness of all areas of the student's development (i.e. social, behavioural and emotional), and how ADHD affects each area (696). Much of the information is learned from parents/caregivers and the students and cannot be learned during teacher training because it is student-specific. For example, two students in the same class may have ADHD, but they are unlikely to have the same learning profiles, characteristics of ADHD, personalities or adaptive skills.

Inclusive teachers plan thoroughly and extensively, and take a reflective and problem-solving approach to teaching (658). They seek new knowledge by listening to parents/carers and the student, asking questions, finding out which strategies work at home, seeking input from the medical profession, discussing best practices with colleagues, year co-ordinators and the school psychologist, and contacting consultants. Teachers in some schools work collaboratively with Learning Support Teams, special education teachers or Learning Support Co-ordinators (696).

Individual Education Plans (IEPs) or Individual Learning/Behaviour Plans, and Wraparound are collaborative planning approaches that can be effective if all the participants are committed to the processes. In each case, the student with ADHD and everyone involved in his or her education discuss and document long-term goals, short-term objectives, strategies and evaluation methods. The team meets regularly to monitor progress and set new objectives.

Wraparound is a planning process for building constructive relationships and support networks among families, teachers and other caregivers to benefit the inclusion or facilitate the progress of youth with emotional and behavioural problems. The process incorporates a family-centred and strengths-based philosophy of care, and is used to build consensus among a team of professionals, family members and other support providers. Wraparound planning has decreased the numbers of out-of-home and restrictive school placements and improved students' behavioural, academic, social and post-school adjustment indicators (for review see (697)).

Positive Behavioural Interventions and Supports (PBIS) (http://www.pbis.org) addresses the behavioural and discipline systems of schools. PBIS has been widely implemented in the USA and more recently several education systems in Australia have also instigated this program.

10.8 School-based interventions

Research question

- For children and adolescents with ADHD, do school-based interventions, compared to no intervention, affect outcomes?
- For children and adolescents with ADHD, do peer support, tutoring or mentoring programs, compared to no intervention, affect outcomes?
- For adults with ADHD, do university/TAFE-based interventions, compared to no intervention, affect outcomes?

Evidence statements

- One systematic review and six primary research studies found that school-based interventions were of benefit to children in improving ADHD symptoms and classroom behaviour (698-703). (Level II, III-1, III-2)
- In two of three studies that addressed the efficacy of school-based interventions on academic performance in children, no clear benefits were reported (698, 699, 704). (Level II, III-2) One study found improvement in academic performance (704) (Level III-3)
- Three studies found that tutoring programs were of benefit for children with ADHD (705-707). (Level III-2, IV)
- One study found that self or parent monitoring of homework improved homework completion and homework problems for adolescents with ADHD (708). (Level III-2)
- Interventions for adults in university or TAFE settings have not been trialled.

Recommendations

164. Schools should have policies and procedures in place to support students experiencing learning, behaviour, organisation and concentration difficulties; for example, pre-referral processes, Wraparound and Positive Behavioural Intervention Support teams.
✓ *Recommended best practice based on clinical experience and expert opinion*

165. Effective school-based interventions, including peer tutoring, mentoring and peer support (e.g. buddy systems), should be considered for children and adolescents experiencing learning, behaviour, organisation and concentration difficulties to enhance their learning, social and behavioural outcomes. (Grade C)

166. Well-designed research into behavioural and school-based academic interventions that teachers can effectively and easily implement for the benefit of students with ADHD is needed.

10.8.1 Background

Behavioural interventions

Explicit teaching and strong teacher–student relationships are the bases of effective education provision. Schools must also establish policies and procedures to support students with special needs, as required by the Disability Discrimination Act. A pre-referral process works from a strengths-based model and determines which strategies are already in place and which need to be established.

"Response to intervention" (RTI) integrates assessment and intervention within a multilevel prevention system to maximise student achievement and to reduce behaviour problems. With RTI, schools can identify students at risk for poor

learning outcomes, monitor student progress, provide evidence-based interventions and adjust the intensity and nature of those interventions depending on a student's responsiveness, and identify students with learning difficulties (http://www.rti4success.org).

School-based behavioural interventions for ADHD generally focus on disruptive behaviour and task engagement and utilise behaviour modification techniques such as support groups, cognitive behavioural therapy conducted by teachers or time-out procedures. Co-operation and co-ordination between the school, the teachers and the parents/caregivers are required as well as the expertise, time and resources to develop and implement the intervention programs. While studies show that interventions have some impact, it is not always sustained, and beneficial impact may be isolated to one area of development or one context.

Whole school strategies aim to prevent disruptive behaviour in schools. One such program, Positive Behavioural Interventions and Supports (PBIS) (http://www.pbis.org), has been the subject of extensive research in the USA, including RCTs (709, 710). PBIS has been implemented in over 5,000 schools in the USA, with encouraging results in reducing referrals and suspensions and improving academic results and social skills (709). This program has been implemented by several State education systems in Australia.

PBIS uses applied behaviour analysis to gain an understanding of the purpose of a child's behaviour (711). As a systems-based approach, it endeavours to fix the context rather than the child by creating a supportive academic and social environment (711). PBIS is a 3-tiered prevention and intervention model of positive behavioural supports: "primary" school-wide preventative supports, "secondary" interventions for groups of at-risk students and "tertiary" intensive support for individual students (709). In this model, a leadership team of school and community personnel works collaboratively to align school policy, political commitment, funding, resources and training, and monitor implementation (709).

The impact of PBIS has not been specifically evaluated for children and adolescents with ADHD. Research is required to determine if this program will be of particular benefit to students with ADHD.

Another school-based program in use in Victoria is CASEA (CAMHS and Schools: Early Action Program). CASEA has been developed in Victoria by the Royal Children's Hospital and is currently being run in some Melbourne schools. CASEA is a multilevel prevention and early intervention program developed to reduce the incidence and impact of behavioural disorders, particularly CD (http://www.rch.org.au/mhs/casea/index.cfm?doc_id=10214).

Academic interventions

School-based academic interventions target academic performance by focusing on academic instruction, materials or environment. These interventions include help with organisational strategies and computer-assisted instruction.

The complex needs of learners with ADHD may mean that a range of interventions has to be trialled by classroom teachers or tertiary instructors to effect the best possible support for these learners with additional needs.

Several small studies have been conducted that show promising results; however, replication in larger well-designed RCTs is required. For example, six male students aged 11–12 years with a diagnosis of ADHD were trained in self-management that focused on the improvement of classroom preparation skills and homework completion, plus self-monitoring skills using a written log (712). After training, the students were monitored individually, with monitoring fading as students increasingly met their targets. All participants showed improvement, and improvements were maintained after written self-monitoring ceased.

In another study (713), a computer-mediated social skills training program was trialled with four primary school children with ADHD. The program presented specific social skill sequences in a variety of computer facilitated formats, with video peer modelling, social problem solving and reinforcement components. All participants showed improved social problem-solving skills, which were maintained at 6-week follow-up.

Peer support and mentoring

Just as collaborative problem-solving and planning processes can support students with ADHD, so too can collaboration among students, in the form of peer support, mentoring and peer tutoring.

A synthesis of 38 studies of children with emotional and behavioural disorders found that peer tutoring was effective with primary, middle school and secondary school students. Benefits in behavioural symptoms, social interactions and academic outcomes were reported (714). Peer tutoring can involve same-age or cross-age tutoring, reciprocal teaching or reverse-role tutoring (714, 715). In reciprocal teaching, students take turns in being tutor and tutee. In reverse-role tutoring, the student with the learning difficulty is the tutor. In a small study of children with emotional and behavioural disorders, reverse role tutoring generated improvements in self-esteem, behaviour and relationships with peers (715).

Glomb et al (716) describe the development and implementation of a school-based mentoring program that matches children and adolescents (both primary and secondary school) with learning disabilities and attention problems with university students who have experienced similar challenges. Program staff hold weekly 1-hour seminars to provide training and feedback to student mentors. Children and mentors meet for 1 hour per week. Parents and teachers reported moderate to significant improvements in school performance – specifically homework completion – and in attitude towards school. The program was most successful with the 9–12-year-old age group.

10.8.2 Summary of research evidence

DuPaul and Eckert (698) reviewed 63 school-based interventions for ADHD and concluded that school-based interventions were effective in enhancing classroom behaviour, but effects on academic performance were less clear. The methodology of the included studies was varied, with many studies having a small number of participants, no control group or no clear diagnostic criteria for the inclusion of participants.

A number of studies have been conducted since that review:

- A well-designed RCT was used to investigate the use of a combination of behaviour modification techniques in the kindergarten classroom by specially trained teachers (699). The behavioural interventions included a token system, time-out procedures, group training in social skills and anger control, and a daily school report card with home-based reinforcement. When compared to the no-treatment group, children receiving the classroom intervention showed improvement in teacher-rated attention, aggression and social skills behaviour, but there was no improvement in academic achievement and the changes in behaviour were not sustained at home. At the 2-year follow-up, Shelton et al (717) found no differences between the treated and untreated groups.
- A "Stop and Think" program of cognitive behavioural therapy that was aimed at increasing concentration and reflection resulted in significant improvements in ADHD symptoms, school problems and antisocial behaviour measures at post-treatment testing and 2-month follow-up (700). However, there was no benefit in social adjustment or academic performance.

- The use of behaviour modification and cognitive behavioural techniques carried out by teachers in the classroom was reported in two studies. In the first of these, Miranda et al (701) reported significant benefit in the ADHD symptom measures of hyperactivity and self-control only. In the second study, Miranda et al (702) reported benefits of the classroom intervention over a no-treatment control group in measures of inattention and hyperactivity.
- Use of computer-based working memory tasks with escalating difficulty was investigated in a well-designed RCT involving primary school children (703). Parent ratings of inattention and hyperactivity/impulsivity measures were improved, compared to the control group. No differences were found between groups for teacher-rated ADHD symptoms. The impact on academic performance was not addressed.
- Another study compared two interventions that involved teachers working with consultants (such as school psychologists) either as usual (TDAI) or more intensively (IDAI) to develop interventions to target maths and reading skills (704). Although there were some improvements in reading and maths for both groups, without a control group it is difficult to determine the efficacy of these programs.
- A controlled study of middle-school children (11–14 years) with ADHD looked at either self-monitoring or parent-monitoring of homework compared to a wait-list control group (708). In addition to monitoring of homework, students were given training in study strategy. Homework completion and homework problems improved significantly in both groups compared to the control group.

Three studies were identified that addressed the use of peer support or mentoring specifically for students with ADHD:

- One study made use of a "buddy system" that was reported to reduce negative behaviour and increase participation and adaptation (705). Standard ADHD symptom scales were not used and the study was poorly reported, making it difficult to interpret the results.
- Another study investigated a class-wide peer tutoring program that was reported to increase the children's ability to engage actively in academic tasks and reduce the time spent in off-task behaviour (707). Half of the children in this study were found to have improved their academic performance.
- Use of individual tutoring by adults led to improvements in ADHD symptoms. This study did not address academic outcomes (706).

No studies addressing the use of university/TAFE-based interventions for individuals with ADHD were identified.

10.9 Resources for teachers

10.9.1 Websites

http://www.ldonline.org
LD OnLine website in the USA offers advice on ADHD and learning disabilities, including definition, symptoms, diagnosis, causes, treatment, as well as information for family and school, teenagers and adults with ADHD.

http://www.wraparoundkids.com
Australian website for Wrap Around Kids, a collaborative program which facilitates communication amongst family, teachers and professionals to support students with medical conditions, ADHD, ASD, LD, hearing and vision impairments, intellectual and physical disabilities, and emotional and behavioural disorders. Provides information on the program, benefits and access to an online resource centre.

http://www.chadd.org
US Children and Adults with Attention Deficit/Hyperactivity Disorder website established by parents to disseminate information on ADHD. Non-profit organisation offers membership and information on causes, symptoms, evaluations, treatment, research studies and FAQs.

http://www.nimh.nih.gov
US National Institute of Mental Health website. Focuses on mental illnesses and behavioural disorders; research on mind, brain and behaviour. Offers information on ADHD symptoms, diagnosis, causes, family and ADHD, ADHD in adults, references and resources, scientific studies. Book on ADHD can be downloaded.

http://detcms.det.wa.edu.au/inclusiveeducation/detcms/inclusiveeducation/public/resource-topics/supporting-students-with-attentional-difficulties/supporting-students-with-attentional-difficulties.en
Western Australian Department of Education and Training website. Includes an online resource: *Supporting Students with Attentional Difficulties*. Provides information on attentional difficulties, what teachers need to know, how to access and provide support, what to do in the classroom.

http://www.add.org.au
ADDults with ADHD (NSW) Inc. website. Addresses the needs of adults with ADHD and other related conditions, and also the needs of their families.

http://www.ais.sa.edu.au/resources/DDA%20text%20pages%20R8.pdf
Students with Disabilities: Enrolment Guidelines for Independent Schools.
This document from the Association of Independent Schools of South Australia provides advice in the area of disability discrimination and outlines the responsibilities of independent schools.

10.9.2 Books

Barkley RA (1995). *Taking Charge of ADHD.* New York: Guildford Press.

Dendy CAZ (2000). *Teaching Teens with ADD and ADHD*. Bethesda, MD: Woodbine House.

Kohlberg J & Nadeau Brunner K (2002). *ADD-Friendly Ways to Organize Your Life*. New York: Brunner-Routledge.

Mooney J & Cole D (2000). *Learning Outside the Lines*. New York: Simon & Schuster.

Nadeau K (1998). *Help4ADD@HighSchool*. Bethesda, MD: Advantage Books.

Nadeau K & Dixon E (2004). *Learning to Slow Down and Pay Attention: A Book for Kids About ADD*, 3rd edn. Washington DC: Magination Press.

Nadeau K, Littman EB & Quinn PO (2000). *Understanding Girls with AD/HD*. Silver Spring, MD: Advantage Books.

Quinn P (1995). *Adolescents and ADD: Gaining the Advantage*. Washington DC: Magination Press.

Quinn PO & Stern J (2001). *Putting on the Brakes: Young People's Guide to Understanding Attention Deficit Hyperactivity Disorder*, rev. edn. Washington DC: Magination Press.

Reiff MI & Tippins S (2004). *ADHD: A Complete and Authoritative Guide*. Elkgrove, IL: American Academy of Pediatrics.

Reimers C & Brunger BA (1999). *ADHD in the Young Child*. Plantation: Specialty Press.

Rief S (2005). *How to Reach and Teach ADD/ADHD Children*, 2nd edn. New York: The Center for Applied Research in Education.

Solden S (2005). *Women with Attention Deficit Hyperactivity Disorder*. Grass Valley, CA: Underwood Books.

Young JL (2000). *ADHD Grown Up: A Guide to Adolescent and Adult ADHD.* New York: W.W. Norton.

Zeigler-Dendy C. (2000). *Teaching Teens with ADD and ADHD: A Quick Reference Guide for Teachers and Parents*. Bethesda: Woodbine House.

10.9.3 DVDs

Last one picked … first one picked on. Richard Lavoie.

When the chips are down. Richard Lavoie.

How difficult can this be? The F.A.T. City Workshop. Richard Lavoie.

Beyond F.A.T. City: A Look Back, A Look Ahead. Richard Lavoie.

ADHD in the Classroom: Strategies for Teachers. Russell A Barkley.

ADHD in the 21st Century. Edward M Hallowell.

CHAPTER 11. COMPLEMENTARY AND ALTERNATIVE TREATMENTS FOR ADHD

11.1 Introduction

A number of other treatment modalities have been advocated and used for the management of ADHD. These are often referred to as "complementary and alternative medicines" (CAMs), although it is difficult to draw a clear line between CAMs and mainstream approaches (718). An alternative treatment in the context of ADHD is any treatment other than prescription medication or standard psychosocial behavioural treatments that claims to treat the symptoms of ADHD with an equal or better outcome.

Just as with mainstream treatments, some CAM therapies may cause adverse effects and can result in adverse drug interactions, some of them potentially serious. It is important that healthcare practitioners treating people with ADHD ask about their patients' use of both traditional and non-traditional approaches. Similarly, it is important that people with ADHD and/or their parents and carers tell their healthcare practitioners about all the therapies they are using, both traditional and non-traditional.

Two studies have found that the use of CAMs for ADHD is quite common in Australia, with 67% (50/75) of surveyed families in a Victorian sample (719) and 64% (186/290) of surveyed families in a Western Australian sample (720) reporting the use of alternative treatments. Notably in both studies the most frequently reported CAM was modified diet (719, 720).

In general, CAM therapies have undergone less rigorous assessment than other therapies for ADHD, making it difficult to provide positive recommendations for them, despite their widespread use and popular support.

11.2 Diet

11.2.1 Elimination and restriction diets

Research question

- For individuals with ADHD, do diets that eliminate or restrict certain foods or food components, compared with no intervention, affect outcomes?

Evidence statements

- One poorly designed trial on the oligoantigenic diet reported improved behaviour in 50% of participants (721). (Level III-2)
- One small trial found that children with ADHD on a restricted elimination diet showed significant improvement in parent- and teacher-rated ADHD behaviours compared to a control group not on the diet (722). (Level III-2)
- Two food challenge trials assessing the impact of sodium benzoate and artificial food colourings on children from the general population reported an increase in hyperactivity (104, 106). (Level II, III-2)

Recommendations

167. Healthcare professionals should encourage good nutrition and a balanced diet.
✓ *Recommended best practice based on clinical experience and expert opinion*

168. Elimination and restriction diets are not supported as a general treatment for all individuals with ADHD. Consumers considering the use of elimination or restriction diets should be informed about the uncertainties surrounding the efficacy of these diets in treating ADHD, and of the potential risks of unsupervised elimination diets. (Grade D)

169. A subset of children may be sensitive to certain foods or food additives and benefit from careful exclusion diets. Assessment of food sensitivity and initiation of a special diet should be under the care and supervision of a medical specialist and an Accredited Practising Dietitian.
✓ *Recommended best practice based on clinical experience and expert opinion*

Background

Elimination or restriction diets for ADHD are based on the assumption that certain foods or food components affect behaviour. The diets most commonly advocated for use in ADHD restrict food additives and/or preservatives, eliminate sugar, or eliminate potentially allergenic foods such as dairy products, wheat, corn, yeast or soy (oligoantigenic diets) (723, 724).

Modified diets to assist symptoms of ADHD came into prominence in the early 1970s, when Feingold published *Why Your Child is Hyperactive* (1975). In this book he proposed that many children were sensitive to dietary salicylates and artificial colours, flavours and preservatives, and that learning and behavioural problems could be improved by eliminating all food additives and naturally occurring salicylates from the diet. Subsequent controlled studies have generally not supported the Feingold diet (725-727).

Other early studies, such as those by Egger et al (728) and Carter et al (729) used open trials to identify which foods affected individual children, and then tested those incriminated foods using a double-blind crossover design. The incriminated foods varied substantially between children, and included natural foods (e.g. cow's milk, wheat flour, citrus fruit, eggs) as well as artificial colourings and preservatives. Both studies indicated that the results of the open trial could be replicated in the double-blind follow-up study. Some children were helped by

individually designed elimination diets, at least in the short term. Carter et al (729) suggested that children's responsiveness to incriminated foods was predicted by parents' informal observations.

Summary of research evidence

At the time of writing the 1997 ADHD Guidelines, the authors found that scientific evidence to support the use of restriction diets in the management of ADHD was lacking. Three primary studies that were focused on preschool-aged children and children were identified. No trials involving adolescents or adults were found.

Schmidt et al (721) addressed the use of the oligoantigenic diet (avoiding known food allergens) in children with ADHD. The diet comprised two meats (lamb, turkey), two carbohydrate sources (rice, potatoes), two vegetables (cabbage, carrots) and two fruits (apples, bananas), plus apple juice and mineral water. Improved behaviour was reported in approximately 50% of participants. However, the study was of poor quality, with several limitations in design and reporting that make the results difficult to interpret.

A recent randomised, controlled trial in 27 children with ADHD looked at the use of a restricted elimination diet (722). The diet consisted of rice, turkey, lamb, vegetables, fruits, margarine, vegetable oil, tea, pear juice and water. The number of children who showed improvements in parent- and teacher-rated ADHD symptoms was greater in the diet group than in the control group (722).

Two food challenge trials (104, 106) addressed the impact of artificial food colourings on hyperactivity. The participants were children aged 3 years or 8–9 years drawn from the general population, not specifically children with ADHD. These studies found that a short-term challenge (1 week) with sodium benzoate preservatives and artificial food colourings moderately increased features of hyperactivity in both 3-year-old children and 8–9-year-old children irrespective of their atopic status (as identified by skin prick testing) (104, 106).

Overall, there is insufficient evidence to draw conclusions on the use of elimination or restriction diets for the treatment of ADHD. It is possible that a small subset of children may have true sensitivity to certain foods or food additives that could be helped by careful exclusion diets. The research does not support alterations to the diet as a general treatment for all individuals with ADHD. Further research is required using standardised and validated outcome measures in RCTs with a parallel design.

11.2.2 Diet supplements

Numerous dietary supplements have been suggested to be of benefit for the treatment of ADHD; however, there are few well-conducted RCTs evaluating the efficacy of these treatments. The exception is supplementation with essential fatty acids (fish oils), which has been the subject of several controlled trials.

Research question

- For individuals with ADHD, does diet supplementation with essential fatty acids, compared with placebo or no intervention, affect outcomes?

Evidence statement

- Five trials showed conflicting results when comparing essential fatty acids with placebo in children with ADD/ADHD symptoms (730-734). (Level II-III-1)

Recommendations

170. There are insufficient research data to recommend the use of diet supplementation with essential fatty acids for the treatment of ADHD. Consumers considering the use of essential fatty acids should be informed about the uncertainties surrounding their efficacy in treating ADHD.
✓ *Recommended best practice based on clinical experience and expert opinion*

171. The use of essential fatty acids in the management of ADHD symptoms warrants further investigation in well–designed randomised controlled trials (RCTs), including clarification of dosage levels and types of essential fatty acids used.

Background

Essential fatty acids (EFAs) are important for brain development and function. They cannot be synthesised by the human body and must be obtained from dietary sources. EFAs include the omega-3 fatty acids, eicosapentaenoic acid (EPA), docosapentaenoic acid (DPA) and docosahexaenoic acid (DHA); and the omega-6 fatty acids, arachidonic acid (AA), linoleic acid (LA), alpha-linoleic acid (ALA).

The NHRMC has recently recommended an increased consumption of omega-3 fatty acids in the average Australian diet to promote general health (735), suggesting a daily intake of 610mg/day for men and 430mg/day for women. In addition to the benefits to general physical health, EFAs are often promoted as an alternative treatment for many medical and psychiatric conditions, including ADHD.

Nerve cell membranes are composed of phospholipids containing large amounts of polyunsaturated fatty acids (omega 3 and 6), and it has been suggested that deficiencies in EFAs may impact upon brain function in such a way as to cause or worsen some ADHD symptoms. This has been supported by research findings showing that levels of EFA in the blood plasma of people with ADHD are reduced compared to healthy controls (for reviews see (723, 736, 737)). This in turn has led to the hypothesis that dietary supplements of EFA may reduce symptoms of ADHD.

It is important to note that the commercially available EFA supplements may include only a single type of EFA or variable ratios of different types of EFA.

Summary of research evidence

Five randomised, double-blind, placebo-controlled trials were identified that addressed the use of EFAs in the treatment of ADHD. The studies involved children aged 6–13 years, and trialled 8–16 weeks of EFA supplementation. No trials were found involving adolescents or adults with ADHD.

The efficacy of EFA supplementation in the treatment of ADHD remains unclear. Two trials found no improvement with EFA compared to placebo (730, 731), while three trials showed significant benefits in a subset of ADHD-related measures (732-734). None of the trials reported any serious adverse events.

The inconsistent findings may be the result of differences in study design, such as inclusion criteria, dosage levels and type of EFA used (DHA, EPA or a combination of the two). Furthermore, the studies did not take into account confounding factors

such as the inclusion of people on stimulant medication. A formal diagnosis of ADHD was made in only two of the studies.

11.3 Chiropractic

Research question

- For individuals with ADHD, does chiropractic, compared with no intervention, affect outcomes?

Evidence statement

- Chiropractic treatment for ADHD has not been evaluated in clinical trials.

Recommendation

172. Consumers considering chiropractic should be informed about the current lack of research to assess its efficacy in the treatment of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Background

Chiropractic interventions are based on a belief that spinal problems are the cause of health problems, and spinal manipulations ("adjustments") can restore and maintain health (738). Advocates believe that imbalance in muscle tone can cause an imbalance in brain activity, and that spinal adjustments and other somatosensory stimulation (e.g. exposure to various frequencies of light and sound) can effectively treat ADHD and learning disabilities. Other chiropractors believe that the skull is an extension of the spine and advocate a method called applied kinesiology or neural organisational technique. The premise is that learning disabilities are caused by misalignment of the sphenoid and temporal bones of the skull creating unequal pressures on the brain. Treatment involves restoring the cranial bones to the proper position through specific bodily manipulation.

Summary of research evidence

No studies addressing the use of chiropractic treatment for the management of ADHD were identified. The literature in the area is limited to a small number of case reports.

11.4 Behavioural optometry

Research question

- For individuals with ADHD, does behavioural optometry, compared with no intervention, affect outcomes?

Evidence statement

- Use of behavioural optometry, including use of Irlen lenses, for the treatment of ADHD has not been evaluated in clinical trials.

Recommendation

173. Consumers considering behavioural optometry should be informed about the current lack of research to assess its efficacy in the treatment of ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

Background

Behavioural optometry refers to the use of lenses and vision training to improve vision and its impact on behaviour and learning ability. Visual problems such as faulty eye movements, sensitivity of the eyes to certain light frequencies and focus

problems may cause problems with reading. Vision therapy may assist some children with learning difficulties if they have existing visual problems. Programs vary widely and may include eye exercises, educational and perceptual training (e.g. general body movements designed to improve visual perception), and the use of tinted or Irlen lenses.

Summary of research evidence

No studies addressing the use of behavioural optometry for the management of ADHD were identified. The literature in the area is limited to a small number of case reports.

11.5 Biofeedback

Research question

- For individuals with ADHD, does biofeedback, compared with no intervention, affect outcomes?

Evidence statement

- Preliminary studies of biofeedback for the treatment of ADHD in children show some benefit for ADHD symptoms (739-744). (Level III-1, III-2, IV) Larger, well-designed trials are needed.

Recommendations

174. There are insufficient research data to recommend the use of biofeedback for the management of ADHD symptoms. (Grade D)

175. Consumers considering biofeedback should be informed about the uncertainties surrounding its efficacy in the treatment of ADHD, the time required to undertake the treatment and its costs.
✓ *Recommended best practice based on clinical experience and expert opinion*

176. The use of biofeedback in the treatment of ADHD symptoms warrants further investigation using well-designed RCTs.

Background

Biofeedback, also called neurofeedback or electroencephalogram (EEG) biofeedback, aims to train people to self-regulate their brain activity so that they achieve a state of focus. Computerised monitoring of the EEG is fed back to the participant in real time via visual and auditory signals. When the person makes desired changes in the targeted behaviour, he or she is rewarded and the change is positively reinforced. Biofeedback is conducted over a series of sessions over several weeks.

The underlying principle behind the use of biofeedback for the treatment of ADHD is based on research findings that suggest that a person's level of alertness and behavioural control is associated with particular EEG frequencies in specific regions of the brain (reviewed in (745)). In addition, quantitative EEG studies have identified differences in EEG rhythms between individuals with ADHD and individuals without ADHD. The resting EEG of children with ADHD shows increased slow wave activity and decreased fast wave activity (reviewed in (368)). The purpose of biofeedback is to train the brain to control specific EEG frequencies, which will theoretically increase attentiveness and improve behavioural control.

Summary of research evidence

One systematic review and five primary studies were identified that addressed the use of biofeedback in the treatment of ADHD. No RCTs were found.

- The systematic review included 18 studies, 17 of which reported benefits for symptoms from biofeedback in ADHD (739). The review highlighted the flaws in the literature, including a predominance of case studies and a dearth of studies using a control group, randomisation or a combination of outcome measures.
- In a case-series involving children aged 8–13, with no control group, the children showed improvements on a number of ADHD symptom measures, but there was no clear benefit when parent-rated DSM-IV criteria were used (740). The changes were stable at 6 months follow-up. The results are difficult to interpret as 5 of the 23 children were also taking stimulant medication.
- A study of 13 children aged 7–13 years with ADHD found significant improvement in parent ratings of ADHD symptoms in the biofeedback group compared to a wait-list control group (741). Only one rating scale was used, and participants were permitted stimulant medication, which may have confounded results.
- In a study of biofeedback as part of a combined treatment strategy that also included medication and psychosocial interventions, inattention and hyperactivity were significantly improved when neurofeedback was included, compared to the control group (742).
- The remaining two studies compared biofeedback to stimulant medication. One study reported improvements with both biofeedback and medication treatment, but found no differences between the groups (743). The second study reported improvement with both biofeedback and medication on three subscales of the TOVA, but again found no differences between the groups (744).

Although no studies reported adverse events, it was not clearly reported that any of the studies had sought to measure adverse events.

Thus, while biofeedback shows some promise in the treatment of ADHD, RCTs are needed to clarify whether it can be recommended instead of or in combination with medication in ADHD.

11.6 Homeopathy

Research question
• For individuals with ADHD, does homeopathy, compared with no intervention, affect outcomes?
Evidence statement
• One good quality systematic review reported that no conclusions could be drawn from the available 3 small RCTs (746). (Level I) Larger, well-designed trials are needed.
Recommendation
177. There are insufficient research data to recommend the use of homeopathy for the treatment of ADHD. Consumers considering the use of homeopathy should be informed about the uncertainties surrounding its efficacy in treating ADHD. (Grade D)

Background

Homeopathy is based on the principle that "like treats like": substances that are capable of causing specific diseases, and that produce symptoms in a healthy individual, are used to treat the same symptoms when they occur as part of a disease or condition. The goal of treatment is to stimulate the body's own defence mechanisms. Homeopathy is individualised through both diagnosis and treatment

strategies. The active ingredients are given in highly diluted form and for this reason are considered reasonably harmless (747).

Homeopathy has been suggested to be of benefit in a variety of conditions including ADHD.

Summary of research evidence

The research articles identified that address the use of homeopathy for ADHD are primarily case reports. There was a dearth of controlled trials, and no studies addressed the use of homeopathy in adults with ADHD.

A review of three double-blind, placebo-controlled RCTs in children aged 0–19 years who had a diagnosis of ADHD reported that two studies found a benefit from homeopathy compared to placebo, while the third found no differences between the intervention and control groups (746). In one of these trials, adverse events led to the withdrawal of 4 out of 62 participants.

The small numbers of participants in these trials and the varying results mean that at present there is insufficient data to draw a conclusion about the use of homeopathy as a therapy for ADHD. Larger, well-designed trials are needed in all age groups.

11.7 Cerebellar therapies

Research question

- For individuals with ADHD, do cerebellar therapies, compared with no intervention, affect outcomes?

Evidence statement

- One preliminary, uncontrolled study of cerebellar treatment for the management of ADHD has shown some improvement in ADHD symptoms (748). (Level IV)

Recommendations

178. There are insufficient research data to recommend the use of cerebellar therapies for the management of ADHD symptoms. (Grade D)

179. Consumers considering the use of cerebellar therapy should be informed about the uncertainties surrounding its efficacy in treating ADHD, the time required to undertake the treatment and its costs.
✓ *Recommended best practice based on clinical experience and expert opinion*

Background

Cerebellar therapies, such as those used in the Dore Program, aim to stimulate the cerebellum through a series of exercises focused on motor skills. The exercises are conducted for 5–10 minutes each day over an average of 13 months. Cerebellar therapies have been advocated for use as a treatment for a number of conditions including dyslexia and ADHD.

Summary of research evidence

One primary study was found on the use of exercises designed to stimulate the cerebellum in people with ADHD (748). It involved 891 consecutive clients at the Dore Centres in the United Kingdom, 698 aged under 16 years and 193 aged over 16 years. Improvements were reported in inattention and hyperactivity/impulsivity, which appeared to be sustained for 6–12 months after completing the program. No unwanted side effects were reported.

These results, however, must be interpreted with caution. The report was a poster presentation, not a peer-reviewed publication; it lacked a control group; and it did not use objective outcome measures. Further research is required using well-designed RCTs.

Cerebellar therapies are expensive and as such consumers should be aware of the shortcomings in the existing research literature (for review of the Dore Program, see (749)).

11.8 Sport, exercise and relaxation

Research question

- For individuals with ADHD, does participation in sport, exercise or meditation programs, compared with no intervention, affect outcomes?

Evidence statements

- Two small studies show some benefit of yoga in children and adolescents with ADHD (750, 751). (Level IV)
- Two small studies show some benefit of massage therapy in children and adolescents with ADHD (752, 753). (Level IV)
- One small study showed some benefit of tai chi in children and adolescents with ADHD (754). (Level IV)

Recommendations

180. Yoga, massage and tai chi may be of some benefit in treating ADHD. (Grade D)

181. While other sport, exercise and meditation programs may have many mental and physical health benefits, their role in the management of ADHD has yet to be demonstrated.

Background

Exercise, relaxation and meditation programs are increasingly being promoted as a treatment for ADHD. While there is strong evidence for the physical health benefits of exercise, research into its effects on mental health is less common. Recent systematic reviews addressing the impact of physical activity on self-esteem (755) and anxiety and depression (756) demonstrated positive effects. However, both reviews noted the small number of studies and the need for further research.

Summary of research evidence

Five case-series were identified. They addressed the use of yoga (750), yoga meditation (751), massage (752, 753) and tai chi (754) for children and adolescents with ADHD. No trials involving preschool-aged children or adults were identified. No studies evaluating exercise or sport programs were identified.

The three identified studies involved pre- and post-test outcome measures using the Conners' Parent or Teacher Rating Scale, and all showed some evidence of improvement in ADHD symptoms. The methodology of the studies was limited and none of the three involved randomisation or use of controls. No adverse effects were reported.

Further research is required with larger numbers of participants in RCTs.

11.9 Sensory integration interventions

Research question

- For individuals with ADHD, do sensory diets / sensory integration treatments, compared with no intervention, affect outcomes?

Evidence statement

- One preliminary study in children with ADHD reported improvements in ADHD symptoms in 11/20 study participants (275) (Level IV)

Recommendation

182. There are insufficient research data to recommend the use of sensory diets / sensory integration therapies for the treatment of ADHD. Consumers considering the use of sensory diets / sensory integration therapies should be informed about the uncertainties surrounding the efficacy of these programs in treating ADHD. (Grade D)

Background

Sensory integration therapy is an intervention used by occupational therapists for children who have difficulties processing sensory information (see section 5.7 Psychoeducational assessment, page 45). Sensory integration therapies have been widely used among occupational therapists working with children with developmental, learning and behavioural problems (for review see (274)). A recent survey of Australian occupational therapists found that approximately 50% of the surveyed therapists had specific training in sensory integration therapy (757). The content of sensory integration therapies varies as they are generally developed to be specific for each individual child. The term "sensory diet" is sometimes used and this describes a daily program of sensory activities for the child at school and at home.

In general, the efficacy of sensory integration therapies has not been rigorously studied (274, 758). Preliminary data from one well-designed controlled trial suggests sensory integration therapy may be of benefit in treating sensory modulation disorders (758).

Summary of research evidence

One study was identified that utilised occupational therapy with a sensory integration approach for the management of children with ADHD. This small preliminary study of 20 children found improvement in ADHD symptoms in 11 of the 20 participants based on either parent or teacher reports. The study did not include a control group and was not blinded, therefore the results should be interpreted with caution. Further research is required with larger numbers of participants in RCTs.

PART IV: SOCIAL AND ECONOMIC CONSIDERATIONS

CHAPTER 12. THE VOICES OF INDIVIDUALS WITH ADHD

Many people, both adults and children who have ADHD, are as yet undiagnosed and unaware of the real cause of their difficulties. But increasingly, people are learning about the condition, joining support associations and seeking treatment. For many people, this newly found access to knowledge which accurately reflects their own life and experience of the world, enhances their sense of personal freedom and autonomy. Here are some stories provided by members of Australian ADHD support associations.

12.1 Adolescent voices

A group of six Melbourne adolescents participated in a panel discussion about their experiences with friends before and after they were diagnosed with ADHD and tried medication (759). The names of the adolescents have been changed.

Starting treatment

Moderator: What things did you notice when you first started the medication?

Peter: People didn't get so annoyed with me as they used to and it was just a lot easier to get on with people.

Robert: I didn't really notice anything, but other people were saying "You're not being such a little shit".

Jane: I noticed that I got a lot more friends than I'd had, and it helped me to concentrate a bit better.

Craig: I've been getting better grades at school since I've been on medication, and it's been a bit easier for me at home with my Mum as well.

John: I got so many more friends after I started taking medication …

Moderator: Why do you think you had more friends?

John: I wasn't acting stupid.

Robert: My friends all said "Why aren't you being so rebel-ish any more?"

Peter: A lot of people who you thought were your friends were just there to watch you get into trouble. I fell into the mould of doing things to get a laugh out of people, doing stupid things and getting myself into trouble. When that sort of thing stops, you get real friends coming to you.

School

Moderator 1: What aspect do you think the medication helped you most with?

Robert: Schoolwork.

John: Being able to sit down and do ONE thing instead of trying to do half of three million things.

Peter: Not doing stupid things. I just don't feel the need to throw something across the class or flick someone's ear. I don't feel the need any more.

Belinda: You don't feel the need to be the centre of attention any more.

Peter: Yes. Exactly.

Belinda: You feel like you can actually be like everyone else in the classroom and actually do something, and not be there for entertainment's sake.

Peter: It makes you a lot more thoughtful.

Moderator 2: How do you think the medication helps you in the practical day-to-day activities in doing your schoolwork?

John: It works wonders. I've just had a week of almost solid exams and I sat one of those without my tablet. It was a disaster. I just sort of thought "Oh, I can't do that question so I might just draw a little cartoon on the bottom of the page". And you look at it afterwards and you think "My God! What was I doing? Why on earth did I do this?"

Robert: And you get it back and you think "Why did I put that?"

Peter: Yes exactly. And you often overlook really simple things.

Belinda: Or you just keep on reading the same question over and over.

Peter: That's a common one.

Robert: Or you skip questions. You think "I can't be bothered doing that one so I'll go to the next one".

Friends and family

Moderator: How do you feel about yourself, your achievements, about how you get on with your friends and family?

Belinda: The teachers have always said that they don't understand why you're like this, because you've got the ability to do well, but you don't. Now that you're actually getting the grades that they think you should have got, it's so much easier, because they don't think that you're not trying …

Belinda: It's so much easier to be in a situation where you are not always fighting with the teachers all the time. And fighting for them to listen to you because you feel like you haven't done anything wrong.

Peter: You don't have a fear of school any more, like I used to …

Peter: The main thing that you hear from the teachers and that I see on [my] reports all the time is "Not working to his full capacity. Has the potential but … Blah blah blah".

John: If you know what you want to do, it's good, but if you don't know what you want to do and you don't have the concentration to sit down and think about what you want to do, it's a real problem.

Belinda: It opens up a whole new area that you can look at for a career because before [some] areas were too hard to concentrate on like science, but now, it's so much easier.

John: Before: garbo? Afterwards: Um engineer.

12.2 Adult voices

Voice 1

Being diagnosed as an adult with ADHD was the most dramatic and life-changing event and provided an explanation to the difficulties I had experienced since I was a child. My behaviour, poor academic performance and laziness were clustered under two broad headings – environmental problems and, of course, poor parenting. Looking back at this journey I can't help feel that it was so unnecessary and so different had the medical expertise available today been in place then.

Those early school days were filled with educational assessments, tutoring, reading, spelling and mathematics support. The negative impact from these early years on my self-esteem, social development and academic outcomes still create painful and embarrassing memories to this day. It seemed that my mother's efforts were

disproportionate to the outcomes and the criticism and cynicism she received as a parent were unhelpful and unjust.

My journey with ADHD came to an end, or perhaps the beginning, a little over 10 years ago. At that time, after another job change, I found myself facing the reality that I could no longer make excuses for my behaviour. Also my son, who was in Year 3 at the time, had been experiencing a number of learning and behavioural difficulties at school and was subsequently diagnosed with ADHD and medicated.

As I educated myself about my son's condition, read the texts and articles, I found myself leaping from the pages. I wasn't just reading about the condition my son was affected by, but about myself. Whilst I was filled with an enormous sense of relief to finally have a potential explanation for the difficulties I experienced, [there was] a real sense of grief for the life that could have been had I been diagnosed as a child.

I then sought the advice of a specialist in the field of adult ADHD. After a lengthy history and discussion of my behaviours, with input from my wife, a diagnosis was made and medication prescribed. The benefits were almost immediate. Suddenly I could see myself doing the actions that people had commented upon for years. I could now remain focused, complete simple tasks quickly and be less socially and verbally impulsive. My life went from ordinary to good quite quickly, and within two years I was able to describe all aspects of my life as excellent.

My journey to this point has shown me that I had to search out the appropriate professionals, educate myself about the condition and work closely with the people assisting to achieve the best outcome.

Voice 2

What is it like living with ADHD? Every family who has a member with that diagnosis will have a wealth of anecdotes to tell you. One of the compensations of being inflicted with that or Autism, is that those affected do intrinsically "out there" things. It is a bit like gallows humour. I have had to deal with my kids doing things ranging from putting the puppy in the tumble dryer, to putting siblings into the water tank and forgetting about them. Once after I had driven the two hours to Melbourne, I discovered on arrival that one of my offspring had disassembled the entire back seat of the car, removing all of the bolts.

What is living with ADHD? It is eternal vigilance, looking out for the possible dangers and likely impulsive triggers. It is nearly every weekend at the emergency department with fractured limbs and lacerations. It is annoyance at the sanctimonious hand wringers who "tut tut" about using drugs to sedate children. Those who are loudest in the media I suspect are not those who have family members with true ADHD.

We are involved in running a small school for students with medical disorders affecting their schooling. A large percentage of our students have a formal diagnosis of ADHD (using DSM-IV criteria) in addition to their other diagnoses. We provide in our setting as much of the environmental modifications as possible for attentional difficulties. All of our students do yoga, regular physical exercise, work in a small group setting (usually 2–3 in a group, no more than 6–7), use visual learning and computers. I know from personal experience (from the days that they have "forgotten" their tablets) that almost one-third of our group would not be able to attend school and learn anything without their medication.

Do I have ADHD? My son clearly has, but I am (well, relatively speaking) quite functional. One day on impulse, I decided to do the ADHD questionnaire on myself. To my surprise I could tick almost every box for ADHD, save the one that stated that there had to be clear impairment in work or social settings (which begs the question, what is impairment?) To my even greater surprise, when I mentioned this

to a couple of close friends, they were not the slightest bit surprised. They had clearly seen these characteristics.

How much better would I function without these traits? I don't have any learning disabilities, have been lucky enough to have a good memory and no language difficulties. I work in a complex environment, juggling a lot of tasks and making quick decisions about courses of action. On the other hand, perhaps this is a good environment for someone with these traits. Let's think about this. How have I structured my life?

I am a GP. I live in the country and several years ago acquired a second-hand bicycle to try to keep my exercise up (good, sound, preventive health advice). I ride to the hospital for ward rounds, then the clinic, then home for lunch, back to the hospital if there are any emergencies or to home visits and finally home at the end of the day. I have 15 minute appointments. That means every 10 or 15 minutes I get up out of my swivel chair –I really like that swivelling! – walk to the front desk and call the next patient in. I see a large number of people each day, and probably get most of the social contact I need for the day. I am presented with a great variety of problems, from delivering babies to palliative care. I will see anyone that can walk, or be wheeled or carried through the door. I occasionally have medical emergencies that can include absolutely anything whatsoever.

My attention span is well suited to short appointments. If something drags on and is not interesting, I can find my attention wandering, thinking about black holes, where I can get some Wasabi plants for the backyard pool, and what I am having for dinner that night. As you do.

If I go to meetings, or even movies, I find it quite difficult to sit still for the required length of time, frequently recrossing my legs and moving about, until I get thumped by my partner and told to settle down.

I pondered on my bike riding. I don't ride sedately by, enjoying the sunshine. I usually ride flat out, for the couple of kilometres each way. There is no good reason for this, it is just what seems to happen. I thus get about 5 minutes strenuous exercise half a dozen times a day, that breaks up my sedentary existence.

I have staff! Think about that! They organise my appointments, make phone calls for me and rearrange my schedule if needed. If I have a weak spot (well, the most obvious one anyway), it is paperwork. My staff can't do everything, but it would be a hell of a lot worse without them.

Voice 3

I am a 45-year-old mother who was incredibly relieved, even joyful, to be diagnosed this year with ADHD; prior to that my life had been a roller-coaster of anxiety, depression, self-loathing and confusion. It was almost two years ago that I had reached a point when I could no longer function at work because the anxiety had become so overwhelming; my whole body shook and my mind felt like shattering. I stopped work, was prescribed antidepressants and saw a psychologist. Deep down I knew there was a specific cause; that there had always been something intrinsically different about me. But no one recognised the ADHD.

When my son's Kindergarten teacher told me he was bright but often unresponsive, easily distracted and slow to get going, I became concerned. I joined a group of parents with kids like my son and it was here that I had the opportunity to hear a guest speaker talk about ADHD. I had been researching relentlessly for months, scouring the internet and reading a slew of books. It became increasingly evident to me that both my son and I had ADHD.

On the whole, school was a miserable place for me, despite having been identified as gifted in Year 7. I often became so hyper-focused on what I was doing I would block out the world and that constantly got me into trouble. I was constantly late

and I didn't hear the teacher. In fact, teachers often thought I was deliberately ignoring them and that I had an attitude problem. Another issue for me was remembering multi-step verbal instructions. It was simply impossible for me. I would sit there in a panic too scared to ask and watching everyone else for a clue. "Why weren't you listening; you need to learn to listen; pay attention!" the teachers would say ad nauseum. I would literally shutdown and withdraw into myself in an attempt to spare my heart and my head from more than I could bear. I realise now that the memory and hearing problems can be attributed to the "attention deficit", although I know I did pay attention as best that my brain would allow.

Labels don't help. Yet it does make me sad, angry and ashamed that I'm too fearful to tell my son that he has ADHD, or about the meds he's taking, simply because of the ignorance and narrowmindedness of even the highly educated. My battered self-esteem is still a major obstacle and the sense of loss I feel from not knowing until now the essence of my problem still plagues me. The media has stigmatised and sensationalised ADHD to such an extent I doubt I will ever be able to share it with my friends or my family.

Voice 4

I am a 28-year-old woman who was diagnosed with ADHD and medicated almost 2 years ago. I can honestly say that it has astronomically improved my life in all areas of functioning. I came to be diagnosed almost by accident. Working as a health professional I attended a "Law and the Courts" conference and had the opportunity to hear Dr Caroline Stevenson discuss the clinical presentation and nature of adult ADHD. It didn't take long for me to inch to the edge of my seat as I realised that I too actually had ADHD. I had found the answer that I had spent my life searching for!

As a child in primary school, I was a high academic achiever, however I felt different to my peers, as though I didn't fit in and that I was somehow fundamentally flawed. My family and teachers, however, had a very different perception, they saw me as intelligent, caring and capable.

The transition into high school was difficult. I felt overwhelmed and anxious and had significant difficulty sitting through classes and suffered from significant mood swings. I also had difficulty maintaining friendships in school. It was not long before my grades dropped and I soon began avoiding classes and completing assignments. My report cards displayed a common theme that I was not achieving academically to my potential. This caused significant problems at home with my parents. I completed high school feeling like a failure and believed I was of average intelligence.

I then attended university and chose to study within the health profession. Studying an area that I enjoyed, at a smaller university, I began to thrive and maintained a Distinction average. But the anxiety, depression and mood swings still prevailed. Intimate relationships were difficult. After the completion of my Postgraduate thesis the agitation, anxiety and mood swings worsened and I had a major depressive episode. I was admitted to a private psychiatric hospital and had my first contact with a psychiatrist who told me I had rapid cycling bipolar disorder, borderline personality disorder, generalised anxiety disorder, major depression and/or possibly dysthymia. Needless to say this was a very confusing and difficult time. Hospital staff informed me that I was so unwell it was unlikely I would complete my Masters program, nor would I ever handle full-time employment, and that clearly I suffered from severe mental illness.

My admission to hospital allowed me to gain the professional psychiatric assistance I needed; however, I received no answers. I always felt as though something was missing, something wasn't right. Over the years I have tried seven different

antidepressants, mood stabilisers and benzodiazepines. None of these medications provided me with much relief. I also saw a clinical psychologist and a psychotherapist for extended periods of time, but the mood swings and depression never seemed to lift.

I managed to finish my Masters in 4 years with a Distinction average. During this period I also developed a substance dependence, which was a direct result of needing to escape as a coping strategy, in addition to self-medicating – it was the only way at times I could feel relief.

After hearing [a doctor] speak at the conference, I researched adult ADHD and took the information to my psychiatrist. He had no knowledge of adult ADHD and the symptomatology, even though he had worked in drug and alcohol and mental health for years! We trialled Strattera. Within days the results were significant. I felt calmer and was able to finally fall asleep at night, as my mind was no longer racing with scenarios and ideas. My cravings for substances stopped overnight.

Following a second opinion, I then switched to a stimulant medication. I sleep at night, I don't have any feelings of agitation, restlessness or anxiety and I do not experience any significant mood swings. I feel focused and my work performance has improved to such an extent I can now complete the same amount of work in much less time and to a better standard. My social relationships have improved, my self-esteem is good, I no longer have the feeling as though something isn't right. I feel content.

It is difficult at times to live with this disorder, particularly with public misperceptions and myths. It is even difficult to access clinicians for assistance as most professionals are still not trained in adult ADHD, even though it can have such clinically significant impairments on daily functioning. Hopefully "evidence based research" will finally be acknowledged, and through appropriate education and awareness, clinicians and the community can start to support those adults who struggle all day, every day, to live with ADHD.

Voice 5

With ADHD, whether you are medicated or not, it seems to exacerbate your mood. You have high highs and low lows. Many of those who I know have ADHD also have depression. I have had three lots of depression, The last went for about 3 years.

In some ways my ADHD is an advantage. I work in retail, and it helps that I am sociable. I have done well. Sometimes I am too sociable. The kind of work that I do suits my personality. In some ways, I am a perfectionist.

At home, my room is always messy. Everyone who knows me knows that I spread my things everywhere. I broke up with my ex because he couldn't cope with my messiness. There are things that I keep putting off because I can't face them.

I don't blame myself for this. It's just the way that I am.

I've been lucky because I've always had really good people around me. My parents were really supportive. That was a huge thing. I had a really good childhood. My friends are people who are like me. If I forget something, they don't go off at me.

If I had not been medicated, I would never have finished school. I could never concentrate on my work. Before medication, I was always in trouble, e.g. saying stupid things without thinking. After medication, I was offered scholarships to various prestigious schools, and I got a score of 96 in Year 12.

One thing that really worries me is that ADHD seems to be such a dominant trait. My mother had two ADHD children; my brother and me. I really think that my brother was the worst child ever. He used to beat me up. He urinated on my books. He was just nasty. I would hate to end up like my mother, with a kid like that.

Voice 6

I am a male of 47 years. As long as I can remember I have suffered with anxiety and depression. I have spent most of my life in a living hell, not knowing what was wrong. Suicide attempts and failed relationships have made me a bitter person. I saw everything in a negative way and had very low self-esteem and self-worth. When agitated I would stutter and breathe heavily when I talked. I would easily become angry and frustrated, compulsed to say and do things I knew I shouldn't – and emotional to the point of tears. As an older adult I became paranoid, not wishing to leave the house. I found solace in heavy drinking and gambling.

Nothing I tried helped – not GA, not the numerous psychiatrists and psychologists I attended over the years, nor the various antidepressants I tried.

After a recent suicide attempt, I was finally diagnosed ADHD and prescribed stimulant medication. I became a totally different person. The anxiety and depression lifted. My drinking and gambling literally stopped overnight – I no longer had the urge or the reason.

Whilst I am undergoing strategies to manage my ADHD, and counselling to deal with the grieving for 25 lost years of my life; I am now re-building relationships with my ex-wife and my children. At last I can see sun and blue skies … I am the happiest man in the world.

CHAPTER 13. ADHD IN THE WORKPLACE

The symptoms of ADHD can create challenges for the adult in the workplace, just as they do for the child in school. People with ADHD may have difficulties in the workplace with staying focused, attending to details, remaining organised, following through on instructions, forgetfulness, restlessness and scheduling and prioritising tasks (760). Inattention and distractibility can be the most prominent symptoms of ADHD in adults, with hyperactivity and impulsivity tending to decrease with age (161, 162).

In addition, adults with ADHD can display symptoms that are related to executive function deficits in attention, behavioural inhibition and verbal long-term memory (761). They may also have deficits in problem-solving ability and planning (762). All of these executive function problems can have a direct impact on skills and abilities that are important at work.

Adults with ADHD frequently report difficulties in social interactions (198, 222) and in the workplace this may affect relationships with employers or other members of staff. Negative preconceptions about ADHD can also be an issue. In one investigation of the social stigma associated with a diagnosis of ADHD in adulthood the researchers found "a fairly subtle, negative bias toward ADHD that contributes to rejection of individuals with the disorder, particularly in academic and work settings" (763).

Workplace safety is also an issue, with ADHD associated with increased risk of workplace accidents and injuries (764-766).

Research looking directly at how individuals with ADHD function in the workplace has been sparse. One study considering the relationship between ADHD and efficacy in working in teams (767) found that adults with ADHD had lower confidence about their ability to work in teams than their counterparts without ADHD (767). A simulated workplace has been used to compare the work performance of 18 adults with ADHD with 18 without ADHD (768). Most notably, those with ADHD had more difficulty in comprehension and speed while reading in this situation.

It is also clear that individuals with ADHD have poorer educational outcomes than their peers, which may in turn affect the types of work they undertake. Long-term follow-up studies have found that individuals with ADHD, compared to controls, completed less formal schooling (198, 769) (about 2 years less on average (769)) and did less well in class than their peers, with a lower grade point average and class ranking (198).

Similarly, a retrospective study (chart review) of college students found that those with ADHD tended to have significantly lower grade point averages and report more academic problems than students without the disorder (195). Finally, a survey of 500 adults with ADHD and 501 community controls found that those with ADHD were less likely to have graduated from high school (83% graduated compared to 93% of controls) or to have obtained a college degree (19% compared to 26%) (770).

13.1 Employment patterns

Adult ADHD is associated with greater levels of unemployment than control groups (196-198). It may also influence patterns of employment.

Individuals with ADHD prefer, and may be better suited to, certain professions, particularly those that permit self-employment or autonomy in work. Preliminary information from a survey of 1,463 US workers using the Adult-Self-Report Scale (ASRS) suggested that individuals with symptomatic ADHD were more likely to be

employed in non-office-based occupations such as tradespeople (plumbers, carpenters, electricians, gardeners, etc.) entertainers (comedians, actors, musicians) and elected officials. Office, bank and retail store clerks were least likely of all the surveyed occupations to show behaviour consistent with Adult ADHD (771). A long-term follow-up study of children with ADHD found that, at average age 24 years, those with ADHD had lower ranking occupational positions than controls, and were more often self-employed (769).

Recently, the prevalence of ADHD amongst workers was found to be 3.5% in a survey of 7,075 18–44-year-olds in paid or self-employment conducted across 10 countries from North and South America, Europe and the Middle East, as part of the WHO World Mental Health Survey Initiative (199). ADHD was less common among professionals (1.7%) than other workers: white collar technical (5.8%), service (2.9%), and blue collar (4%).

People with ADHD are more likely to have been through a rapid turnover of jobs, either as the result of dismissal or through a persistent need for change. A study of 30 adults with ADHD found them more likely than controls to have taken on many different types of occupations, rather than developing a career in a single occupation (772).

Similarly, a survey of 500 adults with ADHD and 501 community controls found that those with ADHD had more job changes over the preceding 10 years (mean of 5.4 jobs compared to 3.4 for controls) (770). Long-term follow-up of children diagnosed as hyperactive (198) found that, compared to controls, these adults had been fired from more jobs and showed greater levels of employer-rated symptoms of ADHD and ODD and lower job performance (198). A significant predictor of being fired was employer-rated ADHD and self-rated ODD in the workplace.

An Australian qualitative study of 10 adults with ADHD provides a more detailed picture (200). All participants recalled changing employment frequently, one reporting 20 different jobs, while another had more jobs than "he could remember". With poor school performance and/or leaving school early, many had started with low-skilled work. Boredom was a common reason for moving from job to job, and often the participants had moved to a new town with each new job, "in search of excitement". Other jobs were lost when the person was fired. Reasons for being fired included a lack of organisational skills, "rushing through the work and mucking it up", "over-focusing on unimportant aspects" of the job and not meeting deadlines, and "personality clashes".

13.2 Work performance

Adult ADHD is associated with significant deficits in work performance compared to control groups (196-198).

The WHO World Mental Health (WMH) Survey Initiative discussed above found that ADHD was associated with an average annual reduction in work quantity (21.7 excess days) and quality (13.6 excess days) compared to workers without ADHD (199). The researchers estimated 143.8 million lost days of productivity associated with ADHD each year in the surveyed countries. This study also considered treatment, and only a small minority of workers reported having been treated for ADHD (199). Only in the Netherlands (2.7%) and the USA (12.6%) did those with ADHD report receiving treatment specifically for ADHD, although treatment for other emotional problems did occur in other countries (199).

A US nationally representative household survey, with follow-up interviews (196), found that 4.2% of US workers had ADHD. ADHD was associated with an average of 35 days lost performance per worker with ADHD per year (a mix of absenteeism and low performance while at work). Figures varied across different employment groups, with 55.8 days for blue collar workers, 32.6 for service workers, 19.8 days

for technical workers, and 12.2 days for professionals. Notably, this study did not find a difference in the prevalence of ADHD between males and females. This was most likely due to a significant association between ADHD and unemployment in men but not women (196).

A survey in a large manufacturing firm found an ADHD prevalence of 1.9% (766). ADHD was associated with a 4–5% reduction in work performance, with twice as many sickness absence and workplace accidents and injuries in the ADHD group. Productivity losses were attributed to low on-the-job performance rather than sickness absence.

Analysis of medical claims databases for a large national US manufacturing company found a higher rate of work loss (773) and accidents (764) in individuals with ADHD.

Barkley et al's (198) long-term follow-up of children diagnosed as hyperactive demonstrated a link between work performance and severity of ADHD, with employer-rated ADHD and parent-rated severity of childhood hyperactivity predicting lower work performance ratings from employers (even after controlling for workplace ODD, childhood conduct problems, lifetime CD, and IQ) (198).

The study also considered the impact of ADHD on personal financial issues (198). The hyperactive group did not differ from controls in their annual income or total savings; however, they owed twice as much to other people and reported having more difficulty saving to pay their bills.

13.3 Workplace solutions

13.3.1 Interventions and strategies

To date no research has been conducted to assess directly the impact of the treatment of ADHD on absences, work performance or workplace injuries. There is, however, evidence to suggest that ADHD medication improves executive functioning in adults with ADHD (774-776).

There is also sparse research on workplace-based interventions that may assist individuals with ADHD. It has been suggested that mentoring early in a person's career may help the individual with ADHD fare better in the workplace (777).

The Australian Government JobAccess website offers workplace adjustments and solutions for individuals with ADHD that may be useful to both the person with ADHD and their employer. The website provides solutions and adjustments for the following job requirements:

- attention and memory
- active listening
- focusing attention
- learning and applying knowledge
- managing emotions at work
- organisation and planning
- problem solving and decision making.

Available at: http://www.jobaccess.gov.au/JOAC/Advice/Disability/Attention_Deficit_Hyperac.htm

The high prevalence of ADHD in the workplace and the associated losses in work performance have led to suggestions that ADHD could be targeted for workplace screening and treatment programs (199). The cost-effectiveness of such programs

has not been determined and caution is warranted as workers with ADHD should not be stigmatised.

13.3.2 Vocational assessment

Recommendation
183. Career and workplace assessments are often valuable in assisting adults with ADHD in their selection of career or workplace function. ✓ *Recommended best practice based on clinical experience and expert opinion*

It is important that clinicians and career consultants have knowledge and training in how to help adults with ADHD select careers or jobs (760).

Career choice needs to match the person's strengths, weaknesses, ADHD tendencies and co-existing conditions. In particular, people with ADHD will have different degrees of symptom severity and varying functional limitations.

Career and workplace assessments may be of benefit to assist people with ADHD to determine the types of employment to which they are best suited. In adults with ADHD, neuropsychological testing may be helpful to generate a profile of the person's particular impairments/deficits and strengths, to inform career choice.

Vocational assessment should be individualised and may include one or more of the following (760):

- clinical interview to take a work history and assess current workplace functioning
- neurocognitive testing to measure strengths and weaknesses
- psychological testing to evaluate comorbid psychiatric conditions
- personality testing to assess temperament and values related to career
- interest testing to assess appropriateness of fit between career choice and interests.

A key concern is workplace safety, given the link between ADHD and increased risk of workplace accidents and injuries (764). In a recent study of male college students, those with ADHD reported placing less emphasis on job safety, compared to their peers, when considering their professional direction (778). This suggests that it might be of benefit to individuals with ADHD if vocational counsellors broached the topic of work safety when discussing vocational choice (778).

In Australia, there are several employment agencies that provide specialist assistance to individuals with ADHD. ADHD support groups from each State and Territory can provide details (see Appendix I, for contact details).

13.4 Workplace discrimination

In Australia, the *Disability Discrimination Act 1992* (Cth) covers:

- recruitment
- terms and conditions of employment
- opportunities for promotion, transfer or training
- other benefits associated with employment
- termination of employment.

See: http://www.humanrights.gov.au/index.htm

CHAPTER 14. ADHD AND DRIVING

14.1 Obtaining a driver's or pilot's licence

Having ADHD is not a contraindication to holding a driver's licence in Australia. Drivers' licences are not required to note a diagnosis of ADHD, nor that a person is receiving stimulant therapy (or any other legally prescribed psychoactive therapy) (779).

National medical assessment guidelines warn that stimulants taken in high doses may increase aggressiveness and risk taking, and people on such medications should be cautioned accordingly (779). However, stimulants in the doses prescribed for ADHD do not pose a problem.

People with a diagnosis of ADHD who wish to gain a pilot's licence are required to have a thorough assessment by a psychiatrist. Applicants will not be eligible for a pilot's licence if they are found to have persistent cognitive deficits or any behavioural aberrancy, or to require regular stimulants for their ADHD (780).

14.2 ADHD and driving ability, accident rates and traffic violations

Studies considering the impact of ADHD on driving performance demonstrate that individuals with ADHD (compared to individuals without ADHD) are at greater risk of adverse driving outcomes such as greater numbers of traffic infringements, more frequent and more severe crashes, and an increased likelihood of having a licence suspended or revoked (for review see (17, 201)). This increased risk has been found in both longitudinal studies of adolescents and young adults diagnosed with ADHD in childhood and studies of clinically referred adults with current symptoms of ADHD.

Inattention, risk taking and distractibility, particularly in-vehicle distraction, are frequent contributors to traffic accidents. Accordingly, executive functioning deficits that contribute to inattention and impulsivity have been suggested to contribute to the poor driving outcomes in individuals with ADHD (17).

14.3 Effect of treatment on driving ability in people with ADHD

Research question

- For individuals with ADHD, does the use of interventions (pharmacological, psychosocial or other), compared with no intervention, improve driving performance?

Evidence statements

- **MPH:** Two systematic reviews (five small studies) reported that treatment with MPH, compared to placebo, in adolescents and adults significantly improved driving performance in simulated driving exercises (17, 201). (Level III-2)
- **ATX:** One study found that treatment with ATX, compared to placebo, in adults improved self ratings of driving performance but not observer rating or test score in simulated driving exercises (781). (Level II)
- **Non-medication intervention:** One small study found that use of a manual transmission compared to an automatic transmission in adolescents improved driving performance in simulated driving exercises (782). (Level II)

Recommendations

184. People with ADHD should be strongly advised to take their stimulant medication if they are driving. Treatment with MPH improves driving performance for people with ADHD. The use of extended-release stimulants is preferable if the person drives at night. (Grade C)
185. There are insufficient research data to recommend the use of ATX for the improvement of driving performance in individuals with ADHD. (Grade D)
186. The use of a manual transmission over an automatic transmission should be considered for individuals with ADHD. (Grade C)

14.3.1 Summary of research evidence

Two systematic reviews addressed the impact of MPH on driving performance in adolescents and adults with ADHD (17, 201).

Five small RCTs were considered. Four of the five used a virtual reality driving simulator and one used on-road testing. MPH was found to improve driver performance on driving simulator tests in all studies. Further studies are needed to support these outcomes, especially with larger sample sizes.

One of the studies on MPH included in the systematic reviews found that driving performance worsened later in the day when MPH-IR was used (783). This contrasted with MPH-ER, where performance was improved at all driving test time points throughout the day (783).

One small crossover trial compared treatment with ATX to placebo in adults and reported improved self ratings of driving performance but not observer rating or test score in simulated driving exercises (781).

One study was identified that considered the use of a manual transmission compared to an automatic transmission in adolescents with ADHD. Improved driving performance was seen when using a manual transmission in simulated driving exercises (782).

14.4 Legal issues regarding driving and medications

In most States and Territories in Australia, roadside drug testing has been, or soon will be, introduced. These roadside screening tests are limited to detecting three substances in saliva: tetrahydrocannabinol (TCH), methamphetamine (speed) and MDMA (ecstasy). The potential problem of identifying psychoactive substances that have been prescribed for therapeutic use (including stimulants) has been recognised, and testing will not detect the presence of prescription medications for ADHD.

CHAPTER 15. ISSUES FOR FAMILIES, PARENTS AND CARERS

When a child, adolescent or adult has ADHD, the impact of the disorder may be felt by every member of the family. In addition, the high heritability of ADHD means that a number of family members may have the disorder. Many studies have investigated the psychosocial impact on families of children and adolescents with ADHD. ADHD in children may have a substantial impact on parents/caregivers and siblings, in addition to its impact on the child with the disorder. Children with ADHD experience significant difficulty in their relationships with peers (186), so it is not surprising that these children will also have problems in relationships with family members. The impact of adult ADHD on family function and parenting has also been investigated, and here too the effects tend to be negative, with impacts on relationships with spouses/partners and children. It is also important to consider the special needs of children and adolescents with ADHD in out-of-home care.

a. Families with a child or adolescent with ADHD

Recommendations

187. Clinicians should be alert to the risk of depression in parents/caregivers of children or adolescents with ADHD. Parents/caregivers may need referral for support and treatment.
✓ *Recommended best practice based on clinical experience and expert opinion*

188. When a child or adolescent is diagnosed with ADHD, the clinician should consider the impact of marital discord on the child or adolescent over and above the effects of the ADHD, as ADHD may exacerbate underlying family tensions.
✓ *Recommended best practice based on clinical experience and expert opinion*

189. Consideration should be given to the siblings of children with ADHD. Siblings may need additional support at school if there is an expectation that they care for their sibling with ADHD or if they become the focus of peer ridicule because of the behaviour of their sibling with ADHD.
✓ *Recommended best practice based on clinical experience and expert opinion*

15.1.1 Family functioning

Much of the research on families with a child or adolescent with ADHD has addressed the wellbeing of individual family members and specific interactions within the family, such as mother–child interactions, and the impact on the parents/caregivers. Fewer studies have investigated the overall functioning of families with a child with ADHD and the impact of the disorder on the entire family system.

Overall, the research in this field consistently shows that families with a child or adolescent with ADHD experience considerable discord and greater deficits in family functioning than controls.

One of the few studies to look at family functioning in a community sample found higher levels of family dysfunction in families with children with ADHD compared to families with children without the disorder (784). An increase in the severity of ADHD symptoms was directly associated with higher levels of family dysfunction, even after controlling for the presence of comorbid disorders (784).

There are similar findings from clinic-referred samples of children and adolescents with ADHD (175, 785-787). For example, families with a child with ADHD were found to have less adaptive coping styles, more problematic relationships and increased levels of family dysfunction compared to controls (175). Other studies have suggested that families with a child with ADHD have lower family coherence

(i.e. poor co-operation) and experience greater conflict than controls (788, 789). These families had specific deficits in problem solving, communication, affective responsiveness and involvement (788).

Studies finding an increased rate of family dysfunction have primarily been conducted with male children with ADHD. One study that examined reports of family functioning in families with girls with ADHD found similar patterns to those for families of boys with ADHD (785). Compared to controls, the girls with ADHD were more likely to report greater disruption in their family environment (785).

Studies of family functioning have largely compared families with a child with ADHD to families with non-affected children. Little is known about the relative effects on family functioning of having a child with ADHD compared to a child with another mental health difficulty. In the first study of its type, researchers explored family functioning in families with a child with ADHD, families with a child with emotional disorders (mood and anxiety) and control families (790). No significant differences were found between families with a child with ADHD compared to families with a child with emotional disorders; however, both of these groups reported significant deficits in family functioning compared to control families (790). These families reported higher levels of stress and lower levels of social support and quality of life compared to families with non-affected children (790). Families with a child with ADHD are also at greater risk of family adversity (396, 784, 791, 792). One study found significantly more family adversity in families with a child with ADHD compared to controls, and significantly higher adversity in children with the combined subtype compared to the inattentive subtype, even after controlling for comorbid ODD and CD (396). Family adversity was associated with socio-economic status, parental psychopathology (maternal and paternal), marital conflict and stressful events (396). These findings are particularly important as family adversity has been shown to predict ADHD diagnosis and persistence in a longitudinal sample of children at a 4-year follow-up (793).

Financial impact on families

The financial cost of raising a child or adolescent with ADHD is an important issue for many families. It has been consistently documented that there are higher medical costs for children with ADHD than children without the disorder (794-798). Estimates of exact costs vary considerably across studies depending on the types of services included and whether services related to the treatment of comorbid disorders are included (798). A recent review of studies of the economic impact of ADHD in children and adolescents estimated that the average annual cost of ADHD treatment and medical services was approximately $2,636 (798). When costs related to parental work loss, juvenile delinquency and education were considered, the average annual cost rose to $14,576 (798).

In addition to the costs directly related to the child with ADHD, family members also have significantly higher costs associated with medical care and work loss, compared to family members with children without the disorder ($2,728 versus $1,440) (773). It is unclear whether these large differences in cost are due to the increased pressures of having a child with ADHD in the family, or to the familial link between ADHD and other disorders.

The financial cost of having a child or adolescent with ADHD has yet to be explored in an Australian sample. An important Australian study of the use of health- and school-based services in a national sample of children and adolescents with ADHD found that 28.1% of the children with ADHD had attended a health- or school-based service in the previous 6 months (234). They were also more likely to have attended a health-based service (22.6%) than a school-based service (17.1%), although this difference was non-significant (234). They frequently attended paediatricians and family doctors, and counselling was the service most often used by children with ADHD in schools and in health services. Children with the combined

subtype of ADHD were significantly more likely to attend services than children with the predominantly inattention or predominantly hyperactive/impulsive subtype of ADHD (234). This is consistent with other research that suggests children with ADHD combined type experience greater difficulties than children with the other subtypes, and commonly present to clinic-based services.

15.1.2 Parent–child interactions

Many studies have explored the patterns of interaction between parents and children with ADHD. These studies have consistently identified greater adversity and more difficulties in the style of interaction than experienced by parents and non-affected children (e.g. (175, 799-801)). Most of this research has focused on mother–child interactions, but a growing number of studies have considered the important role of fathers (800, 802-804).

An early study (805) observed the interactions of unaffected and hyperactive children with their mothers in both structured tasks and free play. Mothers of hyperactive children spent significantly more time attempting to direct, control and structure their child's play in both settings. Other studies also suggest that mothers of children with ADHD are more directive (804, 806), more negative (175, 807) and less responsive to child-initiated interactions compared with mothers from control samples (806, 808).

While similar patterns have been observed for fathers of children with ADHD (804), several studies have reported minor differences. Fathers were found to make fewer demands than mothers in dyadic interactions and increase their demands during interactions with the mother and child (802). Mothers of children with ADHD see themselves as more likely than fathers to give in to child misbehaviour, with less efficient coping methods to anticipate and avoid problems during interactions with their child (808).

Several studies have explored the behaviour of the child with ADHD in mother–child interactions during free play and structured tasks. Compared to controls, children with ADHD were found to be more negative (799, 804, 809), less compliant (175, 802, 810) and more competitive (799, 804). Research has also found increased conflict in the interactions between mothers and children with ADHD (787, 799), and one study found a link between this conflict and the number of ADHD symptoms in the child (787).

Impact of comorbidity

It is unclear whether the difficulties in parent–child interactions can be attributed to ADHD symptomatology alone. A number of studies have considered the potential role of comorbid externalising disorders such as ODD or CD. When compared to non-affected controls, parent–child interactions in ADHD-only groups, comorbid ADHD-ODD groups (803) and comorbid ADHD-CD groups (811) are more negative and have more non-compliant child behaviours. Reports from studies addressing whether these difficulties are related to ADHD, comorbid externalising disorders or a combination of the two are conflicting.

Some studies have suggested that difficulties in parent–child interactions are more commonly associated with comorbid ADHD-ODD and ADHD-CD than with ADHD alone (803, 811).

In contrast, one recent study found that while there was significantly less warmth, engagement and communication in interactions between parents and children with ADHD during problem-solving tasks, the presence or absence of a comorbid externalising disorder had no significant impact on these interactions (800).

There is also evidence to suggest that externalising and internalising disorders in combination may lead to additional difficulties in parent–child interactions. In one

study, mothers of children with comorbid externalising/internalising problems displayed less warmth and were more hostile and controlling than mothers of children with pure externalising difficulties (812). In addition, children with comorbid problems were more hostile and non-compliant during interactions with their mothers (812).

Other research suggests that symptoms of ADHD may be less important than those of related externalising disorders in certain domains of interaction. One recent study investigated the interactions between mothers and children with ADHD, ADHD plus ODD, and controls without ADHD or ODD (813). Mothers of children with ADHD plus ODD were less responsive and more over-reactive than mothers of control children without ADHD or ODD (813). However, mothers of children with ADHD only were not significantly more responsive than mothers of children with ADHD plus ODD nor significantly less responsive than mothers of control children. These findings suggest that ODD symptoms may be a greater predictor of maternal responsiveness and over-reactivity than ADHD symptoms. Similarly, maternal responsiveness in parent–child interactions has been reported to be the result of the child's CD symptomatology rather than symptoms of ADHD (814).

The heterogeneous outcomes observed in studies addressing whether difficulties in parent–child interaction are related to ADHD, externalising disorders or a combination of the two may be explained by factors such as symptom severity and differences in study design. Several studies suggest that problems in parent–child interactions may in fact be due to increased symptomatology rather than categorical diagnoses (787, 800). It has also been suggested that the quality of parent–child interactions is influenced by the type of interaction being observed. When compared with problem-solving tasks, sessions of game playing have been associated with more positive interactions between parents and children, irrespective of whether the child had ADHD only or ADHD plus a comorbid externalising disorder (307).

15.1.3 Impact on parents/caregivers

The impact of caring for a child with ADHD on the mental health and wellbeing of parents/caregivers is well documented. It has repeatedly been reported that the often adverse behaviours demonstrated by children with ADHD result in increased levels of stress, low parenting self-efficacy, low self-esteem, marital discord and depression in parents. The majority of studies have focused on the impact on mothers, but the few studies examining the impact of ADHD on fathers are just as important.

Parental stress

Parents of children diagnosed with ADHD frequently experience elevated stress in their parenting role (807, 815-819). It has been suggested that the high levels of stress are due, at least in part, to the increased care-taking demands on these parents (805).

Parents often see the behaviours associated with ADHD (hyperactivity/impulsivity, difficulty in sustaining attention) as both disruptive and annoying, and this may add to their stress levels. A study of 40 mothers of hyperactive children found that their levels of stress were significantly higher than those of mothers of non-affected children (820). Child characteristics such as distractibility and degree of bother accounted for over 74% of the variance between the groups (820).

In a study looking at both maternal and paternal parenting stress, 20 sets of parents and children with ADHD were compared (817). Mothers identified their child with ADHD as more stressful than did fathers; however, although this difference was significant, it was minimal and accounted for only a small proportion of the variance (817). The researcher concluded that fathers and mothers of children with

ADHD experienced comparable levels of parenting stress, but mothers were more likely to perceive child characteristics as more stressful (817). The study had no control group, so it is unclear whether this self-reported stress would differ significantly from that experienced by parents with non-affected children.

Both maternal psychopathology and child oppositional-defiant behaviour have been shown to be significant predictors of parenting stress for parents of children with ADHD (815). Other factors, such as ADHD severity, child health status and maternal health status were found to be less important (815). Similarly, parent stress has been significantly associated with maternal depression and severity of child psychopathology (aggression, conduct problems, hyperactivity) (818). The level of parenting stress has also been shown to be associated with the severity of the child's behavioural disturbance, and the level of control that parents perceived themselves as having over the child's behaviour (821).

Parenting self-efficacy and self-esteem

Parenting self-efficacy has been defined as "an estimation of the degree to which parents perceive themselves as capable of the varied tasks associated with this highly demanding role" (822). Parents who have high parenting self-efficacy are better equipped to deal with the behaviours often associated with children diagnosed with ADHD (823). A study involving 100 mothers and 57 fathers found that parents of children with ADHD reported low parenting efficacy, which was further associated with poorer treatment outcomes for children with ADHD (823). Mothers reported lower parenting efficacy than fathers (823).

The same study also found low levels of self-esteem in both mothers and fathers of children with ADHD, with maternal self-esteem being lower than paternal self-esteem (823). Parents with low self-esteem were inclined to reduce their effective participation in treatments designed to assist their children (823).

An earlier study found that parents of hyperactive children saw themselves as significantly less knowledgeable and skilled than parents of children unaffected by hyperactivity. They also reported that they gained less sense of value and comfort from their parenting roles than the parents of unaffected children (820).

Parental depression

Several studies have identified a possible genetic link between ADHD and major depressive disorders through examining children with ADHD and their first-degree relatives (824, 825). In a study of 73 ADHD probands and 264 of their first-degree relatives, and a control sample of 26 probands and 92 relatives, 33% of the ADHD probands had a major affective disorder (bipolar disorder, major depressive disorder, or dysthymia), compared to 4% of controls. Major depression was the most prominent affective disorder, with 21% of ADHD probands meeting diagnostic criteria. In addition, the first-degree relatives of probands with ADHD were at greater risk of having any affective disorder than the relatives of the control group (825). Similar results were obtained in a subsequent follow-up study (824).

Marital discord

Within the literature investigating the marital relationships of parents of children with ADHD, the majority of studies suggest an association between ADHD and marital discord. In these studies, parents of children with ADHD report less marital satisfaction and increased levels of conflict, compared to parents of non-affected children (799, 801, 816, 826, 827). However, there are exceptions and some studies have found no significant difference in marital discord between parents of children with ADHD and parents of controls (807, 828, 829). Rates of divorce and separation are also not consistently higher in families of children with ADHD than in families with unaffected children (786, 807, 829).

15.1.4 Siblings of children with ADHD

Research on the siblings of children with ADHD and their relationship with their brother or sister with ADHD is limited, although interest in this area is expanding. Increasingly, texts are highlighting the importance of considering the potential impact of ADHD on non-affected siblings (830, 831), and several studies have investigated the neuropsychological and psychosocial consequences of having a sibling with ADHD. Research in this area is particularly important as the sibling relationship is potentially the longest lasting of all relationships (832) and is known to facilitate childhood social development (833).

Sibling characteristics

Several early studies examined the intellectual functioning and the prevalence of developmental disorders in biological siblings of children with ADHD. One study found that while non-affected siblings of children with ADHD had greater intellectual impairment and school failure than a control sample, these differences were not significant (183). Both ADHD and learning disorders were also found to be more prevalent in siblings of children with ADHD, compared to siblings of children with Down syndrome (834) and normal controls (824, 835, 836).

The search for endophenotypes to determine specific genetic links that contribute to ADHD has led many researchers to investigate the neuropsychological functioning of children with ADHD and their non-affected siblings. As siblings share much of their genetic make-up, it is thought that siblings of a person with ADHD may share some of the genes that predispose individuals to ADHD, though they do not develop the disorder. One study investigated measures of attention, memory and executive functioning in siblings (with and without ADHD) of children with ADHD and siblings of children without ADHD (837). Results showed a similar pattern of neuropsychological functioning in unaffected siblings of children with ADHD and the siblings of control children, suggesting that some neuropsychological deficits in siblings are primarily associated with ADHD status (837). The exception was verbal learning, where siblings of children with ADHD were significantly more impaired than those in the control group (837).

Studies have also found similar patterns of impairment on measures of response inhibition for ADHD probands and non-affected siblings (838, 839). Most recently, a study of neuropsychological deficits associated with ADHD looked at a sample of non-identical twins of whom one had ADHD, and control twins with no ADHD (840). Those without ADHD themselves but with a twin with ADHD showed impairment on many of the same measures as their co-twin with ADHD (e.g. measures of executive function, processing speed and response variability) (840). As twins with ADHD and their non-affected co-twins were both significantly more impaired than controls, these findings suggest that measures of executive functioning, processing speed and response variability may be significant endophenotypes in characterising ADHD.

Differences between mother–child interaction with a child with ADHD and with a non-affected sibling have also been investigated. In one such study, boys with hyperactivity showed more conflicting behaviours associated with parental requests compared to their non-affected siblings, and had more severe behaviour management problems in both free play and structured settings (810).

Sibling relationships and the impact of having a brother or sister with ADHD

A recent study investigated sibling relationships among children with ADHD and children in a control sample (841). The study compared reports from three informants (mother, child with ADHD, and sibling), and considered the potential influence of comorbid internalising and externalising problems (841). Findings

suggest greater conflict in sibling relationships of children with ADHD compared to controls, with mothers and children reporting similar amounts of conflict in the sibling relationship. While no significant differences were found between the groups in warmth/closeness, mothers reported more warmth/closeness in the sibling relationship than children with ADHD. Comorbid internalising and externalising problems both predicted less warmth/closeness, and externalising problems were associated with higher levels of conflict in the sibling relationship (841). Comorbid internalising and externalising behaviours accounted for many of the difficulties in the sibling relationships, highlighting the importance of considering the potential influence of comorbidity.

The severity of behavioural symptoms in children with ADHD was associated with the level of conflict in their relationship with siblings (787). Furthermore, younger siblings developed significant active coping strategies due to their frequent responsibilities in caretaking for their sibling with ADHD. In another study, mothers of children with ADHD reported less warmth/closeness, fewer intimate relationships and more arguments within the sibling relationship, compared to the reports of mothers of non-affected siblings (842). Compared to controls, siblings of children with ADHD in this study were seen as having increased feelings of resentment towards their ADHD brother or sister (842).

These studies have built on Kendall's qualitative research (843), which was the first published study to investigate the experiences of siblings of a child (in this study, a brother) with ADHD and to examine the impact of the disorder on their lifestyle and relationship with their sibling. The study found disruption to be the major complaint of non-ADHD siblings, due to the symptoms and externalising behaviours of the child with ADHD (843). Siblings experienced disruption in three ways: victimisation, caretaking, and sorrow/loss. They reported feeling victimised by their sibling with ADHD through "… overt acts of physical violence, verbal aggression, and manipulation and control" (843). Siblings were expected by parents to look after and to protect their brother with ADHD, and because of this the majority viewed negatively the responsibility of caring for their brother with ADHD. Non-ADHD siblings reported anxiousness, worry and sorrow due to the absence of a normal family environment (843).

Kendall et al (843) also reported that parents often overlooked or minimised the disruption felt by siblings of a child with ADHD. Non-ADHD siblings described not obtaining help from parents when they were experiencing difficulty, and often being ignored and distrusted. They managed disruption in one of three ways: retaliatory aggression, accommodation, or avoidance (843).

A study of internalising symptoms in twins and non-twin siblings of children with ADHD found that, overall, twins with ADHD were more impaired than non-twin siblings (844). Non-ADHD twins who had a twin with ADHD combined subtype showed increased symptoms of both generalised anxiety and separation anxiety compared to controls (844). Generalised anxiety was also high for non-ADHD twins whose twin had ADHD-predominantly inattentive type.

In a recent qualitative study (830) siblings reported that the child with ADHD was responsible for creating considerable discord within the family, with disruption often created by extreme moodiness, verbal abuse, intimidation and physical violence. Siblings reported multiple episodes of disruption that would escalate and cause significant discord in family relationships (830).

Annoyance and resentment were the feelings most commonly reported by siblings when speaking of their interactions and relationship with their brother or sister with ADHD (830). There are a number of reasons for these feelings: the child with ADHD exerting control over the family, parents giving in to the child, parents being lenient towards the child, perceived violations of trust, and the child with ADHD embarrassing the sibling in front of his or her peers (830). Siblings reported various

coping strategies to manage their feelings and reduce tension and discord: talking to their mothers if they wanted information about ADHD or advice on coping with the disruptive behaviour; reflecting on the experiences of other family members; avoiding situations where conflict was likely; trying to persuade their sibling with ADHD to comply with parental requests; and feigning compliance with parental demands (830).

Overall, findings from both quantitative and qualitative studies are consistent and suggest that siblings of children with ADHD experience more difficulties than controls and have more problems in their sibling relationships. The consistency of these findings is notable, as some studies relied on reports from the mother and some from the child, and consistent reporting by children and parents is unusual (845). Nevertheless, more research is needed to obtain a complete picture of the experience of siblings of children with ADHD. For example, only one study to date (841) has considered whether results may be attributable to comorbid disorders, and differences between ADHD subtypes are yet to be explored.

15.2 Adult ADHD and its impact on the family

Recommendations

190. Treatment planning for adults with ADHD needs to include strategies for daily living and additional support during life transitions such as changes in career or family situation.
✓*Recommended best practice based on clinical experience and expert opinion*

191. Treatment planning for children with ADHD needs to take into account whether the parent/caregiver has symptoms of ADHD, as parents/caregivers with ADHD symptoms may need additional support to implement the program with their child successfully.
✓*Recommended best practice based on clinical experience and expert opinion*

192. When an adult is diagnosed with ADHD, the clinician should consider the impact on their partner and family as additional support may be needed.
✓*Recommended best practice based on clinical experience and expert opinion*

15.2.1 Adult ADHD and relationships

The difficulties in peer relationship and family functioning that often affect children and adolescents with ADHD frequently extend into adulthood and may continue regardless of age or role (parent or child).

In a longitudinal study that followed individuals with ADHD over 13 years, young adults (aged 19–25 years) reported having fewer friends and more difficulty in keeping friends than controls. Their current dating relationships were of lower quality, and they were more likely than controls to report arguments with friends (222).

Adults with ADHD also report higher rates of separation and divorce (154, 223). In an exploration of marital and family functioning (224), adults with ADHD reported poorer marital adjustment and more family dysfunction than controls. There were no significant differences for their spouses, compared to controls, on overall marital adjustment and family functioning, but marital adjustment scores were more impaired for spouses of people with ADHD. Compared to their spouses, adults with ADHD had a more negative view of the health of their marriages and families.

15.2.2 Adult ADHD and parenting

Parenting by individuals with ADHD is a relatively new area of research, and one that is important given the high heritability of ADHD.

Parents with ADHD may face problems in parenting effectively due to their own difficulties paying attention, being organised and/or managing their own impulsive and distractible behaviour.

A review of the clinical implications of ADHD in parents of a child with ADHD has drawn attention to some of the possible negative and positive attributes of parents with ADHD (846). Adults with ADHD may have difficulty maintaining attention while supervising children and difficulty in concentrating on their child's actions and behaviour. They may also find it difficult to defuse a volatile situation and calm the child down, as they may over-react and escalate the situation (846).

One study of parenting a child with ADHD found that mothers with ADHD themselves monitored their child's behaviour significantly less than mothers without the disorder (847). They were also less efficient in disciplining their child and more impaired in identifying strategies for effective child rearing (847).

Parents with ADHD may also have limited confidence in their parenting abilities. Mothers with high levels of ADHD report lower parenting self-esteem, a more external parenting locus of control and less effective disciplinary styles, compared to mothers with fewer ADHD symptoms (848).

Harvey et al (849) investigated the association between parental ADHD symptomatology and parent–child behaviour among 46 mothers and 26 fathers of children with ADHD. Mothers and fathers with symptoms of inattention, and fathers with symptoms of impulsivity, were more likely to report lax parenting, both before and after parenting programs, and fathers with symptoms of impulsivity were also more likely to report being over-reactive with their child (849). Mothers who reported the most inattention were most negative in their interactions with their child.

Research has also demonstrated how having ADHD may help a parent to understand their child with ADHD. A study that explored whether the similarity between mothers and children with ADHD would help or hinder parenting found that maternal ADHD symptoms appeared to ameliorate the negative effects of child ADHD symptoms on parenting (850). In addition, when mothers and children both had high levels of ADHD symptoms, the mother's response to the child was significantly more positive and affectionate (850).

One critical aspect of parenting children with ADHD is the role of parents in the treatment of the child's ADHD. For parents with ADHD themselves this may pose several difficulties. Problems with following instructions, listening and completing tasks may affect the ability of parents with ADHD to adhere to their child's treatment program, or to participate in parenting programs (846). In addition, a study of parenting programs for preschoolers with ADHD found that maternal ADHD symptoms limited the improvement shown by children with ADHD (851). This study highlights the importance of treatment for parents with ADHD who are participating in treatments for their children with ADHD.

At the same time, parents with ADHD may act as a positive role model for a child with ADHD, showing insight into ADHD symptoms, being available to provide information, modelling coping strategies and being involved in a treatment program themselves (846).

15.3 Children and adolescents with ADHD in out-of-home care

Recommendations

193. All children and adolescents in out-of-home care should receive a medical assessment that includes a developmental and mental health assessment.
✓*Recommended best practice based on clinical experience and expert opinion*

194. Special care needs to be taken in establishing or refuting a diagnosis of ADHD in children in out-of-home care, because of the high risks of misdiagnosis and the equally high risks of doing harm by ceasing established therapy for children already at high risk of long-term disadvantage and disability.
✓*Recommended best practice based on clinical experience and expert opinion*

195. When a child with a diagnosis of ADHD is placed in out-of-home care, every effort should be made to maintain continuity of treatment and to ensure that foster carers are educated about the special needs of the child.
✓*Recommended best practice based on clinical experience and expert opinion*

196. The professionals in Australia's welfare system who are responsible for the care of children and adolescents should be educated about ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

197. Research on the management and care of children and adolescents with ADHD in out-of-home care is needed.

Children and adolescents in out-of-home care are a small but significant sub-population in Australia. Children and adolescents can be placed in out-of-home care in response to a court order or voluntarily. The number of persons aged below 17 years living in out-of-home care in Australia at 30 June 2007 was 28,441, including 7,892 Indigenous children and adolescents (852). The total number of children and adolescents in out-of-home care has risen dramatically in the last decade, increasing 102% from 1997, when the number was 14,078.

The majority of children and adolescents in out-of-home care at 30 June 2007 were in home-based care (95%), in either foster care (50%), relative/kinship care (44%), or in some other type of home-based care (1%). Four percent of children in out-of-home care were living in residential care (852).

Children in out-of-home care are a vulnerable, at-risk group with special needs (853). A high proportion of children and adolescents in out-of-home care are shown to have mental health problems. International studies report levels of mental health problems (including inattention and hyperactivity) among children and adolescents in welfare systems that are much higher than those reported in the general population (854-857).

A high prevalence of ODD and ADHD has also been found in adoptive populations in the US. A study of 808 adopted youth (4–18 years) found that residing in foster homes prior to being adopted was significantly more prevalent for children with ADHD and ODD (858). Further, residing in multiple foster homes increased the risk of exhibiting ADHD/ODD and ODD symptomatology, but not solely ADHD behaviours (858).

Australian studies of children and adolescents in out-of-home care also report a high prevalence of mental health problems that include ADHD symptoms such as inattention and hyperactivity (579, 859, 860).

15.3.1 Services for children and adolescents with ADHD in out-of-home care

All children and adolescents in out-of-home care need medical assessment, including mental health assessment, development of a healthcare plan and a

transferable health record, to underpin continuity of care (853). This is particularly important given the high levels of mental health problems in this population.

Children and adolescents in out-of-home care pose particular problems in assessment and management because of the issues of differential diagnosis of comorbidity and of alternative causes of symptoms. In addition, there is inherent bias in some systems against a diagnosis of ADHD and it is important that the professionals in Australia's welfare system who are responsible for the care of children and adolescents are educated about ADHD. As Australia relies heavily on volunteer caregivers to provide homes for children and adolescents in the welfare system, researchers also support the need for high-quality professional support for volunteer caregivers (579).

When families with a child with suspected ADHD come to the attention of child welfare services, it is critical that a diagnosis is sought through a specialist clinician. As discussed in section 15.2 Adult ADHD and its impact on the family, page 190, parents of a child with ADHD may have symptoms of ADHD themselves and may need support and appropriate referral.

The treatment and care needs of children and adolescents with ADHD in out-of-home care are likely to differ from those of the general community. For example, the needs of this group are complicated by the issues associated with adjustment to out-of-home care and the possible adversities such as abuse, neglect, family dysfunction and parent psychopathology that have resulted in their placement (861).

Research data on the treatment and care of children and adolescents with ADHD and other psychiatric disorders in out-of-home care are sparse. Studies in the US have focused on medication or service use for children with ADHD in foster care, but are yet to address treatment outcomes (862, 863).

One study of 326 children and adolescents in home-based foster care in Adelaide between August 2004 and January 2006 found a high prevalence of mental health problems including inattention (579). Only half of those living in home-based foster care who were identified by caregivers as needing professional help had received it during the previous 6 months (579). Notably, there was also a high proportion of children and adolescents in the community control group who had not accessed professional care. These findings suggest that barriers to accessing care were generalised and not specific to individuals in foster care.

More research is required to determine the incidence of ADHD amongst children and adolescents in out-of-home care and to examine strategies for their management and care that can be used to inform policy and practice decisions.

15.4 Issues for families living with ADHD that have not been addressed in these Guidelines

There are a number of important issues for Australian families living with ADHD that cannot be adequately addressed in these Guidelines because of the reliance upon scientific evidence in the process of guideline development. These issues which concern consumers and their supporters warrant acknowledgement by clinical and health service planners. They include the frustration, false starts, and wasted time and money that is often involved in finding appropriate help, because of the widespread scepticism and lack of understanding among clinicians about ADHD and its management. The problem often resurfaces in the transition period between, for example, seeing a paediatrician and moving to the care of a psychiatrist as the child grows older. It frequently happens that a diagnosis made by one clinician is disputed by another, or by school staff or a social worker. Sceptics within the professions sometimes combine with promoters of non-scientific treatments and people associated with socio-religious cults to foster disrespect for

the science behind the understanding of ADHD. Satirising of ADHD and sensationalised media reporting create a particularly onerous stigma that greatly exacerbates the burden of the condition. Parents in higher income brackets may be accused of seeking ADHD medication to give their child an unfair advantage at school, while those in lower income brackets may be suspected of inventing or causing their child's problems by abuse or neglect. Such beliefs tacitly underlie some treatment approaches, and only serve to discourage people from seeking help and to disempower those who do.

Adults face particular difficulties in accessing and affording services and treatments. Psychiatrists in the public health system do not treat ADHD in adults, except in some remote areas of Australia. Few psychiatrists and psychologists are familiar with ADHD, and adults can find themselves misdiagnosed, inappropriately medicated and on a very expensive merry-go-round. They may also find inconsistencies with diagnostic procedures and dosage rates from state to state and difficulty renewing prescriptions when travelling or holidaying across states. Of great concern for adolescents and adults is holidaying, or travelling overseas on business, with stimulant medication, particularly in countries where stimulants of any kind are banned. Difficulties also arise when adults with ADHD and depression seek life insurance or insurance for loss of income. The stigma of being labelled ADHD prevents many adults from being diagnosed and treated for this debilitating condition.

CHAPTER 16. ADHD AND JUSTICE

16.1 ADHD and risk of delinquency and criminal behaviour

Although the vast majority of individuals with ADHD will never become involved with crime, research indicates a consistent association between ADHD and delinquency, criminal behaviour and recidivism. Identifying the role of ADHD in crime, however, is a complex task, particularly given that ADHD often occurs with other psychiatric conditions, including depression, anxiety disorder, substance use disorder, CD, and anti-social personality disorder (864). In addition, factors such as IQ and socio-economic status may also have an impact upon the risk of later delinquency or crime. A meta-analysis of studies assessing a link between ADHD and crime and delinquency (212) and several subsequent longitudinal studies that have followed cohorts with ADHD (209, 865) or cohorts drawn from other population groups (213, 866-870) support an association between ADHD and offending.

The meta-analysis by Pratt et al (2002) (212) considered 48 studies and found a statistically significant overall association of ADHD with crime and delinquency. The overall effect size was 0.155 (CI 0.135-0.175, p <0.01), indicating that ADHD is an important risk factor for crime and delinquency.

Long-term follow-up studies of individuals with ADHD support these findings. Satterfield et al (865, 871) have followed a cohort of 179 clinically referred hyperactive Caucasian boys and 75 community controls in the US over 30 years, from childhood to mid-adulthood. A substantial subgroup of the hyperactive boys became serious adult offenders, with high rates of arrests (44%), convictions (29%) and incarcerations (26%). The authors concluded that hyperactive boys are at risk for antisocial behaviour as adults, and that socio-economic status, IQ and a history of childhood conduct problems were related to an antisocial outcome.

Barkley et al (209) conducted a 13-year prospective follow-up of children diagnosed with hyperactivity (n = 147) and a matched control group (n = 73). Participants had a mean age of 20–21 at the most recent follow-up. Both self-report and official arrest records showed significantly higher rates of crime in the hyperactive group compared to controls. For example, 27% of the hyperactive group compared to 11% of the control group had a felony arrest.

A prospective study of 230 males and 75 females in the San Francisco area showed that symptoms of hyperactivity/impulsivity alone, and in combination with CD, predict both official arrests and a high level of self-reported crime by males, but not females. However, symptoms of inattention seem to be largely unrelated to adult criminal activity (211).

Several long-term follow-up studies from other population groups have been conducted:

- Analysis of data from the 1970 British Cohort Study (with over 10,000 participants) (213) found that 7.4% of the participants met criteria for ADHD at age 10, and at age 30 these participants were significantly more likely than those without ADHD to face negative outcomes in education, economic status, housing, relationships, health and crime. By age 30, compared to their unaffected peers, men with childhood ADHD were 13.1% more likely to report minor offending and 7.8% more likely to report persistent offending. Women with childhood ADHD were 3.8% more likely to report minor offending.
- A German prospective study of 321 8-year-old children followed up to the age of 25 years (866) looked at three different life courses of delinquency, namely episodic, juvenile delinquency, continued juvenile delinquency in young adulthood and late-starting delinquency. The study found that CD/ADHD was

significantly associated both with continued juvenile delinquency and with late-starting delinquency.

- A UK longitudinal study of 86 women raised in institutional care (868) found that rates of conviction were 39%, compared to 7% in a community control group. The study found a strong link between antisocial behaviour, institutional rearing, hyperactivity and CD in childhood, and offending in adulthood.
- A US longitudinal study of 622 African American youth (867) found that, compared to those who had never committed an offence, those who reported committing a felony offence in adolescence were more likely to have had ADHD symptoms in late childhood.
- A Finnish longitudinal study (869) looked at childhood predictors for crime in late adolescence in a follow-up sample of 2,713 boys born in 1981. Over the 4 years from age 16 to 20, 22.2% of boys committed at least one criminal offence other than a minor traffic violation and 4% committed more than five criminal acts. Factors at age 8 that independently predicted more than five offences were living in a non-intact family, low parental education level, parent reports of conduct problems and teacher reports of hyperactivity problems.
- A longitudinal study sample of 754 adoptees found ADHD was a significant predictor of later illegal behaviour, arrest, jail stay or felony conviction (870). ADHD retained significance in predicting adult disruptive behaviour, arrest, jail stays and felony conviction after controlling for other variables such as CD and substance abuse.

16.2 Prevalence of ADHD and comorbidities among offenders

Recommendation
198. As ADHD and ADHD symptoms are common in individuals entering the justice system, screening for ADHD may be indicated in this population. ✓ *Recommended best practice based on clinical experience and expert opinion*

16.2.1 Prevalence studies

Mental health problems are common in juvenile offenders and in adult prisoners. In many cases, individuals will have more than one psychiatric disorder. For example, a large study of juvenile detainees in the USA (872) found that 66.3% of male detainees and 73.8% of female detainees met diagnostic criteria for one or more psychiatric disorder.

It is clear from prevalence studies that the rates of ADHD among both adult and juvenile offenders are considerably higher than in the general population, although rates vary across the studies (see Table 7).

Variations in prevalence rates stem primarily from differences in the methods used to assess ADHD in the incarcerated populations, with differences among the available studies being in the types of rating scales and symptom cut-offs used. The most frequently used rating scale has been the Wender Utah Rating Scale, which does not strictly correspond with the DSM-IV classification of symptoms (873). In addition, comparisons between countries are difficult, as different ages are used to differentiate juvenile and adult offenders, prisoners may be segregated by age, sex or degree of security risk, and different legal systems may be more or less likely to impose custodial sentences.

Many offenders with ADHD meet criteria for additional psychiatric conditions. For example, the Ottweiler Study in Germany looked at 129 male prisoners aged 15–28 years (average age 19.5) and a group of matched controls. The prevalence of ADHD in the offender group was 45% compared to 7.5% in the control group.

Twenty-five of the prisoners with ADHD (19.4% of the total group) also had another psychiatric condition (alcoholism/substance use disorder, externalising disorder and/or personality disorder) (864). A Norwegian study of 82 adult prisoners aged 19–57 years found that 46% met the criteria for childhood ADHD (assessed using the Wender Utah Rating Scale) and 30% met the criteria for adult ADHD (assessed using the Brawon Attention Deficit Disorder Scale – BADD) (874). Reading disorders and personality disorders were more prevalent amongst those prisoners with childhood or current symptoms of ADHD.

Estimates of the prevalence of ADHD among juvenile offender populations also vary, but again are consistently higher than the prevalence in the general population. Two overseas studies were identified:

- A Dutch study (875) found that, among 108 young people aged 12–18 years who were brought before the Juvenile Court of the district of The Hague in 1993 and who were either required, or volunteered, to be assessed, 14% had ADHD as measured by DSM-III criteria (a further 70 neither volunteered nor were required to be assessed).
- An Irish study compared three groups of adolescent boys: 30 in juvenile detention schools, average age 14.9 years; 20 awaiting an initial appointment at an adolescent psychiatry clinic; and 30 from the community. Among the 83% of boys in the offender group who met diagnostic criteria for at least one psychological disorder (compared to 60% in the mental health group), 10.71% had ADHD, based on the Diagnostic Interview Schedule for Children Version IV (876).

Across several published Australian studies of juvenile offenders, ADHD prevalence rates have ranged from 13% to 46% (see Table 7). In a survey of 802 young people aged 12–21 years on community orders in New South Wales, 144 (19%) reported a diagnosis of ADHD (877). This prevalence may have been underestimated as over 1,000 of 1,900 eligible participants were excluded from the study due to refusal to participate or being uncontactable or exclusion criteria such as "too violent or disruptive" (877). In a study of 100 teenage girls (13.5–19 years, mean age 16.5 years) in a female juvenile detention centre in Sydney, 13% met DSM-IV criteria for ADHD (878, 879). In 589 screening assessments among youths completing Community Service Orders in South Australia, 25% reported being previously diagnosed with ADHD (A Putnins, personal communication based on data from the South Australian Adolescent Psychosocial Screening program in July 2008).

In Tasmania, of the 53 young people (12–18 years) admitted to a youth detention centre in Tasmania over a 14-month period who agreed to be assessed (63% of all admissions), 46% scored positive for ADHD on the Adolescent Psychology Scale. Psychiatric comorbidity in this group (and in the total sample) was common, and included CD, major depressive disorder, dysthymia, mood disorder, anxiety, post traumatic stress disorder, adjustment disorder, somatisation disorder and substance abuse disorder (880).

Table 7. Prevalence of ADHD amongst offender populations

Reference	Location	Measures	Group	Age (years)	Prevalence of ADHD
Rosler et al 2004 (864) & Retz et al 2004 (881)	Germany (Ottweiler Study)	Wender Utah Rating Scale, & DSM-IV criteria	129 male inmates	15–28	45% current ADHD
Young et al 2003 (873)	England	Wender Utah Rating Scale	69 offenders with personality disorder	18–60	78% childhood ADHD 6% current ADHD
Eyestone & Howell 1994 (882)	USA	Wender Adult/Child list of problems	102 male inmates	16–64	25.5% current ADHD 21.5% childhood ADHD
Gunter et al 2008 (883)	USA	Mini International Neuropsychiatric Interview Plus (Mini-Plus)	264 male and 56 female inmates	Mean age 31.1	22% current ADHD
Minor et al 2003 (884)	USA	Wender Utah Rating Scale	112 male and 103 female inmates	Mean age 32.4	38% of the males and 41% of the females met the criteria for ADHD
Rasmussen et al 2001 (874)	Norway	Wender Utah Rating Scale & Brown Attention Deficit Disorder Scale (BADD)	82 male inmates	19–57	46% childhood ADHD 30% current ADHD
Gudjonsson et al 2008 (885)	Iceland	DSM-IV Checklist criteria for ADHD Wender Utah Rating Scale	90 male inmates	19–56	50% childhood ADHD (of whom 31% had current ADHD symptoms)
Vitelli 1996 (886)	Canada	Wender Utah Rating Scale	100 inmates (gender not reported)	17–70	67% childhood ADHD
Doreleijers et al 2000 (875)	Netherlands	DSM-III criteria	108 at Juvenile Court	12–18	14% current ADHD
Hayes et al 2007 (876)	Ireland	Diagnostic Interview Schedule for Children Version IV	30 males in juvenile detention 30 controls	Mean age 14.9	Offenders: 83% current ADHD Controls: 10.71% current ADHD
Kenny et al 2007 (877)	Australia (NSW)	Adolescent Psychopathology Scale – Short Form (APS-SF)	683 males and 119 females on community orders (largely self-selected)	12–21	19%
Dixon et al 2004 (878), Dixon et al 2005 (879)	Australia (NSW)	Schedule for Affective Disorders and Schizophrenia for School-Age Children – Present and Lifetime Version	100 female inmates 100 age- and SES-matched controls	13.5–19	Offenders: 13% Controls: 1% ($p < 0.001$)

		(K-SADS-PL)			
Bickel et al 2002 (880)	Australia (Tasmania)	Adolescent Psychology Scale	43 male and 7 female inmates	12–18	46%

16.2.2 Screening for ADHD within the justice system

The high prevalence of ADHD among people in prisons and juvenile detention centres, and those placed on community orders, raises the important possibility of screening those in the justice system for ADHD. The goal of screening would be to identify individuals who may benefit from a comprehensive ADHD assessment and, if ADHD is diagnosed, treatment.

Further impetus for screening for ADHD in people entering the justice system comes from the link between ADHD and an increased risk of suicidal behaviour (887). A South Australian study of 900 incarcerated young offenders found that ADHD was one of the factors (even after controlling for prior suicide attempt status) that predicted suicidal behaviour (888). ADHD was also found to be a significant predictor of suicidal behaviours amongst juveniles detained in an Austrian pre-trial detention facility (889).

Regular assessments are needed, not just at the point of entry into the criminal justice or prison system as the mental health needs of offenders change over time. For example, in a study of 3,058 offenders (890), the prevalence of DSM-IV attention deficit or disruptive behaviour disorders (ADHD, CD, and ODD) were found to vary across age groups. Among 15–17 year olds, prevalence was 23.3% (14/60); in 18–21 year olds, 11.3% (34/300); and among those aged 22 years and older, 2.1% (56/2698).

Self-report questionnaires have been suggested as one possible screening tool as they are fast and cost-effective (891). However, self-reporting of ADHD symptoms in this population may be poor, as research suggests that individuals with severe behavioural and psychiatric disorders may minimise symptoms of psychopathology on self-report questionnaires (892). Consequently, it would be important to seek third-party reports to confirm self-reported assessments. Rating scales that consider ADHD symptoms have been designed for assessing adult prisoners. One example is the Conners' Adult ADHD Rating Scales (CAARS) Use in Correctional Settings Supplement.

The Secure Care Psychosocial Screening Tool (SECAPS) is a standardised instrument developed in Australia and used routinely in South Australia for initial brief assessment of young people shortly after admission to juvenile detention. It covers a number of psychological and social need areas, including numeracy, literacy, intellectual functioning, social relationships, mood, self-harm, ADHD signs, anger and aggression, and substance use (893). A recidivism risk index has also been developed, based on the SECAPS, and its predictive accuracy was found to be high when the scale was validated on recidivism status 6 months after first release from secure care in a South Australian study of 458 juvenile offenders (894).

Difficulties in diagnosis may arise from the associated comorbidities. For example, Young et al (873) noted that ADHD may be under-diagnosed or misidentified in offenders with personality disorder as it may be difficult to discriminate retrospectively between childhood CD and ADHD.

16.3 Impact of treatment for ADHD on rates of offending and recidivism

Recommendation
199. More research is needed to determine whether treatment of ADHD can reduce the risk of crime and recidivism.

By intervening early and effectively with children and young people who have known and treatable risk factors, it may be possible to deflect them from offending. Extrapolation of current research that shows treatment of ADHD leads to reductions in substance use and aggressive behaviour, both of which are closely related to offending, suggests that treatment of ADHD is likely to be of benefit in reducing recidivism (for review see (895)). To date, however, there is no clear data to show that treatment of ADHD reduces offending and recidivism. Whether treatment of ADHD in childhood can divert a child from later criminal activity, and which treatments might achieve this, remain unclear, with few studies addressing these specific questions. Although numerous studies have followed up individuals with ADHD to look at the impact of ADHD on later crime, there is a paucity of information on the impact of treatment.

There is also the possibility of treating offenders diagnosed with ADHD to prevent recidivism. There are a number of rehabilitation programs targeted at offenders that have been found to have a positive impact on recidivism (896). However, no studies were identified that specifically looked at the efficacy of these programs for individuals with ADHD.

Self-control is viewed as a key psychological determinant of offending (897). Accordingly, impulsiveness and stimulus seeking are common targets of many cognitive skills programs for offenders that aim to reduce recidivism. As a result, these programs may be particularly relevant to individuals with ADHD.

Cognitive skills programs for offenders are largely based on CBT and social skills training. Such programs, for example "Think First", "Thinking for Change" and "Offending Is Not The Only Choice", have been either implemented or piloted in all Australian States and Territories (898). Cognitive skills programs focus on the way people think about their behaviour and target problem-solving skills, moral reasoning, cognitive style, self-control, perspective taking and victim awareness (898). Research is needed to determine whether these programs could be beneficial for individuals with ADHD.

One international example is a Wraparound program for juveniles with mental health problems that has been developed in the USA (899). In addition, a prosocial competence training program "Reasoning and Rehabilitation" has been described (900). This program has been trialled in a number of countries and meta-analysis has shown a significant decrease in recidivism for program participants compared to controls (900). A version of Reasoning and Rehabilitation has been developed specifically for ADHD. This program, called "Reasoning and Rehabilitation 2 for ADHD in Youths and Adults" is currently being trialled.

To optimise program success with individual offenders there is a need to take into account individual differences (responsivity factors) that affect learning styles. These differences can include literacy, intellectual ability, motivation and psychiatric status. They can also extend to factors particularly associated with ADHD such as distractibility and impulsiveness. Accordingly, it is important that programs are designed to directly engage offenders with ADHD to ensure these individuals are able to benefit fully from the programs that are offered.

16.4 Particular vulnerabilities of people with ADHD in the justice system

Recommendations

200. Officers of the legal and justice systems should be made aware of the potential vulnerabilities and needs of people with ADHD.
✓*Recommended best practice based on clinical experience and expert opinion*

201. Proper assessment and diagnosis of ADHD is important for identifying symptoms that may make an individual vulnerable to standard police and court procedures. Psychoeducational and neuropsychological assessment may be useful in this situation to assess individual vulnerability in comparison to population standards.
✓*Recommended best practice based on clinical experience and expert opinion*

202. Special provisions may be appropriate for some individuals with ADHD (e.g. regular breaks, repetition of important information).
✓*Recommended best practice based on clinical experience and expert opinion*

203. For individuals with ADHD within the prison system, management of ADHD symptoms should be considered in order to improve outcomes in prison, including substance use, antisocial behaviour and critical incidents.
✓*Recommended best practice based on clinical experience and expert opinion*

16.4.1 Vulnerabilities

The British Association for Psychopharmacology, in their evidenced-based guidelines for management of ADHD in adolescents and adults (388), and several research groups (212, 873, 885, 901), have identified a number of ways in which people with ADHD may be vulnerable at all stages of the justice system:

- Inattention and impulsiveness may compromise performance in a police interview.
- Individuals with ADHD may be more compliant during police interrogation (885).
- In arranging for an adult family member to support a young person with ADHD, it should be remembered that they may have undiagnosed or untreated ADHD, and in some cases this may compromise their capacity to provide adequate support and advice.
- People with ADHD can also be vulnerable in court due to inattention and other symptoms, which could have implications for conviction and sentencing.
- In detention, individuals with ADHD may have particular difficulty in conforming to the expectations of this environment, such as attending to instructions or taking on tasks that require extended periods of attention.
- People with ADHD symptoms who are incarcerated have been found to be more disruptive (verbal aggression, damage to property) than a non-ADHD control group (873).

Several studies have looked at whether individuals with ADHD may be more suggestible than people without the disorder. Research addressing the potential vulnerabilities of people with ADHD during police interrogation in a referred clinic population found that those with ADHD were no more suggestible than a matched control group; however, the ADHD group gave more answers of "don't know" (902). A similar study in a prison population found again that individuals with ADHD were not more suggestible than controls, but they did show greater compliance and claimed to have made more false confessions (885). The increased compliance was

found to be significantly related to both current and childhood symptoms of ADHD (885).

16.4.2 Addressing these vulnerabilities

Special provisions for individuals with ADHD during police interrogation or in court

In Australia the *Disability Discrimination Act 1992* (Cth) makes it unlawful to discriminate directly or indirectly against a person with a disability. People appropriately diagnosed with ADHD are entitled to reasonable accommodations during police interrogation or in the courtroom (as in the classroom or workplace).

Some individuals with ADHD coming in for police interrogation or attending court may require special consideration. This may apply particularly to those not currently treated for ADHD and those with severe symptoms. Accordingly, it is important to identify and properly diagnose ADHD. Psychoeducational and neuropsychological assessment might offer a measure of vulnerability and provide a path to allow special provisions for the defendant (901).

Suggestions for how police or court procedures may assist an individual with ADHD in participating fully include (901, 903):

- regular breaks
- avoiding lengthy questions and complex language
- ensuring that important information is put across directly and simply
- repetition of important information
- additional time to reply to questions
- non-confrontational communication.

Treatment of ADHD within prisons

Within the prison system there are many difficulties associated with the treatment of individuals who may have ADHD. For those diagnosed with ADHD, the use of stimulant medications with their potential for abuse may be problematic in a prison environment. Newer medications, such as ATX, with little or no potential for abuse may provide a preferable alternative. (For discussion of the abuse potential of ADHD medications, see section 8.9 ADHD and substance misuse, page 124.) Research addressing the impact of treatments for ADHD within prisons or other correctional facilities is sparse. A single case study from Britain reports a significant improvement in an individual in secure detention following diagnoses of ADHD and subsequent treatment with stimulant medication (904).

16.4.3 Conclusions

There are many gaps in our current state of knowledge about individuals with ADHD and their relationship to the justice system. Some important gaps occur in relation to the possibility of effective early intervention to prevent criminality, and also, in relation to reliable means of assessment of ADHD, and practicable interventions for those with ADHD who find themselves in secure detention.

The opportunity to reduce future offending and imprisonment, and to improve lives, deserves to be given high priority by researchers, clinicians, courts and policy-makers.

CHAPTER 17. ECONOMIC CONSIDERATIONS IN ADHD

17.1 Economic burden of ADHD

17.1.1 What is the cost to the community of ADHD internationally?

There has been limited analysis of the economic impact of ADHD, most of it undertaken in the United States. No studies have assessed the full economic impact of ADHD on society. A limited number of studies have assessed the cost of therapy.

A 2007 review identified 13 studies examining the economic impact of ADHD in children and adolescents using a Cost of Illness Model that included estimates of the costs of medical care, special education, disciplinary costs, parental work loss and juvenile justice (798). Annual costs were estimated to range from $12,005 to $17,458 per individual. Using a prevalence of 5%, this means an annual economic cost of ADHD in the USA of between $36 and $52 billion (798).

ADHD is associated with a loss of productivity in the workplace (see Chapter 13. ADHD in the Workplace, page 176). For example, the recent WHO World Mental Health Survey Initiative found that ADHD was associated with an average annual reduction in work quantity (21.7 excess days) and quality (13.6 excess days) compared to workers without ADHD (199). The researchers estimated 143.8 million lost days of productivity associated with ADHD each year in the 10 surveyed countries from North and South America, Europe and the Middle East. Longitudinal studies show that individuals with ADHD have completed less education and have lower ranking occupations, compared with controls (769) (198).

A 2005 review of the literature on the economic costs and potential economic benefits of treating ADHD identified 22 relevant publications (905). Compared to matched controls, there were additional annual costs (in 2004 US dollars) of US$503 to US$1,343 for children with ADHD, and additional costs of US$4,929 to US$5,651 for adults with ADHD. Cost-effectiveness ratios for treatment with MPH, which is a cost-effective treatment option, ranged from US$15,509 to US$27,766 per quality-adjusted life year gained (905).

Direct medical costs for youth with ADHD were found to be approximately double those of youth without ADHD, with costs being highest for those with comorbid psychiatric disorders and those being treated with stimulant medication (906). A subsequent study found increased health service costs associated with ADHD, and decreased use of Emergency Department facilities with stimulant therapy for ADHD (797, 907).

In a study of 143,561 patients in disease cohorts in a managed care plan, the annual economic cost for adults with ADHD was less than for diabetes or depression, but equivalent to seasonal allergy (908).

Children with ADHD aged 2–10 years in an integrated healthcare system were found to use significantly more services in the 2 years both pre and post diagnosis than children without ADHD (909).

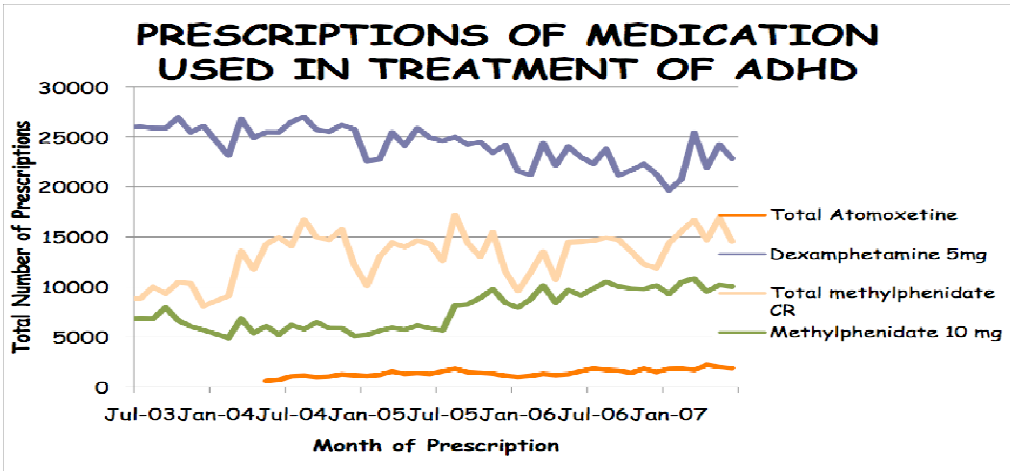
17.1.2 What is the cost to the community of ADHD in Australia?

Stimulant medications subsidised by the Pharmaceutical Benefits Scheme in Australia do not appear in the top 100 drugs by volume or by cost.

In Western Australia, during the period August 2003 to December 2004, there were a total of 19,062 patients with at least one record of a dispensed stimulant prescription (910). For these patients, a total of 178,369 prescriptions were dispensed. The average number of prescriptions for a stimulant medication dispensed per patient was 9.4, with a range of 1 to 100.

The New South Wales Clinical Excellence Commission reported that there were 5.015 "defined daily doses" per 1,000 population per day for 4–17 year olds in Australia for the 12 months from 30 June 2006 (460). Figure 1 shows the number of prescriptions for medication used to treat ADHD in Australia for the years 2003 to 2007. These data record both private and Pharmaceutical Benefits Scheme prescriptions.

Figure 1: Prescriptions of medication used in treatment of ADHD in Australia



17.2 Cost-effectiveness of treatment

17.2.1 Cost-effectiveness of treatment versus no treatment

Analysis of cost-effectiveness of treatments has been conducted for the MTA study,which considered 579 children aged 7–9.9 years and compared 14 months of treatment with medication, behavioural treatment, combined medication and behavioural treatment, or community care (911). All groups showed symptom improvement, with medication and combined medication and behavioural therapy showing the greatest improvements and being equally efficacious at 14 months. There was, however, a four-fold variation in treatment costs, with medication being the least and combined treatment the most expensive. Medication was only marginally more costly than community care.

In an extension of this study, it was noted that the most cost-effective therapy for comorbidities was likely to be behaviour therapy, with or without medication, and that this would yield greater long-term benefits to policy-makers prepared to pay the higher costs (912).

King et al's (443) systematic review of treatment costs in the USA and Canada concluded that medication therapy was superior to no medication therapy, that there were no significant differences in terms of efficacy or side effects between medications, and that the additional benefits from behavioural therapy were uncertain. The cost-effectiveness of therapy was dependent upon medication costs, and economic modelling suggested DEX as the optimal first-line treatment followed by MPH-IR, with ATX as the third-line agent. For patients in whom stimulants are contraindicated, ATX was the preferred agent.

A comparison of MPH with placebo demonstrated that the medication was "reasonably" cost-effective in the short term, but data were lacking on long-term benefits (913).

A large US study of adults found MPH to be a lower cost option than MAS or ATX over the 6-month period following initiation of treatment (914). This cost benefit

was for drug costs and total medical and drug costs. The study controlled for substance abuse, depression and other comorbidities.

Overall, DEX provides the most cost-effective treatment option for ADHD in Australia, although current Australian pricing structures may artificially influence this conclusion.

17.3 Conclusions

The limited data available indicate that ADHD poses an economic burden on families and the community. It is not possible to estimate the full magnitude of this burden in Australia. Similarly, it is not clear whether treating ADHD provides an economic advantage, particularly as the full societal costs, including educational costs and lost employment opportunities, have not been well assessed.

ABBREVIATIONS AND ACRONYMS

ABI	acquired brain injury
ACCC	Australian Competition and Consumer Commission
ACRRM	Australian College of Rural and Remote Medicine
ADHD	Attention deficit hyperactivity disorder
ADRAC	Adverse Drug Reactions Advisory Committee
AISRS	Adult ADHD Investigator Symptom Rating Scale
APS	Australian Psychological Society
ATX	Atomoxetine
AUD	alcohol-use disorder
BSI	Brief Symptom Inventory
CAHE	Centre for Allied Health Evidence
CALD	culturally and linguistically diverse
CBT	cognitive behavioural therapy
CD	conduct disorder
CGI	Clinical Global Impression
CI	confidence interval
CLAM	Conners' Loney & Milich Scale
CPRS-R	Conners' Parent Rating Scale – Revised
CPRS	Conners' Parent Rating Scale
CPRS-H	Conners' Parent Rating Subscale - Hyperactivity
CTRS-R	Conners' Teacher Rating Scale – Revised
CTRS	Conners' Teacher Rating Scale
DALY	disability adjusted life year
DEX	dexamphetamine sulphate
DoHA	Department of Health and Ageing
DSM-III	*Diagnostic and Statistical Manual of Mental Disorders* (3rd edition)
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders* (4th edition)
ECG	Electrocardiogram
EEG	Electroencephalogram
GAR	Guidelines Assessment Registrar
ICD-10	International Statistical Classification of Diseases and Related Health Problems (10th revision)
ICER	incremental cost-effectiveness ratio
ITT	intention-to-treat
MAS	mixed amphetamine salts

MAS-ER	mixed amphetamine salts – extended-release
MeSH	Medical Subject Headings
MPH	Methylphenidate
MPH-ER	methylphenidate – extended-release
MPH-IR	methylphenidate – immediate-release
MPH-MLR	methylphenidate – multilayer-release
MTA	Multimodal Treatment Study of ADHD
NHMRC	National Health and Medical Research Council
ODD	oppositional defiant disorder
PATS	Preschool ADHD Treatment Study
PBS	Pharmaceutical Benefits Scheme
PICO	Population, intervention, comparator, outcome
RACGP	Royal Australian College of General Practitioners
RACP	Royal Australasian College of Physicians
RANZP	Royal Australian and New Zealand College of Psychiatrists
RCT	Randomised controlled trial
SCT	Sluggish combined type
SKAMP	Swanson, Kotkin, Agler, M-Flynn and Pelham (scale)
SNAP	Swanson, Nolan and Pelham (scale)
SST	social skills training
TGA	Therapeutic Goods Administration

GLOSSARY

Allied health professionals	Health professionals other than doctors and nurses. Allied health professionals who may be involved with people with ADHD include (but are not limited to) occupational therapists, social workers, psychologists, speech pathologists and audiologists.
Audiology	The study of hearing.
Behavioural optometry	Behavioural optometry is a system of eye care that emphasises visual training as a way to improve the way a patient uses his or her eyes. Behavioural optometry aims to treat the whole patient, not just correct his or her vision.
Biofeedback/ neurofeedback	A technique in which people learn to control involuntary body processes such as breathing rate, blood pressure and body temperature by responding to feedback from electrodes that monitor changing body conditions.
Bipolar disorder	A psychiatric disorder where the individual has episodes of mania (or hypomania) alone or with depressive episodes at other times. Can occur as mixed episodes and with varying degrees of intensity.
Clinician or health professional	A professional such as a GP, nurse, psychologist or psychiatrist employed in clinical practice.
Comorbidity	The occurrence of more than one mental health disorder at the same time.
Conduct disorder	A disruptive behaviour disorder of childhood or adolescence characterised by a persistent pattern of conduct in which the rights of others or age-appropriate societal norms or rules are violated. Behaviours may include bullying, cruelty to animals or people, and law-breaking activities such as shoplifting, vandalism and deliberately lighting fires.
Differential diagnosis	An alternative diagnosis that could be made on the basis of observed signs and reported symptoms.
Executive function	A cluster of high-order skills, which include selective attention, behavioural planning and response inhibition, the manipulation of information in problem-solving tasks, and the regulation of behaviour.
Efficacy	The extent to which an intervention or treatment produces favourable outcomes under ideally controlled conditions, such as a randomised controlled trial.
Epilepsy	A disorder characterised by recurrent unprovoked seizures with sudden onset.
Extended-release medications	Extended-release medications are designed to release the medication over a longer period of time. The advantage is that the extended-release medications can often be taken less frequently than immediate-

	release formulations of the same medication.
Homeopathy	A system of therapy where people are treated with highly dilute doses of substances thought to be capable of causing specific diseases, and that produce the same symptoms in a healthy individual.
Immediate-release medications	Immediate-release medications release the full dose immediately. Multiple doses may be needed to maintain the effect of the drug.
Intellectual disability	Limitations in intellectual functioning. Difficulty in learning and performing certain daily life skills.
Meta-analysis	A statistical synthesis that combines the results from a set of comparable studies, identified in a systematic review, that have investigated the same research question.
Multimodal therapy	Treatment strategies that typically combine medication and psychosocial interventions such as behaviour therapy, psychoeducation, counselling or support. For children and adolescents, educational interventions that are designed to help with learning difficulties can also be included.
Neuroimaging	The production of images of the brain by non-invasive techniques. Examples of neuroimaging techniques include magnetic resonance imaging (MRI), functional magnetic resonance imaging (fMRI), diffusion tensor imaging (DTI), positron emission tomography (PET) and single photon emission computed tomography (SPECT).
Neuropsychological tests	Neuropsychological tests are specifically designed tasks used to measure brain function. They can be used to examine a range of mental processes from simple motor performance to complex reasoning and problem solving.
Neurophysiological tests	Neurophysiological tests measure the electrical activity of the brain from the skull surface. Electrophysiological measures such as event-related potentials (ERP) and electroencephalography (EEG) are examples of neurophysiological tests. EEG maps the electrical activity of specific brain regions. ERPs provide information on electrical activity taking place in the brain in response to stimuli.
Open label studies	A clinical trial in which the researchers and the participants in a research study know the treatment the participant is using.
Oppositional defiant disorder	A type of disruptive behaviour disorder characterised by a recurrent pattern of defiant, hostile, disobedient and negativistic behaviour directed toward those in authority, including such actions as defying the requests or rules of adults, deliberately annoying others, arguing, spitefulness and vindictiveness that occur much more frequently than would be expected on the basis of age and developmental stage.

Parent/carer	The parent(s) or person(s) that take legal responsibility for the preschooler, child or adolescent and provides direct care. This includes birth parents, step-parents, adopted parents, foster parents, legal guardians, custodial parents or other appropriate primary caregivers.
Parenting programs	Parenting programs (or parent-training programs) aim to teach parents/caregivers strategies for managing disruptive behaviour in their child and improving parent–child relationships. Parenting programs make use of behaviour modification techniques such as structured reward systems and discipline techniques. They also commonly involve cognitive behavioural techniques which require identifying problem behaviours, analysing their cause, developing a consistent response and modifying it on the basis of feedback.
Pervasive developmental disorders	A group of disorders that includes autism, Rett syndrome, Asperger's syndrome, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder Not Otherwise Specified (PDD NOS). PDDs are characterised by delays in the development of socialisation and communication skills. Symptoms may include problems with using and understanding language; difficulty relating to people, objects and events; unusual play with toys and other objects; difficulty with changes in routine or familiar surroundings; and repetitive body movements or behaviour patterns.
Psychosocial interventions	A therapeutic intervention using cognitive, cognitive-behavioural, behavioural or supportive interventions that is carried out by mental health professionals.
Psychotropic medications	Medications that primarily act on the central nervous system and affect the mind or mood or other mental processes.
Randomised controlled trial	An experimental comparison study in which participants are allocated to treatment/intervention or control/placebo groups using a random mechanism. Participants have an equal chance of being allocated to an intervention or control group and therefore allocation bias is eliminated.
Recidivism	A relapse into prior criminal or delinquent behaviour especially following conviction and punishment.
Research question	Specific and clearly defined questions concerning key areas of interest which are addressed in the systematic review.
Respite	Any support service that offers both individuals and their carers a break or change from their routine for anything from a few hours to a few weeks.

Sensory integration	A form of occupational therapy in which special exercises are used to strengthen the patient's sense of touch, sense of balance, and sense of where the body and its parts are in space.
Systematic review	The process of systematically locating, appraising and synthesising evidence from scientific studies in order to obtain a reliable overview.
Tic disorders	Tic disorders are characterised by the persistent presence of tics, which are abrupt, repetitive involuntary movements and sounds. Tics may be simple (using only a few muscles or simple sounds) or complex (using many muscle groups or full words and sentences).
Tourette syndrome	A neurological disorder characterised by repetitive, stereotyped involuntary movements and sounds.
Wraparound	A family centred planning process for building constructive relationships and support networks among families, teachers and other caregivers to benefit the inclusion or facilitate the progress of youth with emotional and behavioural problems.

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