Sultan Qaboos University Med J, February 2021, Vol. 21, Iss. 1, pp. e12–21, Epub. 15 Mar 21
Submitted 14 May 20
Revision Req. 5 Jul 20; Revision Recd. 20 Jul 20
Accepted 13 Aug 20
https://doi.org/10.18295/squmj.2021.21.01.003

REVIEW

Clinical Practice Guidelines for the Evaluation and Diagnosis of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents

A systematic review of the literature

*Hira Abdul Razzak,[1] Nariman Ghader,[2] Ateeq A. Qureshi,[3] Mehnaz Zafar,[4] Jeena F. Shaijan,[5] Muna Al Kuwari[2]

دلائل إرشادية للممارسة السريرية لتقييم وتشخيص اضطراب فرط الحركة وتشتت الانتباه عند الأطفال والمراهقين

مراجعة منهجية

هيرا عبد الرزاق، ناريمان غادر، عتيق أحمد قرشي، مهناز ظفار، جينا فيجي شاجان، منى الكواري

ABSTRACT: This article presents a comprehensive review of clinical practice guidelines (CPGs) for the evaluation and/or diagnosis of attention deficit/hyperactivity disorder (ADHD) in children and adolescents. A systematic review was undertaken to summarise the recommendations reported in CPGs. MEDLINE® (National Library of Medicine, Bethesda, Maryland, USA), Cumulative Index to Nursing and Allied Health Literature® (EBSCO Information Services, Ipswich, Massachusetts, USA) and other databases were searched to retrieve CPGs. A total of five guidelines were included for analysis. The selected CPGs were appraised independently by five reviewers using the AGREE II instrument. The highest total score was achieved by the National Institute for Health and Care Excellence guidelines (91.4%) followed by the CPGs from the Scottish Intercollegiate Guidelines Network, Canadian Attention Deficit Hyperactivity Disorder Resource Alliance, British Association of Psychopharmacology and the American Academy of Paediatrics. By appraising current ADHD guidelines, clinicians cannot only identify CPGs related to ADHD but can also determine which guidelines should be considered of high quality and trustworthy to follow during clinical practice. The researchers recommend using the AGREE II instrument for CPG appraisal in healthcare professional education and training. Improvements in the applicability of guidelines are warranted in the future to enhance its clinical use and relevance.

Keywords: Attention Deficit Hyperactivity Disorder; Practice Guidelines; Adolescents; Children; Diagnosis.

الملخص: تقدم هذه الدراسة مراجعة شاملة للدلائل الإرشادية للممارسة السريرية عند تقييم وتشخيص اضطراب فرط الحركة وتشتت الانتباه عند الأطفال والمراهقين. تم عمل مراجعة منهجية لتلخيص التوصيات الواردة في إرشادات الممارسة في ميد لاين MEDLINE (مكتبة الطب القومية، بيثثدا، ميريلاند، الولايات المتحدة الأمريكية) والفهرس التراكمي للتمريض والأدبيات الصحية المساعدة (خدمات المعلومات EBSCO، ابسويش، ماساتشوستس، الولايات المتحدة الأمريكية) وقواعد بيانات أخرى تم البحث فيها عما نُشر من دلائل إرشادية للممارسة السريرية. وتضمنت هذه الدراسة خمسة إرشادات تم تقييمها من قبل خمسة مراجعين-بصورة مستقلة -باستخدام أداة AGREE II. وحصلت إرشادات الممارسة السريرية للمعهد القومي للصحة والرعاية على أعلى مجموع نقاط (91.4%)، يليها إرشادات الممارسة السريرية للشبكة الأسكتلندية للإرشادات المشتركة بين الكليات، وتحالف الموارد الكندي لإرشادات الممارسة السريرية، ثم جمعية علم الأدوية النفسية، والأكاديمية الأميركية لطب الأطفال. وعند تقييم الدلائل الإرشادية لاضطراب فرط الحركة وتشتت الانتباه، لا يستطيع الطبيب المعالج فقط التعرف على تلك الارشادات، بل يمكنه أن يحدد أي الارشادات أفضل نوعية وموثقه وأجدر بالاتباع في ممارسته معاينه المراجعين. ويوصي الفريق البحثي لهذه الدراسة باستخدام أداة AGREE II لتقييم الدلائل الإرشادية للممارسة السريرية عند تعليم وتدريب المهنيين العاملين في مجال الرعاية الصحية. ومن اللازم أيضا إحداث تحسينات في قابليتها للتطبيق مستقبلا من أجل تعزيز ملائمتها واستخدامها عياديا.

الكلمات المفتاحية: اضطراب فرط الحركة وتشتت الانتباه؛ الدلائل الإرشادية للممارسة السريرية؛ المراهقون؛ الأطفال؛ التشخيص.

Attention deficit/hyperactivity disorder (ADHD) is a frequently diagnosed, pervasive and controversial neurobehavioural childhood disorder that has received extensive attention from the media, public and researchers.[1] ADHD makes focusing on everyday requests and routines challenging.[2] Individuals suffering from ADHD often have trouble with focus, organisation, impulsivity and practical planning. They may be noisy, jittery or incapable of adapting to environmental changes.[3] It is a chronic impairing disorder that negatively impacts several aspects of a child's life like social skills, academic attainment,

[1]Statistics and Research Center and [2]Specialized Care Department, Ministry of Health & Prevention, Dubai, United Arab Emirates; [3]Department of Child & Adolescent Mental Health, Maudsley Health, Dubai, United Arab Emirates; [4]Department of Psychiatry, Al Amal Psychiatry Hospital, Dubai, United Arab Emirates; [5]Department of Psychiatry, NMC Medical Centre, Dubai, United Arab Emirates

**Corresponding Author's e-mail: Hira.AbdulRazzak@mohap.gov.ae*

child-parent relationship as well as the well being of the entire family.

The aetiology of ADHD has been linked to genetic factors, potential gene-environment interactions and other environmental risk factors such as toxic metal exposure.[4] A study from the United Arab Emirates (UAE) found that increased blood concentrations of lead, manganese and zinc levels were found to be significantly associated with ADHD. Other potential risk factors include low birth weight, prenatal exposure to alcohol, tobacco use and premature birth.[4] ADHD is manageable if appropriate treatments are used. While several treatment and management options are available, what works best is mostly based on the individual and their family members. Whilst seeking the best treatment/management options, parents should work closely with other people who are involved in a child's life including therapists, coaches, healthcare providers, educators and other family members. Treatment may consist of medications or behaviour therapy, including training for parents.

Epidemiological data on ADHD are scarce due to the fact that few population-based studies have been conducted globally and also because of changing diagnostic criteria. Nevertheless, due to its high prevalence, ADHD represents a public health problem.[5] This condition manifests in 5.9–7.1% of children and adolescents worldwide.[6] Several studies have estimated ADHD prevalence; it has been reported at 5% in the USA, 7.6–9.5% in Korea and 10–20% in India, whereas the prevalence of hyperactivity symptoms was reported to be 14.9% in the UAE.[7–10] Prevalence rates are markedly different based on the diagnostic criteria utilised, the sample's origin (i.e. general or clinical population), gender and age of focus and the methodology used.

The definition of ADHD was amended in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).[7] Although ADHD is a disorder that begins in childhood, it can linger through adulthood. It is often categorised by persistent patterns of impulsivity, hyperactivity and inattention. Symptoms are usually present for a minimum of six months and are commonly observed in children below seven years of age; however, normal diagnostic criteria are mostly applicable to children aged 6–12 years.[11] The intensity of symptoms of hyperactivity may subside with age or can be replaced in older individuals with restlessness, which is difficult to quantify. Characteristics such as organisational dysfunction (i.e. executive function), inattentiveness and impulsivity often persists past the initial diagnosis.

ADHD diagnosis is complicated by a variety of factors and patients suffering from ADHD often present to different medical services for assessment, diagnosis and treatment. Application of different diagnostic classification systems, like DSM-IV TR, DSM-5 criteria or ICD-10, often tend to present challenges for the practising physicians.[7,12,13] These challenges may also include under-diagnosis, high levels of comorbidity, misuse of pharmacological treatments, and the risks of diversion.[11] Statements about ADHD should be developed systematically to information about diagnostic strategies and management of the condition to mental health practitioners, paediatricians and families with children suffering from ADHD or with children suspected to have ADHD.

The evolution of medical understanding of ADHD reflects the complicated nature of the condition. The DSM-IV retained ADHD terminology and outlined three specific subtypes: hyperactive-impulsive, inattentive and combined.[12] These subtypes are defined by excessive symptoms of hyperactivity-impulsivity and/or inattention. DSM-IV-TR modified the classification of ADHD as a disruptive behaviour disorder.[12] The DSM-5 saw the addition of the Neurodevelopmental Disorders category which brought a significant adjustment to ADHD classification and resulted in revisions to ADHD's diagnostic criteria;[7] The diagnostic criteria of ADHD also underwent some revisions in DSM-5. The same 18-symptom criteria were involved as previously, with the addition of specific examples under each criterion, to facilitate classification of the disorder across the individual's lifespan.

The age of ADHD onset was also revised to 12 years in the DSM-5 compared to the previous restrictive barrier for diagnosis of seven years of age.[11] Some of the specifiers were included to designate either hyperactive/impulsive or inattentive ADHD presentations. The adult ADHD diagnosis criterion endured a symptom threshold variation: adults have a cut-off of five symptoms of hyperactivity or inattention, unlike the six symptoms needed in younger people. Hence, the DSM-5 chapter on neurodevelopmental disorders allows for a comorbid ADHD diagnosis which had previously not been acceptable under the DSM-IV-TR.[4,12] Such a diagnosis can currently be made based on the presentation of only mild symptoms or the inability of individuals to compensate for their difficulties through various coping mechanisms. In contrast to the DSM goals, the primary goal of the ICD-10 lies in classification instead

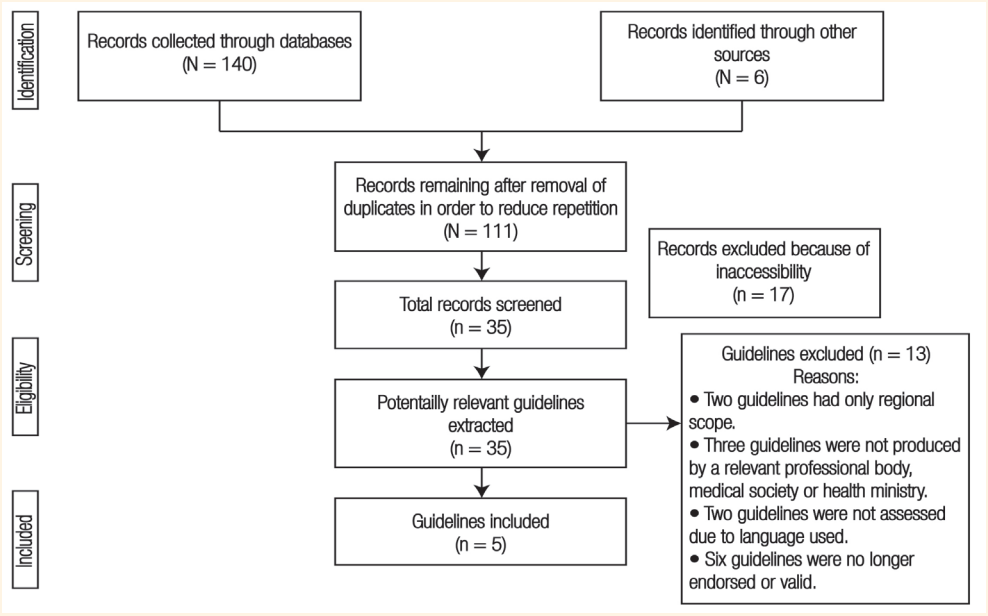

Figure 1: Flowchart showing the process used to identify clinical practice guidelines for the evaluation and diagnosis of attention-deficit/hyperactivity disorder in children and adolescents.

of diagnosis. ADHD is found in the ICD-10 under the code F90.0.[13]

Consistent clinical guidelines are important for providing better quality care, evidence-based medical practice and cost-efficient services and for improving clinical outcomes, care planning, multidisciplinary communications and resource allocation. Such guidelines, however, have limitations. Guidelines can become out-dated, be of methodologically poor quality or command unavailable or biased care standards. Several international medical societies have targeted different groups of health professionals in their published guidelines on the evaluation and diagnosis of ADHD.

Globally, ADHD has been researched extensively because of the potential repercussion it has on children's families and personal development.[11] No agreement, however, exists about which instrument should be utilised in diagnosing children with possible ADHD and there are several controversies regarding the criteria currently used for diagnosis. Such complications in the diagnostic processes, detection and methodology have given rise to considerable changes (demographic or geographic), mainly leading to over- or under-diagnosis of ADHD.[11] Due to a lack of biological markers, ADHD diagnosis is mainly clinical. Given the large body of international evidence on the topic, healthcare providers working in the fields of psychiatry, psychology, neurology and paediatrics must have practical guidelines on ADHD's diagnosis and evaluation.[11] Such guidelines should be based on the best scientific evidence and be useful in helping health practitioners select the best options for diagnosis and treatment, support clinical audits and aid in risk management.

This article aims to conduct a comprehensive review of CPGs, mainly emphasizing on diagnosis, evaluation and management recommendations. It identifies established differences in practice and standards for the evaluation and diagnosis of ADHD by comparing recommendations in the guideline documents. In addition, the methodological quality of the selected ADHD guidelines will be further analysed in adolescents and children. This article provides a recommendation about which guidelines will help healthcare professionals provide higher quality care for adolescents and children with ADHD and their caregivers.

Method

This literature review used systematic methods to collect secondary data generated between 2008–2018 and critically appraised research studies to synthesise findings on ADHD in adolescents and children. MEDLINE® (National Library of Medicine, Bethesda, Maryland, USA), Cumulative Index to Nursing and Allied Health Literature® (EBSCO Information Services, Ipswich, Massachusetts, USA), National Guideline Clearinghouse, NHMRC (the Australian National Health and Medical Research Council), and the Centre for Reviews and Dissemination of the University of York (University of York, York, UK)

were searched for best practice global evidence and guidelines related to ADHD. The following keywords were used: 'attention deficit hyperactivity disorder', 'ADHD', 'Practice guidelines', "Diagnosis" and 'children and adolescents' [Figure 1]. Cross-referencing was also performed to collect further information.

CPGs that were conducted exclusively among school-aged children and adolescents with ADHD, guidelines that focused on assessment and/or management of ADHD, English-language articles and studies conducted by international or national medical societies, health ministries and professional bodies were included. Case reports, local protocols, consensus statements, animal studies and previous reviews were excluded. Studies not showing results and evidence unrelated to the established objectives were also excluded.

The quality of the CPGs was assessed independently by five reviewers, using the Appraisal of Guidelines for Research & Evaluation II (AGREE II) tool. AGREE is an internationally accepted standard for evaluating the methodological quality of all CPGs and was used to assess methodological quality.[14] The revised version (AGREE II) was launched in 2009. AGREE II consists of 23 key items which are rated on a four-point Likert scale organised under six domains: applicability, clarity and presentation, rigour of development, stakeholder involvement, scope and purpose and editorial independence. The sum of all domain scores gives a total score. These scores can be presented as a maximum possible percentage for that domain or as a maximum possible total score.

The AGREE II Instrument Training Manual was used as a resource to guide us. Final selection of guidelines was based on the scores on each criterion according to AGREE-II Instrument.[15] The five reviewers performed the scoring and agreed upon the consensus rating for each item score in the cases of initial differences. Guidelines that met established inclusion criteria were reviewed and recommendations on assessment/screening and diagnosis were extracted.

AGREE-II guidelines do not include specific cut-off scores to distinguish between low- or high-quality guidelines. To be considered acceptable for this study, a guideline score had to be 60% or above in all domains. These statistics were mainly founded on cut-off scores reported in prior published appraisals of the guidelines.[16] Scores were calculated as follows:

$$\textit{Maximum possible score} = 7\ \textit{(strongly agree)} \times 3\ \textit{(items)} \times 5\ \textit{(appraisers)} = 105 \quad \text{[Equation 1]}$$

$$\textit{Minimum possible score} = 1\ \textit{(strongly disagree)} \times 3\ \textit{(items)} \times 5\ \textit{(appraisers)} = 15 \quad \text{[Equation 2]}$$

$$\textit{Scale domain score} = \frac{\textit{Obtained score} - \textit{Minimum possible score}}{\textit{Maximum possible score}} \times 100 \quad \text{[Equation 3]}$$

Based on the scores, various guidelines were identified as acceptable for the evaluation and diagnosis of ADHD.

Results

A total of 18 relevant guidelines were extracted of which five were selected for inclusion: the American Academy of Paediatrics' (AAP) guidelines, the British Association of Psychopharmacology (BAP) guidelines, the National Institute for Health and Care Excellence (NICE) guidelines, the Scottish Intercollegiate Guideline Network (SIGN) guidelines and the Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA) practice guidelines. Table 1 provides an overview of the selected guidelines.

The AAP (2000, 2001 and 2011) guideline consists of two-parts and were created for primary care physicians by the AAP Committee on Quality Improvement.[17,18,19] The first part (2000) addressed evaluation and diagnosis and the second part, which was published in 2001, addressed the treatment for uncomplicated ADHD cases in 6–12-year-olds presenting to primary care physicians. These guidelines were then updated in 2011.

The BAP guidelines (2006 and 2014) were the first and foremost ADHD guidelines created in the year 2006 and dealt with the management as well as diagnosis of ADHD in adolescents and adults who were in a transitional phase to receiving adult services.[20,21]

The NICE guidelines (2008 and 2018) were developed for the National Health Service (NHS) in Wales and England.[22,23] These extensive guidelines covered treatment and assessment of patients three years or older. This work was considered to supersede a technology appraisal, which addressed the utilisation of dexamphetamine, atomoxetine and methylphenidate in 2006 among children and adolescents with ADHD. For treatment and diagnosis of children over three years of age as well as adults and adolescents suffering from ADHD, key priorities were precisely defined. In England and Wales, the NICE guidelines demonstrated a significant impact on the provision of public health along with extending its influence on some other commonwealth and European countries. This set of guidelines also makes a differential recommendation for ADHD pharmacological treatment. NICE recommends that pharmacological treatment shall be considered

Table 1: Overview of included clinical practice guidelines used for the evaluation and diagnosis of attention-deficit/hyperactivity disorder in children and adolescents[19,21,23,26,27]

	Clinical practice guideline				
	SIGN	**CADDRA**	**AAP**	**BAP**	**NICE**
Author(s)	Forbes *et al.*	Doron Almagor *et al.*	Wolraich *et al.*	Bolea-Alamañac	Baird *et al.*
Publication year of latest version	2009	2011	2011	2014	2018
Publication year(s) of previous version	2001	2006 and 2008	2001	-	2006 and 2008
Origin	Scotland	Canada	USA	UK	UK
Target group	Health professional	Physician	Primary care clinician	GP, paediatrician, CAMH and psychologist	Clinician
Grading of evidence	Yes	Yes	Yes	Yes	Yes
Funding	Public funding	Self-funded with individual disclosures	Unclear	Pharmaceutical	Unclear
Diagnosis	Yes	Yes	Yes	Yes	Yes
Treatment	Yes	Yes	Yes	Yes	Yes
Diagnostic Criteria	ICD-10 and DSM-IV	DSM-IV	DSM-IV	ICD-10 and DSM-IV	ICD-10 and DSM-IV
Screening	-	Yes	Yes	Yes	Yes
Screening for Comorbidities	Yes	Yes	Yes	Yes	Yes
ADHD specialist	Yes	Yes	-	Yes	Yes
Psychiatric Interview	Patient, parents and school	Patient, parents, school and informants	Patient, parents, school and informants	Patient and informants	Patient and informants
Questionnaires and rating scales	-	CAAT	To be used optionally: CTRS-R, CPRS or SSQ-R Not recommended for diagnosis: CBCL-R and DSMD–Total Scale or TRF, CPRS-R or CTRSR-Global Problem Index	ASRS, WURS, BSOPA-SC, BADDS, ADHD-RS-IV, ASRS-V1.1 or CCSC	CAADID, Conners' rating scales, SDQ or C-GAS
Physical Examination	Yes	Yes	Yes	Yes	Yes
Other Investigations	EEG, blood analysis and brain imaging if essential to exclude underlying medical issues	EEG, polysomnography and brain imaging may be indicated	Thyroid function, blood lead levels, brain imaging, continuous performance tests and EEG not routinely recommended	-	ECG if clinical/ historical indications

SIGN = Scottish Intercollegiate Guideline Network; CADDRA = Canadian Attention Deficit Hyperactivity Disorder Resource Alliance; AAP = American Association of Psychopharmacology; BAP = British Association of Psychopharmacology; NICE = National Institute for Health and Care Excellence; GP = general practitioner; CAMH = Child and Adolescent Mental Health; ICD = International Classification of Diseases; DSM = Diagnostic and Statistical Manual of Mental Disorders; CAAT = Clinical Assessment of Attention Deficit; CTRS-R = Conners' Teacher Rating Scale-Revised; CPRS = Conners' Parent Rating Scale; SSQ-R = School Situations Questionnaire-Revised; CBCL-R = Child Behaviour Checklist-Revised; DSMD = Deveraux Scales of Mental Disorders; TRF = Teacher Report Form; CPRS-R = Conners' Parent Rating Scale-Revised; ASRS = ADHD Self-Report Scale; WURS = Wender Utah Rating Scale; BSOPA-SC = Barkley Self, Other and Past ADHD symptom checklist; BADDS = Brown Attention-Deficit Disorder Scales; ADHD-RS = ADHD Rating Scale; CCSC = Canadian Consensus Screening Checklist; CAADID = Conners' Adult ADHD Diagnostic Interview for DSM-IV; SDQ = Strengths and Difficulties Questionnaire; C-GAS = Children's Global Assessment Scale; EEG = electroencephalogram; ECG = electrocardiogram.

first-line treatment in adolescents and children and adults with a severe ADHD impairment. It should also be part of a comprehensive treatment plan which includes educational, behavioural and psychological interventions. These guidelines additionally recommend the formation of multiagency groups in all training provisions and localities for teachers or health professionals as well as multidisciplinary specialist ADHD clinics or teams. In 2018, these guidelines were updated to improve diagnosis, recommendations

Table 2: Pharmacological and psychosocial treatment of attention deficit/hyperactivity disorder recommendations in selected clinical practice guidelines[19,21,23,26,27]

Treatment	Clinical practice guideline (version)				
	SIGN (2009)	CADDRA (2011)	AAP (2011)	BAP (2014)	NICE (2018)
Pharmacological treatment					
MPH	FLO	NRF	FLO	FLO	FLO
MPH-MR	FLO	FLO	FLO	FLO	FLO
Dexamphetamine	FLO	FLO	FLO	FLO	FLO (In young people and children aged five and above)
Mixed amphetamine	NRF	FLO	FLO	NRF	NRF
Salts lisdexamphetamine	NRF	FLO	NRF	NRF	-
Atomoxetine	EFLR	FLO	NRF	FLO	FLO (In children and adolescents)
Bupropion	EFLR	EFLR	OS	EFLR	EFLR
Clonidine	EFLR	NRF	OS	EFLR	EFLR
Guanfacine	NRF	NRF	NRF	EFLR	NRF
Modafinil	-	EFLR	NRF	EFLR	EFLR
Pemoline	NRF	NRF	-	-	NRF
TCA	EFLR	EFLR	OS	EFLR	EFLR
Pre-treatment safety					
Measures	EFLR	EFLR	NRF	NRF	EFLR
Explicit dose	For some				
agents only	EFLR	EFLR	NRF	EFLR	
Titration	EFLR	EFLR	OS	NRF	EFLR
Monitoring	EFLR	EFLR	EFLR	EFLR	EFLR
Adverse effects	EFLR	EFLR	EFLR	EFLR	EFLR
Contra-indications	NRF	EFLR	EFLR	NRF	EFLR
Cost consideration	NRF	EFLR	NRF	EFLR	EFLR
Drug holidays	NRF	NRF (Exceptions permitted)	NRF	NRF	NRF (Exceptions permitted)
Psychosocial treatment					
Individual interventions	NRF	EFLR	NRF	NRF	EFLR
Group interventions	NRF	NRF	NRF	NRF	EFLR
Family-based interventions	EFLR	EFLR	NRF	NRF	EFLR
School-based interventions	EFLR	EFLR	EFLR	EFLR	EFLR
Occupational interventions	NRF	EFLR	NRF	EFLR	NRF
Behavioural training for parents	EFLR	EFLR	EFLR	NRF	EFLR
Behavioural management	NRF	EFLR	NRF	NRF	EFLR
Psychoeducation	EFLR	EFLR	EFLR	EFLR	EFLR
Family therapy	NRF	EFLR	NRF	NRF	NRF
Social skills training	NRF	EFLR	NRF	NRF	EFLR
Cognitive therapy	NRF	NRF	-	NRF	NRF
CBT	NRF	EFLR	-	NRF	EFLR

SIGN = Scottish Intercollegiate Guideline Network; CADDRA = Canadian Attention Deficit Hyperactivity Disorder Resource Alliance; AAP = American Association of Psychopharmacology; BAP = British Association of Psychopharmacology; NICE = National Institute for Health and Care Excellence; MPH = methylphenidate; FLO = first line option; NRF = no recommendation found; MR = modified release; EFLR = explicitly favourable recommendation; TCA = Tricyclic antidepressant; OS = outside scope; CBT = cognitive behavioural therapy.

Table 2 (cont'd): Pharmacological and psychosocial treatment of attention deficit/hyperactivity disorder recommendations in selected clinical practice guidelines[19,21,23,26,27]

Treatment	Clinical practice guideline (version)				
	SIGN (2009)	CADDRA (2011)	AAP (2011)	BAP (2014)	NICE (2018)
Self-help	EFLR	EFLR	NRF	NRF	EFLR
Counselling	NRF	EFLR	NRF	NRF	NRF
Cognitive remediation	NRF	Academic skills	NRF	NRF	NRF
Carer support	EFLR	EFLR	EFLR	NRF	NRF
Other therapies	Recommended to avoid omega-3 and omega-6 fatty acid supplements, case-specific food additives (þ), zinc supplements, iron supplements, Bach flower remedies, antioxidants, neurofeedback, massage therapy and homeopathy	Anger management, play therapy, interpersonal therapy and expressive arts therapy.	Play therapy is not recommended	NRF	Elimination and restriction diets not recommended. Fatty acid supplements not routinely recommended
Multimodal interventions	EFLR	EFLR	EFLR	NRF	EFLR

SIGN = Scottish Intercollegiate Guideline Network; CADDRA = Canadian Attention Deficit Hyperactivity Disorder Resource Alliance; AAP = American Association of Psychopharmacology; BAP = British Association of Psychopharmacology; NICE = National Institute for Health and Care Excellence; MPH = methylphenidate; FLO = first line option; NRF = no recommendation found; MR = modified release; EFLR = explicitly favourable recommendation; TCA = Tricyclic antidepressant; OS = outside scope; CBT = cognitive behavioural therapy.

and quality of care for people with ADHD. Further clarifications and updates were also made on some of the recommendations, impacts and rationales. Both documents (2008 and 2018 versions) have a vibrant cost-effectiveness investigation which addresses the impact of recommendations on the provisions of the healthcare services and healthcare economics. The NICE guidelines influence not only ADHD care but also the needs for the NHS to offer age-appropriate services for all ADHD patients.

Developed in 2009 to disseminate and develop national CPGs in Scotland, the SIGN (2001, 2005 and 2009) guidelines cover ADHD treatment and diagnosis in adolescents and children.[24,25,26] SIGN guidelines play a role in ADHD resource allocation and policy-making in Scotland's NHS.

In 2011, the CADDRA practice guidelines for primary care practitioners and specialists were issued both in English and French.[27] The guidelines were developed through the consensus of general practitioners, psychiatrists and paediatricians with declared objectives of simplifying care in training and practice and standardising ADHD care worldwide. The guidelines are organised based on the complexity of the presenting case and include templates and assessment tools for liaison with and monitoring by external agencies. An online tool kit for primary care practitioners provides free ADHD rating scales and structured interview tools for every age group, with precise usage instructions. The CADDRA guidelines simplify assessment across age groups and allow ADHD to be better managed in primary care settings.

The most recent versions of the selected guidelines were published between 2009 and 2018. Originating from the United Kingdom, United States and Canada, guidelines showed no significant differences when compared to each other. However, a single particularity was noted for NICE and CADDRA; both guidelines provided recommendations to all age groups, whereas all others focused on only children and adolescents.

These guidelines supported the utilisation of categorical diagnostic criteria; the majority recommend using either ICD-10 or DSM-IV. Recommendations for collateral informants, psychiatric interviews and questionnaire/rating scale use are also provided. All guidelines vary widely in terms of laboratory tests and psychoeducational assessment. Neuropsychological evaluation is not essential for establishing an ADHD diagnosis through these guidelines.

Table 2 displays pharmacological and psycho-social treatments for ADHD. In most guidelines, stimulants constitute the first-line pharmacological choice for the treatment of ADHD. CADDRA (2011) is the only guideline that recommends lisdexamphetamine. In most guidelines, the noradrenaline reuptake inhibitor atomoxetine was considered the preferable treatment option. Other drugs, such as tricyclic antidepressants, guanfacine, clonidine and bupropion, are highly recommended for those who have had unsuccessful treatment(s) or suffer any comorbidities, notwithstanding first-line options. Pemoline received negative recommendations from AAP and BAP, based on evidence of liver failure cases.

Table 3: Aggregated results of selected guidelines according to the Appraisal of Guidelines for Research & Evaluation II tool[19,21,23,26,27]

Category (maximum score)	Obtained Score (%)*				
	SIGN (2009)	CADDRA (2011)	AAP (2011)	BAP (2014)	NICE (2018)
Scope and purpose (105)	100 (94.4)	87 (80)	99 (93.3)	87 (80)	105 (100)
Stakeholder involvement (105)	81 (73.3)	84 (76.6)	87 (80)	84 (76.6)	93 (86.6)
Rigour of development (280)	240 (83.3)	232 (80)	240 (83.3)	224 (76.6)	264 (93.3)
Clarity and presentation (105)	90 (83.3)	99 (93.3)	69 (60)	84 (76.6)	102 (96.6)
Applicability (140)	124 (86.6)	108 (73.3)	100 (66.6)	108 (73.3)	128 (90)
Editorial independence (70)	62 (86.6)	62 (86.6)	42 (53.3)	60 (83.3)	54 (73.3)
Total score (805)	693 (83.7%,)	672 (80.7%)	637 (75.6%)	647 (77.1%)	746 (91.4%)

SIGN = Scottish Intercollegiate Guideline Network; CADDRA = Canadian Attention Deficit Hyperactivity Disorder Resource Alliance; AAP = American Association of Psychopharmacology; BAP = British Association of Psychopharmacology; NICE = National Institute for Health and Care Excellence.

**The percentages were calculated based on Equation 3.*

Twenty-eight antipsychotics received three positive recommendations in the different guidelines.[18,20]

A strong disagreement among guidelines related to certain psychosocial interventions for ADHD treatment was found. Most of the guidelines precisely agreed on the requirements for certain specific forms related to the psychosocial interventions comprising education programmes performed individually with suitable adaptations as required, psychoeducation, support for caregivers and parent training. Most of the guidelines recommended that optimal ADHD management should usually include some form of psychosocial intervention either with or without medication.

Table 3 shows the aggregated score results of the five reviewed guidelines. The highest total score was achieved by the NICE guidelines followed by the SIGN, CADDRA, BAP and AAP guidelines. All the selected guidelines provide unambiguous and specific recommendations, along with different management options. These recommendations generally yielded scores that reflect clarity in presentation. Patient preferences and views were only considered by the NICE guidelines. None of the reviewed CPGs was piloted among target users. The documents developed by NICE, CADDRA and SIGN were revised through an external review process before publication. Only the NICE guidelines offered a clear timeline and procedure for a continuous revision and considered detailed cost implications of its implementation. Two of the guidelines from the UK (i.e. SIGN and NICE) provided materials and criteria for auditing and monitoring purposes mainly derived from their key recommendations. However, only three of the guidelines, CADDRA (62; 86.6%), SIGN (62; 86.6%) and BAP (60; 83.3%) provided satisfactory information on their editorial independence from the funding body.

Discussion

This comprehensive review of CPGs related to the treatment, management and diagnosis of ADHD included five CPGs developed by national medical associations or specialist groups in the UK, USA and Canada were reviewed. The reviewed guidelines reflect a diversity of healthcare systems and professionals from primary care to tertiary specialists. The methodological quality of the individual CPGs on the domains of the AGREE-II were assessed, allowing for a comparison of CPGs based on these domains. The AGREE-II can, therefore, guide clinicians and CPG groups in identifying trustworthy and high-quality evidence-based ADHD CPGs using AGREE-II criteria.[15] The findings of this review can be utilised to inform the development of revised and improved ADHD guidelines.

Most guidelines reviewed describe ADHD diagnosis based on a complete clinical interview that comprises impairment assessment, mental state examination, development, family history, comorbidity and physical examination. The child and adolescent ADHD guidelines also included a family interview. All guidelines reviewed indicated that clinical interview remains the gold standard of an ADHD evaluation. The utilisation of rating scales has improved as has standardised efficiency and their breadth and reliability of assessment. The importance of excluding psychiatric and physical comorbidity has also been addressed in most of the reviewed guidelines. Regarding pharmacological treatment, all the reviewed guidelines suggested utilising stimulants in adolescents and children.[19,21,23,25,27] NICE recommends prescribing an atypical antipsychotic (i.e. risperidone) along with stimulants for children aged five years and above, young persons and adults with ADHD. This recommendation also applies to

patients with coexisting pervasive aggression, with rage or irritability causing severe impairment and for those who are inadequately responsive to behavioural interventions.[23]

Moreover, healthcare practice is becoming considerably more complex because of several factors. One such aspect is the increasing amount of scientific evidence available. For clinical decisions to be correct, safe and efficient, healthcare providers primarily need to update their knowledge and, to this end, a great deal of effort is being invested in the UAE.

All CPGs logically defined scope and purpose of the guidelines. CADDRA and AAP guidelines, however, lacked clarity and detail in defining scope and purpose compared to the other included guidelines. The involvement of the patient, family members and other stakeholders at every step of the development process is an essential part of good quality CPGs. Such involvement recognises patients as experts and helps develop CPGs that are patient-centred, improving implementation and acceptability.[31,32] Although all CPGs described stakeholder involvement, this element was not clearly described for every step of the development process; only AAP and NICE scored ≥80% on this important domain which is a key element of high-quality evidence-based CPGs.[33]

All CPGs, except the BAP guidelines, demonstrated good rigor of development with scores ≥80%. This domain is a strong indicator of overall guideline quality.[34,35] Three out of the five CPGs scored ≥80% for clarity and presentation, with NICE scoring particularly high; the appraisers' score for that category in the AAP were low (60%), reflecting a lack of clarity in presentation. Only the SIGN and NICE guidelines scored >80% on the applicability domain. Scores on the applicability domain are a strong indicator of overall quality as well as recommendations for use. Low scores on applicability domains for CPGs can raise questions on how recommendations can be implemented.[15] The SIGN, CADDRA and BAP guidelines were scored >80% in the category of editorial independence showing that they are clear and detailed in describing editorial independence. Some research has shown that adherence to guidelines by health professionals can be improved by trainings grounded in guideline recommendations.[33]

This review was subject to certain limitations. One of the limitations of this review is the evaluation of recommendations that do not essentially share a common denominator. Moreover, CPGs included were published only in the last ten years and looked at the evidence available at the time, which can explain some of the chronological variability of the recommendations. Finally, it is possible that other guidelines might have been missed or may not have been identified.

Conclusion

All CPGs investigated within this systematic review had overall strong scores according to the AGREE-II instrument. Some relevant information such as stakeholder involvement or editorial independence were not always easily accessible or clearly described; future CPG developers should keep these findings in mind. The NICE guidelines most recent CPG included, had the highest total score and the highest scores on all domains except editorial independence. The NICE guidelines can be used as a model in developing the future ADHD guidelines for the UAE and globally. CPGs for ADHD in the UAE must be developed using high quality evidence, while diminishing bias with openness, methodological rigor, stakeholder involvement and transparency. Embedding the implementation and use of AGREE II for CPGs appraisal in the education and training of healthcare providers is also recommended in future.

References

1. Barnett R. Attention deficit hyperactivity disorder. Lancet 2016; 387:737. https://doi.org/10.1016/s0140-6736(16)00332-9.
2. American Psychological Association. ADHD. From: https://www.apa.org/topics/adhd#:~:text=ADHD%2C%20or%20attention%2Ddeficit%20hyperactivity,plans%20and%20thinking%20before%20acting Accessed: Jul 2020.
3. Davidovitch M, Koren G, Fund N, Shrem M, Porath A. Challenges in defining the rates of ADHD diagnosis and treatment: Trends over the last decade. BMC Pediatr 2017; 17:218. https://doi.org/10.1186/s12887-017-0971-0.
4. Yousef S, Adem A, Zoubeidi T, Kosanovic M, Mabrouk AA, Eapen V. Attention deficit hyperactivity disorder and environmental toxic metal exposure in the United Arab Emirates. J Trop Pediatr 2011; 57:457–60. https://doi.org/10.1093/tropej/fmq121.
5. Herrerias CT, Perrin JM, Stein MT. The child with ADHD: Using the AAP clinical practice guideline. American Academy of Pediatrics. Am Fam Physician 2001; 63:1803–10.
6. Willcutt EG. The prevalence of DSM-IV attention-deficit/hyperactivity disorder: A meta-analytic review. Neurotherapeutics 2012; 9:490–9. https://doi.org/10.1007/s13311-012-0135-8.
7. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Washington DC, USA: American Psychiatric Association, 2013.
8. Moon S. Cultural perspectives on attention deficit hyperactivity disorder: A comparison between Korea and the US. J Int Bus Cult Stud 2012; 6:1–11.
9. Malhi P, Singhi P. Spectrum of attention deficit hyperactivity disorders in children among referrals to psychology services. Indian Pediatr 2000; 37:1256–60.
10. Bu-Haroon A, Eapen V, Bener A. The prevalence of hyperactivity symptoms in the United Arab Emirates. Nord J Psychiatr 1999; 53:439–42. https://doi.org/10.1080/080394899427683.

11. Crunelle CL, van den Brink W, Moggi F, Konstenius M, Franck J, Levin FR, et al. International consensus statement on screening, diagnosis and treatment of substance use disorder patients with comorbid attention deficit/hyperactivity disorder. Eur Addict Res 2018; 24:43–51.

12. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 4th ed, Text Revision. Washington DC, USA: American Psychiatric Association, 2000.

13. World Health Organization. ICD-10: International Statistical Classification of Diseases and Related Health Problems. 10th Revision. From: https://www.who.int/classifications/icd/ICD10Volume2_en_2010.pdf Accessed: Jul 2020.

14. Brouwers MC, Kerkvliet K, Spithoff K; AGREE Next Steps Consortium. The AGREE reporting checklist: A tool to improve reporting of clinical practice guidelines. BMJ 2016; 352: i1152. https://doi.org/10.1136/bmj.i1152.

15. Hoffmann-Eßer W, Siering U, Neugebauer EA, Brockhaus AC, Lampert U, Eikermann M. Guideline appraisal with AGREE II: Systematic review of the current evidence on how users handle the 2 overall assessments. PloS One 2017; 12:e0174831. https://38.doi.org/10.1371/journal.pone.0174831.

16. Salarvand S, Hemati S, Adibi P, Taleghani F. A review of the quality of extant clinical practice guidelines in cancer therapy-induced mucositis. International Journal of Cancer Management 2017; 10:e11553. https://doi.org/10.5812/ijcm.11553.

17. American Academy of Pediatrics (AAP), Committee on Quality Improvement Subcommittee on Attention-Deficit/Hyperactivity Disorder. Clinical practice guideline: Diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. Pediatrics 2000; 105:1158–70. https://doi.org/10.1542/peds.105.5.1158.

18. American Academy of Pediatrics (AAP), Committee on Quality Improvement, Subcommittee on Attention-Deficit/Hyperactivity Disorder. Clinical practice guideline: Treatment of the school aged child with attention-deficit/hyperactivity disorder. Pediatrics 2001; 108:1033–44. https://doi.org/10.1542/peds.108.4.1033.

19. ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/ Hyperactivity Disorder in Children and Adolescents- 2011. From: https://turnersyndromefoundation.org/wp-content/uploads/2017/07/ADHD-Guidelines-peds.2011-2654.full.pdf Accessed: Jul 2020.

20. Nutt DJ, Fone K, Asherson P, Bramble D, Hill P, Matthews K, et al. British Association for Psychopharmacology. Evidence based guidelines for management of attention deficit/hyperactivity disorder in adolescents in transition to adult services and in adults: Recommendations from the British Association for Psychopharmacology. J Psychopharmacol 2007; 21:10–41. https://doi.org/10.1177/0269881106073219.

21. Bolea-Alamañac B, Nutt DJ, Adamou M, Asherson P, Bazire S, Coghill D, et al. Evidence-based guidelines for the pharmacological management of attention deficit hyperactivity disorder: Update on recommendations from the British Association for Psychopharmacology. J Psychopharmacol 2014; 28:179–203. https://doi.org/10.1177/0269881113519509.

22. National Institute for Health and Clinical Excellence (NICE). Attention Deficit Hyperactivity Disorder – Diagnosis and Management of ADHD in Children, Young People and Adults. NICE clinical guideline 72. London: The British Psychological Society and The Royal College of Psychiatrists, 2008.

23. National Institute for Health and Clinical Excellence (NICE). Attention deficit hyperactivity disorder: diagnosis and management. London: National Institute for Health and Clinical Excellence, 2018.

24. Scottish Intercollegiate Guidelines Network. SIGN 50: a guideline developers' handbook. Edinburgh, Scotland: SIGN, 2001.

25. The Scottish Intercollegiate Guidelines Network (SIGN): an update. Scott Med J 2005; 50:51–2. https://doi.org/10.1177/00369330050000202.

26. Scottish Intercollegiate Guidelines Network (SIGN) (Management of Attention Deficit and Hyperactivity Disorders in Children and Young People – A National Clinical Guideline. Edinburgh: Scottish Intercollegiate Guidelines Network (SIGN). 2009. From:www.argyll-bute.gov.uk/sites/default/files/adhd_informtion.pdf Accessed: Jul 2020.

27. Canadian attention deficit hyperactivity disorder resource alliance (CADDRA): Canadian ADHD practice guidelines [Internet], 3rd ed. Toronto, Canada: CADDRA, 2011.

28. Rosh JR, Narkewicz ML, Birnbaum AH, Whitington GL. Pemoline Associated Severe Hepatic Dysfunction and Failure† 509. Pediatric Res 1997; 41:87.

29. Bennett K, Gorman DA, Duda S, Brouwers M, Szatmari P. Practitioner review: On the trustworthiness of clinical practice guidelines - A systematic review of the quality of methods used to develop guidelines in child and youth mental health. J Child Psychol Psychiatry 2016; 57:662–73. https://doi.org/10.1111/jcpp.12547.

30. Subcommittee on Attention-Deficit/Hyperactivity Disorder; Steering Committee on Quality Improvement and Management; Wolraich M, Brown L, Brown RT, DuPaul G, et al. ADHD: Clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. Paediatrics 2011; 128:1007–22. https://doi.org/10.1542/peds.2011-2654.

31. van der Ham AJ, van Erp N, Broerse JE. Monitoring and evaluation of patient involvement in clinical practice guideline development: Lessons from the Multidisciplinary Guideline for Employment and Severe Mental Illness, the Netherlands. Health Expect 2016; 19:471–82. https://doi.org/10.0000/hex.12370.

32. Selva A, Sanabria AJ, Pequeño S, Zhang Y, Solà I, Pardo-Hernandez H, et al. Incorporating patients' views in guideline development: A systematic review of guidance documents. J Clin Epidemiol 2017; 88:102–12. https://doi.org/10.1016/j.jclinepi.2017.05.018.

33. Wolraich ML, Bard DE, Stein MT, Rushton JL, O'Connor KG. Pediatricians' attitudes and practices on ADHD before and after the development of ADHD pediatric practice guidelines. J Atten Disord 2010; 13:563–72. https://doi.org/10.1177/1087054709344194.

34. Alonso-Coello P, Irfan A, Solà I, Gich I, Delgado-Noguera M, Rigau D, et al. The quality of clinical practice guidelines over the last two decades: A systematic review of guideline appraisal studies. Qual Saf Health Care 2010; 19:e58. https://doi.org/10.1136/qshc.2010.042077.

35. Brosseau L, Rahman P, Poitras S, Toupin-April K, Paterson G, Smith C, et al. A systematic critical appraisal of non-pharmacological management of rheumatoid arthritis with Appraisal of Guidelines for Research and Evaluation II. PLoS One 2014; 9:e95369. https://doi.org/10.1371/journal.pone.0095369.