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What is This?
ADHD matures: time for practitioners to do the same?

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Abstract
Attention deficit and hyperactivity disorder (ADHD) is not restricted to children. Abundant evidence from follow-up studies accumulated since the 1970s supports the concept of ADHD in adulthood. Genetic research points to a heritability of 76%, and neuroimaging studies have reported structural and functional brain abnormalities in patients with ADHD. Contrary to popular belief, ADHD is not a culturally bound disorder and has been described worldwide. ADHD has a cost for society, as adults with this disorder suffer from increased rates of unemployment and psychiatric comorbidity, including substance use disorders. Studies undertaken in forensic populations describe high rates of ADHD in these groups, particularly amongst young offenders. One of the main issues in the diagnosis of ADHD in the adult is the fact that most clinicians have not been educated to diagnose and treat ADHD. Effective pharmacological treatments for ADHD are available and should be prescribed for these patients. The National Institute for Health and Clinical Excellence (NICE) and the British Association for Psychopharmacology (BAP) guidelines established a benchmark for service development required to treat ADHD adequately in the adult population. However, the implementation of new services has been slow. More resources are needed to effectively assess and treat ADHD in the adult.

Keywords
ADHD, ADD, hyperactivity, inattention, hyperkinetic disorder, drug treatment, service provision, methylphenidate

Introduction
Attention deficit and hyperactivity disorder (ADHD) in adults is not a new disorder and indeed has been described operationally since the 1970s (Wender et al., 1981; Wood et al., 1976). Subsequent research has shown that ADHD in adults is a valid diagnostic construct that reflects persistence of the childhood disorder into adulthood and the effectiveness of evidence based treatments (NICE, 2008, Nutt et al., 2007). The estimated prevalence of ADHD in the adult is 3%-4% (NICE, 2008).

Both pharmacological and non-pharmacological treatments can help adults with ADHD by relieving the symptoms and functional impairments that affect their lives (Asherson, 2005). The National Institute for Health and Clinical Excellence (NICE) UK guidelines state the importance of developing clinical services to diagnose and treat ADHD in adults. However, a lack of education and training about the condition and its treatment amongst clinicians, and competing demands for resources in psychiatry, are impairing the development of adult ADHD clinics in the UK and other European countries. As a result the disorder often remains undiagnosed and inadequately treated (Kooij et al., 2010).

What is the evidence that ADHD persists into adulthood?
ADHD is not a new diagnostic concept. Perhaps the earliest recorded account of ADHD was that of Alexander Crichton in 1798 who described a state of ‘mental restlessness’ (Crichton, 2008). At the beginning of the twentieth century, George Frederick Still, considered the father of British paediatrics, reported a series of cases in the prestigious Goulstonian lectures (Still, 2006). Attempts at treatment with amphetamines were described by Bradley as early as 1937. Thirteen years later, he published a seminal paper (Bradley, 1950) describing the effects of stimulant...
medications in various groups of children, including some who would be categorized today as having ADHD. The concept of ADHD persisting into adulthood was first described in the 1970s by Wood et al. (1976) who noted the continuity of ADHD symptoms from childhood to adulthood, and treated adult subjects successfully with stimulant medications. The subsequent accumulation of follow-up studies (Biederman et al., 1990; Gittelman et al., 1985; Greenfield et al., 1988; Manuzza et al., 1991; Yan, 1998) yielded consistent evidence on the persistence of ADHD into the adult years, the familial association between parent and offspring ADHD, development of significant comorbidities (Biederman et al., 1991, 1992) and response to treatment.

Epidemiological, genetic, neuroimaging and pharmacological studies confirm that ADHD in adults is a well-defined disorder that is associated with similar neurobiological findings and response to drug treatments to that seen in children with ADHD. Neuroimaging studies detect both structural and functional brain abnormalities in adults with ADHD, similar to those described in children (Schneider et al., 2006). Differences in both gray and white matter have been reported in studies of patients with ADHD (Shaw and Rabin, 2009). Most studies point to a volume decrease in the prefrontal cortex, particularly in the right hemisphere (for a review see Fassbender et al., 2006). Other areas known to be affected in adults with ADHD include the anterior cingulate cortex, the basal ganglia (Schneider et al., 2010) and parietal cortical regions involved in attentional processes. Functional neuroimaging studies show inhibitory deficits, which appear more prominently in adults than in children with ADHD (Fassbender et al., 2006). Single photon emission computed tomography (SPECT) studies revealed altered dopamine D2 receptor binding and possible differences in density of the dopamine transporter (Hesse et al., 2009; Krause et al., 2000, 2005). Moreover, preliminary research points to a link between normalization in perfusion of the involved brain areas after treatment with stimulant medication (O’Gorman et al., 2008).

In terms of genetics, the results of more than 20 twin studies conducted on ADHD point to a heritability of around 76% (Faraone et al., 2000, 2005). Furthermore, there is evidence of increased familial risks amongst the offspring of parents with ADHD and the parents of children with ADHD (Faraone et al., 2000). Recently, a novel gene associated with ADHD in several independent data sets was identified in both child and adult ADHD samples (Arcos-Burgos et al., 2010; Ribasés et al., 2011). Future research targets for adult ADHD must encompass new ways of administering treatments (e.g. flexible dosing, combined treatment with more than one drug and pro-drugs), systematic investigation of comorbidities and the neurophysiology of the disorder.

Is ADHD a cultural concept?

Many studies on ADHD have been performed in a small number of centres in the USA. This has reinforced the suggestion that ADHD is an ‘American’ invention. However, more than 30 studies on non-US populations reported similar prevalence rates to those in the USA (Faraone et al., 2003). Furthermore, systematic reviews emphasize the worldwide prevalence and lack of cultural specificity of the illness (De Graaf et al., 2008; Fayyad et al., 2007; Simon et al., 2009). The World Mental Health Survey Initiative (led by the World Health Organization) included ADHD diagnostic questions in national surveys of working adults in 10 countries and yielded similar results in each country, including comparable increases in loss of working days and addiction problems amongst those with ADHD (De Graaf et al., 2008). A recent meta-analysis of 102 studies assessing the prevalence of ADHD concluded that rates were similar in Europe and North America, and that rate differences in other countries were not location dependent but a result of the use of diverse methodologies (Polanczyk et al., 2007).

Societal cost and effectiveness of treatment

Economic evaluation analysis established an important societal cost for ADHD (NICE, 2008) resulting from decreased function, comorbidity or employment problems. Furthermore recent studies point to high prevalence of ADHD in young offenders (Rössler et al., 2004; Young et al., 2010), prisoners (Young et al., 2009) and patients with substance misuse disorders (Arias et al., 2008). Early diagnosis and better access to treatment for these groups could help prevent offending and facilitate rehabilitation and reintegration into society. The development of appropriate services to administer the many effective treatments now available for ADHD provides an opportunity to reduce the societal burden presented by these groups.

Several meta-analyses performed on the pharmacological treatment of ADHD have found good effect sizes for stimulant and non-stimulant medication (Faraone and Buitelaar, 2010; Faraone and Glatt, 2010; Mézáros et al., 2009), which compare favourably with those of drug treatment of other common mental disorders. Pharmacological treatment is known to improve quality of life (Adler et al., 2008; Spencer et al., 2008) and increase social and psychological functioning (Görksoy and Nottestad, 2008).

National Institute for Health and Clinical Excellence (NICE) UK guidelines

The first UK guidelines on the diagnosis of adults with ADHD were published by the British Association for Psychopharmacology (Nutt et al., 2007) following a review of the scientific literature and formulation of a consensus by leading experts in the field. The NICE Guideline Development Group subsequently completed a systematic review of the scientific evidence for ADHD and reached the following conclusions with regard to ADHD in adulthood (NICE, 2008):

- Symptoms of inattention, hyperactivity and impulsivity cluster together both in children and adults.
- ADHD represents the tail of a continuously distributed trait in the population. It is distinguishable from normality by the number and severity of symptoms and their association with clinically significant impairments.
ADHD symptoms persist into adulthood in the majority of cases.
- Both genetic and environmental factors influence risk for ADHD.
- Stimulants should be first-line treatment unless the patient prefers psychological therapy.
- Stimulant treatment should be started under the guidance of a psychiatrist or a nurse prescriber specializing in ADHD, or other clinical prescriber with training in ADHD diagnosis and clinical management.
- Medication should be provided by primary care physicians as part of a shared care protocol with specialists.
- ADHD treatment should be part of a comprehensive treatment programme addressing psychological, behavioural and educational or occupational needs.

The NICE guidelines also recommend an extensive assessment prior to drug treatment including:

- Full mental health and social assessment.
- Full history and physical examination, including assessment of history of exercise syncope, undue breathlessness and other cardiovascular symptoms. Family history of cardiac disease and examination of the cardiovascular system, and baseline weight and pulse. An ECG is recommended if there is past medical or family history of serious cardiac disease, a history of sudden death in young family members or abnormal findings on cardiac examination.
- Risk assessment for substance misuse and drug diversion.

Regarding selection of drug treatment, methylphenidate should normally be prescribed first but atomoxetine or dexamphetamine should be considered if symptoms do not respond to methylphenidate or the person is intolerant to it after an adequate trial (usually about 6 weeks). Atomoxetine can be considered as a first-line treatment in people at risk of stimulant misuse or diversion or when the patient has used it successfully in childhood. The NICE guidelines do not recommend antipsychotics for the treatment of ADHD.

Considering the role of psychological treatment, group or individual cognitive behavioural therapy is recommended for adults who are stabilized on medication but have persisting functional impairments associated with ADHD. In addition, the NICE guidelines consider that psychological therapies have a role when there is partial or no response to drug treatment, drug intolerance, or if the patient has made an informed choice not to have pharmacological treatment. Psychotherapy can also be useful when the patient has difficulties accepting the diagnosis or adhering to treatment.

Despite this clear endorsement from NICE, there remains unease amongst some mental health professionals about the identification and treatment of ADHD (Singh, 2008). This phenomenon is multifactorial in origin (Kooij et al., 2010): contributory factors are (a) lack of training on the subject; (b) the erroneous impression that the condition is a construct manufactured by the pharmaceutical industry (Goldstein, 2006); (c) fear that broadening the remit of already overstretched psychiatric services to include adults with ADHD will lead to an even greater workload for clinicians. In recognition of this last point, NICE suggested the creation of multidisciplinary groups that would act as ‘steering groups’ in the development of services. These teams should not only provide pharmacological treatment but also age-appropriate psychological interventions (for a review, see Young and Amarasinghe, 2010). The NICE guidelines additionally recognized the difficulties that adolescents suffer in their transition to adult services and recommended that transitional services be set up specifically to address this problem.

**Existing models of service**

Service provision for adults with ADHD varies widely across Europe. Appropriate psychiatric care should be available to all adults with ADHD as it is for any other mental health condition. In the UK, with a few exceptions, the uptake of the recommendations of the NICE Guidelines has been poor. This fact, taken together with the limited training in the assessment and management of ADHD makes the situation in the UK and many parts of Europe highly unsatisfactory and a source of considerable distress for people with ADHD and their families (Kooij et al., 2010)

NICE suggests two approaches to the delivery of care for adult ADHD patients. It supports general mental health teams to be trained to treat adults with ADHD, or if this is not possible the development of specialist care teams. In both cases it is recommended that primary care remains the primary prescriber following initiation and stabilization of treatment. Each health care provider must weigh the advantages and disadvantages of each approach and decide which best suits their locality.

**United Kingdom Adult ADHD Network**

The United Kingdom Adult ADHD Network (UKAAN) was set up following the publication of the NICE guidelines (NICE, 2008) by a group of practitioners with expertise in the diagnosis and management of ADHD in adults. The founding group included two members who participated in the NICE Guideline Development Group and guidance from two service-user representatives. A number of educational events have been held by UKAAN including: a national foundation conference focusing on service development and guideline implementation; a series of expert workshops that have so far included a focus on the role of neuropsychology; the treatment of ADHD within the criminal justice and forensic settings (see Young et al., 2011); ADHD and addiction; ADHD and occupational health; and a national conference focusing on models of service delivery. A European conference on ADHD across the lifespan will be held in London in September 2011. More information about UKAAN and its publications can be accessed at: http://ukaan.org/.

**ADHD and addiction**

The international experts’ workshop on adult ADHD and addiction held in London in January 2011 highlighted the complex interrelationship between attentional symptomatology and addiction. Several studies have described higher rates of ADHD in adults treated for opioid dependence (Carpentier et al., 2011) and of ADHD and substance abuse...
in prison inmates (Edvinsson et al., 2010). However, more research is needed to elucidate the common neurophysiological pathways for both disorders and to develop specific strategies for intervention in the groups at risk.

**Conclusion**

Our understanding of the aetiology, clinical presentation, diagnosis, and treatment of ADHD in adults has advanced greatly in the last decade. NICE provided evidence-based standards for the initiation and development of new services for adults with ADHD across the UK that is also highly relevant for services across Europe. The need to provide comprehensive services for adults with ADHD is underpinned by evidence-based research that clearly defines an impairing clinical disorder that is amenable to pharmacological treatments. Treatment of adults with ADHD can produce marked benefit both to the individual and to society as a whole by improving quality of life, alleviating significant mental health problems and reducing costs of the disorder to society. ADHD needs to be recognized and treated not only in children, but also in adult patients. The education of clinicians to recognize the illness and the development of services and resources to treat these patients should be an imperative for any modern, evidence based, mental healthcare system.

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Dr M Adamou has been a consultant for Janssen-Cilag and has given educational talks at meetings sponsored by Shire.

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Professor Asherson has been a consultant for Janssen-Cilag. He has a consultant for Eli-Lilly, Shire and Flynn Pharma. Professor Asherson has given a research grant from Shire. He has received grants related to ADHD from Wellcome Trust, The Medical Research Council, US National Institute of Mental Health and the National Institute of Health Research. He has given an educational grant from Janssen-Cilag. Professor Asherson has developed educational programmes for Janssen-Cilag. He has given educational talks at meetings sponsored by Janssen-Cilag, Shire and Flynn-Pharma. Professor Asherson has been a member of the NICE guideline development group for ADHD.

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Professor Thome has been a consultant for Janssen-Cilag and Eli-Lilly and has given educational talks at meetings sponsored by Janssen-Cilag and Eli-Lilly.

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