

# Attention Deficit Hyperactivity Disorder in Medical Learners and Physicians and a Potentially Helpful Educational Tool

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**Purpose:** Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by functionally impairing levels of inattention and/or hyperactive-impulsive behavior. It affects 3% to 5% of adults. This perspective piece aims to highlight the occurrence of ADHD in medical learners and physicians, including its reported prevalence in these groups, why reported rates may reflect underestimates, consequences of untreated symptoms, and a potentially helpful innovative educational tool to assist these individuals with a critical aspect of medical training and practice.

**Results:** Despite recent attention being paid to concerning levels of depression, anxiety, and burnout in medical learners and physicians, comparatively little attention has been devoted to the occurrence of ADHD in these groups. Reported rates of ADHD in medical learners and physicians, though low compared to rates of other mental health conditions and compared to rates of ADHD in the general population, may represent underestimates for a variety of reasons. The consequences of untreated ADHD symptoms are likely numerous and significant for these groups. Research has shown that about half of adults with ADHD discontinue prescribed treatment (stimulant medication) over time due to lack of perceived effectiveness, highlighting the need for durable, effective interventions to help medical learners and physicians with ADHD during and after their training. An innovative educational tool to assist medical learners and physicians with ADHD with a critical facet of their training and practice – the reading of scientific articles – is proposed, including a description of the tool, rationale for its design, practical considerations around implementation, and proposed directions for future research.

**Conclusion:** Untreated ADHD in medical learners and physicians may have numerous and significant consequences that can adversely impact training, practice, and ultimately patient care. These challenges warrant proper support for medical learners and physicians with ADHD via evidence-based treatments, program-based accommodations, and innovative educational tools.

**Keywords:** ADHD, medical student, resident, learner, physician, education

## Plain Language Summary

Attention Deficit Hyperactivity Disorder (ADHD) is a condition characterized by functionally impairing levels of poor focus and/or hyperactive-impulsive behavior. While initially thought of as a childhood disorder, studies have shown that in 60% of cases, symptoms persist into adulthood. It affects 3% to 5% of adults. This perspective piece aims to highlight the occurrence of ADHD in medical learners (ie, medical students and residents) and practicing physicians. It reviews what has been published about the prevalence of ADHD in these groups, why the rates in residents and practicing physicians may be higher than what has been reported in the scientific literature, the consequences of untreated ADHD in these groups, and a potentially helpful, innovative educational tool to help medical learners and physicians with ADHD with an important aspect of their training and practice – the reading of scientific articles. Dr. Im's team concludes that although it has received less attention in the scientific literature than depression, anxiety, and burnout in medical learners and physicians, ADHD has numerous and significant consequences for these individuals that can have a negative effect on medical training, practice, and ultimately patient care. This makes it imperative to support medical learners and physicians with ADHD via evidence-based treatments, program-based accommodations, and innovative educational tools.



## Introduction

The multiple challenges, physical and emotional, associated with pursuing a career in the medical profession are well-documented.<sup>1,2</sup> Recent studies have documented significant rates of depression, anxiety, psychological distress, and burnout among medical students,<sup>3–5</sup> with some research noting higher rates of these conditions among medical students (58% depression, 27.2–33.8% anxiety, 49.6% burnout) compared to age-matched population samples.<sup>6–8</sup> Significant rates of depression, anxiety, and burnout have also been reported among medical residents (7% to 47% depression,<sup>9–15</sup> 18% to 56% anxiety,<sup>9–18</sup> and 37% to 85% burnout)<sup>9,11–14,19</sup> and practicing physicians (22% to 40% depression,<sup>6,9</sup> 44% anxiety,<sup>9</sup> and 37% to 73% burnout).<sup>6,9</sup>

While increasing attention has been appropriately paid to these concerning levels of depression, anxiety, and burnout in medical students, residents, and practicing physicians, comparatively little attention has been devoted to the occurrence of symptoms of attention deficit hyperactivity disorder (ADHD) in medical learners and physicians. ADHD is a neurodevelopmental disorder characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development.<sup>20</sup> Symptoms of ADHD can include not seeming to listen when spoken to, easy distractibility, forgetfulness, making careless mistakes in work or school, procrastination, difficulty sustaining attention, difficulty completing tasks, excessive fidgetiness or restlessness, impulsivity, becoming easily bored or impatient, and blurting out answers or interrupting others.<sup>20</sup> Although originally conceptualized as a childhood disorder, research has shown that ADHD persists in up to 60% of adults who experienced symptoms as children.<sup>21</sup> Evidence from genetic, neuroimaging, and neurological studies reveals difficulty in executive functioning in ADHD associated with lack of availability of dopamine and norepinephrine in the prefrontal cortex.<sup>22–25</sup>

The purpose of this perspective piece is to highlight the occurrence of ADHD in medical learners and physicians, including its reported prevalence in these groups, why reported rates may reflect underestimates, consequences of untreated symptoms, accommodation-based interventions to date, and a potentially helpful innovative educational tool to assist with a vital aspect of their medical training and practice.

## Prevalence and Consequences of ADHD in Medical Learners and Physicians

While several studies have reported on the prevalence of ADHD in medical students,<sup>26–32</sup> some of these studies focused primarily on the non-medical use of prescription stimulants rather than on ADHD per se,<sup>30–32</sup> and the published literature on ADHD in medical residents and practicing physicians is scant. For example, for medical students, disability-related registry data from the Association of American Medical Colleges (AAMC) suggest an ADHD prevalence of 0.9% to 1.4%,<sup>4,26</sup> while other studies, mostly employing self-report methodology, have reported prevalence rates of 3.5%,<sup>27</sup> 4.5%,<sup>28</sup> 5.5%,<sup>30</sup> 9%,<sup>31</sup> 12.7%,<sup>32</sup> and 24.4%.<sup>29</sup> For medical residents, rates of ADHD are largely unknown; one survey of emergency medicine residency program directors<sup>33</sup> noted that 3 of 4644 (0.06% of) residents were known by program directors to have ADHD. Another study, also a cross-sectional survey of emergency medicine residency program directors,<sup>34</sup> noted that 4 of 104 programs reported having one or more residents with known disability due to ADHD. For practicing physicians, data from the 2019 AAMC National Sample Survey of Physicians indicate a prevalence of ADHD of 0.32%.<sup>35</sup>

At first glance, the lower reported rates of ADHD in medical learners (particularly residents) and practicing physicians – compared to published rates of depression, anxiety, and burnout in these groups and compared to ADHD prevalence estimates of 3% to 5% in the general adult population<sup>36,37</sup> – may seem intuitive, since having ADHD would ostensibly constitute a significant barrier to successfully completing the rigorous level of focused study, clinical rotations, scholarly activities, and other tasks necessary to complete medical training. In essence, then, it could be argued that medical residents and practicing physicians represent a sample that is pre-selected not to have ADHD.

However, five factors warrant consideration before presuming that rates of ADHD among medical residents and practicing physicians are sufficiently negligible to obviate concern about this diagnosis in these groups. First, it is possible that a significant number of medical residents and practicing physicians with a confirmed diagnosis of ADHD do not report having this diagnosis out of fear of being stigmatized or scrutinized by colleagues or supervisors, or because of concern about legal or licensing ramifications.<sup>38,39</sup> Second, many medical residents and practicing physicians, despite

long experiencing symptoms of ADHD, may not seek formal evaluation and treatment for these symptoms, either because of lack of recognition by themselves, family members, or friends that these symptoms represent ADHD (eg, symptoms are exclusively attributed to personality traits or are dismissed because the individual was accepted into medical school) or an internal belief that as a future or current medical provider, having a neurodevelopmental disorder warranting treatment is unacceptable.<sup>39–41</sup> Third, even when medical residents and practicing physicians do seek evaluation and treatment for ADHD, they may face resistance by mental health providers to diagnosing and treating the condition due to cognitive and affective biases on the part of psychiatrists about prescribing medications like stimulants.<sup>42,43</sup> Fourth, as with many mental health conditions, significant inter- and intra-individual variability affects assessment of severity and functional impairment of ADHD symptoms,<sup>44</sup> and many medical residents and practicing physicians, prior to medical training, may have compensated for ADHD symptoms by relying on strong intellectual ability, the flexibility of teachers/professors, the support of significant others, and selected areas of study or activities that either provide a level of structure protective against academic, athletic, or social floundering, or are sufficiently void of tight deadlines and/or the need to regularly prioritize or multi-task that goals are achieved successfully despite the presence of inattentive symptoms.<sup>38,40</sup> These compensatory mechanisms then become challenged when the volume and complexity of material to be learned and applied increase dramatically during medical training.<sup>38,44,45</sup> Finally, although varying across studies, reported prevalence rates of ADHD in medical students<sup>27,28,30–32</sup> are comparable to rates in the general adult population, making a precipitous drop (on the order of 10–15 times less) in such rates among residents and practicing physicians difficult to reconcile.

The consequences of experiencing untreated ADHD symptoms, while not extensively studied for medical learners and providers, are likely numerous and significant for these groups, if we extrapolate from general studies in adults with ADHD.<sup>21,37,46</sup> These conceivably include difficulty engaging in effective and efficient study, poor academic performance,<sup>47</sup> tardiness for or absence from clinical duties (due to forgetfulness or disorganization),<sup>43</sup> poor sleep (due to inefficient completion of coursework, poor time management, and baseline sleep difficulties associated with having ADHD),<sup>44</sup> relationship difficulties (due to inattentive or impulsive symptoms causing conflicts or less dedicated free time),<sup>21</sup> secondary anxiety,<sup>21</sup> secondary depression,<sup>21</sup> and increased substance use as a means to manage poor focus, sleep deprivation, or stress.<sup>21</sup> Moreover, one study found that medical students with ADHD (among other cognitive/learning disabilities), compared with matched cohort controls, had lower United States Medical Licensing Examination (USMLE) Step 2 scores, were less likely to graduate on time, and were less likely to match into a residency program on their first attempt.<sup>48</sup> Ultimately, untreated ADHD symptoms in medical learners and providers have the potential to adversely impact patient care, if knowledge and skills critical to serving as a competent physician are not mastered (for students and residents), if careless mistakes are made in the process of performing procedures, interpreting test results, or prescribing medications (in the case of residents and practicing providers), or if associated depression, anxiety, substance abuse, or burnout hinder sufficient motivation, concentration, energy, and persistence to provide medical care.

Research suggests that even when adults are properly diagnosed and treated for ADHD, over time about half of them discontinue treatment (specifically stimulant medications, the first-line treatment for ADHD), with the most common reason being lack of perceived effectiveness.<sup>49,50</sup> This underscores the need to not only increase awareness of the possibility that symptoms of ADHD may adversely impact the lives of some medical learners and providers, but to develop effective, durable interventions to support these individuals during and after their medical training.

## Accommodation-Based Interventions for Medical Learners with ADHD

Accommodation-based interventions for medical students and residents with ADHD, guided by interpretations of the Americans with Disabilities Act (ADA) of 1990 and subsequent Americans with Disabilities Amendments Act (ADAAA) of 2008, have been reported or suggested in the literature to include task management strategies (such as detailed instruction and templates for guiding task completion), environmental modifications (such as quiet, distraction-free environments for testing, learning, charting, or phone calls), and self-management strategies (such as frequent reorientation to tasks, pacing of workflow, use of timers and alarms to help with time management, and scheduling explicit time each day to organize tasks using tools like checklists and filing systems).<sup>21,51</sup> Other accommodation-based strategies have included direct daily feedback to residents regarding time management, task prioritization, and areas for

improvement, review of daily task lists by residents, guidance by the resident to staff members as to when and how to provide instruction and non-urgent teaching, assistance by faculty for residents to develop a comprehensive reading plan, time allowance by faculty for residents' personal health-care appointments, and coordination between residents' care providers, program supervisors, and residents regarding helpful accommodations and any changes in these over time.<sup>52</sup>

While these accommodations have likely provided significant benefit to medical students and residents struggling with ADHD, little to no mention is made in the literature about one particular task area that is a crucial part of medical training and practice, and likely an area of challenge for learners and physicians with ADHD: the reading of scientific articles.

## Scientific Articles and Their Role in Medical Training and Practice

Scientific article reading and application of information contained therein has long been part of training and practice in many disciplines, including medicine. At the medical student level, it may receive less emphasis compared to textbooks, course packs, and pocket reference guides, but the practice may gain more salience during clinical rotations, when attending physicians either ask medical students about their knowledge of the literature in a given area or provide brief teaching points during rounds that reference recently published studies. At the resident level, scientific article reading becomes more important, as two of the general competencies that residents are expected to demonstrate based on the Accreditation Council for Graduate Medical Education (ACGME) guidelines,<sup>53</sup> "medical knowledge" and "practice-based learning and improvement," require that residents "appraise and evaluate scientific evidence" and "demonstrate knowledge about established and evolving biomedical, clinical, and cognate...sciences and the application of this knowledge to patient care," respectively.<sup>21</sup> These skills can practically come into play when residents staff cases with attending physicians, during which time there is discussion about evidence-based approaches to patient care and any recent changes in the relevant evidence base. For practicing physicians, scientific article reading is often required to meet continuing medical education (CME), self-assessment, and cognitive component requirements for board recertification as dictated by the American Board of Medical Specialties.<sup>54</sup> It is also an integral part of conducting research, which, for physicians in academic settings, is either a requirement of employment (for tenure track faculty) or a partial requirement for promotion (for clinical or instructional track faculty).

## Scientific Articles and Challenges for Medical Learners and Physicians with ADHD

While the specific content of scientific articles varies based on medical specialty, subspecialty, journal featuring the article, writing style of the author(s), and other factors, these articles generally have several features in common that may pose challenges for medical learners and physicians with ADHD. First, scientific articles are often lengthy, typically spanning several pages. It is well-documented that individuals with ADHD struggle with sustained attention, particularly with subject matter that is experienced as more mundane and not personally stimulating (eg, a resident or faculty member needing to read an article that is outside their area of subspecialty interest).<sup>20</sup> Second, scientific articles are typically written in the third person style, which avoids use of "I" or "you" pronouns, providing less immediate engagement for readers in general and becoming problematic for individuals with ADHD, who are more inclined to become easily bored due to under-release of dopamine and norepinephrine in the prefrontal cortex.<sup>22-25</sup> Third, scientific articles frequently contain jargon or concepts that are not immediately comprehensible to readers who are unfamiliar with the particular subject matter of those articles. Neuropsychological studies have shown that adults with ADHD exhibit poorer performance on tasks higher in complexity or time requirements, as would characterize the reading of scientific articles containing jargon or concepts needing clarification via looking up of such terminology;<sup>55</sup> moreover, recent studies have suggested impaired reading comprehension abilities in ADHD, with particular difficulty picking out main ideas from material that is read.<sup>56</sup> Fourth, scientific articles are presented, with rare exceptions, in small-font text format with minimal illustrations. Neuropsychological studies have revealed that adults with ADHD struggle with tasks requiring use of verbal memory (responsible for encoding much of information presented in written form), focused attention, sustained attention, and abstract verbal problem solving with working memory.<sup>57</sup> As a result, it has been recommended that individuals with ADHD have information presented to them in multimodal (eg, visual and auditory) forms and in a well-structured and highly interesting way in order to engage interest, avoid waning of attention, and enhance encoding and consolidating of memory processes.<sup>58</sup> Most of these methods of information presentation are not provided by scientific articles.

## The 5-Minute Video Summary (5MVS): An Innovative Educational Tool

Given the likely aforementioned numerous challenges associated with reading scientific articles for medical learners and physicians with ADHD, and the already heavy demands on time, concentration, energy, and sleep for medical learners and providers in general (making timely, consistent, and thorough reading of scientific articles challenging), we propose the development of an innovative educational tool for presenting relevant information from scientific articles. This consists of a 5-minute recorded video summary in which an engaging speaker presents the relevant information from a scientific article using a brief PowerPoint<sup>®</sup> (Microsoft Corporation, Redmond, Washington, United States)<sup>59</sup> presentation shared using videoconferencing (eg, Zoom<sup>®</sup> [Zoom Video Communications, Incorporated, San Jose, California, United States])<sup>60</sup> technology. Use of a limited number of slides, underlining, bolding, and graphics when possible are employed to highlight the salient aspects of the visually presented information, and regular eye contact, engaged facial expression, variable vocal tone, and insertion of periodic commentaries similarly are used to de-monotonize verbally expressed material. Information is thus presented in both written and oral form, providing visual and auditory engagement of the learner, while keeping the session brief to prevent waning of attention over time. The recording would be captured in a video file that can be easily accessed from the learner's desktop computer, laptop computer, smartphone, or other electronic device, and can be listened to (without being viewed) while exercising, driving, or engaging in other activities for convenience. The recording can be paused, stopped, re-wound, and re-played at the learner's convenience (eg, to clarify content that may have been missed the first time, or to review particularly complex material), in line with the benefit of repeating presentation of instructions or other information to individuals with ADHD to address forgetfulness, distractibility, or difficulty following through. The video summary, while brief, would allow presentation of information on study limitations, discussion points, and other material that would not typically be captured in article abstracts.

One might question how the 5-minute video summary (5MVS) differs from the use of video abstracts offered by some scientific journals. Key differences include: (1) Video abstracts provide a video summary of the background, methods, results, and conclusions of the article being presented – a visual form of the article abstract, as the title implies. The 5MVS, however, includes not only these elements of the article, but discussion of the strengths and limitations of the article via commentaries designed to enhance reader engagement. The longer duration of the 5MVS (five minutes) compared to video abstracts (typically one to three minutes) facilitates this inclusion of additional information. (2) Video abstracts are typically presented by the author(s) of the featured article, to provide an overview of the research from the standpoint of the authors, who presumably are in the best position to describe the context, motivation, and intent behind the study. The 5MVS, on the other hand, is presented by a physician who is not one of the article's authors, providing potentially greater objectivity in disseminating the article's findings, particularly with use of commentaries on the strengths and limitations of the article, as noted above. (3) While both video abstracts and the 5MVS can be viewed by any medical learner or physician, the 5MVS is specifically designed to help medical learners or physicians with ADHD through intentional use of visual enhancements (such as text bolding, underlining, italicizing, coloring, and use of easy-to-follow pictures and schematics), engaged facial affect, variation in vocal pitch/tone, and insertion of periodic commentaries, with the goal of capturing and maintaining attention through multiple modes of information presentation. (4) Video abstracts are customarily offered by the scientific journals featuring the articles on which the video abstracts are based, as a means of enhancing reader interest in the articles featured, whereas the 5MVS would be made available independent of an article's particular journal affiliation, with the goal of providing readers with ADHD an avenue to process and retain the important content of scientific articles more effectively and efficiently.

The effectiveness of the 5MVS tool could be assessed via real-time and cumulative approaches. Real-time approaches could entail including a limited number (eg, three) of multiple choice questions at the end of the 5MVS designed to assess understanding, retention, and application of the material presented, with responses by each individual viewer (including percent correctly answered) tracked and recorded in a central database, akin to how retention of material from maintenance of certification articles is assessed and tracked by the American Board of Medical Specialties.<sup>54</sup> Cumulative approaches could involve, for example, assigning a group of residents with ADHD six articles to read in four weeks; half of the residents would have access to 5MVSs of these articles, and half would not (all residents would have access to the full-length articles, which could feature topics relevant to the medical field but unlikely to have been previously read by the residents). The two resident groups could be matched on demographic, specialty, ADHD severity, comorbid psychiatric and learning conditions, and other variables. At the end of the six weeks, the residents would take a multiple-choice quiz designed to assess understanding, retention, and application of material from the six articles. Those who had access to the 5MVSs could then be compared to those who did not in terms of quiz scores.



One might question the utility of the 5MVS in terms of helping medical learners and physicians to critically appraise scientific literature, rather than merely read it. Two points are noteworthy here: (1) The 5MVS includes commentaries by the presenter regarding the strengths and limitations of the article, to both increase engagement of the viewer as well as encourage the viewer to critically evaluate the article's findings; and (2) The 5MVS is not intended to replace other approaches aimed at encouraging medical learners and physicians to critically assess scientific literature, including the use of journal clubs, workshops, clinical and methodological critiques, listserv discussions, and other approaches.<sup>61,62</sup> That stated, to the extent that some of these approaches utilize articles or other formats that may lend themselves to video summarization (eg, workshops, clinical and methodological critiques), the 5MVS could prove valuable in helping medical learners and physicians with ADHD improve their development of critical appraisal skills.

Residency training programs and medical institutions could provide training of interested providers (perhaps residents and faculty with a passion for teaching) in the construction and implementation of the 5MVSs, incorporating the aforementioned elements to optimize the educational experience for all learners, including those with ADHD. One potential barrier to this would be time constraints on the part of busy residents and faculty physicians. This might be addressed by providing a certain percentage of protected time for residents and/or faculty members to devote to the creation of this tool for learners. Another potential barrier could be technology constraints, although most academic institutions currently have the capability of employing videoconferencing technology, and current costs associated with acquiring such technology do not appear prohibitive for most organizations.<sup>63</sup> It would also be important to achieve an acceptable balance between making a presentation stimulating and engaging (through use of visual techniques, tone of voice, insertion of commentaries, and other methods as above) and maintaining objectivity in how scientific information is presented, so as not to inadvertently introduce bias in presentation of the material.

## Conclusion

While receiving less published attention than depression, anxiety, and burnout, untreated ADHD in medical learners and physicians has numerous and significant consequences that can adversely impact training, practice, and ultimately patient care. Standard, first-line treatments for ADHD (ie, stimulant medications) provide benefit, but nearly half of adults with ADHD discontinue treatment over time due to lack of perceived effectiveness, and accommodation-based interventions, while helpful and important, do not specifically address a crucial facet of medical training and practice – the reading of scientific articles. We propose an innovative educational tool for helping medical learners and physicians with ADHD acquire relevant information from scientific articles, taking into account constraints imposed by the disorder and learning approaches that are more likely to be effective in light of these challenges. Future research should examine both the perceived effectiveness of this tool among medical learners and providers with ADHD who have used it and objective data (using validated measures of information comprehension, retention, and conceptual application) comparing the effectiveness of this tool with standard approaches to the reading of scientific articles. As noted by Duong and Vogel (2022),<sup>39</sup> a growing community of physicians is challenging the notion that neurodivergence (defined as having a neurodevelopmental condition such as ADHD that may produce challenges functioning in a “neurotypical” society but may also offer strengths) is incompatible with a medical career, particularly if individuals with these conditions are properly supported via evidence-based treatments, program-based accommodations, and innovative educational tools.

## Disclosure

The authors report no conflicts of interest in this work.

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