1 ADHD AND ITS TREATMENT

QUESTION ONE

Peter, a 35-year-old stockbroker, has been advised by his supervisor to come and see you, the company mental health consultant. His supervisor is complaining that he often comes to appointments late, is inappropriately fidgety, interrupts people during meetings, has been offensive toward coworkers, and has been known to party excessively on weeknights. Peter asserts that he is just fine; he has a lot of projects on his mind and is simply standing up for himself when speaking with others. He likes to go out in the evenings to unwind. Recognizing probable attention deficit hyperactivity disorder (ADHD), you interview both the patient and his work buddy, who is a longtime friend. How would you start your questions?

A. Compared to his parents, how often does the patient …

B. Compared to other people his age, how often does the patient …

C. Compared to his childhood, how often does the patient …

D. Compared to his children, how often does the patient …

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Answer to Question One

The correct answer is B.

Choice	Peer answers
Compared to his parents, how often does the patient …	1%
Compared to other people his age, how often does the patient …	82%
Compared to his childhood, how often does the patient …	17%
Compared to his children, how often does the patient …	0%

The symptoms of ADHD can **present differently** in patients at **different ages**. While **hyperactivity** is a main symptom in children for example, this will frequently translate into **internal restlessness** in adults.

A and D – Incorrect. While ADHD has a strong genetic component, it is not advised to ask him first to compare himself to either his children or his parents. An accurate family history would be beneficial, however.

B – Correct. When trying to diagnose this adult patient with ADHD, it is preferable to **first** ask him to **compare his behavior** to that of **other adults his age**, as this will give a better idea of the severity of his symptoms at this time.

C – Incorrect. While it is important to obtain a medical history, the patient might not have the best recollection and might not be the best judge of his behaviors as a child.

Reference

Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION TWO

According to DSM-5 criteria, what is the maximum age threshold for symptom onset when making a diagnosis of ADHD?

A. 5

B. 7

C. 12

D. 15

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Answer to Question Two

The correct answer is C.

Choice	Peer answers
5	4%
7	10%
12	79%
15	7%

C – Correct. In the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, the maximum age threshold for symptom onset for diagnosing ADHD changed from 7 to 12. Other revisions included the fact that, although symptoms must have been present prior to age 12, there does not have to have been impairment prior to age 12 when diagnosing someone who is older. The symptom count threshold also changed for adults (defined as age 17 and older), with five (instead of six) symptoms required in the inattention and/or hyperactive/impulsive categories.

A, B, and D – Incorrect.

Reference

American Psychiatric Association. *Diagnostic and statistical manual of mental disorder*, fifth edition. Arlington, VA: American Psychiatric Publishing; 2013.

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QUESTION THREE

A 15-year-old with inattentive-type ADHD has a hard time staying focused on the task at hand, has trouble organizing her work, and relies heavily on her mother to follow through with her homework. Problem solving is one of the hardest tasks for her. Her difficulty with sustained attention could be related to aberrant activation in the:

A. Dorsolateral prefrontal cortex

B. Prefrontal motor cortex

C. Orbital frontal cortex

D. Supplementary motor cortex

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Answer to Question Three

The correct answer is A.

Choice	Peer answers
Dorsolateral prefrontal cortex	68%
Prefrontal motor cortex	24%
Orbital frontal cortex	7%
Supplementary motor cortex	1%

A – Correct. **Sustained attention** is hypothetically modulated by the cortico-striatal-thalamic-cortical loop involving the **dorsolateral prefrontal cortex** (DLPFC). Inefficient activation of the DLPFC can lead to problems following through or finishing tasks, disorganization, and trouble sustaining mental effort; the patient exhibits all these symptoms. The dorsal **anterior cingulate cortex** is important in regulating **selective attention**, and is associated with behaviors such as losing things, being distracted, and making careless mistakes. This area is certainly also inefficient in this patient.

B – Incorrect. The **prefrontal motor cortex** hypothetically modulates behaviors such as fidgeting, leaving one's seat, running/climbing, having trouble being quiet.

C – Incorrect. The **orbital frontal cortex** regulates impulsivity, which includes symptoms such as talking excessively, blurting things out, and interrupting others.

D – Incorrect. Finally, the **supplementary motor area** is implicated in planning motor actions; thus, this brain area would be more involved in hyperactive symptoms.

References

Arnsten AF. Fundamentals of attention-deficit/hyperactivity disorder: circuits and pathways. *J Clin Psychiatry* 2006;67(Suppl 8):7–12.

Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

Stahl SM, **Mignon L**. *Stahl's illustrated attention deficit hyperactivity disorder*. New York, NY: Cambridge University Press; 2009. (Chapter 1)

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QUESTION FOUR

Which of the following is true regarding cortical brain development in children with ADHD compared to healthy controls?

A. The pattern (i.e., order) of cortical maturation is different

B. The timing of cortical maturation is different

C. The pattern and timing of cortical maturation are different

D. Neither the pattern nor the timing of cortical maturation is different

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Answer to Question Four

The correct answer is B.

Choice	Peer answers
The pattern (i.e., order) of cortical maturation is different	8%
The timing of cortical maturation is different	34%
The pattern and timing of cortical maturation are different	52%
Neither the pattern nor the timing of cortical maturation is different	6%

ADHD is a neurodevelopmental disorder characterized by inattentive, hyperactive, and/or impulsive symptoms. Neuroimaging has been used to evaluate cortical maturation in children with ADHD compared to typically developing controls, specifically by comparing the age of attaining peak cortical thickness in children with and without ADHD.

A – Incorrect. Research shows that the pattern of cortical maturation is similar for children with and without ADHD. Specifically, the primary sensory and motor areas attain peak cortical thickness earlier in development than do high-order association areas such as the dorsolateral prefrontal cortex.

B – Correct. There are differences in the timing of cortical maturation between children with and without ADHD that are apparent as early as age 7. That is, cortical maturation in children with ADHD seems to lag behind that of healthy children. In fact, the median age by which 50% of the cortical points achieve peak thickness is delayed by 3 years in children with ADHD. Delay is most prominent in the superior and dorsolateral prefrontal regions, which are particularly important for control of attention and planning. Delay is also seen in subcortical structures. A large cross-sectional mega-analysis demonstrated that the delay in brain maturation is not attributable to medication use.

Interestingly, there is one brain region in which children with ADHD achieve peak cortical thickness earlier than typically developing controls: the primary motor cortex.

C and D – Incorrect.

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References

Hoogman M, **Bralten J**, **Hibar DP** et al. Subcortical brain volume differences in participants with attention deficit hyperactivity disorder in children and adults: a cross-sectional mega-analysis. *Lancet Psychiatry* 2017;4(4):310–19.

Shaw P, **Eckstrand K**, **Sharp W** et al. Attention-deficit/hyperactivity disorder is characterized by a delay in cortical maturation. *Proc Natl Acad Sci U S A* 2007;104(49):19649–54.

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QUESTION FIVE

Irina is a 35-year-old patient with untreated ADHD who reports abusing alcohol to manage severe anxiety. Irina's symptoms may represent a case where the firing of _____ and _____ neurons innervating her prefrontal cortex is dysregulated and causing excessive arousal.

A. Norepinephrine; glutamate

B. Norepinephrine; dopamine

C. Dopamine; glutamate

D. Dopamine; serotonin

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Answer to Question Five

The correct answer is B.

Choice	Peer answers
Norepinephrine; glutamate	23%
Norepinephrine; dopamine	57%
Dopamine; glutamate	16%
Dopamine; serotonin	5%

A – Incorrect.

B – Correct. When norepinephrine (NE) and dopamine (DA) neurotransmission in the prefrontal cortex are optimally tuned, modest stimulation of postsynaptic alpha 2A receptors and dopamine 1 receptors allows for efficient cognitive functioning. If NE or DA neurotransmission is excessive, as in situations of stress or comorbid conditions such as anxiety or substance abuse, this can lead to overstimulation of postsynaptic receptors and consequently to cognitive dysfunction as well as other symptoms.

C – Incorrect.

D – Incorrect.

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Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION SIX

Martin is a 19-year-old patient with a history of ADHD since childhood and is treated with an immediate-release amphetamine (D, L) tablet once a day upon waking. However, Martin has now started college and his class schedule is spread out throughout the day. He complains that he is unable to concentrate and takes scattered notes during his early evening courses. What dose adjustment would you recommend?

A. Decrease the dose of his immediate-release amphetamine

B. Increase the dose of his immediate-release amphetamine

C. Switch to an extended-release formulation of amphetamine

D. Do not change anything

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Answer to Question Six

The correct answer is C.

Choice	Peer answers
Decrease the dose of his immediate-release amphetamine	0%
Increase the dose of his immediate-release amphetamine	1%
Switch to an extended-release formulation of amphetamine	99%
Do not change anything	0%

The goal is to enhance phasic DA neurotransmission with low to moderate, continuous drug delivery, trying to increase mostly tonic DA firing and only judiciously increase phasic DA firing. To achieve prudent and therapeutic improvement of tonic and phasic DA neurotransmission, without disastrous increases in phasic DA neurotransmission leading to abuse and addiction, sustained delivery is what is wanted.

A – Incorrect. Immediate-release preparations have a duration of 4–6 hours. Decreasing the dose of immediate-release amphetamine (D, L) will have no therapeutic effect on helping the patient manage his symptoms later in the day.

B – Incorrect. Immediate-release preparations have a duration of 4–6 hours. Pharmacological actions of high-dose amphetamine are not linked to therapeutic action in ADHD, but to reinforcement, reward, and euphoria in amphetamine abuse. Increasing the dose of immediate-release formulations elicits pulsatile drug administration that causes immediate release of DA and could potentially lead to the highly reinforcing pleasurable effects of drug abuse, especially at high enough doses and rapid enough administration. For this reason, using immediate-release stimulants, especially in young adults, is increasingly being avoided.

C – Correct. Extended-release preparations have a duration ranging from 8 to 16 hours, depending on the formulation. Controlled-release (or extended-release) preparations for stimulants result in slowly rising, constant, steady-state levels of the drug. Under those circumstances, the firing pattern of DA will theoretically be mostly tonic, regular, and not at the mercy of fluctuating levels of DA. Some pulsatile firing is fine, especially when involved in reinforcing learning and salience.

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D – Incorrect. Not changing anything will have no therapeutic effect on helping the patient manage his symptoms later in the day.

References

Cortese S, **Adamo N**, **Del Giovane C** et al. Comparative efficacy and tolerability of medications for attention-deficit hyperactivity disorder in children, adolescents, and adults: a systematic review and network meta-analysis. *Lancet Psychiatry* 2018;5(9):727–38.

Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION SEVEN

Alexandra, a 27-year-old bartender, was diagnosed with ADHD at age 10. She has been on and off medication since then, first on immediate-release methylphenidate, then on the methylphenidate patch. She experimented with illicit drugs during her late adolescence and is still a heavy drinker. After a few years of self-medication with alcohol and cigarettes, she is seeking medical attention again. You decide to put her on 80 mg/day of atomoxetine, one of the nonstimulant medications effective in ADHD. Why does atomoxetine lack abuse potential?

A. It decreases norepinephrine levels in the nucleus accumbens, but not in the prefrontal cortex

B. It increases dopamine levels in the prefrontal cortex but not in the nucleus accumbens

C. It modulates serotonin levels in the raphe nucleus

D. It increases dopamine in the striatum and anterior cingulate cortex

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Answer to Question Seven

The correct answer is B.

Choice	Peer answers
It decreases norepinephrine levels in the nucleus accumbens, but not in the prefrontal cortex	17%
It increases dopamine levels in the prefrontal cortex but not in the nucleus accumbens	69%
It modulates serotonin levels in the raphe nucleus	9%
It increases dopamine in the striatum and anterior cingulate cortex	5%

Atomoxetine is a selective norepinephrine reuptake inhibitor (**NET inhibitor**).

A – Incorrect. In the nucleus accumbens there are only a few NE neurons and NE transporters. **Inhibiting NET in the nucleus accumbens** will not lead to an increase in NE or DA.

B – Correct. The prefrontal cortex lacks high concentrations of dopamine transporter (DAT), so in this brain region, DA gets inactivated by NET. Therefore, **inhibiting NET in the prefrontal cortex** increases both DA and NE. As only a few NET exist in the nucleus accumbens, atomoxetine does not induce an increase in DA and NE in the nucleus accumbens, the reward center of the brain, thus atomoxetine does not have abuse potential.

C – Incorrect. Atomoxetine does not modulate serotonin levels.

D – Incorrect. The striatum and the anterior cingulate cortex are not brain areas involved in reward.

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Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION EIGHT

A 14-year-old patient with ADHD has a rare mutation in the gene for the dopamine transporter (DAT). In deciding which treatment to initiate for this patient's ADHD, you know it will be important to avoid treatments that depend on normally functioning DAT. Which of the following drugs are transported into neurons via the DAT?

A. Methylphenidate

B. Atomoxetine

C. Amphetamine

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Answer to Question Eight

The correct answer is C.

Choice	Peer answers
Methylphenidate	15%
Atomoxetine	23%
Amphetamine	62%

A – Incorrect. Methylphenidate binds to the DAT and to the norepinephrine transporter (NET), in both cases acting as an allosteric modulator. That is, it binds to each transporter at a different site than the neurotransmitter itself binds. When it does so, it stops the action of the transporters, preventing reuptake and thus allowing DA and NE to accumulate in the synapse. Methylphenidate itself is not taken up into the presynaptic neuron.

B – Incorrect. Atomoxetine is an inhibitor of the NET, and like methylphenidate it binds at a site distinct from where monoamines bind. It does not have actions at the DAT.

C – Correct. Like methylphenidate, amphetamine blocks the transporters for both DA and NE. However, unlike methylphenidate, which acts as an allosteric modulator, amphetamine is a pseudosubstrate and a competitive inhibitor at these receptors. That is, it binds to the same site as the substrate – either DA or NE – thus competing with the neurotransmitters and preventing them from being taken up into the terminal. In addition, because amphetamine is a pseudosubstrate, it is actually transported into the presynaptic nerve terminal. This is important, because amphetamine is *also* a pseudosubstrate and competitive inhibitor at the vesicular monoamine transporter (VMAT). VMAT is a proton pump that exchanges DA for protons, packaging the DA into synaptic vesicles where it is stored for subsequent reuse. When amphetamine binds to VMAT, it not only blocks the further transport of DA into synaptic vesicles but is actually packaged into vesicles itself, where it has the ability to displace stored DA – or NE – back into the cytoplasm. This occurs only at high doses of amphetamine, as in cases of amphetamine abuse.

Reference

Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION NINE

A patient with ADHD has not yet had successful treatment: he has experienced either loss of efficacy toward the end of the day or efficacy but insomnia at night. He is frustrated and wants to know what other treatment options exist. The most recently available new treatments for ADHD represent:

A. Novel neurotransmitter targets

B. New formulations of existing active ingredients

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Answer to Question Nine

The correct answer is B.

Choice	Peer answers
Novel neurotransmitter targets	21%
New formulations of existing active ingredients	79%

A – Incorrect. Investigational and recently available medications for ADHD largely still target the DA and/or NE system.

B – Correct. The majority of approved treatments for ADHD, and specifically new agents approved recently, are formulation variations of either amphetamine or methylphenidate. Their differences lie not in the active ingredient but rather in how that active ingredient is delivered (i.e., release mechanism). Modified-release formulations are designed to release the drug in a controlled and predictable manner that allows for a particular efficacy and safety profile. Modifying the release of the drug can improve tolerability by eliminating peaks and troughs in plasma concentration and can improve efficacy by increasing duration of action as well as by eliminating peaks and troughs.

References

Grady MM, **Stahl SM**. A horse of a different color: how formulation influences medication effects. *CNS Spectr* 2012;17:63–9.

Neuroscience Education Institute. NEI Prescribe [Mobile application software]. 2020. Available at: http://nei.global/neiprescribeitunes.

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QUESTION TEN

Rita is a 28-year-old patient with untreated ADHD. You are currently deciding between guanfacine and clonidine as potential treatments for this patient. The selective alpha 2A agonist guanfacine appears to be:

A. Less tolerated than the alpha 2 agonist clonidine

B. Better tolerated than the alpha 2 agonist clonidine

C. Less efficacious than the alpha 2 agonist clonidine

D. More efficacious than the alpha 2 agonist clonidine

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Answer to Question Ten

The correct answer is B.

Choice	Peer answers
Less tolerated than the alpha 2 agonist clonidine	4%
Better tolerated than the alpha 2 agonist clonidine	75%
Less efficacious than the alpha 2 agonist clonidine	6%
More efficacious than the alpha 2 agonist clonidine	15%

There are two direct-acting agonists for alpha 2 receptors used to treat ADHD, guanfacine and clonidine. Guanfacine is relatively more selective for alpha 2A receptors than for other subtypes, whereas clonidine binds to alpha 2A, alpha 2B, and alpha 2C receptors. Clonidine also has actions on imidazoline receptors, which is thought to be responsible for some of clonidine's sedating and hypotensive actions.

A – Incorrect. Although the actions of clonidine at alpha 2A receptors exhibit therapeutic potential for ADHD, its actions at other receptors may increase side effects. By contrast, guanfacine is 15–60 times more selective for alpha 2A receptors than for alpha 2B and alpha 2C receptors. Additionally, guanfacine is ten times weaker than clonidine at inducing sedation and lowering blood pressure. Thus, guanfacine is better tolerated than clonidine.

B – Correct. Guanfacine is better tolerated than clonidine.

C – Incorrect. Guanfacine is 25 times more potent in enhancing prefrontal cortical function. Thus, it can be said that guanfacine exhibits therapeutic efficacy with a reduced side effect profile compared to clonidine.

D – Incorrect. There are no head-to-head comparisons to establish that guanfacine has superior efficacy to clonidine in ADHD.

References

Stahl SM. *Stahl's essential psychopharmacology, the prescriber's guide*, seventh edition. New York, NY: Cambridge University Press; 2020.

Stahl SM. *Stahl's essential psychopharmacology*, fifth edition. New York, NY: Cambridge University Press; 2021. (Chapter 11)

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QUESTION ELEVEN

Aggregate data suggest that, compared to stimulants, nonstimulants have:

A. Smaller effect sizes

B. Approximately the same effect sizes

C. Larger effect sizes

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Answer to Question Eleven

The correct answer is A.

Choice	Peer answers
Smaller effect sizes	82%
Approximately the same effect sizes	16%
Larger effect sizes	2%

A – Correct. Multiple meta-analyses assessing the effects of stimulant medications have shown that, as a class, nonstimulants have smaller effect sizes than stimulants. Due to differences in study design, these meta-analyses do not address potential differences in efficacy among specific medications.

B and C – Incorrect.

References

Faraone SV, **Glatt SJ**. A comparison of the efficacy of medications for adult attention-deficit/hyperactivity disorder using meta-analysis of effect sizes. *J Clin Psychiatry* 2010;71(6):754–63.

Faraone SV, **Biederman J**, **Spencer TJ**, **Aleardi M**. Comparing the efficacy of medications for ADHD using meta-analysis. *MedGenMed* 2006;8(4):4.

Hanwella R, **Senanayake M**, **de Silva V**. Comparative efficacy and acceptability of methylphenidate and atomoxetine in treatment of attention deficit hyperactivity disorder in children and adolescents: a meta-analysis. *BMC Psychiatry* 2011;11:176.

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QUESTION TWELVE

Isaac is an 8-year-old patient with ADHD. Among male children with ADHD, which of the following is the most commonly seen comorbidity?

A. Anxiety

B. Oppositional defiant disorder

C. Depression

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Answer to Question Twelve

The correct answer is B.

Choice	Peer answers
Anxiety	15%
Oppositional defiant disorder	81%
Depression	4%

A and C – Incorrect. While anxiety and depression are common comorbidities in patients with ADHD, they are more often found in girls compared to boys.

B – Correct. Argumentative, disobedient, and aggressive behaviors are often seen in patients suffering from ADHD and oppositional symptoms. The presence of comorbid disruptive behavior disorders such as oppositional defiant disorder, or conduct disorder, within children with ADHD has been well established. About five in ten children with ADHD have a behavior or conduct problem and this is seen at a higher rate in boys than in girls in studies.

References

Elwin M, **Elvin T**, **Larsson JO**. Symptoms and level of functioning related to comorbidity in children and adolescents with ADHD: a cross-sectional registry study. *Child Adolesc Psychiatry Ment Health* 2020;14:30.

Jensen PS, **Hinshaw SP**, **Kraemer HC** et al. ADHD comorbidity findings from the MTA study: comparing comorbid subgroups. *J Am Acad Child Adolesc Psychiatry* 2001;40(2):147–58.

Reale L, **Bartoli B**, **Cartabia M** et al. Comorbidity prevalence and treatment outcome in children and adolescents with ADHD. *Eur Child Adolesc Psychiatry* 2017;26(12):1443–57.

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QUESTION THIRTEEN

A 44-year-old man was diagnosed with ADHD, inattentive subtype, in college but has not taken medication for the last several years. He is seeking treatment now because of declining work performance following a promotion 7 months ago. Specifically, he complains of difficulty finishing papers and staying focused during meetings, and fears that his boss is losing confidence in him. Assessment confirms a diagnosis of ADHD, inattentive subtype. After 2 months of treatment on a therapeutic dose of a long-acting stimulant, he states that his focus, sustained attention, and distractibility are much better, but that he still can't get organized and that it takes him longer to complete tasks than it should. At this point, would it be appropriate to raise the dose of the stimulant to try to address his residual symptoms?

A. Yes

B. No

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Answer to Question Thirteen

The correct answer is B.

Choice	Peer answers
Yes	56%
No	44%

A – Incorrect. Dose response studies of stimulant medications suggest that the optimal dose varies across individuals and depends somewhat on the domain of function. Specifically, higher doses may lead to greater improvement of some domains (e.g., vigilance, attention) but not executive function (e.g., planning, cognitive flexibility, inhibitory control).

B – Correct. If medication dose is high enough to substantially diminish symptoms of inattention and distractibility, then executive function needs to be addressed independently and will not likely respond to higher medication dosing.

References

Pietrzak RH, **Mollica CM**, **Maruff P**, **Snyder PJ**. Cognitive effects of immediate-release methylphenidate in children with attention-deficit/hyperactivity disorder. *Neurosci Biobehav Rev* 2006;30:1225–45.

Swanson J, **Baler RD**, **Volkow ND**. Understanding the effects of stimulant medications on cognition individuals with attention-deficit hyperactivity disorder: a decade of progress. *Neuropsychopharmacology* 2011;36:207–26.

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QUESTION FOURTEEN

The cumulative data on the effects of physical exercise as an adjunctive treatment for children with ADHD have demonstrated the potential beneficial effects of:

A. Acute aerobic exercise

B. Chronic aerobic exercise

C. A and B

D. Neither A nor B

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Answer to Question Fourteen

The correct answer is C.

Choice	Peer answers
Acute aerobic exercise	11%
Chronic aerobic exercise	13%
A and B	74%
Neither A nor B	3%

A and B – Partially correct.

C – Correct. Comparisons have been made between aerobic/nonaerobic, and acute vs. chronic exercise on cognitive and behavioral symptoms in children with ADHD. Numerous published studies on exercise and cognition in children with ADHD have shown that aerobic exercise appears to be the most effective for improvements in executive function. Both acute and chronic exercise have beneficial effects on behavioral and cognitive measures in children with ADHD, when assessed immediately after exercise. Cognitive measures include improved response inhibition, cognitive control, attention allocation, cognitive flexibility, processing speed, and vigilance.

Physical exercise is beneficial as adjunctive treatment, but there is not enough evidence to suggest that it is a stand-alone treatment. Exercise may be particularly effective for youth, potentially preventing or altering the course of ADHD. The literature is promising; however, the most challenging complications for these types of studies are random assignment, blinded raters, and adequate control groups.

D – Incorrect.

References

Den Heijer AE, **Groen Y**, **Tucha L** et al. Sweat it out? The effects of physical exercise on cognition and behavior in children and adults with ADHD: a systematic literature review. *J Neural Transm (Vienna)* 2017;124(Suppl 1):3–26.

Hoza B, **Martin CP**, **Pirog A** et al. Using physical activity to manage ADHD symptoms: the state of the evidence. *Curr Psychiatry Rep* 2016;18(12):113.

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QUESTION FIFTEEN

A patient with a history of alcohol use disorder has been sober for 6 weeks. He begins medication treatment for adult ADHD and experiences improvement, but 4 months later relapses with his alcohol use disorder, engaging in three binge drinking episodes over a 2-week period. Does this patient need to discontinue medication treatment for ADHD?

A. Yes, he should be switched to a non-medication treatment

B. Only if he is currently on a long-acting stimulant; nonstimulant medication is acceptable in this scenario

C. No, both long-acting stimulants and nonstimulant medications are acceptable in this scenario

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Answer to Question Fifteen

The correct answer is C.

Choice	Peer answers
Yes, he should be switched to a non-medication treatment	11%
Only if he is currently on a long-acting stimulant; nonstimulant medication is acceptable in this scenario	32%
No, both long-acting stimulants and nonstimulant medications are acceptable in this scenario	58%

A – Incorrect. Because ongoing substance abuse can hinder the treatment progress of other disorders, in many cases it may be necessary to address this problem first. However, these are general guidelines in the ordering of treatment, and one should be careful that this prioritization of symptoms/conditions does not lead to the neglect of ADHD treatment in adults. In fact, there is an evidence base for prescribing ADHD medication for patients in early sobriety from an alcohol use disorder. Specifically, atomoxetine, which is approved for adult ADHD, has been shown to be effective for ADHD and to decrease both alcohol cravings and heavy drinking days. Atomoxetine is not contraindicated in patients with acute alcohol use disorder or in patients with liver impairment, so the patient's alcohol use would not require medication discontinuation. It is an appropriate treatment choice; however, it is not the only appropriate treatment choice.

B – Incorrect. Long-acting stimulant medications are not contraindicated in patients with acute alcohol use disorder, although they do carry a black box warning indicating caution in patients with a history of substance dependence. In general, nonstimulant options may be preferable to stimulants in patients with substance use disorders, but long-acting stimulants should remain as a second-tier option.

C – Correct. Nonstimulant and long-acting stimulant medications are both options for ADHD co-occurring with substance use disorders; however, nonstimulants may be preferred as the first-line approach. If a stimulant is prescribed to a patient in early sobriety from substance use and/or continued low-level substance use, then he/she should be monitored closely for misuse of the prescribed medication.

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References

McGough JJ. Treatment controversies in adult ADHD. *Am J Psychiatry* 2016;173:960–6.

Wilens TE, **Morrison NR**. The intersection of attention-deficit/hyperactivity disorder and substance abuse. *Curr Opin Psychiatry* 2011;24:280–5.

Wilens TE, **Morrison NR**, **Prince J**. An update on the pharmacotherapy of attention-deficit/hyperactivity disorder in adults. *Expert Rev Neurother* 2011;11(10):1443–65.

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QUESTION SIXTEEN

A 7-year-old boy has just been diagnosed with ADHD, combined type, and his care provider feels that the best therapeutic choice is a stimulant. Family history is significant for depression and diabetes. The patient's medical history is significant for asthma; physical exam reveals no abnormalities. According to current recommendations, what should be the care provider's next step?

A. Prescribe a stimulant, as no additional tests are indicated for this patient

B. Obtain an electrocardiogram (ECG), as this patient's family history and exam results warrant it

C. Obtain an ECG, as this is mandatory prior to prescribing a stimulant to any child

D. Prescribe a nonstimulant, as a stimulant would not be appropriate for this patient

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Answer to Question Sixteen

The correct answer is A.

Choice	Peer answers
Prescribe a stimulant, as no additional tests are indicated for this patient	71%
Obtain an electrocardiogram (ECG), as this patient's family history and exam results warrant it	8%
Obtain an ECG, as this is mandatory prior to prescribing a stimulant to any child	17%
Prescribe a nonstimulant, as a stimulant would not be appropriate for this patient	4%

A – Correct. Current recommendations from the American Heart Association (AHA) are that it is reasonable but not mandatory to obtain an ECG prior to prescribing a stimulant to a child. The American Academy of Pediatrics (AAP) does not recommend an ECG prior to starting a stimulant for most children.

B – Incorrect. According to recommendations, it is at the physician's discretion whether to obtain an ECG; however, in this case there is no evidence of cardiovascular disease in either the family history or patient exam.

C – Incorrect. According to AHA and AAP recommendations, treatment with a stimulant should not be withheld because an ECG is not obtained.

D – Incorrect. There is no reason why a stimulant would not be a reasonable choice for this patient.

Reference

American Academy of Pediatrics/American Heart Association. American Academy of Pediatrics/American Heart Association clarification of statement on cardiovascular evaluation and monitoring of children and adolescents with heart disease receiving medications for ADHD. *J Dev Behav Pediatr* 2008;29(4):335.

CHAPTER PEER COMPARISON

For the ADHD section, the correct answer was selected 70% of the time.

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