

Table 1.

## Primary Care Pharmacotherapy Toolkit: Attention and Concentration After TBI

Medication	Typical dosage	Indication/evidence	Common side effects	Serious reactions	Monitoring
<b>Tier 1: first line</b>					
<b>Stimulants</b>					
<b>MPH IR and LA formulations</b>	10–40 mg by mouth daily	ADHD, TRD, TBI-related attention and concentration, narcolepsy	Increased heart rate, elevated blood pressure, nervousness, insomnia, weight loss, palpitations, xerostomia, irritability	Abuse, misuse, addiction, psychosis, mania, aggression, Tourette syndrome, MI, stroke, arrhythmia, sudden death, seizures, anaphylaxis, blood cell dyscrasias, hepatotoxicity	Maximum 60 mg/day; consider cardiac evaluation at baseline, CBC with differential
<b>DEX-AMPH IR and LA formulations</b>	5–40 mg by mouth daily	ADHD, attention and concentration problems, narcolepsy	Increased heart rate, elevated blood pressure, nervousness, weight loss, palpitations, abuse, misuse, addiction, psychosis, mania, aggression, insomnia	Abuse, misuse, addiction, psychosis, mania, aggression, sudden death, MI, stroke, seizures, SJS, TEN, priapism	Maximum 60 mg/day; cardiac evaluation at baseline, blood pressure, heart rate, weight, depression, suicidality, behavioral changes, psychosis
<b>Tier 2 (a): commonly used medications for other conditions with potential benefit in attention and concentration after TBI</b>					
<b>Stimulant</b>					
<b>Lisdexamfetamine</b>	30–70 mg by mouth every morning	ADHD, binge-eating disorder	Increased heart rate, elevated blood pressure, weight loss, nausea, vomiting, nervousness, dizziness, agitation, insomnia, tic exacerbation, dyspnea, nightmares, paresthesia	Misuse and abuse, addiction, psychosis, mania, aggression, sudden death, MI, stroke, cardiomyopathy, anaphylaxis, SJS, priapism, Raynaud phenomenon, rhabdomyolysis	Cardiac evaluation at baseline, blood pressure, heart rate, weight, depression, suicidality, mania, behavioral changes, psychosis
<b>Nonstimulant</b>					
<b>Modafinil</b>	200 mg by mouth daily	Circadian rhythm sleep disorders, narcolepsy, hypersomnolence, wakefulness/alertness, fatigue, multiple sclerosis related, residual daytime sleepiness in OSA	Increased heart rate, elevated blood pressure, chest pain, palpitations, elevated liver enzymes, paresthesia, weight loss, headache, nausea, diarrhea, insomnia, depression	Hypersensitivity reactions, anaphylaxis, SJS, TEN, suicidality, mania, psychosis, hallucinations, misuse and abuse, addiction	Blood pressure, heart rate Doses >200 mg rarely more effective than 200 mg
<b>Armodafinil</b>	150–250 mg by mouth every morning	Circadian rhythm sleep disorders, OSA, shift work sleep disorder, narcolepsy	Elevated blood pressure, nausea, diarrhea, dizziness, dry mouth, palpitations, insomnia, depression	Suicidality, mania, psychosis, hallucinations, misuse and abuse, addiction	Blood pressure, heart rate
<b>Atomoxetine</b>	80 mg by mouth daily or divided 40 mg by mouth twice daily. Start at 40 mg every morning x 3 d then increase, maximum 100 mg/d	ADHD, narcolepsy/somnolence, cataplexy	Increased heart rate, palpitations, elevated blood pressure, weight loss, nausea, vomiting, nervousness, diaphoresis, dizziness, agitation, insomnia, urinary hesitancy and retention, irritability, constipation, dyspnea, nightmares, paresthesia	Psychosis, mania, aggression, sudden death, MI, stroke, tachycardia, QTc prolongation, angioedema, anaphylaxis, priapism, Raynaud phenomenon, rhabdomyolysis, depression, aggression, psychosis, mania, suicidality	Cardiac evaluation at baseline, blood pressure, heart rate, weight, depression, suicidality, mania, behavioral changes, psychosis
<b>Viloxazine</b>	200 mg daily, increase by 200 mg/d per wk, maximum 600 mg/d	ADHD	Increased heart rate, elevated blood pressure, weight loss, nausea, vomiting, irritability, dry mouth, dizziness, insomnia, fatigue, headache, constipation, fever	Mania, suicidality	Renal dosing: eGFR <30 start 100 mg/d, may increase by 50–100 mg/d per wk, maximum 200 mg/d, suicidality

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Medication	Typical dosage	Indication/evidence	Common side effects	Serious reactions	Monitoring
<b>Antidepressants</b>					
<b>Bupropion</b>	150 mg by mouth every morning up to 300 mg by mouth daily, divided daily dose	MDD, seasonal affective disorder, ADHD, nicotine dependence, weight management with naltrexone	Headache, tachycardia, nausea, diarrhea, insomnia, abnormal dreams, agitation, anxiety, tremor, sweating, chest pain	Severe hypertension/elevated blood pressure, MI, arrhythmia, anaphylaxis, SJS, erythema multiforme, hyponatremia, transaminitis, depression, suicidality, mania, homicidal ideation, seizures	Maximum daily dose is 450 mg but may be associated with risk of seizures and decreased seizure threshold
<b>Vortioxetine</b>	10–20 mg by mouth daily	MDD	Nausea, vomiting, diarrhea, constipation, abnormal dreams, pruritus, sexual dysfunction	Worsening depression, suicidality, mania, serotonin syndrome, SIADH, hyponatremia, seizures, anaphylaxis, bleeding	Suicidality, behavioral changes
<b>Tier 2 (b): commonly used medications in the elderly with comorbid AD, PD, or dementia with potential benefit in attention and concentration after TBI</b>					
<b>AChEs</b>					
<b>Donepezil</b>	5–23 mg by mouth at bedtime	AD	Nausea, vomiting, diarrhea, insomnia, dizziness, fatigue, weight loss, ecchymosis, depression, abnormal dreams, syncope, somnolence, urinary frequency	Bradycardia, QT prolongation, AV block, torsades de pointes, syncope, seizures, neuroleptic malignant syndrome, rhabdomyolysis, GI bleeding, urinary obstruction	ECG at baseline and after titration for monitoring for QT prolongation, lowers seizure threshold, signs and symptoms of GI bleeding
<b>Galantamine ER</b>	4 mg by mouth twice daily up to 8 mg by mouth twice daily ER 8 mg to 16–24 mg by mouth in the morning	AD	Nausea, vomiting, diarrhea, dizziness, fatigue, weight loss, headache	Bradycardia, AV block, syncope, hepatotoxicity, SJS, erythema multiforme, EPS, hepatotoxicity	Creatinine at baseline, signs and symptoms of GI bleeding, caution in liver disease, creatinine clearance <60, lowers seizure threshold
<b>NMDA</b>					
<b>Amantadine</b>	100 mg by mouth twice daily	Dystonia, PD, EPS, influenza	Nausea, vomiting, diarrhea, constipation, dry mouth, sedation, peripheral edema, headache, weight loss, orthostatic hypotension, dizziness, fatigue, irritability, depression, anxiety, hallucinations, suicidality, abnormal dreams, ataxia, blurred vision, confusion	Arrhythmia, cardiac arrest, congestive heart failure, respiratory failure, pulmonary edema, blood cell dyscrasias including neutropenia, agranulocytosis, leukopenia, suicidality, psychosis, hallucinations, seizures, sudden sleep episodes, neuroleptic malignant syndrome–like symptoms if abruptly discontinued	Caution in renal impairment and hepatic impairment
<b>Memantine Immediate and ER formulas</b>	5 mg by mouth in the morning–10 mg by mouth twice daily 7 mg ER by mouth daily–28 mg ER by mouth daily	Dementia/AD	Vomiting, diarrhea, constipation, dizziness, fatigue, weight gain, headache, confusion, depression, anxiety, aggression, pain, urinary incontinence	SJS	Caution in renal impairment, renal dosing: consider lower dose up to 5 mg by mouth twice a day
<b>Tier 3: medications with some evidence of effectiveness in the elderly with potential benefit in attention and concentration after TBI but not for adoption in most practices</b>					
<b>Dopamine agonists</b>					
<b>Pramipexole</b>	Varies based on diagnosis from 0.375 up to 2.5 mg by mouth daily	PD, RLS, parasomnias, sleep-related movement disorders	Nausea, diarrhea, headache, muscle spasms, skin reactions, withdrawal symptoms, increased appetite, sexual dysfunction, fatigue, sudden onset of sleep, peripheral edema, confusion, forgetfulness, hallucinations, abnormal dreams	Sudden onset of sleep, orthostatic hypotension, hallucinations, psychosis, EPS, rhabdomyolysis	Creatinine at baseline, orthostatic hypotension, monitor for skin reactions

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Medication	Typical dosage	Indication/evidence	Common side effects	Serious reactions	Monitoring
<b>Bromocriptine</b>	20–30 mg by mouth daily	Dystonia, PD, hyperprolactinemia, acromegaly neuroleptic malignant syndrome	Elevated liver enzymes, nausea, vomiting, diarrhea, headache, fatigue, dizziness, weight loss, involuntary movements, visual disturbances, ataxia, compulsive behaviors	Seizures, stroke, MI, arrhythmia, constrictive pericarditis, syncope, severe hypotension, hypertension, neuroleptic malignant syndrome–like symptoms if abrupt discontinuation, hallucinations, Raynaud phenomenon	Blood pressure at baseline and when initiating treatment, CBC with differential, blood urea nitrogen/creatinine, liver function tests, cardiovascular evaluation with chronic use
<b>AChEIs</b>					
<b>Rivastigmine</b>	1.5–6 mg by mouth twice daily	Dementia secondary to AD and PD, cognitive impairment in brain injury	Nausea, vomiting, dyspepsia, abdominal pain, diarrhea, weight loss, headache, tremor, insomnia or somnolence, depression, anxiety	Hypersensitivity reaction, SJS, allergic dermatitis, seizures, syncope, bradycardia, hypotension, severe diarrhea, severe vomiting, GI bleeding, urinary obstruction, depression, hallucinations, roughening of PD symptoms	Weight, appetite loss, signs and symptoms of GI bleeding
<b>Dopamine</b>					
<b>Carbidopa/levodopa</b>	Individualized doses for parkinsonism from 10 mg/100 mg by mouth 3 times/d–4 times/d Maximum 200 mg/2000 mg/d	PD, parasomnias, sleep-related movement disorders, RLS	Nausea, vomiting, constipation, dry mouth, headache, insomnia, abnormal dreams, depression, mood changes, compulsive behaviors, anxiety, hallucinations, confusion	Arrhythmia, MI, orthostatic hypotension, syncope, depression, suicidal ideation, psychosis, hallucinations, GI bleeding, blood cell dyscrasias, hypersensitivity reaction, dyskinesia	Blood urea nitrogen/creatinine, CBC, liver function tests if extended treatment, intraocular pressure if glaucoma, cardiac function
<b>Honorable mention: OTC medications</b>					
<b>Citicoline</b>	500 mg by mouth twice daily up to 1–2 g/d by mouth or intravenous	Memory and brain function after stroke and TBI	Stomach pain, constipation, headache, blurred vision		Generally viewed as safe
<b>SAME</b>	200 mg by mouth twice daily up to 800 mg by mouth twice daily	TRD, pain disorders, fatigue, cognition, dementia	Nausea, diarrhea, dry mouth, headache, anxiety, restlessness, insomnia	Mania	Generally viewed as safe

Abbreviations: AChEIs = acetylcholinesterase inhibitors, AD = Alzheimer disease, ADHD = attention-deficit/hyperactivity disorder, AV = atrioventricular, CBC = complete blood count, DEX-AMPH = dextroamphetamine-amphetamine, ECG = electrocardiogram, eGFR = estimated glomerular filtration rate, EPS = extrapyramidal symptoms, ER = extended-release, GI = gastrointestinal, IR = immediate-release, LA = long-acting, MDD = depressive disorder, MI = myocardial infarction, MPH = methylphenidate, NMDA = *N*-methyl-*D*-aspartate, OSA = obstructive sleep apnea, OTC = over-the-counter, PD = Parkinson disease, RLS = restless leg syndrome, SAME = *S*-adenosylmethionine, SIADH = syndrome of inappropriate antidiuretic hormone secretion, SJS = Steven-Johnson syndrome, TBI = traumatic brain injury, TEN = toxic epidermal necrolysis, TRD = treatment-resistant depression.