

Table 10.1 Medications Used to Treat Parkinson's Disease

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
Anticholinergics				
Benzotropine (Cogentin)	Single therapy used to treat tremor in early PD, especially in younger patients.	Start at 0.5-1 mg at bedtime and increase by 0.5 mg every 5-6 days to 3-6 mg/day in 2-4 divided doses. Maximum dose of 6 mg/day.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: ++ F: ++	Nausea, vomiting, dry mouth, dry eyes, constipation, cognitive impairment, sedation, urinary retention, tachycardia, nervousness, depression, toxic psychosis, abdominal pain, diarrhea, dyspepsia, ataxia, confusion
Procyclidine (Kemadrin)	Single therapy used to treat tremor in early PD, especially in younger patients.	Start at 2.5 mg 3 times/day after meals; may increase to 5 mg 3 times/day and at bedtime after meals. Maximum dose of 20 mg/day.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: ++ F: ++	Dry mouth, mydriasis, blurred vision, giddiness, lightheadedness, gastrointestinal disturbances (e.g., nausea, vomiting, epigastric distress, constipation), weakness, acute parotiditis associated with dry mouth
Trihexyphenidyl (Artane)	Single therapy used to treat tremor in early PD, especially in younger patients.	Start at 1 mg/day and titrate by 2 mg/day every 3-5 days to 6-10 mg/day in 3-4 divided doses. Maximum dose of 10 mg/day.	Cog: ++ S: ++ A: ++ Motor: ++ D: ++ Com: ++ F: ++	Mild nausea, vomiting, dry mouth, blurred vision, dizziness, dry eyes, constipation, nervousness, cognitive impairment, sedation, urinary retention, abdominal pain, diarrhea, dyspepsia, ataxia, confusion
N-methyl-D-aspartic acid receptor inhibitor				
Amantadine (Symmetrel)	Single therapy used in early disease to treat mild symptoms of bradykinesia and rigidity; used in combination with levodopa to reduce levodopa-induced dyskinesias.	Start at 100 mg/day and titrate up to 100 mg twice/day after 1 wk. Titrate weekly to 100-400 mg/day in 2-4 divided doses. Maximum dose of 400 mg/day.	Cog: ++ S: 0 A: ++ Motor: 0 D: ++ Com: ++ F: +++	Hypotension, dizziness, edema, livedo reticularis, seizures, heart failure, suicide attempts, confusion, hallucinations, nausea, constipation, gastrointestinal bleeding, vomiting, dry mouth
Levodopa enhancers				
Carbidopa-levodopa (Sinemet) Immediate- or sustained-release product (Parcopa) Orally disintegrating tablets; 25/100 mg and 25/250 mg	Gold standard treatment of advanced PD. Initiation is delayed as long as possible by using alternative therapies to prolong its effectiveness in advanced PD.	Immediate release: Start at 25/100 mg 3 times/day and increase by 1 tablet every 24-48 h. Sustained release: Start at 50/200 mg twice/day and increase dose or interval every 3 days. Titrate to effects. Range of 25/100-250/1000 mg/day in 4-6 divided doses. Maximum dose of 800 mg of	Cog: +++ S: +++ A: +++ Motor: +++ D: +++ Com: ++ F: ++++	Anorexia, nausea, vomiting, dry mouth, gastrointestinal bleeding, constipation, somnolence, hallucinations, delusions, sleep disturbances, choreiform movements, dystonia, bradykinesia, cardiac irregularities, orthostatic hypotension, mental changes, depression, dementia

From L. Carl, J. Gallo, and P. Johnson, 2014, *Practical Pharmacology in Rehabilitation: Effect of Medication on Therapy* (Champaign, IL: Human Kinetics).

Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
		levodopa/day.		
Carbidopa (Lodosyn)	Used in combination with levodopa or Sinemet to provide enhanced levels of dopamine and reduce nausea and vomiting associated with levodopa therapy.	Start at 25 mg 3 times/day and increase by 0.5-1 tablet/day. Maximum dose of 200 mg.	Cog: +++ S: +++ A: ++ Motor: + D: +++ Com: ++ F: ++	Confusion, constipation, diarrhea, dizziness, drowsiness, dry mouth, headache, loss of appetite, nausea, taste changes, trouble sleeping, stomach upset, urinary tract infection, vomiting
Carbidopa-levodopa-entacapone combination (Stalevo 50: 12.5/50/200 mg; Stalevo 100: 25/100/200 mg; Stalevo 150: 37.5/150/200 mg; Stalevo 200: 50/200/200 mg)	Combination treatment used in patients with advanced PD with significant wearing off time.	Maximum dose: 8 tablets/day of Stalevo 50, 100, or 150 or 6 tablets/day of Stalevo 200.	Cog: ++ S: +++ A: ++ Motor: +++ D: ++ Com: ++ F: +++	Mild nausea, transient dyskinesias, hypotension, sedation, headache, constipation, diarrhea
Direct dopamine receptor agonists				
Bromocriptine (Parlodel)	Used in early PD to postpone use of levodopa; used in combination with levodopa to reduce the needed dose and prolong the effects of levodopa.	Start at 1.25 mg twice/day with meals and increase by 2.5 mg/day every 14-28 days to 10-50 mg/day in 2-3 divided doses. Maximum dose of 100 mg/day.	Cog: +++ S: +++ A: +++ Motor: +++ D: +++ Com: ++ F: +++	Nausea, dyskinesia, hallucinations, confusion, on-off phenomenon, dizziness, drowsiness, vomiting, visual disturbance, insomnia, depression, hypotension, constipation, retroperitoneal fibrosis (rare), impulse-control disorders, sleep attacks
Pramipexole (Mirapex)	Used in early PD to postpone use of levodopa; used in combination with levodopa to reduce the needed dose and prolong the effects of levodopa.	Start at 0.125 mg 3 times/day with normal renal function and titrate to 0.375 mg/day after 1 wk. Increase by 0.75 mg/day weekly to 3-4.5 mg/day in 3 divided doses. Maximum dose of 4.5 mg/day.	Cog: +++ S: +++ A: +++ Motor: +++ D: +++ Com: ++ F: ++++	Hallucinations, dizziness, insomnia, somnolence, dream abnormalities, anorexia, nausea, vomiting, dry mouth, gastrointestinal bleeding, constipation, sedation, edema, hypotension, compulsive behaviors, confusion, extrapyramidal symptoms, dyskinesias, sleep attacks
Ropinirole (Requip)	Used in early PD to postpone the use of levodopa; used in combination with levodopa to reduce the needed dose and prolong the effects of levodopa. Also	Start at 2.5 mg 3 times/day and increase by 0.75 mg/day weekly for 4 wk, then by 1.5 mg weekly to 9 mg/day. Then titrate by 3 mg/day weekly. Maximum dose of 24 mg/day.	Cog: +++ S: +++ A: ++ Motor: ++ D: +++ Com: ++ F: ++++	Anorexia, nausea, vomiting, dizziness, somnolence, headache, syncope, fatigue, edema, orthostasis, abdominal pain, confusion, dry mouth, gastrointestinal bleeding, constipation, hallucinations, compulsive behaviors, sleep attacks

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Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
	used to treat restless-leg syndrome.			
Apomorphine (Apokyn)	Adjunct therapy used to treat freezing episodes associated with advanced PD.	0.2 ml in patients with normal renal function 3-5 times/day as needed. Titrate by 0.1 ml every few days. Maximum dose of 2 ml.	Cog: +++ S: +++ A: +++ Motor: ++ D: ++ Com: + F: +++	Irritation at the injection site, yawning, dyskinesias, nausea, vomiting, somnolence, dizziness, rhinorrhea, hallucinations, edema, chest pain, sweating, flushing, pallor, orthostasis, impulse-control disorders, sleep attacks. Administered as subcutaneous injection. Use antiemetic therapy with administration to prevent nausea and vomiting.
Rotigotine (Neupro) transdermal patch	Useful for patients who cannot swallow, provides better control of motor symptoms with decreased off time and doubled on time of dopamine effects.	Start at 2 mg/day and titrate by 2 mg/day weekly. Maximum dose of 6 mg/day.	Cog: ++ S: +++ A: + Motor: + D: ++ Com: + F: ++	Reactions at application site, nausea, vomiting, dizziness, somnolence, sleep attacks
Inhibitors of enzymatic breakdown of dopamine				
Rasagiline (Azilect)	MAO-B inhibitor used in early, untreated PD to provide relief of symptoms, delay need for initiation of levodopa, extend mobility, and reduce freezing of gait. When used with levodopa in later PD, it can reduce the dosage requirement for levodopa and attenuate the wearing-off phenomenon.	Monotherapy: 1 mg/day. Adjunctive therapy: 0.5 mg/day. May increase to 1 mg/day. Decrease dose with concurrent CYP1A2 inhibitor to 0.5 mg/day.	Cog: +++ S: + A: +++ Motor: +++ D: ++ Com: + F: ++++	Dyskinesia, arthralgias, depression, dyspepsia, falls, hallucinations, diarrhea, nausea, vomiting, constipation, weight loss, postural hypotension, headache, dizziness, drowsiness, dry mouth, flu-like symptoms, sleeplessness, stuffy nose, ecchymosis with higher doses
Selegiline (Eldepryl)	MAO-B inhibitor used in early, untreated PD to provide relief of symptoms, delay need for initiation of levodopa,	Start at 5 mg/day and titrate to 5 mg twice/day. Maximum dose of 10 mg/day.	Cog: +++ S: 0 A: +++ Motor: +++ D: +++ Com: ++ F: ++++	Anorexia, nausea, vomiting, dry mouth, gastrointestinal bleeding, constipation, confusion, hallucinations, depression, loss of balance, orthostasis, agitation, arrhythmia, delusions,

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Medication	Indications	Dosing	Side effects affecting rehab	Other side effects or considerations
	extend mobility, and reduce freezing of gait. When used with levodopa in later PD, it can reduce the dosage requirement for levodopa and attenuate the wearing-off phenomenon.			hypertension, new-onset angina chest pain, syncope, insomnia, extrapyramidal symptoms, dyskinesias, bradykinesia, chorea
Selegiline (Zelapar) rapidly dissolving oral tablet	MAO-B inhibitor used in early, untreated PD to provide relief of symptoms, delay need for initiation of levodopa, extend mobility, and reduce freezing of gait. When used with levodopa in later PD, it can reduce the dosage requirement for levodopa and attenuate the wearing-off phenomenon.	Start at 1.25 mg/day for 6 wk; then may increase to maximum dose of 2.5 mg/day (dissolve in mouth).	Cog: +++ S: 0 A: +++ Motor: +++ D: +++ Com: ++ F: ++++	Anorexia, nausea, vomiting, dry mouth, gastrointestinal bleeding, constipation, confusion, extrapyramidal symptoms, dyskinesias. Fewer side effects than the oral tablet. Onset is 10-15 min. Do not swallow or chew tablet.
Entacapone (Comtan)	COMT inhibitor used to prolong levodopa effects, enhance motor function, and reduce off time. Not effective as monotherapy; use with levodopa.	Take before Sinemet doses. Start at 200 mg 3 times/day with each Sinemet dose and increase to 1600 mg/day in divided doses.	Cog: +++ S: 0 A: +++ Motor: ++++ D: +++ Com: +++ F: ++++	Diarrhea, exacerbation of levodopa side effects, bright-orange urine, anorexia, nausea, vomiting, dry mouth, gastrointestinal bleeding, constipation, confusion, extrapyramidal symptoms, dyskinesias, hyperkinesias, dizziness, abdominal pain, hypotension, syncope, hallucinations, rhabdomyolysis (rare)
Tolcapone* (Tasmar)	COMT inhibitor used to prolong effects of levodopa, enhance motor function, and reduce off time. Used only if other agents are not effective.	Take before Sinemet doses. Start at 100 mg 3 times/day with each Sinemet dose and titrate to a maximum dose of 600 mg/day in divided doses.	Cog: +++ S: +++ A: +++ Motor: ++++ D: +++ Com: +++ F: ++++	Explosive diarrhea, dyskinesia, nausea, sleep disorders, dystonia, excessive dreaming, anorexia, muscle cramps, orthostasis, somnolence, confusion, dizziness, headache, urine discoloration. Exacerbates side effects of levodopa. Hepatotoxicity;

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	Not effective as monotherapy; use with levodopa.			monitor liver-function tests. Discontinue if liver-function test results are twice normal levels. Fatal hepatotoxicity is rare.

*Use limited due to hepatotoxicity with this medication.

Cog = cognition; S = sedation; A = agitation or mania; Motor = discoordination; D = dysphagia; Com = communication; F = falls; COMT = catechol-O-methyl-transferase; MAO-B = monoamine oxidase-B; PD = Parkinson's disease.

The likelihood rating scale for encountering the side effects is as follows: 0 = Almost no probability of encountering side effects. + = Little likelihood of encountering side effects. +/++ = Low probability of encountering side effects; however, probability increases with increased dosage. ++ = Medium likelihood of encountering side effects. +++ = High likelihood of encountering side effects, particularly with high doses. ++++ = Highest likelihood of encountering side effects; best to avoid in at-risk patients.