

**Appendix**  
**Prescription Benzodiazepine Use in Privately Insured U.S. Children and Adolescents**  
**Bushnell et al.**

**Appendix Table 1.** ICD-9-CM Definitions for Potential Indications, Prescribing Cautions, and Prescription Medications

Variable	ICD-9-CM codes
<b>Potential indication</b>	
Anxiety disorders	300.0x; 300.2x; 300.3x; 308.x; 309.21; 309.81; 313.0x; 313.2x; 293.84; 799.21
Sleep problems	307.4x; 327.0x; 327.3x; 327.4x; 327.5x; 327.8x; 780.50; 780.52; 780.55; 780.56; 780.58; 780.59
Depressive disorders	296.2x; 296.3x; 300.4x; 309.1x; 311.x
Bipolar disorder, schizophrenia, other psychotic disorders	295.x; 296.0x; 296.1x; 296.4x; 296.5x; 296.6x; 296.7x; 296.8x; 293.81; 293.82; 297.x; 298.x
Conduct/disruptive behavior disorders	312.x; 313.81
Epilepsy, convulsions	345.x; 780.3x
Movement disorders, muscle spasm	Cerebral palsy (343); tics (307.2x); muscular dystrophies and other myopathies (359.x); motor neuron diseases (335.x); movement disorders (332.x; 333.x); spasm of muscle/abnormal involuntary movements (728.85; 781.0x)
Other uncommon	Alcohol withdrawal (291.81; 291.0; 303.90–92); burning mouth syndrome (529.6); trigeminal neuralgia (350.1); Irritability/impulsiveness (799.22; 799.23)
Injury	800–904; 910–957
Musculoskeletal, connective tissue condition	710–739 [Subcategories: Spine curvature=737.x; Pain in joint/limb=719.4x, 729.5x; Back/neck pain=723.1x, 723.5x, 724.2x, 724.5x]
<b>Prescribing caution</b>	
Drug-related disorders	292.x; 304.x; 305.2x-305.9x; 965.0x; 760.72; 760.73; 760.75; 779.5; 648.3x; 655.5x
Alcohol-related disorder	291.1x-291.5x; 291.82; 291.89; 291.9x; 303.0x; 303.93; 305.0x; 980.0x; E860.0; V11.3; 760.71; 790.3x
Suicidality	V62.84; E950–E959
Poisoning	960–964.x; 965.1x–965.9x; 966–979.x; 980.1x–980.9x; 981–989.x; E850–E858; E860.1–E860.9; E861–E869; E980; E981; E982
Sleep apnea, hypersomnia	327.1x; 327.2x; 780.51; 780.53; 780.54; 780.57
Respiratory failure, hypoxemia	518.81; 518.83; 518.84; 799.02 (Note: diagnoses on date of benzodiazepine initiation excluded)
Opioid prescription	Alfentanil, buprenorphine, butorphanol, codeine, dihydrocodeine, fentanyl, hydrocodone, hydromorphone, levorphanol, meperidine, methadone, morphine, nalbuphine, oxycodone, oxymorphone, pentazocine, propoxyphene, remifentanil, sufentanil, tapentadol, tramadol
<b>Psychotropic prescription</b>	

**Appendix**  
**Prescription Benzodiazepine Use in Privately Insured U.S. Children and Adolescents**  
**Bushnell et al.**

SSRI	Fluoxetine, citalopram, paroxetine, sertraline, fluvoxamine, escitalopram, vilazodone
Other antidepressant	Desvenlafaxine, duloxetine, levomilnacipran, milnacipran, venlafaxine, amitriptyline, amoxapine, clomipramine, desipramine, doxepin, imipramine, nortriptyline, protriptyline, trimipramine, maprotiline, bupropion, isocarboxazid, phenelzine, tranylcypromine, selegiline, rasagiline, vortioxetine, nefazodone, trazodone, mirtazapine
Stimulant	Amphetamine, dextroamphetamine, dexamethylphenidate, lisdexamfetamine, metamfetamine, methylphenidate
Hypnotic	Zolpidem, zaleplon, eszopiclone, suvorexant, ramelteon, tasimelteon, butabarbital, secobarbital, pentobarbital
Antipsychotic	Aripiprazole, asenapine, cariprazine, chlorpromazine, clozapine, fluphenazine, haloperidol, iloperidone, loxapine, lurasidone, molindone, olanzapine, paliperidone, perphenazine, pimozide, quetiapine, risperidone, thioridazine, thiothixene, trifluoperazine, ziprasidone

SSRI, selective serotonin reuptake inhibitor.

**Appendix**  
**Prescription Benzodiazepine Use in Privately Insured U.S. Children and Adolescents**  
**Bushnell et al.**

**Appendix Table 2.** Initial Benzodiazepine and Days' Supply Dispensed to Children and Adolescents by Potential Benzodiazepine Indication<sup>a</sup>

Potential indication, prior 30 days	N	Initial days' supply		Long-acting BZD, row %	Initial BZD (four most common)			
		Median (IQR)	>2 weeks, row %		Diazepam, row %	Lorazepam, row %	Clonazepam, row %	Alprazolam, row %
Bipolar disorder, schizophrenia, other psychotic disorder	3,415	30 (10–30)	72	45	5	36	40	14
Sleep problem	2,680	30 (10–30)	71	44	8	24	35	20
Depression	12,592	25 (10–30)	67	42	5	30	36	25
Conduct/disruptive behavior disorder	1,877	25 (10–30)	65	43	9	37	34	16
Anxiety disorder	23,592	15 (7–30)	57	37	6	31	30	30
Epilepsy, convulsions	5,372	15 (6–30)	50	72	16	24	42	3
Movement disorders, muscle spasm	5,075	10 (5–30)	40	78	52	16	22	6
Musculoskeletal condition	19,641	7 (5–15)	27	77	67	13	9	8
Injury	10,707	7 (5–15)	26	75	65	14	10	9
No potential indication	28,563	10 (5–30)	38	47	28	26	17	19

<sup>a</sup>Children and adolescents can have multiple potential indications; potential indications based on diagnoses in the prior 30 days, and on the day of, benzodiazepine initiation; potential indications displayed by descending longest days' supply; cohort is restricted to children and adolescents initiating with at least a 3 day supply.

<sup>b</sup>Other, uncommon category not displayed due to low count (n=145, days' supply median=15, IQR=7–30).

BZD, benzodiazepine.

**Appendix**  
**Prescription Benzodiazepine Use in Privately Insured U.S. Children and Adolescents**  
**Bushnell et al.**

**Appendix Table 3.** Sensitivity Analysis: Children and Adolescent Benzodiazepine Initiators Without a Recent Inpatient Admission<sup>a</sup>

Variable	Children, % N=20,187	Adolescents, % N=53,727
Age at benzodiazepine start, median (IQR)	10.0 (7.0–11.0)	16.0 (15.0–17.0)
Female	45.6	60.8
Potential indication, diagnoses prior 30 days <sup>b</sup>		
Any potential indication	40.9	51.3
Any potential indication including injury and musculoskeletal condition	57.9	65.9
Mental health potential indication	25.1	46.2
Anxiety disorder	18.9	32.6
Sleep problems	3.0	3.4
Bipolar disorder, schizophrenia, and other psychotic disorders	1.7	3.7
Conduct/disruptive behavior disorders	2.7	1.6
Depression	3.5	18.2
Epilepsy, convulsions	11.6	3.4
Movement disorders, muscle spasm	8.3	3.9
Injury	10.8	11.6
Musculoskeletal, connective tissue condition <sup>b</sup>	19.5	18.4
Prescribing cautions		
Drug-related disorder	0.3	3.2
Alcohol-related disorder	0.1	0.9
Suicidality	0.6	3.5
Poisoning	0.9	2.1
Sleep apnea; hyposomnia	2.6	1.3
Respiratory failure; hypoxia	1.2	0.3
Opioid prescription, same date	10.0	12.2
Opioid prescription, prior 30 days	12.9	16.4
>10 days supplied	2.6	2.3
Other characteristics <sup>b</sup>		
Mental health provider contact, prior 30 days	19.4	27.6
General provider contact, prior 30 days	46.4	49.3
Specialist provider contact, prior 30 days	28.2	21.6
Neurology	8.5	3.9
Surgery, radiology, anesthesiology	18.3	16.9
Pediatrician specialty, other	7.3	4.0
Complex chronic condition	4.4	1.7

<sup>a</sup>Excluded=children and adolescents initiating benzodiazepines with a psychiatric or non-psychiatric-related inpatient admission in 30 days before benzodiazepine initiation.

<sup>b</sup>Children and adolescent initiators, respectively, with: other uncommon indication (0.1%, 0.1%); Musculoskeletal sub-categories: spine curvature (0.9%, 0.9%); pain in limb/join (5.1%, 6.6%); pain in neck/back (7.0%, 6.6%); Mental health diagnosis (38.0%, 53.7%); Selected psychotropic prescriptions, prior 30 days: SSRIs (16.0%, 30.5%), other antidepressant (3.5%, 8.9%), stimulant (10.8%, 9.5%), antipsychotic (8.0%; 7.4%).

SSRI, selective serotonin reuptake inhibitor.

**Appendix**  
**Prescription Benzodiazepine Use in Privately Insured U.S. Children and Adolescents**  
**Bushnell et al.**

**Appendix Figure 1.** Potential indications in children and adolescents initiating prescription benzodiazepine treatment stratified by sex.

