

Practice Guidelines

Key Potentially Inappropriate Drugs in Pediatrics: The KIDs List

Key Points for Practice

- The KIDs List includes a limited number of medications to avoid or use with caution in children older than one year. More medications are included for infants and neonates.
- Medications such as fluoroquinolones and antidepressants are not included because there are no effective alternatives for some indications.
- Aspirin and other salicylates should be used with caution in suspected viral respiratory illness but may be necessary for other indications.

From the AFP Editors

Adverse drug reactions are responsible for approximately 4% of admissions to children's hospitals. Up to 18% of hospitalized children experience at least one adverse drug reaction. Approximately one-half of pediatric adverse drug reactions affect children between one and 10 years of age, with the other half evenly split between infants and children older than 10 years. Because one-half of medications are not currently labeled for children, off-label prescriptions are common. The Pediatric Pharmacy Association produced a list of key potentially inappropriate drugs in pediatrics, or the KIDs List, to guide physicians who treat children.

Potentially Inappropriate Medications

The panel defined potentially inappropriate medications as medications or medication classes that generally should be avoided in children younger

See related editorial at <https://www.aafp.org/afp/2021/0315/p330.html>.

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This series is coordinated by Michael J. Arnold, MD, contributing editor.

A collection of Practice Guidelines published in AFP is available at <https://www.aafp.org/afp/practguide>.

CME This clinical content conforms to AAFP criteria for CME. See CME Quiz on page 587.

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than 18 years because they pose an unnecessarily high risk and for which a safer alternative is available. Some medications on the list include a caveat if there is an indication for which this medication may be required.

Similar to the Beers criteria for older patients, two recommendation levels were included, avoid and use with caution. Avoid recommendations signify that most children should not receive the medication. They are either strong recommendations based on high-quality evidence or have potential adverse effects that are life-threatening or life-altering. Recommendations to use with caution signify the medication may be used, especially if there is a clear therapeutic need. These weak recommendations are based on low-quality evidence of potential adverse effects.

Medications were identified through a systematic literature review, U.S. Food and Drug Administration communications, and pharmacology databases. Included medications are commercially available in the United States, have a documented adverse effect in children that is more common or severe than that in adults, and have a safer alternative treatment. Allergic reactions, teratogenicity, and breastfeeding exposures were not considered to be adverse events.

KIDs List

For children one year or older, the group identified eight medications or medication classes, some simply restricted by age or weight, that should be avoided and 10 that should be used with caution (*Table 1*). They identified more than 30 medications or medication classes to be avoided in infants and 12 to be used with caution (*Table 2*). Fourteen of these medication recommendations apply only to newborns. Although some of the drugs are considered by the World Health Organization to be essential medicines for children, acceptable alternatives are readily available in the United States.

The list does not include over-the-counter cold medicines, which are generally safe (although not necessarily effective) at labeled doses. The group did not include fluoroquinolone antibiotics or

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antidepressant medications, even though they have been linked to suicidal ideation and suicidality, because the evidence of harm is weak and alternatives are not available.

The group does not suggest avoiding aspirin and other salicylate-containing medicines (e.g., bismuth subsalicylate) even though they have been linked to Reye syndrome. The group cites a

TABLE 1

KIDs List for Children One Year and Older

Age	Drug	Risk	Strength	Evidence quality
Avoid				
< 3 years or 10 kg (22 lb)	Darunavir (Prezista)	Seizures, death	Strong	Very low
< 6 years	Diphenoxylate/atropine (Lomotil)	Respiratory depression, death	Strong	Moderate
	Linaclotide (Linzess)	Death from dehydration	Weak	Very low
	Plecanatide (Trulance)	Death from dehydration	Weak	Very low
< 10 years or 50 kg (110 lb)	Lindane	Seizure, spasm	Moderate	Low
All children	Indinavir (Crixivan)	Nephrolithiasis	Strong	High
	Paregoric	Gasping syndrome, seizures, central nervous system depression, hypoglycemia	Strong	High
	Propofol (Diprivan; avoid more than 4 mg per kg per hour for > 48 hours)	Infusion syndrome	Strong	Moderate
Caution				
< 6 years	Valproic acid	Pancreatitis, fatal hepatotoxicity	Strong	High
< 8 years	Tetracyclines	Enamel hypoplasia, tooth discoloration	Strong	High
All children	Camphor	Seizures	Weak	Low
	Dopamine antagonists*	Dystonia, respiratory depression, death	Strong	Moderate
	Lamotrigine (Lamictal)	Serious skin rashes	Strong	High
	Meperidine (Demerol)	Respiratory depression	Strong	High
	Olanzapine (Zyprexa; concern for use > 24 weeks)	Metabolic syndrome	Strong	High
	Opium tincture	Respiratory depression	Strong	High
	Salicylates (if suspicion of viral illness)	Reye syndrome	Weak	Very low
	Tramadol	Respiratory depression	Weak	Low

KIDs = key potentially inappropriate drugs in pediatrics.

*—Specific dopamine antagonists include chlorpromazine, fluphenazine, haloperidol, metoclopramide (Reglan), perphenazine, pimozide, prochlorperazine, promethazine, trifluoperazine, and trimethobenzamide (Tigan).

Adapted with permission from Meyers RS, Thackray J, Matson KL, et al. Key potentially inappropriate drugs in pediatrics: the KIDs List. *J Pediatr Pharmacol Ther*. 2020;25(3):181-184.

TABLE 2

KIDs List for Infants

Age	Drug	Risk	Strength	Evidence quality
Avoid				
Neonates	Chloramphenicol	Gray baby syndrome	Strong	High
	Gentamicin ophthalmic ointment	Severe ocular reactions	Strong	High
	Macrolides (unless for pertussis or chlamydia pneumonia)	Hypertrophic pyloric stenosis	Strong	High
	Meperidine (Demerol)	Respiratory depression	Strong	High
	Midazolam (if very low birth weight)	Intraventricular hemorrhage, death	Strong	High
	Naloxone (for neonatal resuscitation)	Seizure	Strong	High
	Nitrofurantoin	Hemolytic anemia	Weak	Very low
	Opium tincture	Respiratory depression	Strong	High
	Sodium polystyrene sulfonate (if very low birth weight)	Colonic perforation	Weak	Low
	Sulfonamides (unless treating congenital toxoplasmosis)	Kernicterus	Weak	Very low
< 6 months	Dicyclomine	Apnea	Strong	Low
Teething	Benzocaine	Methemoglobinemia	Strong	High
	Lidocaine, viscous	Seizures, arrhythmia, death	Strong	High
All Infants	Carbinoxamine	Death	Strong	Low
	Codeine	Respiratory depression, death	Strong	High
	Darunavir (Prezista)	Seizures, death	Strong	Very low
	Diphenoxylate/atropine (Lomotil)	Respiratory depression, death	Strong	Moderate
	Dopamine antagonists*	Dystonia, respiratory depression, death	Strong	Moderate
	Indinavir (Crixivan)	Hyperbilirubinemia, nephrolithiasis	Strong	Low
	Ivermectin (Stromectol; oral)	Encephalopathy	Weak	Low
	Linaclotide (Linzess)	Death from dehydration	Weak	Very low
	Lindane	Seizure, spasms	Moderate	Low
	Loperamide (Imodium)	Ileus, lethargy	Strong	High
	Malathion (Ovide)	Organophosphate poisoning	Weak	Very low
	Mineral oil	Lipid pneumonitis	Strong	Low
	Paregoric	Gasping syndrome, seizures, central nervous system depression, hypoglycemia	Strong	High
	Plecanatide (Trulance)	Death from dehydration	Weak	Very low
	Propofol (Diprivan; avoid more than 4 mg per kg per hour for > 48 hours)	Infusion syndrome	Strong	Moderate
	Sodium phosphate enema	Acute kidney injury, arrhythmia, death	Strong	High
	Topical corticosteroids (medium potency and stronger for diaper dermatitis)	Adrenal suppression	Strong	Low
	Valproic acid	Pancreatitis, fatal hepatotoxicity	Strong	High
	Verapamil	Asystole	Weak	Low

continues

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TABLE 2 (continued)

KIDs List for Infants

Age	Drug	Risk	Strength	Evidence quality
Caution				
Neonates	Atazanavir (Reyataz)	Kernicterus	Weak	Very low
	Ceftriaxone	Kernicterus	Weak	Very low
	Chlorhexidine (Peridex; if very low birth weight)	Chemical burn	Strong	Low
	Dicloxacillin	Kernicterus	Weak	Very low
All Infants	Camphor	Seizures	Weak	Low
	Daptomycin (Cubicin)	Neuromuscular and skeletal adverse effects	Weak	Very low
	Difluprednate (Durezol)	Increased ocular pressure	Weak	Low
	Meperidine	Respiratory depression	Strong	High
	Opium tincture	Respiratory depression	Strong	High
	Salicylates (if suspicion of viral illness)	Reye syndrome	Weak	Very low
	Tetracyclines	Affects bone development in premature neonates, enamel hypoplasia	Strong	Moderate
	Tramadol	Respiratory depression	Weak	Low

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weak association and notes important uses such as Kawasaki disease. Aspirin should be used with caution in children with suspected viral illness such as influenza or varicella.

Editor's Note: This is the first effort to make a list of medications to avoid in children that is similar to the lists for older adults such as the Beers and START/STOPP criteria. Fortunately, this group came up with few medications to avoid that are commonly used in infants and children. However, it is a good resource when considering medications not usually used for common childhood concerns. Similar to the Beers criteria, this list may be best suited for the electronic health record to trigger warnings when prescribing these medications.—Michael J. Arnold, MD, Contributing Editor

Guideline source: Pediatric Pharmacy Association

Evidence rating system used? Yes

Systematic literature search described? Yes

Guideline developed by participants without relevant financial ties to industry? Yes

Recommendations based on patient-oriented outcomes? Yes

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