

## Commonly Prescribed Systemic and Ocular Pediatric Medications

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## Commonly Prescribed Systemic Pediatric Medications

Systemic medications for non-ocular concerns

### Course Description

- Course Objectives Systemic and Ocular Medication
- Become familiar with the thirty most prescribed medications for patients under eighteen
- Review indications, adverse effects, and side effects, both ocular and systemic, of these agents
- Review systemic medications used for ocular conditions
- Calculate dosage using mg per kg for pediatric medications.
- Review topical ophthalmic agents for recommended dosage, age recommendations and possible contraindications

### Course Objectives

- Medications are frequently used in the pediatric population to manage chronic and acute conditions. This course will provide information about commonly prescribed systemic and ocular medications. Indications, therapeutic dosing recommendations, adverse effects and ocular side effects will be reviewed.

### Common pediatric conditions

- Asthma
- Attention-deficit hyperactivity disorder (ADHD)
- Infections
- Pain/Fever
- Allergies
- Gastrointestinal (GI) complaints

### Conditions of Interest

- Hyperlipidemia
- Psychosis
- Autism
- Depression

### Factors Unique to Pediatric Pharmacology

- Babies
- Undeveloped metabolic and excretory processes:
- Conjugation reactions are not developed until one year of age. Hence many drugs cannot be used in neonates, newborns and infants up to one year of age.
- Excretory processes are not at adult levels until one year of age.

### Factors unique to Pediatric Pharmacology

- Children one to twelve years of age
- Metabolism
- Is generally faster than normal adult levels until age 2, then slowly declines until puberty, and finally drops to adult levels.
- This may mean increased dosage or dosing frequency for drugs eliminated by hepatic metabolism.

### Drug Dosing in Children

- Doses are often extrapolated from adult doses based on body surface area (Approximation)
- Future dosing should be done based on clinical outcome to maximize therapeutic benefit and minimize adverse effects.

### Top Thirty Drugs Prescribed in Pediatric Medicine

1. Amoxicillin
2. Azithromycin
3. Albuterol
4. Amoxicillin/clavulanate
5. Cefdinir
6. Cephalexin
7. Fluticasone
8. Prednisolone sodium phosphate

### Top Thirty Drugs Prescribed in Pediatric Medicine

9. Ibuprofen
10. Montelukast
11. Trimethoprim/sulfamethoxazole
12. Codeine phosphate/acetaminophen
13. Hydrocodone bitartrate/acetaminophen
14. Mupirocin
15. Nystatin
16. Methylphenidate

### Top Thirty Drugs Prescribed in Pediatric Medicine

17. Dextromethorphan/phenylephrine/chlorpheniramin
18. Mometasone
19. Triamcinolone
20. Prednisone
21. Sodium Fluoride
22. Multivitamins with fluoride
23. Amphetamine/dextroamphetamine
24. Hydrocortisone

### Top Thirty Drugs Prescribed in Pediatric Medicine

- 25. Budesonide
- 26. Ciprofloxacin/desamethasone
- 27. Promethazine
- 28. Prednisolone
- 29. Antipyrine/benzocaine
- 30. Lisdexamphetamine

### Drugs by Classification

- Infection:
  - Amoxicillin
  - Azithromycin
  - Amoxicillin/clavulanate
  - Cefdinir
  - Cephalexin
  - Trimethoprim/sulfamethoxazole
  - Mupirocin
  - Mupirocin
  - Nystatin
  - Ciprofloxacin/dexamethasone

### Drugs by Classification: Asthma Allergy

- Asthma/Allergy
- Albuterol
- Fluticasone
- Prednisolone sodium phosphate
- Montelukast
- Mometasone
- Triamcinolone
- Prednisone
- Hydrocortisone
- Prednisolone

### Drugs by Classification: Pain/Fever

- Pain/Fever
- Ibuprofen
- Codeine phosphate/acetaminophen
- Hydrocodone bitartrate/acetaminophen
- Promethazine (phenergan for nausea and vomiting)
- Antipyrine/benzocaine (A/B otic drops) for pain relief of ear infection

### Drugs by Classification: Behavior Management

- Behavior Management
- Methylphenidate (Ritalin, Concerta, Daytrana)
- Amphetamine/dextroamphetamine (Adderall, Adderal XR)
- Lisdexamphetamine (Vyvanse)

### Optometric Considerations

- Oral Antibiotics may be used to manage pre-septal cellulitis and internal hordeola
- Top picks are:
  - Amoxicillin
  - Cephalexin
  - Azithromycin

### Calculating pediatric dosage

- Demonstrate how to calculate mg/kg for desired therapeutic effect.
- On line calculators search weight based divided dosage calculator or do the math

### Example of calculations

- Example: A doctor orders Acyclovir for a 30 pound 2 year old.
- Acyclovir comes in formulation 200 mg/5ml
- Desired dosage is 20-40 mg/kg/day
- First convert weight in pounds to kilograms:
- 30 pounds divided by 2.2 kilograms/pound=13.63 kg
- $13.6 \text{ kg} * 20 / \text{mg/kg} = 272.72$  (minimum desired dosage)
- $13.6 \text{ kg} * 40 / \text{mg/kg} = 544$  (maximum desired dosage)
- Order 200 mg bid for a total daily dosage of 400 mg which falls well within the dosage range.

### Pediatric side effects of systemic antibiotics

- Diarrhea
- Nausea
- Drug resistance

### Pediatric side effects of Asthma/Anti allergy meds.

- Dry eyes
- Pharmacologically dilated pupil
- Tiredness or Hyperactivity

### Pediatric side effects of Pain meds

- Listless, Tired, fatigued
- Hyperactive

### Pediatric side effects of Behavior Meds

- Dry eye
- Pupil dilation
- Accommodative dysfunction
- Nystagmus

## Commonly used Ocular pediatric medications

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Common pediatric ocular conditions requiring medication

- Conjunctivitis
  - Allergic
  - Bacterial
  - Viral
- Keratitis
- Pre-septal cellulitis
- Glaucoma

### Chart of medication age approved dosage

- Anti allergy drops
- Anti allergy ointment
- Anti allergy orals

### Anti-Allergy Drops-Mast Cell Stabilizers

Medication	Age	Dosage
• Cromolyn Sodium 4%(Crolom)	4+	qid to 6 times daily
• Lodoxamide 0.1% (Alomide)	2+	bid to qid

### Anti-Allergy Drops-Antihistamines

Medication	Age	Dosage
• Ketitogen 0.025% (Zatidor, Alaway)-OTC	3+	bid
• Olopatadine 0.1% (Patanol)	2+	bid
• Olopatadine 0.2% (Pataday)	2+	qd
• Epinastine 0.05%(Elestat)	2+	bid
• Azelastine 0.05%(Optivar)	3+	bid
• Bepotastine 1.5% (Bepreve)	2+	bid
• Alcaftadine 0.25%(Lastacaft)	2+	qd
• Emedastine 0.05% (Emadine)	3+	up to qid

### Anti-Allergy Orals

Medication	Age	Dosage
• Dipenhydramine Citrate- OTC	6-12	19 to 38 mg orally q4-6h
	12+	38 to 76 mg orally q4-6h
• Dipenhydramine HCl	2-6	6.25 mg orally q4-6h
• Maximum dosage not to exceed		37.5 mg daily
• Dipenhydramine HCl	6-12	12.5 to 25 mg orally q4-6h
• Maximum dosage not to exceed		150 mg/day

### Anti-Allergy Orals

Medication	Age	Dosage
• Loratadine (Claritin)-OTC	2+	5mg, 10mg day ages 6+
• Certirizine (Zyrtec)-OTC	6+	10mg day ages 6+
• Fexofenadine (Allegra)-OTC	6+	60mg bid, 180mg qd 12+
• Desloratadine (Clarinex)-OTC	2+	5mg qd ages 12+

### Steroid Drops

Medication	Age	Dosage
• Lotoprednol 0.2% (Alrex)		qid
• Lotoprednol 0.5% (Loemax) gtt, ung, gel		qid
• Fluomethalone 0.1% (FML, Flarex)	2+	bid to qid
• Fluomethalone 0.25% (FML Forte)	2+	bid to qid
• Prednisolone acetate 1%		up to q1h
• Difluprednate 0.05% (Durezol)		

### Anti Infectives

- Antibiotic ointment
- Antibiotic eye drops
- Antifungal eye drops
- Steroid-Antibiotic Drops/Ointments
- Oral antibiotics
- Antivirals Topical
- Antivirals Oral

### Antibiotic Ointments

Medication	Age	Dosage
• Erythromycin 0.5% (Ilotycin)	2+months	qid
• Tobramycin 0.3% (Tobrex)	2+months	bid to qid
• Ciprofloxan 0.3% (Ciloxan)	2+years	tid x days then bid

### Antibiotic Drops

Medication	Age	Dosage
• Polymixin B & Trimethoprim (Polytrim)	2+months	q3h
• Tobramycin (Tobrex)	2+months	
• Ciprofloxan 0.3% (Ciloxan)	1+years	q2hx2 days then qid x 5 days
• Ofloxacin 0.3% (Ocuflox)	same	
• Gatifloxacin 0.3% (Zymar)	same	
• Gatifloxacin 0.5% (Zymaxid)	1+years	q2hx1 day then qid x 6 days

### Antibiotic Drops

Medication	Age	Dosage
• Levofloxacin 0.5% (Quizin)	1+year	q2hx2days then qid x 5 days
• Levofloxacin 1.5% (Iquix)	6+	q2hx2days then qid x 5 days
• Moxifloxacin 0.3% (Vigamox)	1+	tid x 7 days
• Moxifloxacin 0.5% (Moxeza)	4+months	bid x 7 days
• Besifloxacin 0.6% (Besivance)	1+	tid x 7 days
• Azithromycin 1% (AzaSite)	1+	bid x 2days then qd x 5 days

### Antifungal Eye Drops

- Natamycin 5%                      q1h x 1day taper 14-21 days

### Steroid-Antibiotic Drops/Ointments

• Medication	Age	Dosage
• Dexamethasone 0.1% & Tobramycin 0.3% (Tobradex)	2+	
• Dexamethasone 0.1% & Tobramycin 0.5% (Tobradex ST)	2+	
• Loteprednol 0.5% & Tobramycin 0.3% (Zylet) drops		
• Dexamethasone, Neomycin, Polymixin B (Maxitrol)	2+	

### Oral Antibiotics

- Amoxicillin, Clavulanate (Augmentin)
- 20-40 mg/kg/day q 8h
- Formulations 125/200/250/400 mg/5ml

### Oral Antibiotics

- Cephalexin (Keflex) formulations 125/250/500 mg/5ml
- Dosage 25-50 mg/kg/day q12 hours
- Cefaclor (Ceclor) formulations 125/187/250/375 mg/5ml
- Dosage 20-40 mg/kg/day q 8 or 12 h
- Cefdinir (Omnicef) formulations 125/250 mg/5ml
- Dosage 7mg/kg/day q 12 h

### Oral antibiotics

- Erythromycin Ethylsuccinate (EES) formulations 200/400 mg/5ml
- Dosage 30-50 mg/kg/ q 6 h
- Amoxicillin: Formulations 125/200/250/400 mg/5ml
- 25-45-mg/kg/day q 12 h OR
- 20-40 mg/kg/day q 8 h

### Antivirals Topical

• Medication	Age	Dosage
• Triflurothymidine 1% (Viroptic)	6+	2qh up to 9 times per day
• Ganciclovir 0.15% (Zirgan)	2+	5x/day until heals
• then tid For seven days		

### Antivirals Oral

- Acyclovir formulation 200/mg/5ml
- 2+ 20-40 mg/kg/day
- OR
- 1.5-3years 200 mg tid
- 3-5 years 300 mg tid
- 6+ years 400 mg tid

### Anti-Glaucoma Drops: Beta Blockers

- Timolol maleate 0.25, 0.5% Timoptic/XE
- Timolol 0.5% Istalol
- Betaxolol 0.25% (Betoptic S)
- Pregnancy category C
- No safety for pediatrics established

### Anti Glaucoma Drops Adrenergic agonist

- Apraclonidine 0.5%,1% (Iopidine)
- Embryocidal in animal studies, not advised for pregnant women
- No safety for pediatrics is established
- Bimodine 0.2% (Alphagan) Ages 2 and up

### Anti Glaucoma Drops Adrenergic agonist

In a well-controlled clinical study conducted in pediatric glaucoma patients (ages 2 to 7 years) the most commonly observed adverse reactions with brimonidine tartrate ophthalmic solution 0.2% dosed three times daily were somnolence (50-83% in patients ages 2 to 6 years) and decreased alertness. In pediatric patients 7 years of age (>20 kg), somnolence appears to occur less frequently (25%). Approximately 16% of patients on brimonidine tartrate ophthalmic solution discontinued from the study due to somnolence.

### Antiglaucoma drops Carbonic Anhydrase Inhibitors

- Brinzolamide 1% (Azopt)
- Dorzolamide 25 (Trusopt)
- Pregnancy category C

### Anti-glaucoma drops Prostaglandin Analogs

- Brimatoprost (Lumigan) Ages 16+
- Travaprost (Travatan) Ages 16+
- Tafluprost (Zioptin) Ages 18+
- Lantanoprost 0.005% (Xalatan) No safety documented for pediatrics
- Changes in iris and eyelid pigmentation are a concern for younger patients



### Anti-glaucoma Drops Combination

- Brimodine 0.2% and Timolol 0.5% (Combigan) indicated for ages 2+
- Brinzolamide 1% and Brimodine 0.2% (Simbrinza) ages 2+
- Dorzolamide 2% and Timolol 0.25% (Cosopt) ages 2+
  
- Later combination eye drops were required to be tested on children even though the individual drugs have "no safety for pediatrics" on their package insert.

### Anti-glaucoma drops

- Management of pediatric conditions may indicate using medications that do not have safety for pediatrics documented
- For example:
  - A fungal ulcer with Natamycin
  - A raging uveitis with Pred Forte or Durazol

### Conclusion

- Managing pediatric patients requires comfort with systemic medication management and ocular medication management. Managing the desired results and potential side effects of medications will result in optimal outcomes.