ANTIBIOTICS and PHARMACOLOGY in PEDIATRIC DENTISTRY

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SBH
Questions to Ask ??

- Medical history
- Medications
  - Prescribed, homeopathic, OTC?
  - Interactions
- Allergies
  - Familial tendencies to adverse drug reactions
- Capsules, chewable tablets, liquid?
- Compliance?
- Weight of child -- get weight or ask
Drug Schedules

☐ Schedule I
   - Research purposes only
   - E.g., heroin, marijuana, LSD

☐ Schedule II
   - Cannot be refilled or phoned in
   - E.g., codeine, morphine, oxycodone, meperidine

☐ Schedule III
   - E.g., codeine combinations, hydrocodone

☐ Schedule IV
   - E.g., chloral hydrate, benzos, barbiturates

☐ Schedule V
   - E.g., anti-diarrheals, codeine cough meds

☐ DEA: you indicate on your application, which classes you are applying for
**Approximate Pediatric Dosages and Conversions**

- **Young's Rule** (age dependent):
  
  \[(\text{age} / \text{age} + 12) \times \text{adult dose}\]

- **Clark's Rule** (weight dependent):
  
  - for lbs: \[(\text{weight} / 150) \times \text{adult dose}\]
  - for kg: \[(\text{weight} / 70) \times \text{adult dose}\]

- **Weight conversions**:
  
  \[1 \text{kg} = 2.2 \text{ lbs}\]

- **Volume conversions**:
  
  \[5 \text{ cc} = 5 \text{ ml} = 1 \text{ teaspoon (tsp)}\]
  
  \[120 \text{ cc} = 4 \text{ oz}\]
ANTIBIOTICS
Odontogenic Infections

- Odontogenic infections → more anaerobes than aerobes (if no external access)
- If Pen doesn’t work, consider Clindamycin since broad spectrum (anaerobes, aerobes, gram+ cocci) and β-lactamase resistant
- Bacteriostatic or bacteriocidal abx?
Penicillin V

- <12 yrs: 25-50 mg/kg/day t/qid
- >12 yrs: 1-2.0 g t/qid
- 3g max/day

Supply:
- 125mg/5ml or 250mg/5ml
- 250mg tabs

- Pen V better than Pen G since higher plasma concs
Amoxicillin

- <20kg/12yrs: 20-40 mg/kg/day tid
  25-45 mg/kg/day bid
- >20kg/12yrs: 250-500mg tid
  500-875 mg bid
- Max 2-3g/day
- Supply:
  - 125 or 250 or 400 mg/5ml oral suspension
  - 125/250 mg tabs
- Better oral absorption than Pen V
- Better compliance than Pen V since taken tid instead of qid
Clindamycin

- <12 yrs: 10-25 mg/kg/day in 3-4 divided doses
- >12 yrs: 150-300 mg qid
- Max: 1.8 mg/day PO

Supply:
- 75mg/5ml oral suspension
- 150/300 mg caps (150 mg caps are cheaper)

- Bactericidal
- Kills everything (broad spectrum)
  - Including GI bacteria → GI upset
Azithromycin

- Kids >6mth-16yrs: 5-12 mg/kg/day once a day (max 500mg)
  30 mg/kg single dose (max 1500mg)
- Adults: 250-600 mg once a day (Zpak - 500mg tab)
  1-2g as single dose
- Supply:
  - Tabs, suspension, caps, injectable
    - Peds: 100 or 200 mg/5ml suspension
- Endocarditis: 15 mg/kg (max 500mg) PO/IM/IV
Cephalexin

- **Kids >1 yrs:** 25-100 mg/kg/day qid or tid
- **Adults:** 250-1000mg qid
- **Max:** 4g/day
- **Supply:**
  - Tabs, suspension, caps
    - 125 or 250/5ml oral suspension
    - 125/250 mg tabs
- **Endocarditis:** 20mg/kg (max 600mg) PO/IM/IV
Example Script – Antibiotic

Example: Barney. 44 lb male comes in with abscess of L with slight buccal swelling. No allergies, healthy. Will prescribe Amoxicillin 250mg/5ml susp tid for 7 days.

1. Convert to kg \( \rightarrow \) 44 lbs divided by 2.2 = 20 kg
2. Max amt needed: 20 kg \( \times \) 40 mg/kg/day = 800 mg per day
3. Min amt needed: 20 kg \( \times \) 20 mg/kg/day = 400 mg per day
4. Amt needed per dose (tid) is: 800 (400) mg / 3 = 267(133) mg per dose
5. Amox comes in 250mg/5ml conc. To make it easy for the parent to dispense and because Amox has a range between 20-40 mg/kg, you can round it to 250 mg per dose.
6. For the amt to dispense in the bottle: 250mg \( \times \) 3 \( \times \) 7 days = 5250 mg
7. The total amt (ml) needed is 5250 mg \( \times \) 5ml / 250 mg = 105 ml.
8. To accommodate for “accidental spillage”, you may want to give 125 ml
Final Script

Amoxicillin 250mg/5ml oral susp
Disp 125ml
Take 250mg tid for 7 days
<table>
<thead>
<tr>
<th>Weight (Kg)</th>
<th>Amoxicillin (125/250 mg/Sc) 20-40mg/kg/day</th>
<th>Amoxicillin SBE Prophylaxis 50mg/kg 1 hr. pre-op</th>
<th>Clindamycin (75mg/Sc) 15-25mg/kg/day</th>
<th>Clindamycin SBE Prophylaxis 20mg/kg 1 hr. pre-op</th>
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INFECTIVE ENDOCARDITIS
Infective Endocarditis

- Bacteria colonize in area of turbulent blood flow
  - Heart valves, endocardium, valvular abnormality, defect, surgical repair, vascular lesion
- Flu-like illness, fever, chills, malaise, heart murmur
- Significant morbidity/mortality → heart failure, pulmonary emboli, cerebral abscess, 10-40% mortality
- Types:
  - Acute - sudden onset, fatal (6 wks), Staph aureus, older folks, males
  - Sub-acute - slower onset, Strep viridians, children
- May develop even if Abx given
- No relationship between magnitude of bacteremia and IE
Cardiac Conditions: AHA guidelines

- Prosthetic cardiac valve(s)
- Previous endocarditis
- Congenital heart disease only in the following categories:
  - Unrepaired cyanotic congenital heart disease, including those with palliative shunts and conduits (e.g., Tetralogy of Fallot, Transposition of the great vessels, Pulmonic stenosis with an atrial or ventricular septal defect, Coarctation of the aorta)
  - Repaired congenital heart disease with prosthetic material or device during the first six months after the procedure (endothelialization of prosthetic material occurs within six months after the procedure)
  - Repaired congenital heart disease with residual defects at the site or adjacent to the site of a prosthetic patch or prosthetic
- Cardiac transplantation recipients with cardiac valvular disease
Dental Situations for Prophylaxis

- Oral procedures that cause bleeding → transient bacteremia
- Manipulation of gingival tissue or the periapical region of teeth, perforation of the oral mucosa

**NOT** recommended for:
- Routine anesthetic injections through noninfected tissue
- Placement of removable prosthodontic or orthodontic appliances
- Placement of orthodontic brackets
- Bleeding from trauma to the lips or oral mucosa
Rx for Infective Endocarditis

- Rx (common regiments) for PEDS:
  - Amoxicillin: 50mg/kg 1 hr pre-op (max 2g)
  - Clindamycin: 20mg/kg pre-op (max 600mg)
  - Others:
    - Ampicillin 50mg/kg IV/IM 30 mins pre-op
    - Cephalexin 20mg/kg (max 600mg) PO/IM/IV
    - Azithromycin 15mg/kg (max 500mg)

Never round down the dose for “convenience”
LOCAL ANESTHESIA
Local Anesthesia

- Idea concentration - lowest possible to avoid toxicity
- Onset depends on:
  - pH of injection area
    - Higher pH $\rightarrow$ faster onset (more uncharged molecules that pass through memb)
    - Lower pH (infection) $\rightarrow$ fewer molecules $\rightarrow$ slower onset
  - Total dose
- Duration depends on:
  - Total dose
  - Vasoconstrictor
  - Plasma protein binding
LA - Esters

- E.g. Cocaine, Benzocaine
- Aromatic portion derived from PABA (allergic rxn)
- Metabolized via pseudocholinesterase enzyme in plasma
- Shorter duration than amides
- Water insoluble
  - Topical use only
LA - AMIDES

- E.g. Lidocaine, Mepivacaine, Articaine, Prilocaine
- Metabolized by liver - cytochrome p450
- Decrease toxicity
- Decrease allergy risk
- Intraoral use

- If true allergy → GA, nitrous
  - Esters are not an alternative
DO NOT EXCEED MAX DOSAGES

If conscious sedation is employed – Dosage should be well below the MRD due to possible potentiation of cardiorespiratory depressant effects

<table>
<thead>
<tr>
<th>Anes</th>
<th>2%Lido</th>
<th>3%Mep</th>
<th>4%Septo</th>
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<tbody>
<tr>
<td>Max Dose</td>
<td>4.4mg/kg</td>
<td>4.4 mg/kg</td>
<td>7.0 mg/kg</td>
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<tr>
<td></td>
<td>(2mg/lb)</td>
<td>(2mg/lb)</td>
<td>(3.2 mg/lb)</td>
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Overdoses

- **Causes:**
  - Excess dosage
  - Intravascular injection

- **Effects:**
  - CNS: excitement, depression, seizures, disorientation, loss of consciousness
  - Respiratory depression
  - CV: tachycardia; vasodilation; myocardial depression (bradycardia) $\rightarrow$ decreased cardiac output $\rightarrow$ cardiovascular collapse
  - GI: nausea
Lidocaine (Xylocaine)

- Wide usage, dependable
- Dosage:
  - Max: 4.4mg/kg or 2mg/lb
  - Max: 300mg
- Avail as 2% solution
  - w/ or w/o epi (1:50000, 1:100000) in 1.8ml/1.7ml cartridges
- Avail in 2% topical, viscous liquid form
Mepivacaine (Carbocaine)

- **Useful:**
  - Short procedures
  - Epi-free
    - Use when epi should be avoided -- medically compromised
- **Toxicity similar to lidocaine**
- **Dosage:**
  - Max: 4.4 mg/kg (2mg/lb); up to 300mg
- **Available in 3% concentration**
Articaine (Septocaine)

- Has ester group (in addition to amide group)
- Higher lipid solubility compared to lidocaine
  - Faster acting -- onset (2-3mins vs 3-5mins)
- Concentration – 4%
- Max dosage: 7.0 mg/kg or 3.2 mg/lb
- Avail in 4% conc with epi 1:100,000 or 1:200,000
- Inferior alveolar nerve parasthesia risk -- greater than other LA (infiltration ok)
- Recent studies show similar effectiveness as 2% lido
- Data doesn’t support use for kids under 4 years
Bupivacaine (Marcaine)

- Kids less than 12 years not recommended as data is incomplete
- Duration: 2-3x Lidocaine/Mepivacaine (avg: 7 hrs)
- For surgical procedures - 8-12 hours of post-op pain
  - Decreased use of analgesics
- Common concs: 0.25% to 0.5% w/ 1:200,000 epi in 1.8ml carp
- Accidental oral trauma
Benzocaine

- Ester
- Gels, ointments
- Duration of action: 10-20 mins
- Dry area increases uptake
- Caution: concentrations much higher than injectable LA
  - Potential for toxicity greater if large quantities
ANALGESICS
Acetaminophen (Tylenol)

- **Uses:** mild pain, fever; no anti-rheumatic, anti-inflammatory

- **Mechanism of action:**
  - Inhibits CNS prostaglandin production; blocks peripheral pain impulse generation; inhibits hypothalamic heat-regulating center to cause antipyresis

- **Dosages:**
  - <12 yrs:  10-15mg/kg/dose every 4-6 hrs (max 1625mg in 24 hrs)
  - >12 yrs:  max 4000mg in 24 hrs
Ibuprofen (Advil, Motrin)

- NSAID, antipyretic, antirheumatic
- Contraindications: allergy to NSAIDs, GI bleeding, ulcer
- Adverse reactions: heartburn, nausea, GI bleed, rash, dizziness; increase bleeding (can inhibit platelet aggregation)
- Oral dosage: 2-8mg/kg/dose every 6-8 hrs
Acetominophen with Codeine

- Uses: severe pain, antipyretic
- Disadvantages: CNS, resp depression; constipation; potentiates sedative drugs; contraindicated with head trauma
- 300/15, 300/30, 300/60 tabs; 120/12/5ml oral susp
- Dosages:
  - codeine: 0.5mg/kg
  - 3-6yrs: 12mg q4-6h
  - 7-12 yrs: 24mg q4-6h
  - MAX: 75mg/kg/day
- Drug seekers!
OTHER IMPORTANT DRUGS
Oxygen

- Important to have portable oxygen system separate from central system
- Deliver high flow 100% $O_2$ for 30 minutes
  - Portable oxygen tank with regulator (E cylinder)
Epinephrine (Adrenaline)

- **Uses:**
  - Anaphylactic reactions
  - Bronchodilator
  - Adjunct in LA
  - Cardiac arrest

- **Contraindications:** hypersensitivity to epi; cardiac arrhythmias

- **Precautions:** diabetes mellitus; CV disease (angina, tachycardia, MI); thyroid disease
Epinephrine (Adrenaline)

- **Dosages:**
  - Hypersensitivity: 1:1000 conc. → 0.01mg/kg q 5 mins IM/subQ
  - Bronchodilator: 1:1000 conc. → 0.01mg/kg q 15 mins
    - if using 1:10000 conc. → 0.1mg/kg

- **Forms:**
  - Injectable:
    - 1mg/ml (1:1000 conc) (1ml, 30ml vials)
    - 0.1mg/ml (1:10000) (10ml)
    - 0.01mg/ml (1:100000) (5ml)
    - Epi Pen adult >5yrs - 0.3mg
    - Epi Pen jr child <5yrs - 0.15mg
  - Topical:
    - 1mg/ml (30ml)
Downloadable Resources

- Epocrates (free)
  - Includes a BMI calculator
  - www.epocrates.com

- Medscape (free)
  - www.medscape.com
WHAT'S THE SECRET OF YOUR GROWING SUCCESS?

I DON'T PLAY FAVORITES! RICH OR POOR, WHITE, BROWN OR BLACK, YOUNG OR OLD, "A" STUDENT OR DROPOUT... I'M AN EQUAL-OPPORTUNITY REAPER!