For drugs prescribed in the NICU please refer to the handbooks available in unit at both McMaster and St Joseph’s Healthcare. There is a separate PICU handbook with a drug formulary specific to the PICU.

This document is intended for use at McMaster Children’s Hospital (MCH) only and may not be applicable elsewhere. While this document is intended to reflect the practice at MCH at the time of writing, new information may become available. Every attempt has been made to ensure accuracy but these recommendations should be used in conjunction with good clinical judgment, and in consultation with a Pharmacist as needed.

For any questions related to the information contained in this document please email: druginfo@hhsc.ca
### Unapproved Abbreviations, Symbols and Dose Designations and Acceptable Corrections

<table>
<thead>
<tr>
<th>Unapproved Abbreviation</th>
<th>Intended Meaning</th>
<th>Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Unit</td>
<td>Mistaken for “0” (zero), “4” (four), or cc.</td>
<td>Use ‘unit’.</td>
</tr>
<tr>
<td>IU</td>
<td>International unit</td>
<td>Mistaken for “IV” (intravenous) or “10” (ten).</td>
<td>Use ‘unit’.</td>
</tr>
</tbody>
</table>

#### Abbreviations for Drug Names

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>QD</td>
<td>Every day</td>
<td>QD and QOD have been mistaken for each other, or as ‘qid’. The Q has also been misinterpreted as “2” (two).</td>
<td>Write “daily” and “every other day” in full</td>
</tr>
<tr>
<td>QOD</td>
<td>Every other day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### OD

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD</td>
<td>Every day</td>
<td>Mistaken for “right eye” (OD = oculus dexter)</td>
<td>Write “daily”</td>
</tr>
</tbody>
</table>

#### AS, AD, AU

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS, AD, AU</td>
<td>Left ear, right ear, both ears</td>
<td>May be confused with one another.</td>
<td>Use “left ear”, “right ear” or “both ears”.</td>
</tr>
</tbody>
</table>

#### D/C

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>D/C</td>
<td>Discharge or discontinue</td>
<td>Premature discontinuation of medications if D/C (intended to mean “discharge”) has been misinterpreted as “discontinued” when followed by a list of discharge medications</td>
<td>Use “discharge” and &quot;discontinue&quot;.</td>
</tr>
</tbody>
</table>

#### SC, SQ, or sub q

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC, SQ, or sub q</td>
<td>Subcutaneous</td>
<td>SC mistaken as SL (sublingual); SQ mistaken as “5 every,” the “q” in “sub q” has been mistaken as “every” (e.g., a heparin dose ordered “sub q 2 hours before surgery” misunderstood as every 2 hours before surgery)</td>
<td>Use &quot;subcut&quot; or &quot;subcutaneous&quot;</td>
</tr>
</tbody>
</table>

#### cc

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc</td>
<td>Cubic centimetre</td>
<td>Mistaken for “u” (units).</td>
<td>Use “mL” or “millilitre”.</td>
</tr>
</tbody>
</table>

#### μg

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>μg</td>
<td>Microgram</td>
<td>Mistaken for “mg” (milligram) resulting in one thousand-fold overdose.</td>
<td>Use “mcg or microgram”</td>
</tr>
</tbody>
</table>

#### Unapproved Symbol

<table>
<thead>
<tr>
<th>Unapproved Symbol</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>@</td>
<td>at</td>
<td>Mistaken for “2” (two) or “5” (five). Use “at”.</td>
<td>Write out “at” in full</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
<td>Mistaken for “7” (seven) or the letter “L”.</td>
<td>Write out “greater than” in full</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
<td>Confused with each other.</td>
<td>Write out “less than” in full</td>
</tr>
</tbody>
</table>

#### Unapproved Dose Designation

<table>
<thead>
<tr>
<th>Unapproved Dose Designation</th>
<th>Intended Meaning</th>
<th>Potential Problem</th>
<th>Acceptable Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailing zero</td>
<td>X.0 mg Or 10.0 mg</td>
<td>Decimal point is overlooked resulting in 10-fold dose error.</td>
<td>Never use a zero by itself after a decimal point. Use “X mg” or 10 mg</td>
</tr>
<tr>
<td>Lack of leading zero</td>
<td>. X mg</td>
<td>Decimal point is overlooked resulting in 10-fold dose error.</td>
<td>Always use a zero before a decimal point. Use “0.X mg”</td>
</tr>
</tbody>
</table>

Adapted from ISMP’s List of Error-Prone Abbreviations, Symbols, and Dose Designations (2010) and ISMP Canada’s Do Not Use – Dangerous Abbreviations, Symbols and Dose Designations (2006)
Legend:

GAS  Group A Streptococcus
GP   Gram Positive
GPC  Gram Positive Cocci
GN   Gram Negative
GNB  Gram Negative Bacilli
MAX  Maximum
MIN  Minimum
NF   Non-Formulary At HHS

Adjust dosing interval for patients with renal impairment.
Safer Order Writing

To reduce the potential for medication errors:
- Write orders clearly and concisely.
- Write medication orders using generic drug names only.
- Be careful with mg/kg/DAY vs mg/kg/DOSE.
- Include the intended dose per kilogram on each order.
- Write the patient's weight on each order sheet.
- Never place a decimal and a zero after a whole number (4.0 mg should be 4 mg) and always place a zero in front of a decimal point (.2 mg should be 0.2 mg). The decimal point has been missed and tenfold overdoses have been given.
- Never abbreviate the word unit. The letter U has been misinterpreted as a 0, resulting in a 10 fold overdose.
- Always order medications as mg, not mL as different concentrations may exist of a given medication. There are a few exceptions such as co-trimoxazole (Septra®).
- QD is not an appropriate abbreviation for once daily, it has been misinterpreted as QID. It is best to write out “once daily” or “q24h.”
- Do not abbreviate drug names (levo, 6MP, MSO4, MgSO4, HCTZ).
- Do not abbreviate microgram to μg, use mcg, or even safer, write out microgram or use milligrams if possible (0.25 mg instead of 250 micrograms)
## ANTIBACTERIALS

**CELL WALL SYNTHESIS INHIBITORS (BACTERICIDAL)**

### β-LACTAMS

### PENICILLINS

<table>
<thead>
<tr>
<th>Penicillin G (IV or IM)</th>
<th>Moderate to Severe Infections:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin V Potassium (PO)</td>
<td><strong>IV:</strong> 100 000 - 400 000 Units/kg/DAY ÷ q4-6h (MAX: 24 million Units/DAY)</td>
</tr>
<tr>
<td></td>
<td><strong>Meningitis:</strong> IV: 400 000 Units/kg/DAY ÷ q4h (MAX: 24 million Units/DAY)</td>
</tr>
</tbody>
</table>

Penicillin V 500 000 units is equivalent to 300 mg.

**benzyl penicillin:** narrow spectrum; NOT Penicillinase resistant

**Penicillin V**

- **Suspension:** 60mg/mL
- **Tablet:** 300mg

Penicillin V 500 000 units is equivalent to 300 mg.

**Penicillin V Potassium (oral):**

1. **Mild to moderate Group A Strep infections:** 25-50mg/kg/day PO ÷ q8-12h x 10 days
   - IDSA (GAS pharyngitis)– Children: 300mg PO BID-TID; Adolescents & adults: 600mg PO BID x 10 days

2. **Rheumatic fever (treatment):** Less than or equal to 27kg: 300mg PO bid x 10 days; Greater than 27kg: 600mg PO BID x 10 days

3. **Rheumatic fever (prophylaxis AND greater than 5 yrs):** 300mg PO BID

4. **Prophylaxis in asplenics:**
   - 6 months – 5 yrs: 150mg PO bid
   - Greater than 5 yrs: 300mg PO bid

**isoxazoyl penicillin:** narrow spectrum; Penicillinase resistant

**Cloxacillin** (IV or PO)

- **Oral:**
  - Suspension 25mg/mL
  - Capsule: 250mg, 500mg

**Primarily used in methicillin-sensitive *Staphylococcus aureus* (MSSA) infections:**

- **IV:** 100-200 mg/kg/DAY ÷ q4-6h (MAX: 12 g/DAY); up to 300mg/kg/DAY may be used in select cases (please consult Infectious Diseases)

- **PO:** Suggest to use cephalaxin (1st generation cephalosporin) in place as cloxacillin has low oral bioavailability, poorly tolerated (GI side effects) and need to be taken on an empty stomach
<table>
<thead>
<tr>
<th><strong>Aminopenicillin: Penicillinase sensitive</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ampicillin (IV)</strong></td>
</tr>
<tr>
<td>Meningitis:  IV:  300-400 mg/kg/DAY ÷ q4-6h (MAX: 12 g/day)</td>
</tr>
<tr>
<td>Other infections: IV: 100-200 mg/kg/DAY ÷ q6h (MAX: 2 g/DOSE)</td>
</tr>
<tr>
<td><strong>Amoxicillin (PO)</strong></td>
</tr>
<tr>
<td>Suspension: 50mg/mL (supplied at HHS); 25mg/mL</td>
</tr>
<tr>
<td>For coverage against <em>Streptococcus pneumoniae</em> (including empiric therapy for community-acquired pneumonia or otitis media):  PO 80-90mg/kg/DAY ÷ q8h (MAX: 1 g/DOSE)</td>
</tr>
<tr>
<td>Standard dose: PO: 40-50 mg/kg/DAY ÷ q8h</td>
</tr>
<tr>
<td>GAS pharyngitis: PO: 50mg/kg ONCE daily (MAX: 1000mg/DOSE)</td>
</tr>
<tr>
<td>OR 25mg/kg (MAX: 500mg/DOSE) BID</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Clavulanic Acid: Enhances spectrum; beta-lactamase inhibitor</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amoxicillin + Clavulanic Acid (Clavulin) (PO)</strong></td>
</tr>
<tr>
<td>Tablets (amoxicillin/clavulanic acid): 500/125mg(4:1); 875/125mg(7:1)</td>
</tr>
<tr>
<td>Suspension (supplied as HHS): 1 mL = 80mg amoxicillin and 11.4mg clavulanic acid (7:1)</td>
</tr>
<tr>
<td>For coverage against <em>Streptococcus pneumoniae</em> (i.e. sequential oral therapy in complicated CAP, AOM, sinusitis): 80-90mg/kg/DAY if amoxicillin component ÷ q8h <strong>BID dosing may be adequate for AOM, but TID dosing is recommended for pneumonia</strong></td>
</tr>
<tr>
<td>Standard dosing for other gram positive, gram negative, anaerobic infections:  PO: 30-50 mg/kg/DAY of amoxicillin component ÷ q8-12h (MAX: 875 mg/DOSE)</td>
</tr>
<tr>
<td>*One major side effect with clavulanic acid (particularly at high doses) is GI intolerance</td>
</tr>
<tr>
<td><strong>When writing discharge prescription and if suspension is required, please indicate (particularly if high dose amoxicillin is used) the formulation of the amoxicillin-clavulanic acid is specified.</strong></td>
</tr>
</tbody>
</table>

**Example of prescription:**
Amoxicillin clavulanic acid suspension - Please dispense as 7:1 formulation (80mg/mL amoxicillin + 11.4mg/mL clavulanic acid)
480mg (of amoxicillin component) po TID x 10 days
### PENICILLINS (CONTINUED)

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage &amp; Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Piperacillin (IV)</strong></td>
<td>For documented <em>Pseudomonas aeruginosa</em> infections&lt;br&gt;IV: 200-300 mg/kg/DAY ÷ q6h (MAX: 16 g/DAY)</td>
</tr>
<tr>
<td><strong>Piperacillin + Tazobactam (IV)</strong></td>
<td>Broad coverage against many pathogens. First line for febrile neutropaenia.&lt;br&gt;IV: 200-300 mg/kg/day (of Piperacillin component) ÷ q6-8h&lt;br&gt;(Adult dose is 4.5g IV q8h)&lt;br&gt;<strong>Order antibiotic as x mg (or g) of piperacillin component IV q6-8h</strong></td>
</tr>
</tbody>
</table>

### CEPHALOSPORINS – do NOT cover MRSA, *Enterococcus* species, *Listeria*, or extended spectrum beta-lactamase producing organisms (ESBL)

#### 1st Generation

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage &amp; Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cefazolin</strong> (Ancef) (IV or IM)</td>
<td>Excellent coverage against <em>S. aureus</em>, group A <em>Streptococcus</em>, <em>E. coli</em>, <em>Klebsiella</em>. Empiric therapy for cellulitis, osteomyelitis, bacterial adenitis.&lt;br&gt;IV: 75-150 mg/kg/DAY ÷ q8h (MAX: 6 g/DAY)&lt;br&gt;Higher doses are needed for infections such as osteomyelitis</td>
</tr>
<tr>
<td><strong>Cephalexin</strong> (Keflex) (PO)</td>
<td>Tablet: 250mg, 500mg&lt;br&gt;Suspension: 50mg/mL&lt;br&gt;PO: 25-100 mg/kg/DAY ÷ qid&lt;br&gt;Osteomyelitis following IV therapy: 100-150mg/kg/DAY (MAX: 4 g/DAY)</td>
</tr>
</tbody>
</table>

#### 2nd Generation

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dosage &amp; Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cefuroxime</strong> (IV or IM)</td>
<td>NO LONGER INDICATED FOR EMPIRIC TREATMENT OF PNEUMONIA. These agents offer no benefit compared to ampicillin/amoxicillin for treatment of <em>S. pneumoniae</em>. Main benefit is coverage against (nontypeable) <em>H. influenzae</em> and <em>Moraxella</em>, which cause sinusitis and otitis.&lt;br&gt;IV: 100-150 mg/kg/DAY ÷ q8h (MAX: 2g/DOSE)</td>
</tr>
<tr>
<td><strong>Cefuroxime Axetil</strong> (Ceftin) (PO)</td>
<td>Poor oral bioavailability; unlikely to achieve optimal concentrations in severe infections</td>
</tr>
</tbody>
</table>
| **Cefprozil**  
| (Cefzil) (PO)  
| Tablet: 250mg, 500mg  
| Suspension: 50mg/mL | (eg. for otitis media unresponsive to high-dose amoxicillin or for acute sinusitis)  
| **PO:** 15-30 mg/kg/DAY ÷ q12h (MAX: 1 g/DAY). |

### 3rd Generation

- **Cefotaxime**  
  (IV or IM) **reserved for neonates less than 1 month old**  
  **Meningitis:** IV: 200-225mg/kg/DAY ÷ q6h; up to 300mg/kg/DAY ÷ q6h may be used in infants and older children for this indication (MAX: 12 g/DAY)

  **Other infections:**  
  IV: 100-200 mg/kg/DAY ÷ q6-8h (MAX: 6 g/DAY)

  Neonates greater than 2kg (if less than 2kg, please refer to neonatal dosing handbook):  
  0 – 7 days of age: 100-150mg/kg/DAY IV ÷ q8-12h  
  Greater than 7 days of age: 150-200mg/kg/DAY IV ÷ q6-8h

- **Ceftriaxone**  
  (IV or IM) **for infants and children greater than 1 month old**  
  **Meningitis:** IV/IM: 100mg/kg/DAY divided q12h or q24h (Max: 2g/DOSE)  
  Other infections: IV/IM: 50-75 mg/kg q24h (MAX: 2 g/DAY)

  **STI (gonococcal infection):**  
  Greater than 45kg: 250mg IM x 1
## ANTIBACTERIALS (CONTINUED)

### CEPHALOSPORINS

| **Ceftazidime**  
(IV or IM) | Active against *Pseudomonas aeruginosa*:  
IV: 75-150 mg/kg/DAY ÷ q8h (MAX: 6 g/DAY) |
|-----------------|--------------------------------------------------|

| **Cefixime**  
(Suprax) (PO)  
(Pills) | Increasing MIC (minimum inhibitory concentration) against *Neisseria gonorrhoea*; avoid use if possible due to increased risk of treatment failure. IM ceftiraxone is preferable.  
Tablet: 400mg  
Suspension: 20mg/mL | Other infections (Not active against *Pseudomonas* and poor GP activity):  
PO: 8 mg/kg/DAY ÷ q12-24h (MAX: 400 mg/DAY) |
|-----------------|--------------------------------------------------|

### CARBAPENEMS – Very broad spectrum antibiotics (coverage against GP, GN and anaerobes including extended beta-lactamase producing strains of GN); no coverage against MRSA ** Requires ID endorsement **

| **Meropenem**  
(IV) | **Meningitis**: 40mg/kg/DOSE IV q8h (MAX: 2g/DOSE)  
Other infections: 20mg/kg/DOSE IV q8h (usual MAX: 1g/DOSE) |
|-----------------|--------------------------------------------------|

| **Ertapenem**  
(IV) | 3 months - 12 years: 15mg/kg/DOSE IV q12h (max: 1 gram/DAY)  
Greater than 13 years: 1 g IV once daily (max: 1 gram/DAY) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GLYCOPEPTIDES</td>
<td>Only active against GP (including MRSA). Use as an alternative for GP coverage in patients with severe penicillin allergy (i.e. anaphylaxis, angioedema)</td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Vancomycin** (IV or PO) | Meningitis: IV: 60 mg/kg/DAY ÷ q6h (MAX: 4 g/DAY)  
Other infections (MRSA or Coagulase Negative Staphylococci):  
IV: 40-60 mg/kg/DAY ÷ q6-12h (usual MAX: 2 g/DAY)  
Higher doses may be required in patients with suspected/confirmed MRSA infections, or individuals who are in clinically severe sepsis  
Infuse over a minimum of 1 hour to avoid Red Man Syndrome; If reaction occurs, increase infusion time. In patients with known history of Red Man Syndrome, write on order to infuse over at least 2 hours.  
Monitor trough levels in patients with septic shock, proven MRSA infections, concurrent nephrotoxins, fluctuating renal function or extended treatment courses  
*Clostridium difficile* infection (usually reserved for severe infection or failed metronidazole):  
PO: 12.5 mg/kg/DOSE q6h (MAX: 125 mg/DOSE) |

The IV formulation will be provided when prescribed orally while in hospital.
### ANTIBACTERIALS (CONTINUED)

#### Protein Synthesis Inhibitors

**VIA 50S Ribosome (Bacteriostatic)**

<table>
<thead>
<tr>
<th>MACROLIDES</th>
<th>Atypicals: Mycoplasma, Legionella, Chlamydia, H. pylori GAS and <em>S. pneumoniae</em> infections in patients with severe penicillin allergy (although substantial macrolide resistance has been observed with these pathogens).</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Clarithromycin</strong></th>
<th><strong>Azithromycin</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet: 250mg, 500mg Suspension: 25mg/mL, (50mg/mL not available at HHS)</td>
<td>Tablet: 250mg Suspension: 40mg/mL</td>
</tr>
<tr>
<td><strong>Useful for mild bacterial pneumonia in adolescents. Also commonly used for atypical mycobacterial infections.</strong></td>
<td><strong>Useful for known atypical respiratory infections and bacterial enteritis. AVOID USING TO TREAT INFECTIONS PRESUMED TO BE CAUSED BY GROUP A STREPTOCOCCUS OR PNEUMOCOCCUS.</strong></td>
</tr>
<tr>
<td><strong>PO:</strong> 7.5 mg/kg/DOSE BID (Max: 500mg/DOSE)</td>
<td><strong>PO/IV:</strong> 10 mg/kg (MAX: 500 mg) once, then 5 mg/kg (MAX: 250 mg) q24h for 4 days</td>
</tr>
<tr>
<td>Rx Interactions: theophylline, carbamazepine, cisapride, digoxin, cyclosporine, tacrolimus.</td>
<td><strong>Pertussis:</strong> 10 mg/kg PO/IV q24h for 5 days</td>
</tr>
<tr>
<td><strong>Chlamydia trachomatis urethritis or cervicitis:</strong></td>
<td><strong>PO:</strong> (Greater than 1 month) 12 – 15mg/kg once (MAX: 1g)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>LINCOSAMIDES</strong></th>
<th><strong>Useful for toxic shock syndromes, anaerobic infections of the head and neck, and for susceptible <em>S. aureus</em> (including some MRSA) and group A streptococcus infections. Be careful – resistance in <em>S. aureus</em> is not particularly uncommon!</strong></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Clindamycin</strong></th>
<th><strong>IV:</strong> 30-40 mg/kg/DAY ÷ q8h (usual MAX: 600 mg/DOSE; 900mg IV q8h is usually prescribed in the setting as adjunct therapy in gram positive toxic shock or necrotizing fascitis)</th>
<th><strong>PO:</strong> 10-30 mg/kg/DAY ÷ q6-8h (MAX: 450 mg/DOSE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capsule: 150mg, 300mg Suspension 15mg/mL</td>
<td><strong>May potentiate muscle weakness with neuromuscular blockers. Oral suspension is very poorly tolerated, avoid if possible, use 150 mg capsules or an alternative antibiotic</strong></td>
<td>---</td>
</tr>
</tbody>
</table>
### VIA 30S and 50S Ribosome (Bacteriocidal)

<table>
<thead>
<tr>
<th>AMINOGLYCOSIDES</th>
<th>GN Aerobes (including <em>Pseudomonas aeruginosa</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tobramycin</strong></td>
<td><strong>IV:</strong> 5-6 mg/kg/dose q24h (extended frequency dosing is preferred in patients without renal impairment to maximize pharmacokinetics and dynamics of drug)</td>
</tr>
<tr>
<td></td>
<td>Synergy with beta-lactams for severe <em>S. aureus</em> and <em>Enterococcus</em> infections: 3mg/kg/day IV ÷ q8h</td>
</tr>
<tr>
<td></td>
<td>Doses as high as 10mg/kg/DAY IV q24h recommended in patients with cystic fibrosis.</td>
</tr>
<tr>
<td></td>
<td>(Inhaled tobramycin for CF patients): 80mg bid to tid via inhalation</td>
</tr>
<tr>
<td></td>
<td>Once daily dosing should be used for all patients &gt; 1 month of age, except in the treatment of endocarditis and in patients with extensive burns. <em>Ototoxicity</em> and <em>nephrotoxicity</em> may occur, consider monitoring trough levels (target &lt;1 mg/L) in patients at risk for nephrotoxicity (e.g. septic shock, concurrent nephrotoxins, fluctuating renal function or extended treatment courses). Prolonged therapy (i.e. greater than 2 weeks) generally not warranted. May potentiate muscle weakness with neuromuscular blockers.</td>
</tr>
</tbody>
</table>

### DNA Complex Damaging Agents (Bactericidal)

| METRONIDAZOLE (IV or PO) Tablets: 250mg; Suspension: 15mg/mL |
|----------------------|-----------------------------------------------------|
| Anaerobic infections: | IV/PO: 20-30 mg/kg/DAY ÷ q8-12h (MAX: 1 g/DAY) |
| *C. difficile* (For Colitis): | (Enteral administration preferred but IV can be used) |
|                        | IV/PO: 30-50 mg/kg/DAY ÷ q6-8h (MAX: 1.5 g/DAY) |
| Excellent oral absorption, use IV only if PO contraindicated or not tolerated |
**ANTIBACTERIALS (CONTINUED)**

<table>
<thead>
<tr>
<th>Folic Acid Metabolism Inhibitors (Bacteriostatic)</th>
</tr>
</thead>
</table>

### TRIMETHOPRIM-SULFAMETHOXAZOLE (TMP-SMX) (Septra, Co-trimoxazole)

Useful for: Pneumocystis carinii, Toxoplasma, Shigella, Salmonella, MRSA (in settings of cellulitis after appropriate incision and drainage), Nocardia

**Order in mg of trimethoprim component and mL of suspension (or number of tablets)**

**Bacterial infections (UTI):**

- **PO/IV:** 8-12 mg/kg/DAY (of Trimethoprim component) ÷ q12h

**Pneumocystis jiroveci pneumonia (PCP):**

- **PO/IV:** 15-20 mg/kg/DAY (of Trimethoprim component) ÷ q6-8h

If PCP is severe (i.e. hypoxia), consider adding IV Methylprednisolone 1 mg/kg q24h

**PCP prophylaxis (Hematology/Oncology, HIV):**

- **PO/IV:** 3-5mg/kg/day (of Trimethoprim component) ÷ bid on Monday, Wednesday, Friday

<table>
<thead>
<tr>
<th>Formulation:</th>
<th>Trimethoprim</th>
<th>Sulfamethoxazole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspension</td>
<td>8 mg/ml</td>
<td>40 mg/ml</td>
</tr>
<tr>
<td>Injectable</td>
<td>16 mg/ml</td>
<td>80 mg/ml</td>
</tr>
<tr>
<td>SS (single strength) Tablet</td>
<td>80 mg</td>
<td>400 mg</td>
</tr>
<tr>
<td>DS (double strength) Tablet</td>
<td>160 mg</td>
<td>800 mg</td>
</tr>
</tbody>
</table>

**Excellent oral absorption, use IV only if PO contraindicated. Maintain good fluid intake and urine output. Monitor CBC and LFTs. Do not use in patients with G-6-PD deficiency.**

<table>
<thead>
<tr>
<th><strong>Trimethoprim</strong></th>
<th><strong>Urinary tract infection prophylaxis:</strong> 2 – 5mg/kg/DAY trimethoprim once daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet: 100mg</td>
<td></td>
</tr>
<tr>
<td>Suspension: 10mg/mL</td>
<td></td>
</tr>
</tbody>
</table>
# DNA Gyrase Inhibitors (Bactericidal)

## QUINOLONES

Enteric GNB, including most ESBL and *Pseudomonas*. Levofloxacin also has excellent coverage against *S. pneumoniae*. Theoretical risk of development of arthropathy in children is based primarily on animal studies. The use of quinolones in situations of antibiotic resistance where no other agent is available is reasonable, weighing the benefits of treatment against the low risk of toxicity of this class of antibiotics. Another situation would be where there are no other orally administered antibiotics available.

<table>
<thead>
<tr>
<th><strong>Ciprofloxacin</strong></th>
<th><strong>Levofloxacin</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>(IV or PO) Tablet: 250mg, 500mg, 750mg</td>
<td>Tablet: 250mg, 500mg, 750mg</td>
</tr>
<tr>
<td>Suspension: 100mg/mL (tablets are preferable if dose is given via NG tubes)</td>
<td>Suspension not available commercially; use dissolve and dose</td>
</tr>
<tr>
<td><strong>REQUIRES ID ENDORSEMENT</strong> <strong>REQUIRES ID ENDORSEMENT</strong></td>
<td><strong>REQUIRES ID ENDORSEMENT</strong></td>
</tr>
</tbody>
</table>

Ciprofloxacin usually reserved for infections caused by *Pseudomonas aeruginosa* or other resistant gram negative bacilli

| IV/PO: 20-30 mg/kg/DAY ÷ q12h (MAX: 400 mg/DOSE IV or 750 mg/DOSE PO) EXCELLENT ORAL ABSORPTION, USE IV ONLY IF PO CONTRAINDICATED. FEEDS, FORMULA, CALCIUM, MAGNESIUM, IRON, ANTACIDS AND SUCRALFATE REDUCE ABSORPTION, HOLD FEEDS FOR 1 HOUR BEFORE AND 2 HOURS AFTER DOSE. |

Levofloxacin usually reserved for infections caused by *Pseudomonas aeruginosa*, other resistant gram negative bacilli or penicillin-resistant *Streptococcus pneumoniae*. **REQUIRES ID ENDORSEMENT**
| **ANTIFUNGALS** | **Fluconazole (IV or PO)** | Oropharyngeal candidiasis: IV/PO: 3 mg/kg q24h  
Esophageal candidiasis: IV/PO: 6 mg/kg q24h (MAX: 400 mg/DAY)  
Candidemia: IV/PO: 12 mg/kg once (MAX: 800 mg) Then 6 mg/kg/DAY (MAX: 400 mg/DAY, ↑ doses)  

Excellent oral absorption, use IV only if PO contraindicated.  
May increase serum levels of cyclosporine, midazolam, cisapride, phenytoin.  
Aspergillus species and *Candida krusei* are intrinsically resistant,  
*Candida glabrata* may respond to higher doses.  
Dosage adjustment is required in patients with impaired renal function |
| **Voriconazole (IV or PO)** | Tablet: 50mg, 200mg  
Suspension: 40mg/mL  
**Requires ID endorsement**  
Coverage against many *Candida* species and *Aspergillus*  
Children 2 to < 12 years:  
Loading dose (IV): 9mg/kg/dose q12h x 2 doses then  
Maintenance dose (IV): 8mg- 9mg/kg q12h (MAX: 350mg/dose)  
Oral following IV therapy: 9mg/kg PO q12h (MAX: 350mg/dose)  
Children ≥12 years:  
Loading dose: (IV) 6mg/kg/dose q12h x 2 doses then  
Maintenance dose(IV): 4mg/kg/dose q12h  
Oral following IV therapy: Less than 40kg: 100mg q12h  
Greater than 40kg: 200mg q12h  
Only IV formulation needs to be used with caution in patients with renal impairment (use oral formulation in this scenario) |
**ANTIFUNGALS (continued)**

| **Liposomal Amphotericin B (IV) (Ambisome)** | **Requires ID endorsement**
| **Coverage against many *Candida* species, *Aspergillus* and most *Mucor***
3 – 5 mg/kg IV once daily
Monitor renal function and electrolytes (particularly potassium and magnesium). Infusion-related adverse effects (e.g. fever, rigors etc) may require pre-treatment with acetaminophen, diphenhydramine |

| **Caspofungin (IV)** | **Requires ID endorsement**
Loading dose: 70mg/m²/DAY IV x 1 dose (MAX: 70mg) then
Maintenance dose: 50mg/ m²/DAY IV once daily (MAX: 50mg) |

| **Nystatin** | Oral candidiasis: PO:
infants: 100 000 Units swish and swallow QID
children: 250 000 Units swish and swallow QID
adolescents: 500 000 Units swish and swallow QID |
<table>
<thead>
<tr>
<th>ANTI-VIRALS</th>
<th>Acyclovir</th>
<th>Need to monitor kidney function and ensure adequate hydration (especially on high dose of intravenous therapy). Dosing adjustment is necessary in patients with impaired renal function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablets: 200mg, 400mg and 800mg</td>
<td>Suspension: 40mg/mL</td>
<td></td>
</tr>
<tr>
<td>Infants 1-3 months: 60mg/kg/DAY IV ÷ q8h (duration will be dependent on organ involvement – 21 days for CNS and disseminated disease; 14 days for skin and mucous membrane involvement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HSV encephalitis (3 months to 12 years): 60mg/kg/DAY IV ÷ q8h (MAX: 1g/DOSE)</td>
<td>HSV encephalitis (Greater than 12 years): 30mg/kg/DAY IV ÷ q8h (MAX: 1g/DOSE)</td>
<td></td>
</tr>
<tr>
<td>Mild – moderate mucocutaneous HSV infection in immunocompetent hosts: 30-50mg/kg/DAY PO ÷ 3 TO 5 TIMES DAILY</td>
<td>HSV infection in immunocompromised hosts or severe infection (eg. eczema herpeticum): 15-30mg/kg/DAY IV ÷ q8h PO dosing (following IV therapy): 60-80mg/kg/DAY PO ÷ 3 TO 5 TIMES DAILY</td>
<td></td>
</tr>
<tr>
<td>Varicella or zoster in immunocompromised hosts: 30mg/kg/DAY IV q8h PO dosing (following IV therapy): 80mg/kg/DAY PO ÷ 3 TO 5 TIMES DAILY</td>
<td>Varicella or zoster in immunocompetent host (note that therapy not always indicated): 80mg/kg/DAY PO ÷ 3 TO 5 TIMES DAILY</td>
<td></td>
</tr>
</tbody>
</table>
Oseltamivir
Available as 75 mg capsules OR 6mg/mL suspension

Usual treatment duration is for 5 days only
*dosage adjustment is necessary in renal impairment*

**NOTE:** Consult Infectious Diseases for premature infants & neonates (Less than 1 month of age).

*Infants - 1 month to 12 months:*

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>Infants 1 to 8 months</th>
<th>Infants 9 to 11 months†</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 – 3.5 kg</td>
<td>9 mg BID</td>
<td>12 mg BID</td>
</tr>
<tr>
<td>3.6 – 4.5 kg</td>
<td>12 mg BID</td>
<td>15 mg BID</td>
</tr>
<tr>
<td>4.6 – 5.5 kg</td>
<td>15 mg BID</td>
<td>18 mg BID</td>
</tr>
<tr>
<td>5.6 – 6.5 kg</td>
<td>18 mg BID</td>
<td>21 mg BID</td>
</tr>
<tr>
<td>6.6 – 7.5 kg</td>
<td>21 mg BID</td>
<td>24 mg BID</td>
</tr>
<tr>
<td>7.6 – 8.5 kg</td>
<td>24 mg BID</td>
<td>27 mg BID</td>
</tr>
<tr>
<td>8.6 – 9.5 kg</td>
<td>27 mg BID</td>
<td>30 mg BID</td>
</tr>
<tr>
<td>9.6 kg and over</td>
<td>30 mg BID</td>
<td>30 mg BID</td>
</tr>
</tbody>
</table>

†AAP recommends 3.5mg/kg/dose twice daily in infants aged 9 – 11 months (Reference: AAP Policy Statement: Recommendations for Prevention & Control of Influenza in Children 2013-2014).

*Children greater than 12 months:*

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>DOSE (if suspension is used)</th>
<th>DOSE (if capsules are used)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 15kg</td>
<td>30mg BID</td>
<td>--</td>
</tr>
<tr>
<td>15 – 23 kg</td>
<td>48mg BID</td>
<td>--</td>
</tr>
<tr>
<td>23 – 40 kg</td>
<td>60mg BID</td>
<td>--</td>
</tr>
<tr>
<td>40 kg</td>
<td>78mg BID</td>
<td>75mg BID</td>
</tr>
</tbody>
</table>

PEDiatric FORMULARY

Acetaminophen
Analgesic and antipyretic.

PO/PR: Refer to table for weight based dosing standardization
Can be dosed q4-6h prn

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Single Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 3.9</td>
<td>40</td>
</tr>
<tr>
<td>4.0 - 5.4</td>
<td>60</td>
</tr>
<tr>
<td>5.5 - 7.9</td>
<td>80</td>
</tr>
<tr>
<td>8.0 - 10.9</td>
<td>120</td>
</tr>
<tr>
<td>11.0 - 15.9</td>
<td>160</td>
</tr>
<tr>
<td>16.0 - 21.9</td>
<td>240</td>
</tr>
<tr>
<td>22.0 - 26.9</td>
<td>320</td>
</tr>
<tr>
<td>27.0 - 31.9</td>
<td>400</td>
</tr>
<tr>
<td>32.0 - 43.9</td>
<td>480</td>
</tr>
<tr>
<td>44 – over</td>
<td>650</td>
</tr>
</tbody>
</table>

Acetylsalicylic Acid
Antiplatelet:
PO: 5 mg/kg/DOSE q24h.
Minimum 20 mg, usual maximum 325 mg.

Kawasaki disease:
PO: 80-100 mg/kg/DAY ÷ q6h,
reduce dose to 3-5 mg/kg q24h once fever resolves.
Supplied as 80 mg chewable tablets and 325 and 650 mg tablets.

AmLODIPine
Calcium channel blocker:
PO: 0.1-0.3 mg/kg/DAY (max 15mg/kg/day
Due to long half life of drug, dose adjustments should be made every 3-5 days only)
**Captopril**
Angiotensin converting enzyme inhibitor (ACE-I).

- **PO:** 0.1-0.3 mg/kg/DOSE q8h initially (usual maximum 6 mg/kg/DAY or 200 mg/DAY).

Monitor blood pressure closely after first dose, may cause profound hypotension. Cough is a common side effect of ACE-I. Not available as liquid formulation-consult pharmacist for administration directions.

**CarBAMazepine**
Anticonvulsant.

- **PO:** 10-20 mg/kg/DAY initially, usual maintenance dose is 20-30 mg/kg/DAY. Divide daily dose q8-12h.

Serum trough concentration target is 17-50 micromol/L (4-11 microgram/mL).

**Charcoal**
Adsorbent used in toxic ingestions.

- **PO:** 1-2 g/kg once (max 50 g/DOSE).
- **PO:** Multiple dose therapy 0.5 g/kg q4-6h.

Give via NG if necessary, consider antiemetics.

**Chloral Hydrate**
Sedative and hypnotic.

- **Procedural Sedation:**
  - **PO/PR:** 80 mg/kg 20-45 mins before procedure may repeat half dose if no effect in 30 minutes (maximum 2 g/dose).

- **Sedation:**
  - **PO/PR:** 25-50 mg/kg/DOSE q6-8h (maximum 500 mg q6h or 1 g hs).

Avoid in liver dysfunction. Tolerance develops and withdrawal may occur after long-term use. For PR use dilute syrup with water.
**Codeine**: Codeine has now been replaced with Morphine as the preferred oral narcotic analgesic for acute pain at HHSC due to better safety profile. Please refer to morphine dosing.

**Dexamethasone**
Corticosteroid.

**Acute Asthma:**
- **IV/PO**: 0.3 mg/kg/DOSE (usual max 8 mg/DOSE)

**Croup:**
- **IV/PO**: 0.6 mg/kg ONCE (usual max 12 mg)

**Cerebral Edema:**
- **IV/PO**: 1-2 mg/kg then 1-1.5 mg/kg/DAY divided Q6H (usual maximum 16 mg/DAY)

**Antiemetic for antineoplastic regimens:**
- **IV/PO**: 0.25mg/kg/DAY divided q8h

Discontinuation of therapy greater than 14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

**Dextrose**

**Treatment of hypoglycemia:**
- **IV**: 0.5-1 g/kg/DOSE:
  - 1-2 mL/kg of 50% dextrose
  - 5-10 mL/kg of 10% dextrose

1 mmol of dextrose (0.2 g of dextrose) provides 2.8 kJ (0.67 kcal).
Diazepam
Benzodiazepine sedative, anxiolytic and amnestic.

**Status epilepticus:**
IV: 0.1-0.5 mg/kg/DOSE
   (usual maximum 5 mg for children less than 5 yrs
   10 mg for children greater than 5yrs)
PR: 0.5 mg/kg/DOSE (maximum 20 mg/DOSE).
   For PR route, use IV formulation diluted with water

Skeletal muscle spasms:
PO: 1-2.5mg /DOSE q3-4h prn (May increase gradually as needed)

Fast onset and short duration of action with single doses, duration of
action prolonged with continued use. Withdrawal may occur if
discontinued abruptly after prolonged use. Not recommended for
continuous infusion due to poor solubility.

DimenhyDRINATE (Gravol)
Antihistamine used to treat nausea and vomiting.
   IV/IM/PO: 0.5 -1 mg/kg/DOSE q4-6h prn
   (maximum 50 mg/DOSE).
Available as 3mg/mL liquid. Please round to nearest 2.5mg dose.
Not indicated for infants less than 2 years of age

DiphenhydrAMINE (Benadryl)
Antihistamine used primarily to treat urticaria.
   IV/IM/PO: 0.5-1 mg/kg/DOSE q6h prn
   (maximum 50 mg/DOSE).
Available as 2.5mg/ml elixir. Please round to nearest 2.5mg dose.
**Docusate (Colace)**
Laxative
PO: 5 mg/kg/DAY once daily or in divided doses 2-4 times/DAY (maximum 200 mg/DAY)

Available as 10 mg/mL suspension or 100 mg capsule. Suspension is bitter tasting. Mask taste by diluting with juice or milk/formula. *Please round to nearest multiple of 5mg.*

**Domperidone**
Prokinetic agent.
PO: 1.2-2.4 mg/kg/DAY ÷ q6h (usual maximum 30 mg /DAY due to risk of QTc prolongation-Health Canada)
Give 15-30 mins prior to feed/meals and at bedtime. Baseline ECG and ECG after initiation recommended.

**Enoxaparin**
Anticoagulant, low-molecular weight heparin.
**Treatment:**
Subcutaneous:
Less than 2 months of age: 1.5 mg/kg/DOSE q12h.
Greater than 2 months of age: 1 mg/kg/DOSE q12h.
**Prophylaxis:**
Subcutaneous:
Less than 2 months of age: 0.75 mg/kg/DOSE q12h or 1.5 mg/kg q24h
Greater than 2 months of age: 0.5 mg/kg/DOSE q12h or 1mg/kg q24h
Maximum prophylactic dose 30mg q12h, or 40mg q24h

Monitor platelets and hemoglobin. Avoid in severe renal dysfunction. Anti-factor Xa level drawn 4 hours post Subcutaneous injection should be 0.5-1 unit/mL for treatment and 0.2-0.4 unit/mL for prophylaxis.
Epinephrine (1:1000)
NEB: If less than 10kg: 2.5mg/DOSE inhaled q8h prn
10kg or greater: 5mg/DOSE inhaled q8h prn

Bronchiolitis:
NEB: 1.5 mg in 4 mL of 3% Hypertonic saline q8h

fentANYL
Narcotic analgesic
Continuous infusion:
Continuous infusion: 0.5-2 mcg/kg/hr
Initial bolus (loading) dose: IV: 0.5-1 mcg/kg
PRN Breakthrough dose: 0.5-1 mcg/kg q1-2 h prn
(refer to continuous infusion electronic order set)

Please note: **Fentanyl is 100 x more potent than morphine**
To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (greater than 5 days). Common adverse effects are pruritus, nausea and constipation

Ferrous Sulfate: See iron.

Fluticasone (Flovent)
Inhaled corticosteroid.
INH: 50-500 microgram q12h.
Available as 50mcg, 125mcg, 250 mcg /inhalation metered dose inhaler, orders must specify strength as well as number of puffs

Furosemide
Loop diuretic.
PO: 1-2 mg/kg/DOSE q6h-q24h (usual max 80 mg/DOSE)
IV: 0.5-2 mg/kg/DOSE q6h-q24h (usual max 80mg/DOSE)
or
begin at 0.1 mg/kg/hour and titrate to clinical effect (maximum 0.5 mg/kg/h).
Available as 10mg/mL oral solution. *Please round to nearest 1mg dose.*
**Hydrochlorothiazide**  
Thiazide diuretic.  
PO: 1-4 mg/kg/DAY ÷ q12h  
Available as 5mg/mL suspension. *Please round to nearest 0.5mg or 1mg.*

**Hydrocortisone**  
Corticosteroid.  

**Acute asthma:**  
IV: 1-2 mg/kg/DOSE q6h for 24-48 hours then reassess.  
(usual max is 5mg/kg/DOSE)  

**Anaphylaxis:**  
IV: 5-10 mg/kg/DOSE.  

**Acute adrenal crisis:**  
IV: 1-2 mg/kg then:  
Infants: 25-150 mg/DAY ÷ q6h.  
Older children: 150-250 mg/DAY ÷ q6h.  

Discontinuation of therapy greater than 14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

**HYDROMORPHONE**  
Narcotic analgesic  

**Analgesia:**  
PO: 0.03-0.08 mg/kg/DOSE q4-6h prn  
(usual initial max 3mg/DOSE)  
IV: 0.01-0.02 mg/kg/DOSE q2-4h prn  

**Sedation/analgesia:**  
Continuous infusion: 2-8 microgram/kg/hr  
Initial bolus (loading) dose: IV: 0.01-0.02 mg/kg  
PRN breakthrough dose: 0.01-0.02 mg/kg q3h prn  
(refer to continuous infusion electronic order set)

To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (Greater than 5 days). Common adverse effects are pruritis, nausea and constipation.
**HydrOXYzine**

**Anti-pruritic:**

PO: 2 mg/kg/DAY ÷ TID or QID

Available as a 2mg/mL suspension or 10mg, 25mg capsules

**Hypertonic Saline 3%:**

**Bronchiolitis**

NEB: 4 mL of 3% saline q8h (with epinephrine 1.5mg)

**Ibuprofen**

Analgesic and anti-inflammatory (NSAID).

Can be dosed q6-8h prn.

PO:

<table>
<thead>
<tr>
<th>Weight (kg)</th>
<th>Single Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5 - 3.9</td>
<td>20</td>
</tr>
<tr>
<td>4.0 - 5.4</td>
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<td>300</td>
</tr>
<tr>
<td>44 – over</td>
<td>400</td>
</tr>
</tbody>
</table>

Do not administer within 6 hours of Parenteral or PO Ketorolac (duplicate NSAIDs).

Administer with food, if able, to minimize GI upset.

Avoid in patients with renal impairment or increased risk of bleeding.
Insulin (regular)-Humulin R or Novolin Toronto
Recombinant human insulin.
  Diabetic ketoacidosis:
  IV:  0.05-0.1 units/kg/h initially. (add 25 units of regular insulin to 250 mL/NS) then titrate to patients response

For IV administration MUST use regular insulin.
  Hyperkalemia:
  IV:  0.1 units/kg AND dextrose 0.5 g/kg.

Ipratropium (Atrovent)
Inhaled anticholinergic bronchodilator.
  Severe asthma:
  NEB:  125-250 microgram (0.5-1 mL) q4-6h.
  INH:  2-4 puffs q4-6h (1 puff = 20 mcg)

Iron
  Treatment of iron deficiency anemia:
  PO:  4-6 mg/kg/DAY (of elemental iron) ÷ q8-24h. (usual max: 180mg/day = 60mg elemental iron TID)
  Prevention of iron deficiency anemia:
  PO:  2-3 mg/kg/DAY (of elemental iron) ÷ q8-24h.

Give with food if GI upset occurs. Liquid does stain teeth, rinse mouth well.
Available as ferrous sulfate 75mg/mL solution (15mg/mL elemental iron) and tablets containing 60mg elemental iron/300mg ferrous sulfate or 35mg elemental iron/300mg ferrous gluconate. Round to nearest 12.5mg dose (2.5mg elemental iron) for liquid.
Ferrous fumarate and Feramax not available in hospital.

Kayexelate® (Sodium Polystyrene Sulfonate)
Cation exchange resin.
  Treatment of hyperkalemia:
  PO/PR:  1 g/kg/DOSE may be repeated q4-6h prn (usual maximum 30-60 g/DOSE).

Give in water or juice, do not mix with fruit juices with high potassium content such as orange juice.
Ketorolac (Toradol)
Analgesic and anti-inflammatory (NSAID).

**IV/IM:** 1-2 mg/kg/DAY (maximum 120 mg/DAY) ÷ q6h.
**PO:** Adolescents: 10mg q6h (max 40mg/DAY) for 5 days total (IV and PO). No weight based dosing available for children.
Available as 10mg tablets. **IV dosing not equal to PO**
Adverse effects include renal dysfunction, GI irritation and ulceration. **do not administer within 6 hours of ibuprofen (duplicate NSAIDs)**

Lactulose
Osmotic laxative.

**PO:**
- **Infants:** 2.5-5 mL q8-24h.
- **Children:** 5-10 mL q8-24h.
- **Adolescents:** 15-30 mL q8-24h.

LevETIRAcetam:
Anticonvulsant

**PO:** 5-10 mg/kg/DAY (Daily or BID)
May titrate dose to effect (max 3000mg/DAY), may require dosage adjustment in renal impairment

LORazepam
Benzodiazepine sedative, anxiolytic and amnestic.

**Status Epilepticus:**
**IV:** 0.1 mg/kg/DOSE, (usual maximum 4 mg/DOSE).
May repeat 0.1mg/kg in 5 mins if needed
**PR:** 0.2 mg/kg/DOSE (usual maximum 8 mg/DOSE)
Pre-op/procedural sedation:
**PO/SL:** 0.05 mg/kg/dose (max 2 mg /DOSE)
**IV:** 0.03-0.05 mg/kg/dose (max 4 mg/DOSE).
Intermediate duration of action and no active metabolites.
Withdrawal may occur if discontinued abruptly after prolonged use.
Not recommended for continuous infusion due to poor solubility.
May give parenteral preparation rectally, diluted with water.
**Magnesium salts**  
Electrolyte.  
*Treatment of hypomagnesemia:*
- **PO:** 20-40mg/kg/day elemental magnesium ÷ TID-QID  
- **IV:** 25-50 mg/kg (maximum 5g) over 4-5 hours  
**Severe acute asthma:**  
- **IV:** 25-75 mg/kg/DOSE once (usual maximum 2g/DOSE)  

IV available as magnesium sulfate. PO available as magnesium glucoheptonate oral liquid 100mg/mL (5mg/mL elemental Mg) or magnesium oxide 420mg tablet (252mg elemental Mg)

**MethylPREDNISolone**  
Corticosteroid.  
*Severe acute asthma:*  
- **IV:** 0.5-1 mg/kg/DOSE q12h (usual max 40 mg/DOSE)  
  - Or  
  - 1-2 mg/kg/DOSE q6h can be used until improvement seen (usually 24-48 hours) then q24h or switch to oral prednisone.  
**Anti-inflammatory:**  
- **IV:** 1-2 mg/kg/DOSE q24h.  
**High dose/pulse therapy:**  
- **IV:** 10-30 mg/kg/DOSE q24h  

Discontinuation of therapy greater than 14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

**Metoclopramide**  
Antiemetic, gastrointestinal prokinetic agent.  
- **IV/PO:** 0.4-0.5 mg/kg/DAY ÷ q6h  
  - (usual maximum 40 mg/DAY).  

Extrapyramidal reactions occur more commonly in children and may be treated with diphenhydramine. Contraindicated in children less than 1 year and use with caution in children greater than 1 year.
Morphine
Narcotic analgesic.
Analgesia:
PO: 0.2-0.5 mg/kg/DOSE q4-6h prn
(usual max is 10-15 mg/DOSE)
IV: 0.05-0.1 mg/kg/DOSE q2-4h prn and increase as required
Sedation/analgesia:
Continuous infusion: 10-40 microgram/kg/hr infusion
Initial bolus (loading) dose IV: 0.05-0.1 mg/kg
PRN breakthrough dose: 0.05-0.08 mg/kg q3h PRN
(refer to continuous infusion electronic order set)
Please note: Morphine has now replaced codeine as the preferred oral narcotic analgesic for acute pain at HHSC due to better safety profile. Reduced doses may be required if used in combination with benzodiazepines. To prevent withdrawal, avoid abrupt cessation following high doses or long duration of therapy (> 5 days). Common adverse effects are pruritis, nausea and constipation.

Naproxen
Analgesic and anti-inflammatory (NSAID).
PO: 10-20 mg/kg/DAY ÷ q8-12h (maximum 1 g/DAY).
Adverse effects include renal dysfunction, GI irritation and ulceration. Also available as suppositories (250mg) if PR route preferred.

Omeprazole
Inhibitor of gastric acid secretion (proton pump inhibitor).
PO: 1-2 mg/kg/DAY ÷ q12-24h (maximum 40 mg/DAY).
A 2mg/mL oral suspension is available. Please round to nearest 1mg dose.

Ondansetron
Antiemetic.
IV/PO: 0.1-0.15 mg/kg/DOSE q8h prn
(maximum 8 mg/DOSE).
**Oxybutynin (Ditropan)**  
Urinary antispasmodic agent.  
PO:  1-5 years: 0.2 mg/kg/dose BID-QID  
     Greater than 5 years: 5mg/DOSE BID-QID  
Available as 1mg/mL syrup or 5mg tablets

**Pantoprazole**  
Inhibitor of gastric acid secretion (proton pump inhibitor).  
PO/IV: 1-1.5 mg/kg/DAY ÷ q12-24h (usual max 40 mg/DOSE)

   GI bleed (infusion):  
   IV:  5 – 15 kg: 2 mg/kg/DOSE x 1 DOSE, then 0.2 mg/kg/h  
        16 – 40 kg: 1.8 mg/kg/DOSE x 1 DOSE, then 0.18 mg/kg/h  
        Greater than 40 kg: 80 mg x 1 DOSE, then 4 - 8 mg/h

There is no liquid formulation available. Intravenous and oral pantoprazole provide equivalent acid suppression. Tablets are enteric coated - do not crush tablets or administer tablets via gastric tubes.

**PEG-3350 (Polyethylene Glycol)**  
Osmotic Laxative  
   Constipation:  
   PO: 0.5-1 g/kg/DAY (titrate to effect- usual max 17 g/day)  
Available as 17 gram /sachet in hospital. Mix in 125-250 mL of water or juice. Onset 2-4 days. Is odorless and tasteless.

**PHENobarbital**  
Barbiturate anticonvulsant.  
   Status epilepticus:  
   IV: 20 mg/kg over 20-30 minutes.  
   Maintenance:  
   IV/PO: 3-5 mg/kg/DAY ÷ q12-24h.

Usual serum level for seizure control: 65-172 mmol/L (15-40 mg/L)
Phenytoin
Anticonvulsant
   Status epilepticus:
     IV: 20 mg/kg over 20 minutes.

   Maintenance:
     IV/PO: 5 mg/kg/DAY (range 3-10 mg/kg/DAY) ÷ q8-12h. May require higher doses for patients with head injuries. Must be diluted in saline only and requires in-line filter (0.22 micron). Hold feeds before and after enteral administration as continuous feeds and formula may decrease bioavailability of oral products. Significantly increased free fraction in patients with hypoalbuminemia may result in underestimation of effective drug concentration and difficulty in interpretation of drug levels and toxicity may occur at “therapeutic” serum levels. Therapeutic level: 40-80 micromol/L (10-20 microgram/mL).

Phosphate salts:
Electrolyte
   Treatment of hypophosphatemia:
     PO: 1-2 mmol/kg/day ÷ BID-QID
     IV: 0.15-0.64 mmol/kg (maximum 60mmol) over 4-5 hours

IV available as sodium PHOSPHATE (3 mmol phosphate + 4 mmol sodium/mL) and potassium PHOSPHATE (3 mmol phosphate + 4.4 mmol potassium/mL). PO available as IV formulation of potassium phosphate (see above), given PO, and Phosphate Novartis 500mg effervescent tablet (16 mmol phosphate/3mmol potassium per tablet). Order in mmol phosphate component

Dose recommendations assume normal renal function. Please refer to Pediatric IV monograph for further prescribing details and limitations
**Pico-Salax®** (picosulfate sodium/magnesium oxide/citric acid)

Stimulant and Osmotic Laxative

- **PO:**
  - 1-6 yrs administer ¼ sachet
  - 6-12 yrs administer ½ sachet
  - Over 12 yrs: 1 sachet

Dose can be repeated after 6-8 hours if no effect. Used for refractory constipation, fecal impaction and for cleaning out bowels. Contents of 1 sachet are mixed with 160mL water.

**Potassium Salts**

Electrolyte. 1 mmol of potassium chloride = 1 mEq of potassium chloride

**Treatment of hypokalemia:**

- **PO:** 1-2 mmol/kg/DAY + q6h-24h.
- **IV:** 0.25-1 mmol/kg/DOSE.

For PO administration potassium CHLORIDE is available as oral solution 1.33 mmol/mL, and slow release capsules (Micro-K) 600 mg (= 8 mmol). Potassium CITRATE (K-Lyte) is also available as effervescent tablet (25 mEq/tablet). Give po with food. Dilute oral solution in water or juice and give over 5-10 mins. Slow-release capsules should be swallowed whole or can be opened and contents sprinkled on semi-solid food.

Usual maximum = 80 mmol/DAY. Doses greater than 20 mmol should be divided for tolerability.

Risk of arrhythmias and cardiac arrest with rapid IV administration. Dose recommendations assume normal renal function. Please refer to Pediatric IV monograph for further prescribing details and limitations.
**PrednisONE or PrednisoLONE**
Corticosteroid.

**Acute asthma:**
PO: 1-2 mg/kg/DOSE q24h.

**Anti-inflammatory or immunosuppressive:**
PO: 0.5-2 mg/kg q24h (usual max is 60mg/DAY)

1 mg PrednisONE = 1 mg PrednisoLONE. Prednisone is 5mg/mL and compounded as liquid in hospital. PrednisoLONE is 1mg/mL and commercially available. Discontinuation of therapy greater than 14 days requires gradual tapering. Consider supplemental steroids at times of stress if patient has received long-term or frequent bursts of steroid therapy.

**Ranitidine**
H₂ receptor antagonist.

**Reduction of gastric acid secretion:**
IV: 2-4 mg/kg/DAY ÷ q8-12h (usual max 50 mg q8h).
PO: 4-10 mg/kg/DAY ÷ q8-12h (usual max 300 mg/DAY).

IV dose is approximately 50% of oral dose. Modify dosage interval for patients with renal impairment. May add IV daily dose to TPN. Available as a 15mg/ml oral solution, 75mg or 150mg tablets.
Salbutamol (Ventolin)
Bronchodilator, $\beta_2$ agonist.

**Acute asthma:**
MDI: 4-8 puffs q30 mins – q4h prn.
NEB: Less than 10 kg: 2.5 mg q30mins – q4h PRN
   10 kg or greater: 5 mg q30mins – q4h PRN
Administered in 3 mL of NS.
Available as 5 mg/mL solution for nebulization.

**Maintenance therapy:**
MDI: 1-2 puffs q4h prn.
Titrates dose to effect and/or adverse effects (tachycardia, tremor and hypokalemia). For most patients metered dose inhalers with a spacer device are the preferred method of drug delivery.

**Senna**
Stimulant laxative.

**PO:**
   - infants: 1 or 2.5 mL (1.7 or 4.25 mg) q24h.
   - children: 2.5 or 5 mL (4.25 or 8.5 mg) q24h.
   - adolescents: 5 or 10 mL (8.5 or 17 mg) q24h.
Some patients, particularly those receiving opiates may require higher doses and/or more frequent administration. Also supplied as 8.6 mg tablets.

**Spironolactone**
Potassium sparing diurectic.

**PO:** 1-3 mg/kg/DAY ÷ q12-24h.
Available as a 5mg/mL suspension. Please round doses to the nearest 0.5mg or 1mg.
**Topiramate**
Anticonvulsant
For greater than 2 yrs and less than 16 yrs:
   PO: 1-3 mg/kg/DAY as single dose (initial max 25 mg/DAY)
   then can increase dose at 1-2 week interval by 1-3 mg/kg/DAY
   divided q12h.
   Usual maintenance
   PO: 5-9 mg/kg/DAY divided q12h
17 years and older:
   PO: 25 to 50 mg/DAY as a single dose, may increase dosage
   by 25 to 50 mg/DAY at 1-week intervals, give q12h.
   Titrate dose to response to a usual maintenance dose of 200 to
   400 mg/DAY divided q12h

Available as 6mg/mL liquid (compounded in hospital), or 25mg or
100mg tablets

**Ursodiol**
TPN Cholestasis:
   PO: 30mg/kg/DAY divided q8h
Biliary Atresia:
   PO: 10-15 mg/kg/DAY once daily

**Valproic Acid and Derivatives**
Anticonvulsant.
   Maintenance
   PO: 15-20 mg/kg/DAY increased to a maximum of
   30-60 mg/kg/DAY ÷ q6-12h.
Desired therapeutic range: 350-700 micromol/L (50-100
microgram/mL).
Dosing is equivalent for valproic acid, divalproex and sodium
valproate. Valproic acid oral liquid may be administered rectally (PR)
Valproic acid IV is special access only and reserved for specific
indications. Please consult Pharmacist.
**Vitamin K (Phytonadione)**
Reversal of prolonged clotting times or warfarin induced anticoagulation.

IV/PO: 0.5-10 mg/DOSE.
Use lower doses if there is no significant bleeding and patient will require warfarin in the future. May repeat in 6-8 hours. Injection may be given by mouth, undiluted or in juice or water.

**Zinc Sulphate**
Supplement

PO: 0.5-1 mg elemental zinc/kg/DAY divided q8-12h
(usual max 15mg elemental zinc/DAY)
Available as 10mg/mL elemental zinc suspension, 10mg or 50mg elemental zinc tablets (as zinc gluconate)
Suggested dose equivalence apply in stable analgesic states. Patients with acute postoperative pain may have variations to suggested conversions.

<table>
<thead>
<tr>
<th>OPIOID</th>
<th>Parenteral Dose (mg)ᵃ</th>
<th>Oral Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl</td>
<td>0.1</td>
<td>N/A</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>Methadone</td>
<td>N/Aᵇ</td>
<td>2.5-10ᵇ</td>
</tr>
<tr>
<td>Morphine</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>N/A</td>
<td>15</td>
</tr>
</tbody>
</table>

These approximate analgesic equivalences should be used only as a guide for estimating equivalent doses when switching from one opioid to another in chronic pain patients. Additional references & patient response should be consulted to verify appropriate dosing of individual agents.

ᵃ Parenteral route includes intravenous, intramuscular and subcutaneous route, but does not include intraspinal route.
ᵇ Methadone equivalency is highly variable – this ratio from Micromedex as suggested equivalency ratio in patients on chronic oral methadone.
## Approximate Systemic Corticosteroid Equivalence

<table>
<thead>
<tr>
<th>Drug</th>
<th>Equivalent Dose (mg)</th>
<th>Relative Mineralocorticoid Potency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Glucocorticoids:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Short-acting</strong> (biologic half-life 8–12 h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cortisone</td>
<td>25</td>
<td>2</td>
</tr>
<tr>
<td>Hydrocortisone</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td><strong>Intermediate-acting</strong> (biologic half-life 12–36 h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Prednisone</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Long-acting</strong> (biologic half-life 36–54 h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>0.75</td>
<td>0</td>
</tr>
</tbody>
</table>

*a Equivalent doses are approximations and may not apply to all diseases or routes of administration. Duration of hypothalamic-pituitary-adrenal (HPA) axis suppression and degree of mineralocorticoid activity must be considered separately.*