### Definitions and Equations

<table>
<thead>
<tr>
<th>BMI = weight (kg) / height² (m²)</th>
</tr>
</thead>
</table>

### WHO BMI Classification

<table>
<thead>
<tr>
<th>Definition</th>
<th>BMI 30-40 kg/m²</th>
<th>BMI ≥ 40 kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obese Class I and II (obese)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese Class III (morbidly obese)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Body Weight Equation

<table>
<thead>
<tr>
<th>ITW (kg)</th>
<th>Equation*</th>
</tr>
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<tbody>
<tr>
<td>Male: 50.0 + 2.3 x (number of inches over 5 ft)</td>
<td></td>
</tr>
<tr>
<td>Female: 45.5 + 2.3 x (number of inches over 5 ft)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABW (kg)</th>
<th>Equation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBW + C x (TBW – IBW)</td>
<td></td>
</tr>
<tr>
<td>C = either 0.3 or 0.4 (ABW⁰.³ or ABW⁰.⁴)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LBW₂⁰₀⁵ (kg)</th>
<th>Equation*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male: 9270 x TBW + 6680 + 216 x BMI</td>
<td></td>
</tr>
<tr>
<td>Female: 9270 x TBW + 8780 + 244 x BMI</td>
<td></td>
</tr>
</tbody>
</table>

### LBW (for anti-tuberculosis medications):
- Lean Body Weight (men) = (1.10 x Weight(kg)) - 128 x (Weight²/(100 x Height(m))²)
- Lean Body Weight (women) = (1.07 x Weight(kg)) - 148 x (Weight²/(100 x Height(m))²)

### Table 1. Recommended Antibiotic Dosing in Obesity (BMI ≥ 30 kg/m²)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Maximum Dose*</th>
<th>Study Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin</td>
<td>No Data</td>
<td></td>
<td>- Consider upper limit of normal dosing in severe infections; e.g. up to 1g PO TID</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>Insufficient data</td>
<td></td>
<td>- Consider upper limit of normal dosing in severe infections; e.g. up to 2g q4h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Single study with 6 patients: higher V₄ but decreased Vd/kg TBW, CL unchanged²</td>
</tr>
<tr>
<td>Nafcillin</td>
<td>Insufficient data</td>
<td></td>
<td>- Single case report in critically ill, obese patient⁶: consider upper end of normal dosing in severe infections; e.g. up to 2 g q4h</td>
</tr>
<tr>
<td>Piperacillin-tazobactam⁴,¹⁴</td>
<td>Up to 4.5 g q8h (prolonged infused over 4 hours) or 4.5 g q6h (30 min infusion)</td>
<td></td>
<td>- Prolonged infusion preferred for critically ill, FN, CF, obese with CrCl &gt; 100 infections with less susceptible pathogens (i.e. MIC ≥16)</td>
</tr>
<tr>
<td>Cefazolin⁵,²¹</td>
<td>Insufficient data</td>
<td></td>
<td>- Consider upper limit of normal dosing in severe infections, e.g. up to 2 g q8h (option for continuous infusion)²², or 1.5-2 g q6h intermittent dosing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- In post-trauma critically ill patients, data suggests 2g q6h if CrCl &gt; 215 ml/min,²³</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>No data</td>
<td></td>
<td>- Consider upper end of normal dosing in severe infections; e.g. 500-1000 mg q6h</td>
</tr>
<tr>
<td>Cefepime, ceftazidime⁴,²⁴,²⁵</td>
<td>Up to 2g q8h prolonged infusion</td>
<td></td>
<td>- Prolonged infusion if critically ill, CF, FN, obese with CrCl &gt; 100 ml/min, infections with less susceptible pathogens (i.e. MIC ≥8)</td>
</tr>
<tr>
<td>Drug</td>
<td>Change</td>
<td>Notes</td>
<td></td>
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<tr>
<td>----------------------------------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Ceftazidime/avibactam</td>
<td>No change</td>
<td>- Consider extended infusion if targeting a higher PD endpoint of 100% fT&gt;MIC or with less susceptible pathogens (i.e. MIC ≥ 2)</td>
<td></td>
</tr>
<tr>
<td>Ceftolozane/tazobactam</td>
<td>No change</td>
<td>- Use caution in renal impairment and with high doses (1g q6h): increased risk of seizures</td>
<td></td>
</tr>
<tr>
<td>Doripenem</td>
<td>No change</td>
<td>- Single case report suggests higher dosing needed for MRSA infections</td>
<td></td>
</tr>
<tr>
<td>Ertapenem</td>
<td>No change</td>
<td>- Insufficient data except as noted in critically ill, septic patients on CRRT.</td>
<td></td>
</tr>
<tr>
<td>Imipenem</td>
<td>No data</td>
<td>- Prolonged infusion if critically ill, FN, CF, obese with CrCl &gt; 100 ml/min, if targeting a higher PD endpoint of 100% fT&gt;MIC, or infections with less susceptible pathogens (i.e. MIC ≥ 2)</td>
<td></td>
</tr>
<tr>
<td>Meropenem</td>
<td>Same dose: consider prolonged infusion for critically ill patients</td>
<td>- PK reportedly unaltered by obesity, however, serum levels may be sensitive to CrCl: 1,000 mg q24h has been suggested for CrCl&lt;sub&gt;IBW&lt;/sub&gt; &gt; 110 ml/min to target gram negative pathogens</td>
<td></td>
</tr>
<tr>
<td>Monobactam</td>
<td>Insufficient data</td>
<td>- Insufficient data except as noted in critically ill, septic patients on CRRT.</td>
<td></td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td></td>
<td>- Insufficient data except as noted in critically ill, septic patients on CRRT.</td>
<td></td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>In critically ill, septic patients on CRRT with organisms with MICs &gt; 0.5mg/L (e.g. P.aeruginosa, A.baumannii): &gt; 90kg: 400 mg IV q8h</td>
<td>- PK reportedly unaltered by obesity, however, serum levels may be sensitive to CrCl: 1,000 mg q24h has been suggested for CrCl&lt;sub&gt;IBW&lt;/sub&gt; &gt; 110 ml/min to target gram negative pathogens</td>
<td></td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>750 mg q24h</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>No change</td>
<td>- Consider maximum dose 200 mg or 2 million units daily to limit risk of toxicity</td>
<td></td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>Use adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;)</td>
<td>- Study q8h if targeting 50% fT&gt;MIC for MRSA</td>
<td></td>
</tr>
<tr>
<td>Polymyxins</td>
<td>Use IBW</td>
<td>- Manufacturer maximum: 2,700 mg/day in severe infections; 4,800 mg/day given by intermittent or continuous infusion for life-threatening infections</td>
<td></td>
</tr>
<tr>
<td>Amikacin</td>
<td>Use adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;) for initial dose</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Gentamicin</td>
<td>Use adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;) for initial dose</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Tobramycin</td>
<td>Use adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;) for initial dose</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Polymyxins methanesulfonate</td>
<td>Limited data. Consider adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;), especially in upper end of dosing range</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Polymyxin B</td>
<td>Limited data. Consider adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;), especially in upper end of dosing range</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Anti-MRSA agents</td>
<td>Studies from prosthetic joint infection and SSTI suggest increased doses warranted</td>
<td>- Consider q8h if targeting 50% fT&gt;MIC for MRSA</td>
<td></td>
</tr>
<tr>
<td>Ceftaroline</td>
<td>No change</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Clindamycin</td>
<td>IV: 600 mg q6h or 900 mg q8h PO: 450 - 600 mg q6h or 600- 900 mg Q8H</td>
<td>- Maximum dose of 360 mg daily to limit the risk of nephrotoxicity</td>
<td></td>
</tr>
<tr>
<td>Drug</td>
<td>Change</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Dalbavancin</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daptomycin</td>
<td>Same weight-based dose but use adjusted body weight (ABW&lt;sub&gt;0.4&lt;/sub&gt;)</td>
<td>- Caution in renal insufficiency, dialysis. Monitor CKs and signs of myopathy</td>
<td></td>
</tr>
<tr>
<td>Linezolid</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oritavancin</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Sulfamethoxazole/trimethoprim | SSTI or severe/complicated UTI: up to 320 mg PO BID or 8-10 mg/kg<sub>ABW</sub>/day in divided doses | - Limited data to guide optimal dosing weight  
- Consider adjusted body weight when using high doses (e.g. >8 mg/kg/day) |
| Tedizolid            | No change |                                                                  |
| Telavancin           | Same dose; consider a maximum of 1,000 mg/dose | - Increased systemic exposure may be related to AKI  
- These are tentative pending results of an ongoing Phase I trial (NCT02753855) |
| Tigecycline          | No change |                                                                  |
| Vancomycin           | See Vancomycin Per Pharmacy Protocol (Appendix C) | - Alternative approach using ABW<sub>0.4</sub>: loading dose 25-30 mg/kg<sub>TBW</sub>, initial maintenance dose approximately 15 mg/kg<sub>ABW</sub> q12h<sup>*</sup>, then adjust by TDM  
- Loading doses commonly ranged from none to 3g; daily doses commonly ranged 2-4g or 20-30 mg/kg<sub>TBW</sub>/day  
- Adjust doses by TDM (peak and trough) using software utilizing Bayesian methods and AUC targets.  
  - If calculating without software, see Hong et al for equations<sup>119</sup>  
  - If only measuring troughs, more cautious and frequent initial monitoring of levels may be warranted |

---

a. Does not include dose adjustments for renal and/or hepatic impairment. Doses listed are within usual safety margins. Lower doses may be sufficient in mild infections (e.g. UTI). Dosages are based on the provided references and/or the authors' opinion, and should not replace clinical judgment. CrCl assumes calculation using ABW<sub>0.4</sub> unless specified in table.

b. Dots represent types of studies available and not quantity

c. Dosing recommendations are for severe or deep-seated infections based on similarities in PK profile and dosing recommendations with other antibiotics of the same class when there is insufficient or no data in obese patients.
### Table 2. Recommended Antifungal Dosing in Obesity (BMI ≥ 30 kg/m²)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Maximum Dosea</th>
<th>Study Typeb</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Caspofungin                   | 70 mg x1, then 50-70 mg daily | • •         | - Retrospective study from 9 clinical studies found no significant difference in favorable responses in invasive candidiasis between obese and non-obese groups  
- PK studies showed no correlation with BMI and PK parameters, but did find negative correlation between caspofungin peak levels and body weight, suggests increased doses needed for higher TBW  
- In clinical trial of invasive candidemia, no safety concerns found with caspofungin 150mg daily |
| Fluconazole                   | Candidiasis: 12mg/kg x1 load, then 6mg/kg q24h (TBW) | • • •       | - Doses up to 1200 mg daily have been reported in the literature for Cryptococcus meningitis  
- In critically ill, esp with CrCl > 50, higher doses may be warranted to achieve PK/PD target of fAUC/MIC > 100, esp if MIC > 2 Candida spp  
- Consider TDM for severe infections |
| Flucytosine                   | IBW                    | •           | - Single case report.  
- adjusted body weight has been suggested in life-threatening infections |
| Liposomal Amphotericin        | Use total or adjusted body weight | • •         | - No PK data in obese humans; in general pop PK studies, linear increase in Vd and CL with weight  
- Safety data: at doses 7.5-15mg/kg/day, similar discontinuation rates; PK became non-linear (max Cmax and AUC at 10mg/kg/day) |
| Voriconazole,                 | Use adjusted body weight or LBW2005 | • •         | - Adjust dosing based on TDM  
- Retrospective TDM studies frequently showed supratherapeutic levels in obese subjects when dosed by TBW  
- Steady state plasma PK of voriconazole did not suggest weight-based dose adjustments necessary |
### Table 3. Recommended Antiviral Dosing in Obesity (BMI ≥ 30 kg/m²)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Maximum Dosea</th>
<th>Study Typeb</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acyclovir</td>
<td></td>
<td></td>
<td>Use ideal or adjusted body weight</td>
</tr>
<tr>
<td></td>
<td>146-148</td>
<td></td>
<td>Case studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cidofovir</td>
<td></td>
<td></td>
<td>Use adjusted body weight</td>
</tr>
<tr>
<td>Foscarnet</td>
<td></td>
<td></td>
<td>Use adjusted body weight</td>
</tr>
<tr>
<td>Ganciclovir</td>
<td></td>
<td></td>
<td>Use adjusted body weight</td>
</tr>
</tbody>
</table>

**DOCUMENT INFORMATION**

**A. Original Author/Date**
Lina Meng, PharmD, BCPS, BCCCP: 12/27/2016

**B. Gatekeeper**
SASS Program

**C. Review and Renewal Requirement**
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Emily Mui, PharmD, BCPS: 03/27/2017, 07/24/2017
Marisa Holubar MD MS: 03/27/2017, 07/24/2017
Stan Deresinski MD: 03/27/2017, 07/24/2017

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Stanford, CA 94305
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