

Guidelines for Second Line Empiric Treatment of Infections in Level 2 and 3 Critical Care

On admission to level 2 or 3 critical care, complete a full antibiotic history in relation to the active infection. Ensure adequate source control where possible (i.e. drainage of collections or abscesses). Consider other causes of systemic deterioration e.g. recent surgical intervention, acute on chronic respiratory disease. Use existing protocols for dosing of vancomycin and gentamicin. Split doses evenly in 24 hours: x 2 = every 12 hours, x 3 = every 8 hours, x 4 = every 6 hours.

Indication	Antibiotic Recommendation (All doses IV)	Comments
Sepsis of Unknown Focus	Aztreonam 2g x 3 PLUS Metronidazole 500mg x 3 PLUS Vancomycin (covers MRSA)	If strong suspicion of group A Strep or Staph Toxic Shock Syndrome, discuss with microbiology and consider adding clindamycin and using immunoglobulin
Community Acquired Pneumonia	<i>If antibiotic switch considered necessary:</i> Levofloxacin 500mg x 2	If patient has following risk factors treat as HAP: recent hospital admission; recent antibiotic therapy
Hospital Acquired Pneumonia <i>Symptoms > 48 hours post admission</i>	Aztreonam 2g x 3 PLUS Vancomycin Second line: Ciprofloxacin 400mg x 2 PLUS Vancomycin	
Severe Community-acquired Pneumonia where MSSA/MRSA suspected e.g. recent influenza or IVDU	Discuss with microbiologist ADD Linezolid 600mg x 2 For treatment of microbiologically proven MSSA pneumonia: Levofloxacin 500mg x 2 PLUS flucloxacillin 2g x 4	Note: Hypertensive crises have occurred in patients taking MAOIs (linezolid is one) and metaraminol. The pressor effects of adrenaline, isoprenaline and noradrenaline may be unchanged or moderately increased.
Suspected necrotising staphylococcal lung infection	Suspect Panton-Valentine Leukocidin (PVL) toxin producing <i>S. aureus</i> strain: Levofloxacin 500mg x 2 PLUS linezolid 600mg x 2	If deteriorating or severe disease consider IV immunoglobulin
Aspiration Pneumonia Aspiration often leads to chemical pneumonitis – use antibiotics only treat where infection suspected.	Metronidazole 500mg x 3 PLUS Amoxicillin 1g <i>Penicillin allergy:</i> metronidazole PLUS clarithromycin 500mg x 2 Severe infection or previous antibiotics* : aztreonam 1g x 3 PLUS amoxicillin 1g x 3 PLUS metronidazole 500mg x 3 Severe Infection, penicillin allergy: levofloxacin 500mg x 2 PLUS metronidazole 500mg x 3	Infection indicated by change in sputum quality to purulent/mucropurulent or fever and new chest X-ray changes. *Antibiotics in the last 2 weeks increases colonisation of oropharynx with gram negative organisms
Intra-abdominal Sepsis	Aztreonam 1g x 3 PLUS amoxicillin 1g x 3 PLUS metronidazole 500mg x 3 In penicillin allergy Aztreonam 1g x 3 PLUS vancomycin PLUS metronidazole 500mg x 3 <i>In severe infection, use aztreonam 2g</i>	Discuss with microbiologist if illness unresponsive or severe illness
Necrotising Fasciitis	Meropenem 2g x 3 PLUS clindamycin 1.2g x 4	Seek urgent surgical opinion and consult microbiology (<i>Notify Public Health</i>)

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Matrix of selected antimicrobial/antibacterial agent combination activity

KEY: Green = active, amber = unreliable (*use only if sensitivity known*), red = intrinsically resistant

Organism Drug (alphabetical)	Gram Positive							Gram negatives					Atypicals (Mycoplasma, Chlamydia)	Renal Dysf ⁿ		Notes
	MRSA	Staph aureus	Coag neg staph	Streps	Ent faecalis	Ent faecium	VRE	Anaerobes	Coliforms	Resp (e.g.H. Influenzae)	Pseudomonas	ESBL		Reduce dose in renal impairment?	Reduce dose in RRT?	
Aztreonam	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Amber	Red	Y	Y	No gram positive cover, check ESBL sensitivity
Chloramphenicol	Green	Green	Green	Green	Green	Amber	Red	Green	Green	Green	Red	Amber	Amber	N	N	Risk of aplastic anaemia
Ciprofloxacin	Red	Green	Green	Amber	Amber	Red	Red	Red	Green	Green	Green	Amber	Green	N	N	Poor gram positive cover, pro-convulsive, interactions
Co-amoxiclav	Red	Green	Green	Green	Green	Red	Red	Green	Green	Red	Red	Red	Red	Y	Y	High risk of infection with <i>C. difficile</i>
Colistin	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Green	Red	Red	Y	N	No gram positive or anaerobic cover, renal toxicity high
Co-trimoxazole	Green	Green	Green	Amber	Amber	Amber	Red	Amber	Green	Amber	Red	Red	Red	Y	Y	
Gentamicin	Amber	Green	Green	Red	Green	Green	Red	Red	Green	Green	Green	Red	Red	Y	N	No strep cover, [§] check MRSA sensitivity, avoid in AKI
Glycopeptides (vanc, teic)	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	Y	Y	No gram negative or broad anaerobe cover
Levofloxacin	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Amber	Green	N	Y	No anaerobic cover
Linezolid	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Amber	N	N	No gram negative or broad anaerobe cover
Meropenem	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green	Red	Y	Y/N	No MRSA cover or atypical cover.
Piperacillin/tazobactam	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Red	Red	Y	Y	
Temocillin	Red	Red	Red	Red	Red	Red	Red	Green	Green	Red	Green	Red	Red	Y	Y	No gram positive or anaerobic cover, no Pseudomonas cover
Tigecycline	Green	Green	Green	Green	Green	Green	Amber	Green	Green	Red	Amber	Green	Red	N	N	Use only on advice of microbiology – not for empiric use in critical illness

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Combinations

Drug \ Organism	Gram Positive							Gram negatives					Notes	
	MRSA	Staph aureus	Coag neg staph	Streps	Ent fecalis	Ent fecium	VRE	Anaerobes	Coliforms	Resp	Pseudomonas	ESBL		Atypicals
Amoxicillin	Red	Yellow	Red	Green	Green	Yellow	Red	Yellow	Yellow	Yellow	Red	Red	Red	Limited Staph, anaerobic and gram negative cover
Glycopeptides (vanc, teic)	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Red	No gram negative or broad anaerobe cover
PLUS														
Metronidazole	Red	Red	Red	Red	Red	Red	Red	Green	Red	Red	Red	Red	Red	
PLUS ONE from														
Aztreonam	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Yellow	Red	
Ciprofloxacin	Red	Yellow	Yellow	Yellow	Yellow	Red	Red	Red	Green	Green	Green	Yellow	Green	
Gentamicin	§	Green	Green	Red	Green	Green	Red	Red	Green	Green	Green	Red	Red	§ Check MRSA Sensitivity to gentamicin
Levofloxacin	Red	Green	Green	Green	Green	Red	Red	Red	Green	Green	Green	Yellow	Green	
SELECTED OTHER AGENTS														
Chloramphenicol	Green	Green	Green	Green	Green	Yellow	Red	Green	Green	Green	Red	Yellow	Yellow	
Clarithromycin	Red	Green	Red	Green	Red	Red	Red	Red	Green	Green	Red	Red	Green	
Colistin	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Green	Red	Red	
Co-trimoxazole	Green	Green	Green	Yellow	Yellow	Red	Red	Red	Green	Yellow	Red	Red	Red	
Linezolid	Green	Green	Green	Green	Green	Green	Red	Red	Red	Red	Red	Red	Yellow	No gram negative or broad anaerobe cover
Temocillin	Red	Red	Red	Red	Red	Red	Red	Red	Green	Green	Red	Green	Red	No gram positive or anaerobic cover, no Pseudomonas cover
Tigecycline	Green	Green	Green	Green	Green	Green	Green	Yellow	Green	Green	Red	Yellow	Green	
FOR COMPARISON														
Co-amoxiclav	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Red	Red	Red	
Meropenem	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Green	Red	
Piperacillin/tazobactam	Red	Green	Green	Green	Green	Red	Red	Green	Green	Green	Green	Red	Red	

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SELECTED DRUG INFORMATION (taken from IV Administration Guide, Renal Drug Database, SPC etc.)

Drug	Usual dose (IV)	Renal dosing	Administration	Fluid restriction	Actual or Ideal BW?
Amoxicillin	1 to 2g every 6 hours (up to 2g every 4 hours for Listeria)	GFR (ml/min): <10 250mg to 1g every 8 hours, max 6g/day CVVHD: dialysed, dose as normal HDF/high flux: dialysed, dose as GFR <10ml/min	Slow IV injection OR infusion over 20-60mins	Slow IV injection	ABW – give max dose
Aztreonam	1to 2g every 8 hours	GFR (ml/min):10-30: 1g x 3 <10: 1-2g loading then 500mg x 3 CVVHD/HDF: 2g every 12 hours	Slow IV injection OR infusion over 20-60mins	Slow IV injection	ABW – give 2g every 6 hours by infusion
Benzyl penicillin	1.2g every 6 hours (up to 2.4g every 4 hours for endocarditis)	GFR (ml/min) 10-20 600mg to 2.4g every 6 hours GFR (ml/min): <10 600mg to 1.2g every 6 hours CVVHD: dialysed, dose as GFR 10-20ml/min HDF: dialysed, dose as GFR <10ml/min	Slow IV injection OR infusion over 20-60mins Dose over 1.2g give at 300mg/min	Slow IV injection	ABW – give max dose
Ciprofloxacin	400mg every 12 hours	GFR (ml/min): < 10: 50% of normal dose CVVHD/HDF: Dose as normal	Infusion over 60 mins	Pre-made bag * (200ml)	ABW – give 800mg x 2 if BMI > 40
Clarithromycin	500mg every 12 hours	GRF (ml/min) <10 to 30 Oral/IV: 250mg - 500mg every 12 hours CVVHD/HDF: Unknown dialysability, dose as in GFR <10-30ml/min	Infusion over 60 mins	Can dilute in 100ml for CVC admin	Unknown, max dose 500mg x 3
Clindamycin	1.2g every 6 hours	No adjustments required	Infusion over 60 mins	Max 18mg/ml	
Co-amoxiclav	1.2g every 8 hours	GFR (ml/min): <30, CVVHD/HDF: 1.2g x 2	Slow IV injection OR infusion over 30-40 mins	Slow IV injection	Consider giving same dose by infusion
Co-trimoxazole	960mg every 12 hours PJP: 120mg/kg/day in 2 to 4 doses <i>S. maltophilia:</i> 90mg/kg/day in 2-4 doses	GFR (ml/min): 15-30: PCP = 60mg/kg 12 hourly for 3 days then 30mg/kg 12 hourly. Other indications = 50% of dose GFR (ml/min): <15: PCP = 30mg/kg 12 hourly. Other indications = 50% of dose. CVVHD/HDF: Dose as in GFR 15-30ml/min	Dilute ampoules and give over 60-90 mins	Can administer undiluted via a CVC over 90-120 minutes	Unknown, suggest IBW + 20% and check levels
Levofloxacin	500mg every 12 hours	GFR (ml/min): 20-50: 500mg loading dose then 250mg x 2 GFR (ml/min): 10-20: 500mg loading then 125mg x 2 GFR (ml/min): < 10: 500mg loading then 125mg x 1 CVVHD/HDF: Loading 500mg then 250mg x 1	Infusion over 60 mins	Pre-made bag * (100ml)	Max dose 500mg x 2
Linezolid	600mg every 12 hours	No adjustments required	Infusion over 30-120 mins	Pre-made bag * (300ml)	If raised MIC (4mg/ml), consider 600mg every 8 hours
Meropenem	1to 2g every 8 hours	GFR (ml/min): 10-25: 1g x 2 GFR (ml/min): < 10: 1g x 1 CVVHD/HDF: 1g every 8 hours	Slow IV injection OR infusion over 30 mins	Slow IV injection	Consider 2g every 8 hours by infusion
Metronidazole	500mg every 8 hours	No adjustments required HDF: dialysed, dose as normal CVVHD: Unknown dialysability, dose as normal	Infuse over 20 mins	Pre-made bag * (100ml)	Unknown, max dose 1g x 4
Piperacillin /tazobactam	4.5g every 8 or 6 hours	GFR (ml/min): <20: 4.5g x 2 CVVHD/HDF: 4.5g x 3	Infusion over 4 hours (preferred) OR slow IV injection	Slow IV injection	ABW – give 4.5g every 6 hours by infusion

* NB. If fluid restricted and drug only available as pre-made bag, discuss antibiotic choices with Microbiology

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