Table 9. Paediatric Oncology Pharmacy Approved Anti-biotic doses for use in Wessex Paediatric Oncology Patients (alphabetical order)

Drug	Route	Age	Dose	Comments
Azithromycin	PO	> 6 months	10mg/kg OD (max. 500mg OD) x 3 days	**Available as**: Capsules 250mg; suspension 200mg/5ml Avoid in hepatic impairment. Dose using IBW in obese patients
Aztreonam	IV	1month- 2 years	30mg/kg 6 hourly	**Renal Impairment advice** Use initial dose, then if CrCl 10-30ml/min/1.73m^2: halve normal dose CrCl < 10ml/min/1.73m^2: quarter normal dose Monitor LFTs **Administration instructions** IV bolus over 3-5minutes or infuse over 20-60 minutes Dilute 1g in at least 50ml 0.9% saline or 5% glucose to infuse
		2 – 18 years	50mg/kg (max. 2g) 6 hourly	
Ceftazidime	IV	1 month – 18 years	50mg/kg 8 hourly (max. 2g tds)	**Administration advice** IV bolus **Renal impairment advice** CrCl 30-50 ml/min/1.73m^2: increase dosage interval to 12 hourly CrCl 15-30 ml/min/1.73m^2: increase dosage interval to 24 hourly
Ceftriaxone	IV	<1 month	50 mg/kg once daily	**Administration advice** Infuse over 60 minutes Extreme caution must be used if patient also needs calcium salts (including TPN) due to risk of precipitation of ceftriaxone-calcium salt. Use alternative antibiotic where possible. Must not be given at same time as calcium (even via different line). Extra precautions apply for newborn up to 28 days, or premature babies up to corrected age of 41 weeks. **Renal Impairment advice** Max. 50 mg/kg or 2g in severe renal impairment
		>1 month	80 mg/kg (max. 4g) once daily	

Ciprofloxacin Prophlaxis	PO	1 month – 18years	Prophylaxis in AML 5 mg/kg bd (max 250 mg bd) orally UKALL 2011 recommend 10 mg/kg BD prophylaxis in Downs	**Available as**: 100, 250, 500, 750 mg tabs; infusion 2 mg/ml, 50 ml vials, 100 ml & 200 ml May be used in children where benefit considered to outweigh risk of antibiotic resistance (risk of tendon damage, to be stopped if tendonitis suspected). Ciprofloxacin prophylaxis to be stopped when broad spectrum antibiotics are started, or when neutrophil count recovery to $0.5x10^9$/L **If obese patient: calculate using a correction factor = 0.45(ABW-IBW)+ IBW** **Administration advice** IV: Infuse IV over 60 minutes - flush with saline. PO: Oral absorption good but do not use with oral Mg, Ca, Zn or Fe (affects absorption) Absorption reduced by enteral feeds. Stopping enteral feeds for 2 hours before feed and restart 2 hours after administration. The suspension is very bitter and the taste is difficult to disguise. **Renal and Hepatic Impairment advice** Monitor renal function & LFTs. Creatinine clearance < 20 ml/minute/1.73m²: consult product literature *AVOID WITH HIGH DOSE METHOTREXATE* Interacts with phenytoin, theophylline, and anticoagulants. Has been reported to delay methotrexate excretion therefore avoid when giving high dose methotrexate
Ciprofloxacin Treatment	PO	1 month – 18 years	20 mg/kg (max. 750 mg) bd	
	IV	1 month – 18 years	10 mg/kg (max. 400 mg) 8 hourly	
Clarithromycin	PO	< 8kg	7.5mg/kg BD	**Administration advice** Oral: suspension 125 mg/5ml, 250 mg/5 ml, 250 mg & 500 mg tabs IV: Infuse over 1 hour into large proximal vein **Renal Impairment advice** CrCl <30 ml/minute/1.73m²: use half normal dose
		8-11kg	62.5mg BD	
		12-19kg	125mg BD	
		20-29kg	187.5mg BD	
		30-40kg	250mg BD	
		12-18 years	250mg BD, increased if necessary to 500mg BD	
	IV	1 month – 12 years	7.5 mg/kg (max. 500mg) 12 hourly	
		> 12 years	500mg 12 hourly	

Clindamycin	PO	1 month – 18 years	6 mg/kg (max. 450mg) 6 hourly	**Available as** 150 mg capsules, 75 mg/5 ml suspension and 300 mg/2 ml or 600 mg/4 ml injection **Administration advice** Infuse over 10 – 60 minutes, maximum infusion rate 20 mg/kg/hr. Dilute to a maximum concentration of 18 mg/ml in glucose 5% or sodium chloride 0.9% **PO suspension:** do not prescribe unless taste test has been performed – very bitter taste. Stop **immediately** if diarrhoea develops (associated with potentially fatal antibiotic-associated colitis)
	IV	1 month – 18 years	6.25mg/kg QDS; increased to 10mg/kg (max. 1.2g) QDS. Total daily dose may alternatively be given in 3 divided doses.	
Co-amoxiclav **(PENCILLIN)**	PO	1 month – 6 years	0.5 ml/kg of 125/31 suspension tds or 0.25 ml/kg of 250/62 suspension tds	**Administration advice**: IV injection over 3-4 minutes or IV infusion over 30-40 minutes. For intravenous infusion, dilute to 10mg/mL in NaCl 0.9% only. **Renal Impairment advice: (IV only)** CrCl 10-30ml/min: 100% dose 12 hourly CrCl < 10ml/min 100% dose stat followed by either 50% of dose every 8 hours. Or 100% dose BD. Cholestatic Jaundice can occur. Monitor for signs of jaundice (usually self-limiting) and consider discontinuing. Monitor LFTs with prolonged use.
		> 6 years	0.3 ml/kg of 250/62 suspension tds or 1 tablet 500/125 tds	
	IV	1-3 months	30 mg/kg 12 hourly	
		3 months – 18 years	30 mg/kg (max. 1.2 g) 8 hourly	
Co-amoxiclav-Duo **(PENICILLIN)**	PO	2 months - 2 years	0.3ml/kg bd	Cholestatic Jaundice can occur. Monitor for signs of jaundice (usually self-limiting) and consider discontinuing. Monitor LFTs with prolonged use.
		2 - 6yrs (13-21 kg)	5ml bd	
		7-12yrs (22-40kg)	10 ml bd	
		12-18 years (>40kg)	10ml bd, increased to TDS in severe infection	

Co-trimoxazole treatment	IV /PO	1 month-18 years	**Treatment of PCP** 60mg/kg every 12 hours for 14-21 days; total dose may alternatively be given in 3-4 doses. Oral route preferred.	**Administration Advice** IV: Infuse over 60-90 minutes For peripheral infusion dilute 25 fold in 5% dextrose or 0.9% saline In severe fluid restriction dilute 10 fold with 5% dextrose or neat (central line) Give centrally wherever possible **Renal Impairment Advice** Reduce dose in renal impairment: halve dose if creatinine clearance 15-30 ml/minute
Co-trimoxazole prophylaxis	PO	< 0.5 m^2	15-24 mg/kg (max. 240mg) bd on 2 consecutive days/week	Used as prophylaxis in many treatment protocols, check supportive care requirements. Ie. UKALL 2011, NHL, HL, Ewings, LGG etc. Also after BMT and PBSCT Interactions include methotrexate and phenytoin
		0.5 – 0.75 m^2	240 mg bd on 2 consecutive days/wk	
		0.76 – 1.0 m^2	360 mg bd on 2 consecutive days/wk	
		1.0 – 1.49 m^2	480 mg bd on 2 consecutive days/wk	
		≥ 1.5 m^2 or ≥ 16 years	960 mg bd on 2 consecutive days/wk	
Flucloxacillin **(PENICILLIN)**	IV	1 month – 18 years	50 mg/kg/dose (max. 2g) 6 hourly	**Administration advice** **IV:** By slow IV injection or IV infusion over 30- 60 minutes. Dilute in glucose 5% or NaCl 0.9% for infusion. **PO:** Ensure child will take orally before discharge
	PO	1 month – 2 years	125 mg 6 hourly	
		2-10 years	250 mg 6 hourly	
		10-18 years	500 mg 6 hourly	
Gentamicin	IV	neonate < 7 days	5mg/kg every 36 hours	Levels before second dose, then every 3rd dose, aim for < 1mg/ml pre dose/trough Once stable levels and normal renal function, levels can be checked twice per week.
		neonate > 7 days	5mg/kg every 24 hours	
		1 month – 18years	7mg/kg every 24 hours	

Meropenem	IV	1 month -18 years	20 mg/kg IV (max. 1g) 8 hourly CNS involvement 40 mg/kg (max. 2g) 8 hourly in meningitis	**Administration advice** IV bolus over 5 minutes or infuse over 15-30 minutes Dilute 1g in at least 50 ml 0.9% NaCl or 5% glucose to infuse **Renal Impairment Advice** CrCl 26-50 ml/minute/1.73m²: use normal dose every 12 hrs CrCl 10-25 ml/minute/1.73m²: use half normal dose every 12 hrs (Dose adjustments in SPC only quoted for adolescents & adults) CrCl <10 ml/minute/1.73m²: use half normal dose every 24 hrs
Metronidazole	PO	1- 2 months	7.5mg/kg every 12 hours	**Available as** 200, 400 mg tablets, 200 mg/5 ml suspension, 500 mg/100 ml IV bags. Treat colitis for 10-14 days **Administration Advice** IV: Infuse over 20 minutes (compatible with 5% dextrose or 0.9% saline (IV 100 ml bags) **Hepatic Impairment Advice** Reduce dose in severe liver failure.
		2months– 18 years	7.5 mg/kg (max. 400mg) 8 hourly	
	IV	1- 2 months	15mg/kg stat dose then 8hrly 7.5mg/kg TDS	
		2months - 18years	7.5mg/kg (max. 500mg) every 8 hours	
Piperacillin with tazobactam **(PENICILLIN)**	IV	< 4 weeks	90mg/kg every 8 hours	**Administration advice** Dilute in NaCl or Glucose and infuse over 20-30minutes
		1 month-18 years	90mg/kg (max. 4.5g) every 6 hours	
Teicoplanin	IV	1 month – 18 years	10 mg/kg (max. 400mg) 12 hourly for 3 doses then 10 mg/kg once daily (max. 400 mg)	**Available as** 200mg and 400mg vials **Administration Advice** IV bolus or IV infusion over 30 minutes Dilute in glucose 5% or sodium chloride 0.9% **Renal Impairment Advice** CrCl 40-60 ml/minute/1.73m²: normal dose days 1-4 then normal maintenance dose every 48hrs CrCl < 40 ml/minute/1.73m²: normal dose days 1-4 then normal maintenance dose every 72hrs

<table>
<tr><td rowspan="4">Vancomycin</td><td>IV</td><td>1month – 18 years</td><td>Normal renal function
20 mg/kg 8 hourly

Mild renal impairment:
15mg/kg 8 hourly</td><td>IV: For specific infections resistant to teicoplanin

*AVOID IN HIGH DOSE METHOTREXATE *

Therapeutic Drug Monitoring
Trough level on 3rd dose (but don’t delay in giving 3rd dose), aim for trough level 10-15 mg/l, 15-20 mg/l for less sensitive MRSA strains.

If mild-moderate renal impairment 15 mg/kg every 8 hours & request trough level on 2nd dose (but don’t delay on giving 2nd dose). check vancomycin guide

Once levels stable with normal renal function, levels can be checked twice a week

New guidelines for dose adjustment if target level not reached produced by Caroline Cole & Kieran Hand (see SUHTranet)

Administration Advice
Dilute in glucose or saline up to 5 mg/ml concentration
Infuse over at least 1 hour, (max 10 mg/minute for doses > 500 mg)</td></tr>
<tr><td rowspan="3">PO</td><td>1 month – 5 years</td><td>5 mg/kg qds x 10-14 days
(increased up to 10 mg/kg qds if infection fails to respond or life threatening)</td><td rowspan="3">For antibiotic associated colitis, either in addition to metronidazole in severe cases of c difficile colitis, or following 2nd relapse of c.difficile colitis (see SUHTranet or local policies for further details).

Administration Advice
Injection may be given orally. Reconstitute a 500mg vial with 10mL of sterile water for injection to give a 50 mg/ml solution. Reconstituted vial can be stored in the ‘fridge for 24 hours. Withdraw the required volume from the vial, <u>remove the needle</u>, and administer orally/NG/PEG. Vials of vancomycin for oral administration kept in the ‘fridge should be clearly labelled with the patient’s name to avoid inadvertent administration to another patient.</td></tr>
<tr><td>5-12 years</td><td>62.5 mg qds x 10-14 days
(increased up to 250 mg qds if infection fails to respond or life threatening)</td></tr>
<tr><td>12-18 years</td><td>125 mg qds x 10-14 days
(increased up to 500 mg qds if infection fails to respond or life threatening)</td></tr>
</table>

Table 10. Paediatric Oncology Pharmacy Approved Anti-fungal doses for use in Wessex Paediatric Oncology Patients (alphabetical order)

Drug	Route	Age	Dose	Comments
Ambisome	**IV**	1 month – 18 years	**Treatment** Test dose of 100 microgram/kg (max. 1 mg) over 15 minutes, observe for 30 minutes if no reaction to test dose follow 1 hour later by 3mg/kg once daily **Prophylaxis** 1mg/kg OD on Mondays, Wednesdays and Fridays.	**Used in** treatment of fungal infections & empiric treatment of PUO in febrile neutropenia Continue for at least 3 days after patient afebrile for treatment PUO, unless complications. Specialist advice for proven fungal infections **Administration Advice** Infuse in 5% dextrose 0.2-2mg/ml over 1-2 hours (30 minutes subsequently if well tolerated) Electrolyte and renal function monitoring required – risk of hypokalaemia, hypomagnesaemia and nephrotoxicity.
Caspofungin	**IV**	1-3 months	25mg/m^2 once daily	Used in treatment of invasive aspergillosis resistant to other antifungals & empirical treatment of PUO in febrile neutropenia Duration of treatment depends on response, recovery from immunosuppression EMC recommends in empirical situation, continuing for at least 3 days after recovery of neutrophils > 0.5 x 10^9/l. For treatment of fungal infection recommend at least 14 days treatment & resolution of symptoms for at least 7 days. For invasive candidiasis treatment should continue for 14 days after last positive culture(may be switched to alternative oral medication) **Administration Advice** Infuse over 60 minutes, dilute in 0.9% saline, dilute to a final concentration not exceeding 500mcg/mL. Incompatible with glucose.
		3-12 months	50 mg/m² once daily	
		1 - 18 years	loading dose 70 mg/m^2 (max. 70 mg) followed by 50 mg/m^2 (max. 70 mg) daily thereafter. Increase to 70 mg/m² (max. 70 mg) daily if lower dose tolerated but inadequate response	
Micafungin	**IV**	1 month-18 years & < 40kg	2mg/kg OD (increased to 4mg/kg daily if inadequate response)	**Administration Advice** Give over 60 minutes, dilute in 0.9% sodium chloride or 5% glucose. Dilute to a concentration of 0.5-2mg/ml.

		1 month-18 years > 40kg	100mg OD (increased to 200mg daily if inadequate response)	
Fluconazole	**IV/PO**		Mucosal candidiasis: 1 month – 12 years 3 mg/kg (max. 100mg) daily; 12 – 18 years 100 mg daily. Oral candidiasis 7-14 days (except in severely immunocompromised when treat longer), 14 - 30 days other mucosal infections (eg oesophagitis, candiduria) Treatment of invasive candidal infections 1 month – 18 years: 6-12 mg/kg/day (max. 800 mg) od oral/iv Prophylaxis in immunocompromised 1 month – 18years: 3-12 mg/kg daily PO/IV (max. 400mg daily)dependent on degree and duration of neutropenia	**Available as** 50 mg capsules, 200 mg capsule, 50mg/5ml and/200mg/5ml suspension; infusion 2 mg/ml 25 & 100 ml) **Administration advice** IV infusion over 10-30 minutes (max 10 ml/min) Anti-fungal spectrum narrow compared to amphotericin but candida albicans usually sensitive. **Renal impairment advice** CrCl 20-50 ml/min/1.73m²: 50% dose CrCl < 20 ml/min/1.73 m²: 25% dose

Itraconazole	**PO**	1 month – 18 years	Liquid 2.5 mg/kg bd Capsules 3.75-5mg/kg BD	**Available as**: 10 mg/ml liquid, 100 mg caps Prophylaxis of fungal infection (see treatment protocol recommendations), or treatment of other fungal infections where other antifungals inappropriate **Administration advice** PO: Liquid (take on empty stomach) should be used as therapeutic levels achieved more readily. If use capsules, then take with cola/food to help absorption. Recommend capsules at 1.5-2 x dose of suspension IV: Dilute with saline, infuse over 1 hour, use in-line filter Causes photosensitivity. **Drug Interactions** Omeprazole reduces absorption. Numerous interactions with other drugs – check when adding or changing drugs Interacts with vincristine, avoid 48 hrs either side of VCR administration. **Therapeutic Drug Monitoring** Trough level needs to be > 0.5 mg/l. Reduce dose if trough level > 2 mg/ml. Takes 7-10 days to achieve steady state If need to achieve adequate levels quickly, can load with IV first (at same time as taking oral) for 48 hours. **Renal Impairment Advice** Use IV infusion with caution if creatinine clearance 30-80 ml/min/1.73m² & monitor renal function carefully Avoid IV if creatinine clearance < 30 ml/min/1.73m²
	IV	1 month – 18 years	2.5 mg/kg (max. 200 mg) bd x 2 days (if IV continued then reduce to 2.5 mg/kg (max. 200 mg) once daily, or continue with oral)	

<table>
<tr><td rowspan="5">Voriconazole</td><td rowspan="3">PO</td><td>2 - 12 yrs or 12 - 15 years & wt < 50 kg:</td><td>9 mg/kg (max. 350 mg starting dose) 12 hourly</td><td rowspan="5">For treatment of invasive aspergillosis, candidaemia & fusarium, can be used as prophylaxis in R3 protocol

Administration Advice
IV infusion (max 3 mg/kg/hr, in 0.9% saline or 5% glucose 0.5 – 5 mg/ml)

Renal Impairment Advice
Discuss use if creatinine clearance < 50 ml/min/1.73 m^2

Patient Monitoring
Check chemistry – may cause alteration in LFTs -usually reversible, avoid hypokalaemia, hypocalcaemia & hypomagnesaemia.
Visual disturbances common – 30% patients experience altered visual perception, blurred vision, colour vision change or photophobia, usually settles with time.

Drug Interactions
Interaction with ciclosporin & other drugs</td></tr>
<tr><td>12 - 15 yrs & wt>50kg or 15 - 18 yrs & wt>40 kg</td><td>400 mg 12 hourly x 2 doses, then 200 mg 12 hourly (increase to 300 mg bd if needed)</td></tr>
<tr><td>15 -18 yrs & wt<40 kg</td><td>200 mg 12 hourly x 2 doses, then 100 mg 12 hourly (increase to 150 mg bd if needed)</td></tr>
<tr><td rowspan="2">IV</td><td>2 – 12 yrs, or 12 – 15 yrs, wt < 50kg</td><td>9 mg/kg 12 hourly for 2 doses, then 8 mg/kg12 hourly (reduced in steps of 1 mg if not tolerated, increased in steps of 1 mg/kg if inadequate response</td></tr>
<tr><td>15- 18 yrs or 12 – 15 yrs and wt> 50 kg</td><td>6mg/kg every 12 hours for 2 doses, then 4 mg/kg every 12 hours (reduced to 3 mg/kg every 12hours if not tolerated</td></tr>
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Table 11. Paediatric Oncology Pharmacy Approved Anti-viral doses for use in Wessex Paediatric Oncology Patients (alphabetical order)

Drug	Route	Age	Dose	Comments
Aciclovir	**For varicella zoster (chickenpox) infections in immunocompromised**			
	IV	1-3 months	20 mg/kg tds IV infusion	**Administration Advice** Infuse over 1 hour. Give undiluted (25 mg/ml via a central line) or dilute to 5 mg/ml in 0.9% saline. **Renal Impairment Advice** Give 12 hourly if creatinine clearance 25-50 ml/minute/1.73m² Give 24 hourly if creatinine clearance 10-25 ml/minute/1.73m² It is important to maintain adequate hydration and monitor daily U&Es, creatinine: there is often deterioration of renal function necessitating adjustment of dose. Give fluids IV for at least first 24 hours & maintain good hydration throughout. Remember to stop chemotherapy until recovered. **Dosing Recommendations** In **obese** patients adjust to ideal body weight for height.
		3 months - 12 years	500 mg/m² tds IV infusion	
		>12 years	10 mg/kg tds IV infusion	
	For herpes zoster (shingles) treated orally or chickenpox post-exposure prophylaxis treated orally			
	PO	1 month – 2 years	200 mg qds	For treatment continue until 2 days after crusting of lesions. For post exposure prophylaxis Oral aciclovir should be given for 2 weeks starting on day 7 after exposure. If fails to respond to oral treatment, use IV doses as above for chickenpox **Renal Impairment advice** Give 8 hourly if creatinine clearance 10 - 25 ml/minute/1.73m² Give 12 hourly if creatinine clearance < 10 ml/minute/1.73m²
		2 -6 years	400 mg qds	
		6-12 years	800 mg qds	
		12-18 years	800 mg 5 x daily	
	Herpes simplex (treated orally) infections in immunocompromised			
	PO	1 month – 2 years	200 mg 5 times daily x 5 days (longer if new lesions appear)	**Renal Impairment Advice** Give 12 hourly if creatinine clearance < 10 ml/minute/1.73m²
		2 – 18 years	400 mg 5 times daily x 5 days (longer if new lesions appear)	

Drug	Route	Age	Dose	Comments
Valaciclovir	**PO**	4-12kg	250mg TDS	Indicated for Herpes zoster. In chickenpox: **Valaciclovir** has a better bioavailability than oral aciclovir and may be considered as an alternative treatment to IV or oral aciclovir, once the lesions are improving or first line for shingles. **Renal Impairment advice** Dose 12 hourly if creatinine clearance 15-30 ml/min/1.73m²
		13-21kg	500mg TDS	
		22-29kg	750mg TDS	
		> 30kg or 12 – 18 years	1g TDS x 7 days	
Ganciclovir	**IV**	1 month - 18 years	5 mg/kg 12 hourly IV infusion x 7-14 days for prevention or 14-21 days for treatment	For pre-emptive therapy CMV disease post transplant, induction treatment Given in discussion with transplant centre, monitor PCR. Marrow toxicity additive with flucytosine, amphotericin, or co-trimoxazole **Administration advice** Infuse over 1 hour, dilute to at least 10 mg/ml in 5% dextrose or 0.9% saline Should not be made up on ward - contact pharmacy **Reduce dose in renal impairment:** Creatinine clearance 50-69 ml/minute/1.73 m²: 2.5 mg/kg bd Creatinine clearance 25-49 ml/minute/1.73 m²: 2.5 mg/kg daily Creatinine clearance 10-24 ml/minute/1.73 m²: 1.25 mg/kg daily
VZIG	**IM**	0-5yrs 6-10yrs 11-14 yrs 15 yrs and over	250 mg IM 500 mg IM 750 mg IM 1000 mg IM	**Varicella Zoster Immunoglobulin** is given by intramuscular injection (or by deep subcutaneous injection in case of bleeding disorders), and provides protection for 3-4 weeks. If for any reason, you cannot get antibody status confirmed within the time period to give VZIG, then at least take sample for future reference, but do not delay administration of VZIG. **VZIG** is now prepared from plasma sourced from outside UK. In Southampton it is kept in pharmacy. VZIG can be prescribed by filling the VZIG risk assessment and prescription forms available on the UHS staff net (see appendix A of guidelines). Use 21G needle as viscous. Relatively large volume: consider giving half the volume in each leg.