

ECMO Antimicrobial and Sedation Dosing Reference

LALK (Revised February 2024)

Extracorporeal Membrane Oxygenation (ECMO) is a life support system for the heart and lungs where blood is removed from the body before being oxygenated and returned to the patient. The ECMO circuit consists of tubing, both from the patient to the machine and within the machine; pumps; and an oxygenator, which oxygenates the blood and removes CO₂.

There are several dosing considerations related to ECMO, including the following:

- Sequestration – drug lost to the circuit by adherence to the tubing and/or oxygenator membranes
- Volume of Distribution – increased effective drug distribution due to hemodilution or distribution into the circuit itself, which lowers the patient's drug levels
- Clearance – altered drug clearance due to the ECMO circuit

Upward arrows indicate an increase in the corresponding pharmacokinetic parameter while downward arrows indicate a decrease.

Patients on ECMO are often also on CRRT, and the [CRRT dosing protocol](#) should also be referenced for these patients.

Vd: volume of distribution, Cl: clearance, t_{1/2}: half-life, PK: pharmacokinetics IV: intravenous, PO: oral, CF: cystic fibrosis, FN: febrile neutropenia, PNA: pneumonia, SSTI: skin and soft tissue infection, BSI: bloodstream infection, IE: infective endocarditis, IAI: intra-abdominal infection, CNS: central nervous system, UTI: urinary tract infection, Obesity: TBW/IBW ≥120%, RRT: renal replacement therapy

Medication	Usual dose	ECMO Effects on PK				Drug Dosing Changes
		Sequestration	Vd	Cl	t _{1/2}	
Amphotericin B Underweight: TBW Normal weight: TBW Obese: DW **Do not automatically adjust without contacting MD first	<u>Mucormycosis**</u> 5 mg/kg IV q24h	<u>Deoxycholate</u> Minimal	↑	↑↓	↑↓	Reasonable to start normal dosing, discuss risk/benefit with clinical pharmacy May consider deoxycholate formulation
	<u>Other indications**</u> 3-4 mg/kg IV q24h	<u>Liposomal</u> Moderate				
Cefepime *Highly recommend extended 3 to 4-hour infusions	<u>UTI, SSTI</u> 2 g IV q12h	Minimal	No change	↓↓	↑↑	CrCl ≥ 61: 2 g IV q8h CrCl 30-60: 1 g IV q8h CrCl 11-29: 1 g IV q12h CrCl ≤ 10: 1 g IV q24h All given over 3 hours
	<u>ICU, CNS, FN, CF, PNA, IE, Pseudomonas</u> 2 g IV q8h					
Cefiderocol Restricted to ID 3-hour infusion time for all doses	2 g IV q8h	Minimal	Unknown	Unknown	Unknown	Insufficient data Reasonable to start normal dosing, discuss risk/benefit with clinical pharmacy
Ceftaroline Restricted to ID	600 mg IV q12h	Significant	↑	Unknown	Unknown	Insufficient data Reasonable to start normal dosing, discuss risk/benefit with clinical pharmacy
	<u>MRSA BSI</u> 600 mg IV q8h					

Medication	Usual dose	ECMO Effects on PK				Drug Dosing Changes
		Sequestration	Vd	Cl	t _{1/2}	
Ceftolozane/tazobactam Restricted to ID	<u>IAI, UTI, SSTI, other infections</u> 1.5 g IV q8h	Minimal	↑	No change	No change	No adjustment necessary
	<u>Pneumonia</u> 3 g IV q8h					
Ceftriaxone	2 g IV q24h	Minimal	No change	No change	No change	No adjustment necessary
	<u>CNS or Enterococcal Endocarditis</u> 2 g IV q12h					
Ciprofloxacin (IV)	400 mg IV q12h	Minimal	↑	↓	↑	No adjustment necessary
	<u>Nosocomial PNA or Intermediate susceptibility</u> 400 mg IV q8h					If MIC > 0.25 mg/L, use alternative agent due to decreased likelihood of reaching a therapeutic level
Fluconazole (PO/IV) Round doses UP to the nearest 200 mg	<u>Vaginal Yeast Infection</u> 200 mg PO/IV x1	Minimal	↑	No change	No change	No adjustment necessary; dose based on TBW
	<u>Heme/onc prophylaxis</u> 400 mg PO/IV q24h					
	<u>Esophageal candidiasis or symptomatic urinary infection</u> 3 mg/kg PO/IV					
	<u>Invasive; CNS, IAI, BSI</u> 12 mg/kg IV/PO loading dose, then 6 mg/kg IV/PO q24h					
	<u>Susceptible dose-dependent <i>Nakaseomyces (Candida) glabrata</i></u> 12 mg/kg IV/PO q24h					
Gentamicin Underweight: TBW Normal weight IBW Obese: DW	Pharmacist PK dosing by drug levels: see facility's aminoglycoside dosing protocol	Minimal	↑	↓	↑	Therapeutic drug monitoring recommended

Medication	Usual dose	ECMO Effects on PK				Drug Dosing Changes
		Sequestration	Vd	Cl	t _{1/2}	
Linezolid	600 mg PO/IV q12h	Minimal	No change	No change	No change	No adjustment necessary
Meropenem Highly recommend extended 3-hour infusions	500 mg IV q6h	Minimal	↑	↑	↓	Limited data, utilize 1-2g extended infusion dosing below
	1 g IV q8h					No adjustment necessary, administer as an extended infusion over 3 hours
	<u>Meningitis, CF, or MIC of 4 mcg/mL</u> 2 g IV q8h					
Micafungin Restricted to ID or Critical Care	100 mg IV q24h	Minimal to Moderate	↑	↑↓	↓↑	150 mg IV q24
Piperacillin/tazobactam (Extended Infusion – over 4h)	4.5 g IV q8h	Minimal	↑	No change	No change	No adjustment necessary
Piperacillin/tazobactam (Standard infusion)	4.5 g IV q6h	Minimal	↑	No change	No change	Use extended infusion Recommend against 30 minute infusions
	<u>Pseudomonas ruled out</u> 3.375 g IV q6h					
Vancomycin IV Use total body weight for dosing	Pharmacist PK dosing by drug levels	Minimal	↑	No change	No change	No adjustment necessary; see facility's vancomycin dosing protocol
Voriconazole Underweight: TBW Normal weight: TBW Obese: DW Adjust dose based on therapeutic drug monitoring; goal steady-state (≥7 days) trough of 1-6 mg/L	<u>Treatment</u> 6 mg/kg PO/IV q12h x2 doses, then 4 mg/kg PO/IV q12h	Significant	↑	↑↓	↑↓	Therapeutic drug monitoring strongly recommended – recommend pharmacy consult to assist
	<u>Prophylaxis</u> 200 mg PO q12h					

Medication	Usual dose	ECMO Effects on PK				Drug Dosing Changes
		Sequestration	Vd	Cl	t _{1/2}	
Dexmedetomidine	0.2 – 1.5 mcg/kg/h Titrate: 0.2 mcg/kg/h q30min to target RASS	Significant	Unknown	Unknown	Unknown	0.2 – 1.5 mcg/kg/h Titrate: 0.2 mcg/kg/h q30min to target RASS Not to exceed 1.5 mcg/kg/h due to bradycardia
Fentanyl	25 – 200 mcg/h Titrate: 25 mcg/h q15min to target RASS	Significant	↑	Unknown	Unknown	50 – 400 mcg/h Titrate: 25 mcg/h q15min to target RASS
Hydromorphone	0.5 – 4 mg/h Titrate: 0.25 mg/h q60min to target RASS	Minimal	Unknown	Unknown	Unknown	1 – 8 mg/h Titrate: 0.25 mg/h q60min to target RASS
Ketamine	0.05 – 2.5 mg/kg/h Titrate: 0.1 mg/kg/h q15min to target RASS	Minimal to moderate	Unknown	Unknown	Unknown	0.5 – 2.5 mg/kg/h Titrate: 0.1 mg/kg/h q15min to target RASS
Midazolam	0.02 – 0.1 mg/kg/h Titrate: 0.02 mg/kg/h q10min to target RASS	Significant	↑	Unknown	Unknown	1 – 10 mg/h Titrate: 1 mg/h q10min to target RASS
Morphine	2 – 30 mg/h Titrate: 0.5 mg/h q30min to target RASS	Minimal to moderate	↑	Unknown	Unknown	2 – 30 mg/h Titrate: 0.5 mg/h q30min to target RASS
Propofol	5 – 50 mcg/kg/min Titrate: 5 mcg/kg/min q5min to target RASS	Significant	Unknown	Unknown	Unknown	10 – 50 mcg/kg/min Titrate: 5 mcg/kg/min q5min to target RASS

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