



Queensland
Government

Peritoneal Dialysis Peritonitis Clinical Pathway

Facility:

(Affix identification label here)

URN:

Family name:

Given name(s):

Address:

Date of birth:

Sex: M F I

Clinical pathways never replace clinical judgement.
 Care outlined in this pathway **must be varied** if it is not clinically appropriate for the individual patient.

This form is to assess patients on peritoneal dialysis (PD) who present with any of the following symptoms (tick as appropriate)

Cloudy effluent Abdominal pain Febrile Systemically unwell

Assessment	Completed	Initial	Time	Date
<ul style="list-style-type: none"> Clinically assess the patient and check allergies 				
<ul style="list-style-type: none"> Collect sterile samples of PD effluent fluid to ensure timely culture for analysis: <ul style="list-style-type: none"> » One anaerobic (orange top) and one aerobic (green top) blood culture bottles » Three sterile yellow top container to total of 150mL » 5mL into EDTA collection tube (purple top) Send specimens to microbiology with pathology request: <ul style="list-style-type: none"> » Sterile fluid culture + fluid in culture medium for M/C/S, WCC and differential. Body site: Peritoneal dialysis fluid 	<input type="checkbox"/>			
<ul style="list-style-type: none"> Commence immediate empiric treatment using below table 				
<ul style="list-style-type: none"> Inspect exit site <ul style="list-style-type: none"> » Swab site if signs of infection 	<input type="checkbox"/>			
<ul style="list-style-type: none"> If temperature above 38°C collect blood cultures 	<input type="checkbox"/>			
<ul style="list-style-type: none"> Admit / transfer patient if any of the following (tick as appropriate below): <ul style="list-style-type: none"> <input type="checkbox"/> Fever or <input type="checkbox"/> Significant pain or <input type="checkbox"/> Unable to perform own dialysis 				
<ul style="list-style-type: none"> Contact the Nephrologist or Peritoneal Dialysis Unit covering the patient as soon as possible at the time of presentation 	<input type="checkbox"/>			

Immediate Empiric Treatment

- Intraperitoneal (IP) administration is preferred route to expedite direct contact with peritoneal membrane as per ISPD guidelines. Negates need for IV access and allows for training of non-clinical personnel to administer.**
- Doses must be added to the patient's medication chart to be a valid order.**
- Dwell time for PD dialysate fluid bag containing antibiotic/antimicrobial must be at least 6 hours.**
- Continue APD if clinically appropriate and dosing as per appendix 1 (page 12).**
- For automated peritoneal dialysis (APD) with no last fill, instill IP antibiotics in a minimum of 200mL dialysate fluid.**

	Drug	Dose	Route	Frequency	Comments
	Nystatin	500,000 international units	PO	QID	Until last antibiotic dose (or 2 days after last aminoglycoside dose and 7 days after last vancomycin dose).
Known hypersensitivity to Nystatin	Fluconazole tablets	200mg	PO	Daily	
Optional	Heparin	500units/L	IP	Every PD exchange	If drained bags contain fibrin or clots, instil Heparin into new PD fluid bag.
Known/suspected or community acquired MRSA or Cephalosporin hypersensitivity	Vancomycin*	30mg/kg up to 2grams	IP	In ONE PD dialysate fluid bag stat†	Check serum trough levels on day 3 and thereafter every 3–5 days; re-dose Vancomycin when level below 15mg/L as per ISPD guidelines.
	Gentamicin*	600mcg/kg up to 50mg	IP	In ONE PD dialysate fluid bag every 24 hours†	ISPD guidelines report the role of measuring gentamicin levels as controversial.
No MRSA	Cefazolin**	15mg/kg	IP	In ONE PD dialysate fluid bag every 24 hours†	
	Gentamicin**	600mcg/kg up to 50mg	IP	In ONE PD dialysate fluid bag every 24 hours†	Once causative bacteria identified and sensitivity confirmed, prompt switch from empirical gentamicin is recommended to minimise risk of ototoxicity.

* Vancomycin and gentamicin may be administered in the same bag without loss of bioactivity.

** Cefazolin and gentamicin may be administered in the same bag without loss of bioactivity. Concerns are acknowledged, however there have been no issues identified at Qld Health facilities undertaking this practice.

† Adjust dose to reflect fill volume of PD bag used for last/long dwell.

Signature Log To be completed by all staff who initial this pathway

Name (print)	Designation	Signature	Date	Name (print)	Designation	Signature	Date

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v4.00 - 05/2021



SW203

PERITONEAL DIALYSIS PERITONITIS CLINICAL PATHWAY



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Immediate treatment

0–6 hours

- Start intraperitoneal antibiotics as soon as possible
- Allow to dwell for at least 6 hours
- Ensure gram-positive and gram-negative coverage
- **Continue usual PD regimen**

6–8 hours

24 hours for remote areas

- Determine and prescribe ongoing antibiotic treatment
- Ensure follow-up arrangements are clear or patient admitted
- Review sensitivity results

Transfer

- If patient remains unwell may need to be transferred to another facility

Empiric treatment following culture results

- If PD effluent fluid WCC above $100 \times 10^6/L$ of which 50% are polymorphonuclear neutrophils



Diagnosis of peritonitis is made

Antibiotic regimen depends on the results of the culture. Follow the links below to locate the correct regimen.

Staphylococcus aureus **Plan 1** *Go to Page 3*

Streptococcus **Plan 2** *Go to Page 4*

Enterococcus **Plan 3** *Go to Page 5*

Other gram-positive organisms **Plan 4** *Go to Page 6*

Single gram-negative **Plan 5** *Go to Page 7*

Pseudomonas species **Plan 6** *Go to Page 8*

Polymicrobial peritonitis: day 1–3 **Plan 7** *Go to Page 9*

Culture negative on day 1 and 2 **Plan 8** *Go to Page 10*

Fungi **Plan 9** *Go to Page 11*

If gram stain shows fungal elements, surgically remove Peritoneal Dialysis (PD) catheter

PD catheter treatment

- Consult with nephrologist as soon as possible
- Continue

Plan of care

Consider re-training patient after successful peritonitis treatment

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Plan of Care 1 This plan of care is only valid if signed by a Medical Officer

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Staphylococcus aureus on culture

- Continue gram-positive coverage based on sensitivities
- Stop gram-negative coverage (gentamicin)
- Assess exit site again

If methicillin resistant (MRSA) change to vancomycin intraperitoneal

- Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5:
- Symptoms resolved
 - PD effluent bags are clear

Clinical improvement

No clinical improvement by 5 days on appropriate antibiotics

- Continue intraperitoneal antibiotics: duration of therapy 21 days

- Surgically remove PD catheter
- After surgical catheter removal patient to remain on treatment for minimum of 14 days



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Plan of Care 2 This plan of care is only valid if signed by a Medical Officer

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Streptococcus sp. on culture

- Continue cefazolin intraperitoneal
- Cease gram-negative coverage (gentamicin)

If resistant or allergic to penicillin / cephalosporin, change cefazolin intraperitoneal to vancomycin intraperitoneal

Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5:

- Symptoms resolved
- PD effluent bags are clear

Clinical improvement

No clinical improvement by 5 days on appropriate antibiotics

- Continue intraperitoneal antibiotics: duration 14 days

- Surgically remove PD catheter
- After surgical PD catheter removal patient to remain on treatment for minimum of 14 days

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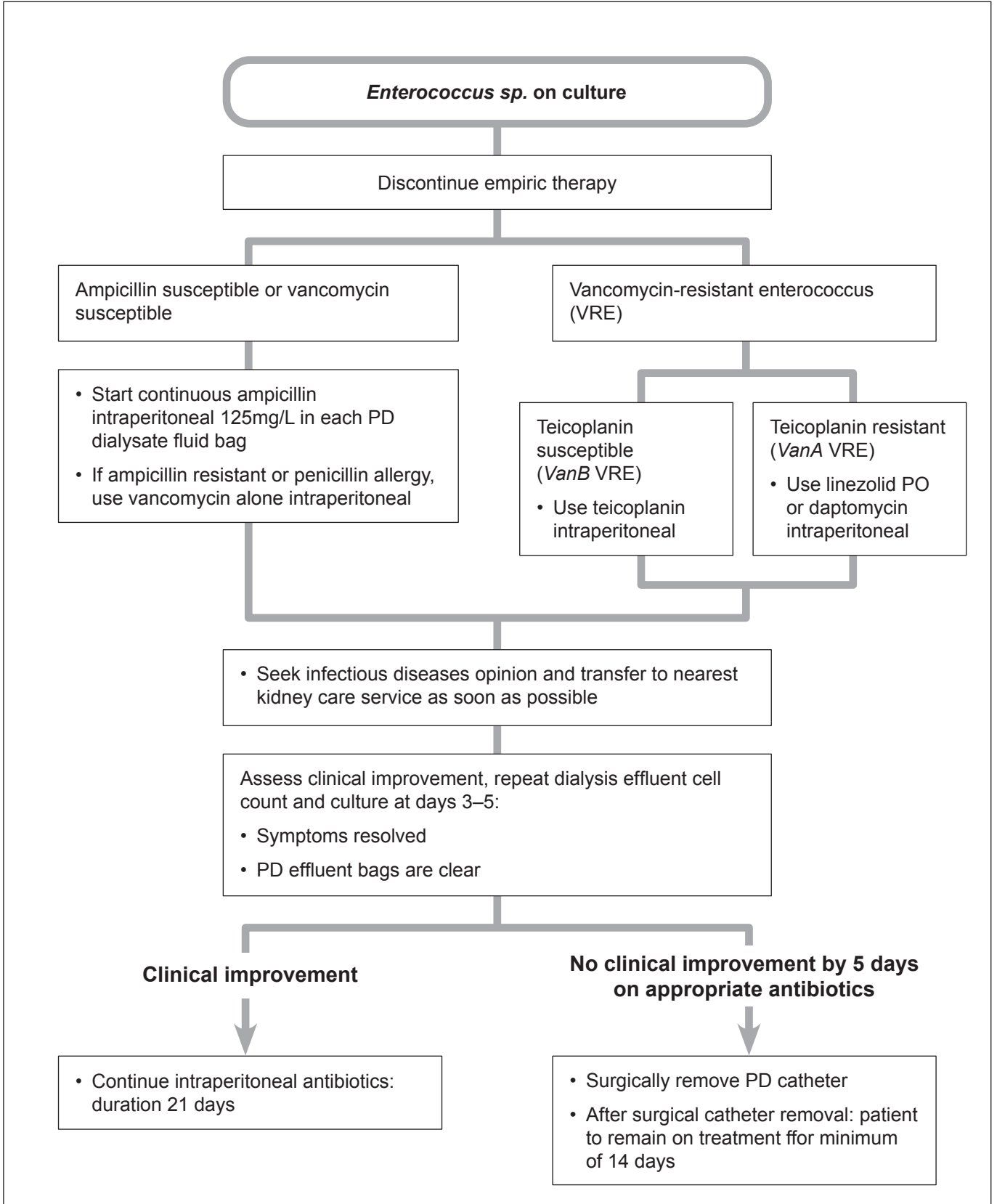
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Plan of Care 3 This plan of care is only valid if signed by a Medical Officer

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Plan of Care 4 This plan of care is only valid if signed by a Medical Officer

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Other gram-positive organisms including coagulase-negative *Staphylococcus* on culture

- Continue gram-positive coverage based on sensitivities
- Stop gram-negative coverage (gentamicin)

Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5:

- Symptoms resolved
- PD effluent bags are clear

Clinical improvement

- Continue intraperitoneal antibiotics: duration 14 days

No clinical improvement by 5 days on appropriate antibiotics

- Surgically remove PD catheter
- After surgical catheter removal: patient to remain on treatment for minimum of 14 days

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Other single gram-negative organism on culture (e.g. *Klebsiella pneumoniae*)

Aeromonas or 'ESCPM':
Enterobacter sp.
Serratia sp.
Citrobacter freundii
Proteus vulgaris
Morganella morganii

Acinetobacter sp.

Stenotrophomonas sp.

Other gram-negative organisms

- Ciprofloxacin PO or cefepime intraperitoneal

- Ciprofloxacin PO

- Trimethoprim sulfamethoxazole PO

- Cefazolin susceptible: continue cefazolin, and cease gentamicin
- Cefazolin resistant: treat according to susceptibilities either ceftazidime intraperitoneal OR cefepime intraperitoneal OR ciprofloxacin PO or seek infectious diseases advice

Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5:

- Symptoms resolved
- PD effluent bags are clear

Clinical improvement

No clinical improvement by 5 days on appropriate antibiotics

- Continue intraperitoneal antibiotics:
 - 28 days for *Stenotrophomonas*
 - 21 days for other gram-negatives

- Surgically remove PD catheter
- After surgical catheter removal: patient to remain on treatment minimum of 14 days

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Plan of Care 6 This plan of care is only valid if signed by a Medical Officer

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Pseudomonas aeruginosa

**Without PD catheter infection
(exit site / tunnel)**

**With PD catheter infection (exit site /
tunnel) current or prior to peritonitis**

- Use two different antibiotics as guided by sensitivities which differ in their mechanism of action (i.e. ceftazidime intraperitoneal *OR* cefepime intraperitoneal *AND* gentamicin intraperitoneal *OR* tobramycin intraperitoneal *OR* ciprofloxacin PO

- Surgically remove PD catheter
- Patient to remain on treatment for minimum of 14 days after catheter removal

Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5:

- Symptoms resolved
- PD effluent bags are clear

Clinical improvement

**No clinical improvement by 5 days
on appropriate antibiotics**

- Continue intraperitoneal antibiotics: duration 21–28 days as per 2016 ISPD guidelines update

- Surgically remove PD catheter
- Patient to remain on treatment minimum of 21 days after peritoneal catheter removal

Prolonged treatment with gentamicin should be avoided and treatment greater than 7 days should *only* proceed following direct advice from nephrologist or infectious diseases physician.

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Polymicrobial peritonitis: days 1–3

Multiple gram-negative organisms or mixed gram-negative / gram-positive

- Consider gastrointestinal problem

- Change therapy to metronidazole PO in conjunction with either ampicillin intraperitoneal and gentamicin intraperitoneal; *OR* ceftazidime intraperitoneal

- Obtain urgent surgical assessment

- In case of laparotomy indicating intra-abdominal pathology / abscess, surgically remove PD catheter

- Continue intraperitoneal antibiotics: duration of 21 days

Multiple gram-positive organisms

- Consider touch contamination
- Consider PD catheter infection

- Continue therapy based on sensitivities: duration minimum of 21 days

Without exit site or tunnel infection

- Continue intraperitoneal antibiotics: duration of treatment for a minimum 21 days

With exit site or tunnel infection

- Remove PD catheter
- After surgical catheter removal patient to remain on treatment for minimum of 14 days

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Plan of Care 8 This plan of care is only valid if signed by a Medical Officer

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Culture negative on day 1 and 2

- Continue initial therapy

- Day 3: culture still negative
- Clinical assessment
 - Repeat PD fluid white cell count and differential

**Infection resolving,
patient improvement clinically**

- Discontinue gentamicin and continue with cefazolin intraperitoneal for 14 days

Infection not resolving

- Special culture technique for unusual causes (*e.g.* mycobacteria, *Legionella*)
- Consider fungi

Now culture positive

- Adjust therapy according to sensitivity patterns
- Duration of therapy based on organism identified

Clinical improvement

- Continue intraperitoneal antibiotics: duration of therapy 14 days

Still culture negative

- No clinical improvement after 5 days, surgically remove PD catheter

- Continue intraperitoneal antibiotics minimum of 14 days after PD catheter removed

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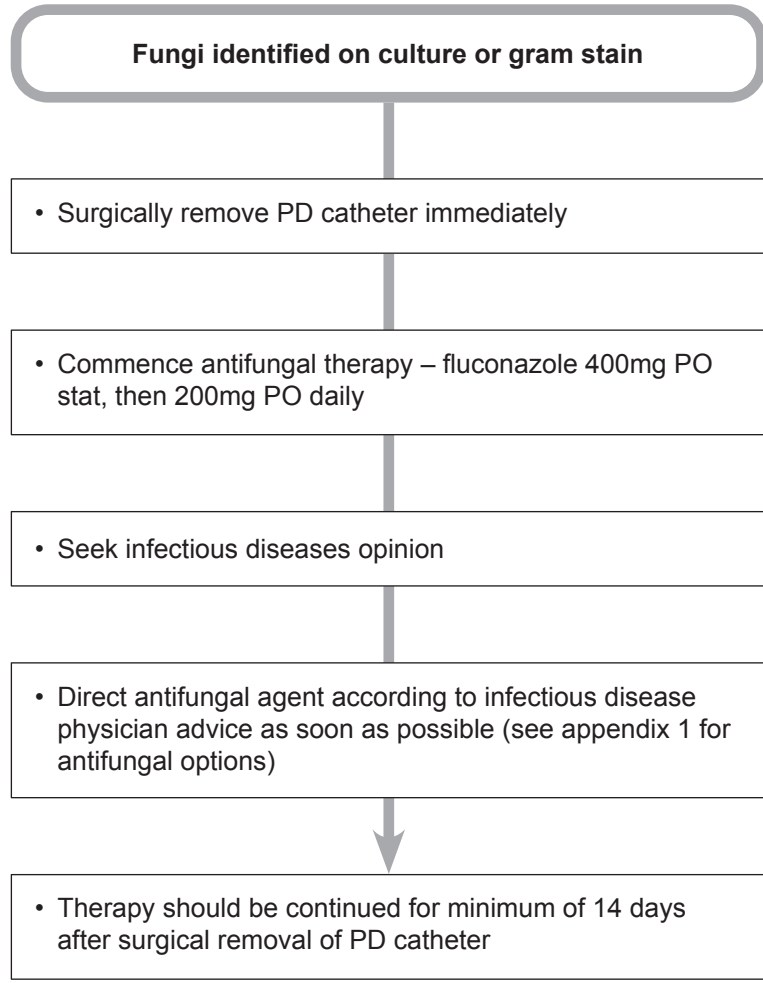
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Appendix 1 (Advise discuss with nephrologist as soon as possible)

Intraperitoneal Antibiotic Dosing Recommendations for CAPD patients*

Dose calculation: For dose prescribed in mg per kg, use patient weight on presentation to calculate dose per bag

Antibiotic Type		Intermittent (per exchange, once daily)	Continuous (mg / L; all exchanges)	Oral Dosing	
Gram-negative cover	Aminoglycosides	Amikacin	2mg / kg	LD25, MD12	
		Gentamicin <i>OR</i>	600mcg / kg	LD 8, MD 4	
		Tobramycin	600mcg / kg	LD 8, MD 4	
	Cephalosporins	Cefepime	1gram	LD 500, MD 125	
		Ceftazidime	LD 3grams, MD 1gram / 24hrs <i>OR</i> 2grams / 48hrs	LD 3grams, MD 1–2grams <i>OR</i> 2 grams / 24hrs	
		Ceftriaxone	1gram		
	Quinolones	Ciprofloxacin	ND	MD 50	500mg PO daily <i>OR</i> 750mg PO daily for pseudomonas
Others	Aztreonam	2grams	LD 1,000, MD 250		
Gram-positive cover only	Penicillins	Amoxicillin	ND	LD 250–500, MD 50	
		Ampicillin	ND	MD 125	
		Benzylpenicillin	ND	LD 50,000 units, MD 25,000 units	
	Others	Daptomycin (115)	ND	LD 100, MD 20	
		Linezolid (41)	ND	LD 600, MD 300	200–300mg once daily
		Teicoplanin	15mg / kg every five days	LD 400, MD 20	
		Vancomycin	15–30mg / kg every 5–7 days	LD 1,000, MD 25	
Gram-negative AND gram-positive	Cephalosporin	Cefazolin	15mg / kg for gram-negative and 15-20mg/kg for gram-positive		
		Meropenem	1gram in night dwell		
	Others	Trimethoprim / Sulfamethoxazole			800/160mg BD for 3 days then daily for remainder of course
Antifungals <i>SEEK ID ADVICE</i>	Fluconazole		200mg every 24–48hrs	400mg stat, then 200mg once daily	

*Icodextrin-containing dialysis solution is compatible with vancomycin, cefazolin, gentamicin, ampicillin, cloxacillin and amphotericin. Exercise caution when prescribing amoxicillin, cefepime, ceftazidime and imipenem due to varying stability linked to storage temperature and duration.

Intermittent Dosing of Antibiotics in Automated Peritoneal Dialysis (APD)

Drug	Intraperitoneal dose into last fill or daytime exchange <i>NB: Consider volume of last fill. For example: dose ordered 1,000mg in fill volume of 1500mL to be injected into a 2,500mL bag – calculate 1,000 divided by 1,500, then multiply by 2,500 = 1.666 grams per bag. If no last fill – instil intraperitoneal antibiotics / antimicrobials in a minimum of 200mL dialysate.</i>
Cefazolin	15mg / kg intraperitoneal every day, in long day dwell (112)
Cefepime	1gram intraperitoneal in one exchange per day (<i>NB: Review icodextrin stability data if loaded bag kept at room temperature for greater than 48 hours</i>)
Fluconazole	200mg intraperitoneal in one exchange per day every 24–48 hours. Seek ID advice
Tobramycin	LD 1,500mcg / kg intraperitoneal in long dwell, then 500mcg / kg intraperitoneal each day in long dwell (112)
Vancomycin	LD 30mg / kg intraperitoneal in long dwell; repeat dosing 15mg / kg intraperitoneal in long dwell every 3–5 days (aim to keep serum trough levels above 15mcg / mL)

LEGEND **BD** Two times per day **LD** Loading dose in mg / L **MD** Maintenance dose in mg / L **ND** No data

Acknowledgement: International Society for Peritoneal Dialysis (ISPD). Table adapted from dialysis-related infections recommendations: 2018 update. Ranganathan, D., Naicker, S., Wallis, S. C., Lipman, J., Ratanjee, S. K., & Roberts, J. A. (2016). Stability of antibiotics for intraperitoneal administration in extraneal 7.5% Icodextrin peritoneal dialysis bags (STAB study). *Peritoneal dialysis international : Journal of the ISPD*, 36(4), 421–426. <https://doi.org/10.3747/pdi.2015.00062>

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