**Paediatric Peritoneal Dialysis Peritonitis Clinical Pathway**

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

This form is to be used to assess patients on peritoneal dialysis who present with any of the following symptoms (tick as appropriate):
- Cloudy effluent
- Abdominal pain
- Febrile
- Systemically unwell

### Assessment

- Clinically assess the patient
- If temperature above 38°C collect blood cultures
- Inspect exit site
  - Swab site if signs of infection and send for M/C/S and fungal culture
- Collect sterile samples of PD effluent fluid (60 mL) to ensure timely culture for analysis
  - Pathology request: Sterile fluid culture + fluid in blood culture medium for M/C/S, fungal culture, WCC & differential. Body site: Peritoneal dialysis fluid
- Commence immediate Empiric Treatment using table below
- Admit/transfer patient if any of the following (tick as appropriate below):
  - Fever or Significant Pain or Unable to perform own dialysis
- Contact the Paediatric Nephrologist / Peritoneal Dialysis Unit as soon as practical

### Dosing regimen for empiric treatment of suspected peritonitis in children on PD

NB. All antibiotics given intraperitoneally (IP). Empiric therapy cover first 48 to 72 hours of therapy only.

- MRSA negative patients - use cefepime as monotherapy or cefazolin + Gentamicin*, if cefepime not available.
- Known/suspected MRSA positive patients or immediate Penicillin/ Cephalosporin hypersensitivity (e.g. anaphylaxis) - use Vancomycin + Gentamicin for empiric treatment*.

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Initial Dosing</th>
<th>Subsequent Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SINGLE DWELL ONLY</td>
<td>APD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CAPD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All cycle exchanges</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daytime dwell</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>500 mg/L</td>
<td>125 mg/L; increase last fill volume to 50% of usual night time dwell volume</td>
</tr>
<tr>
<td>- cefepime</td>
<td></td>
<td>125 mg/L in each dwell</td>
</tr>
<tr>
<td>- cefazolin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gentamicin*</td>
<td>0.6 mg/kg (max. 50mg)</td>
<td>Usual last fill volume without antibiotic; 0.6 mg/kg daily in 6 hour manual exchange before starting APD</td>
</tr>
<tr>
<td>Vancomycin*</td>
<td>30 mg/kg (max. 1.5g)</td>
<td>0.6 mg/kg daily in a single 6 hour dwell</td>
</tr>
</tbody>
</table>

*If ongoing Vancomycin or Gentamicin treatment required: Vancomycin - check blood level on day 3 and re-dose Vancomycin if serum level <15 mg/L; Gentamicin - check level daily and redose if serum level <1 mg/L.

For duration of antibiotic treatment, use antifungal prophylaxis:

- **Nystatin OR**
  - Less than 5 years of age: 200,000 units (2 mL) four times a day (orally or via NGT). If able to swallow tablets: 500,000 units (1 tablet) four times daily.
- **Miconazole 2% oral gel**
  - 2.5 mL to 5 mL four times a day, applied to oral mucosa (gums and tongue). If NGT in-situ: Use Miconazole gel topically on oral mucosa and give Nystatin liquid via NGT.

### Signature Log

To be completed by all staff who initial this pathway

<table>
<thead>
<tr>
<th>Name (print)</th>
<th>Designation</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
</table>
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

Empiric Treatment following Culture Results

Plan of Care

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

- **Staphylococcus aureus**
- **Enterococcus/Streptococcus**
- Other Gram-positive organisms
- **Pseudomonas species**
- Single Gram-negative
- Polymicrobial peritonitis day 1–3
- Culture negative on day 1 & 2
- If Gram stain shows fungal elements, surgically remove PD catheter

Transfer
• If patient remains unwell may need to be transferring to other facility

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Medical Officer / Nurse Practitioner (print name): [Signature: ] [Date: ]
**Staphylococcus aureus on culture**

- Cease Gram-negative coverage (Gentamicin or Cefepime)
- No allergies: Continue Gram-positive coverage (Cefazolin IP)
- Cephalosporin immediate type hypersensitivity: Seek Infectious Diseases (ID) opinion.
- Assess exit site again

**Flucloxacillin and/or Cefazolin sensitive S.aureus**

**Methicillin resistant S.aureus (MRSA)**

- Cease Gram-negative coverage (Gentamicin or Cefepime)
- Continue Gram-positive coverage (Vancomycin IP)
- Check Vancomycin level on day 3 and re-dose if serum level <15 mg/L.

- Assess clinical improvement, repeat dialysis effluent cell count and culture at days 3–5
- PD fluid collection and send for cell count and culture at day 3–5

**Clinical improvement**

- Continue antibiotics
- Duration of therapy 21 days

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

- Surgically remove PD catheter
- Continue antibiotics minimum 14 days
**Plan of Care 2**  This plan of care is only valid if signed by a medical officer/nurse practitioner:

*Enterococcus* or *Streptococcus sp.* on culture

- Discontinue empiric treatment
- Start continuous ampicillin IP in each PD dialysate bag

- If ampicillin resistant or immediate type penicillin hypersensitivity, change to Vancomycin IP alone.
- Check blood level on day 3 and re-dose Vancomycin if serum level <15 mg/L
- If Vancomycin Resistant *Enterococcus* (VRE), seek Infectious Disease opinion

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

**Clinical improvement**

- Continue antibiotics
- Duration of therapy:
  - 14 days (streptococcus)
  - 21 days (enterococcus)

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

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

Medical Officer / Nurse Practitioner (print name): 
Signature: 
Date:  

URN:
Family name: 
Given name(s): 
Address: 
Date of birth:  
Sex: M F I
Plan of Care 3

This plan of care is only valid if signed by a medical officer/nurse practitioner:

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

- Stop Cefepime and 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 clear

**Clinical improvement**

- Continue antibiotics
- Duration of therapy: 14 days

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

- Surgically remove PD catheter
- Patient to remain on treatment for 14 days after PD catheter removal
Pseudomonas sp (e.g. aeruginosa) on culture

Without PD catheter infection (exit-site/tunnel)

- Treat with Cefepime IP or Ceftazidime IP if sensitive - otherwise seek ID advice

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

Clinical improvement

- Continue antibiotics
- Duration of therapy: 21 days*

*Adult ISPD 2016 guidelines recommend up to 28 days treatment

No clinical improvement by 5 days on appropriate antibiotics

- Surgically remove PD catheter
- Patient to remain on treatment for 21 days after PD catheter removal

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

- Surgically remove PD catheter
- Patient to remain on treatment for 21 days after PD catheter removal
Plan of Care 5

This plan of care is only valid if signed by a medical officer/nurse practitioner:

Other single Gram-negative organism on culture

**E. coli, Proteus, Klebsiella**

- Adjust antibiotics to sensitivity pattern
- If Cefepime IP is used empirically, consider rationalizing therapy to Cefazolin IP if sensitive

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

**Stenotrophomonas**

Oral Trimethoprim / Sulphamethoxazole 4 mg/kg of trimethoprim component twice daily orally (max. 160 mg/dose)

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

Clinical improvement

- Continue antibiotics
- Duration of therapy 21 days

No clinical improvement by 5 days on appropriate antibiotics

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

Clinical improvement

- Continue antibiotics for 28 days
- No need to change
Plan of Care 6

This plan of care is only valid if signed by a medical officer/nurse practitioner:

Medical Officer / Nurse Practitioner (print name):

Signature:

Date:

Polymicrobial peritonitis: days 1–3

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

Consider GI problem

- Add oral metronidazole 7.5 mg/kg (max. 400 mg) twice daily
- Discuss ongoing antibiotic management with Infectious Disease Consultant

Obtain urgent surgical assessment

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

Continue antibiotics for minimum duration of 21 days

Multiple Gram-positive organisms

- Touch contamination
- Consider PD catheter infection

Continue therapy based on sensitivities – duration 21 days

Without exit site or tunnel infection

Continue antibiotics for a minimum duration of 21 days.

With exit site or tunnel infection

Surgically remove PD catheter

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

Consider GI problem

- Add oral metronidazole 7.5 mg/kg (max. 400 mg) twice daily
- Discuss ongoing antibiotic management with Infectious Disease Consultant

Obtain urgent surgical assessment

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

Continue antibiotics for minimum duration of 21 days
Plan of Care 7

This plan of care is only valid if signed by a medical officer/nurse practitioner:

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 improving clinically

- Cease Gentamicin
- Continue with or change to Cefazolin IP 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 antibiotic
- Duration of therapy: Minimum 14 days dependent on organism identified

Still culture negative

No clinical improvement after 5 days, surgically remove PD catheter

Continue antibiotics for at least 14 days after PD catheter removal

Medical Officer / Nurse Practitioner (print name):
Signature:
Date:
Fungi identified on culture or Gram stain

Surgically remove PD catheter immediately

Commence oral fluconazole
Loading dose: 12 mg/kg daily (max. 800 mg) on days 1 and 2, then maintenance dose of 6 mg/kg daily (max. 200 mg) and consider TDM. Seek ID advice.

Direct antifungal agent according to infectious disease physician advice (see Appendix for antifungal options)

Therapy should be continued for minimum 14 days after removal of catheter

### Intraperitoneal antimicrobial dosing recommendations for patients with PD-associated peritonitis

<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>Continuous (LD = loading dose, exchange dwell of 3 to 6 hours) (MD = maintenance dose)</th>
<th>PD dialysis solution stability at room temperature and 37 degrees C (1, 2)</th>
<th>Drug-Heparin compatibility#</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aminoglycosides</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Gentamicin</td>
<td>0.6 mg/kg (max. 50 mg)</td>
<td>Stable for up to 4hrs in P2 and EI</td>
<td>Incompatible</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>0.6 mg/kg (max. 50 mg)</td>
<td>Stable for up to 4hrs in P2 and EI</td>
<td>Incompatible</td>
</tr>
</tbody>
</table>

Aminoglycosides and penicillins/cephalosporins should not be mixed in the same PD bag due to the potential inactivation of the aminoglycoside. Check level daily and re-dose if serum level is <1 mg/L.

<table>
<thead>
<tr>
<th>Cephalosporins</th>
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</thead>
<tbody>
<tr>
<td>Cefazolin</td>
<td>-</td>
<td>LD 500 mg/L MD 125 mg/L</td>
<td>Stable for up to 24hrs in P1, P2 and EI</td>
</tr>
<tr>
<td>Cefepime</td>
<td>-</td>
<td>LD 500 mg/L MD 125 mg/L</td>
<td>Stable for up to 12hrs in EI, only 5 hrs in P2 and 10 hrs in P1</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>-</td>
<td>LD 500 mg/L MD 125 mg/L</td>
<td>Stable for up to 24hrs in EI, only 6 hrs in P2 and 12 hrs in P1</td>
</tr>
<tr>
<td>Cefotaxime</td>
<td>-</td>
<td>LD 500 mg/L MD 125 mg/L</td>
<td>Limited data. Stable for up to 6 hrs in F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Glycopeptides</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Vancomycin</td>
<td>Load: 30 mg/kg (max. 1.5 g) Repeat dosing 15 mg/kg based on levels*</td>
<td>LD 1000 mg/L MD 25 mg/L</td>
<td>Stable for up to 24hrs in P1, P2 and EI</td>
</tr>
<tr>
<td>Teicoplanin (seek ID advice)</td>
<td>15 mg/kg every 5 days</td>
<td>LD 400 mg/L MD 20 mg/L</td>
<td>Stable for up to 24hrs in P1 and EI</td>
</tr>
</tbody>
</table>

In patients with residual renal function, glycopeptide elimination may be accelerated. If intermittent therapy is used in such setting, the second dose should be time-based on a blood level obtained 2-4 days after the initial dose. For vancomycin, re-dosing should occur when the blood level is <15 mg/L. For teicoplanin, re-dosing should occur when the blood level is <20 mg/L. Seek ID advice. Intermittent glycopeptide therapy is not recommended for patients with residual renal function unless serum levels of the drug can be monitored in a timely manner.

<table>
<thead>
<tr>
<th>Penicillins and others</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>-</td>
<td>MD 125 mg/L</td>
<td>Incompatible</td>
</tr>
<tr>
<td>Aztreonam</td>
<td>-</td>
<td>LD 1000 mg/L MD 250 mg/L</td>
<td>Stable for up to 24hrs in EI</td>
</tr>
<tr>
<td>Imipenem-cilastatin</td>
<td>-</td>
<td>LD 250 mg/L MD 50 mg/L</td>
<td>Stable for up to 6hrs in EI, 2 hrs in P1 and P2</td>
</tr>
</tbody>
</table>

In patients on APD, increase the last fill volume to 50% of usual dwell volume to maintain ongoing antibiotic exposure.

<table>
<thead>
<tr>
<th>Antifungals</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluconazole (seek ID advice)</td>
<td>6 mg/kg (max. 200mg) In one exchange per day 24-48 hrly</td>
<td>-</td>
<td>Compatible</td>
</tr>
<tr>
<td>Voriconazole (seek ID advice)</td>
<td>2.5 mg/kg (max. 200mg) in one exchange per day 24 hrly</td>
<td>-</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Intraperitoneal dosing recommendations from Sanford Antimicrobial guidelines 2021.

Peritoneal dialysis (PD) fluids: Physioneal 1.36% = P1; Physioneal 3.86% = P2; Extraneal (Icodextrin) = EI, Fresenius = F


#Heparin compatibility should be assessed on a case by case basis – consider type of PD fluid and antimicrobials used IP.