PERITONEAL DIALYSIS – INTRAPERITONEAL ANTIBIOTICS DOSAGE, DURATION, COMPATIBILITY AND STABILITY

1. Purpose	A Clinical Business Rule (ClBR) listing the numerous antibiotics with the recommended dosage and duration for intraperitoneal administration. It also serves as a guideline for the compatibility and stability of antibiotics in peritoneal dialysis fluid and other additives for the safe intra-peritoneal administration in peritoneal dialysis patients.
2. Risk Rating	Medium
3. National Standards	1 – Clinical Governance 3 – Preventing and Controlling Infections 4 – Medication Safety 5 – Comprehensive Care
4. Employees it Applies to	Registered Nurses (RN) Medical Officers (MO) Pharmacists

5. PROCESS

Localised delivery of antibiotics intraperitoneally is preferred for the prevention and/or treatment of peritonitis for peritoneal dialysis patients with important considerations to prevent complications and peritoneal membrane damage:

- Dosing & duration of antibiotic treatment for intraperitoneal (IP) administration varies from oral and intravenous treatment
- Stability of antibiotics in the PD solution and compatibility of antibiotics with other IP additives in the PD solution also varies based on dialysate concentration, temperature and type
- Ask patient if receiving antibiotics for the first time and check allergy list. *Note: High risk of acute anaphylaxis reaction for first timers, refer to* SGH CLIN520 *Acute Anaphylaxis-Management of the Adult Inpatient SGH for management*

5.1 ANTIBIOTICS RECOMMENDED FOR INTRAPERITONEAL (IP) ADMINISTRATION AND ITS INDICATION ARE LISTED IN THE FOLLOWING CLBRS:

1. SGH CLIN 357 *Peritoneal Dialysis Catheter (and Extension set) – Management of Contamination*
2. SGH CLIN 433 *Peritoneal Dialysis (PD) Catheter Infection – Exit Site and Tunnel Infection Management and Treatment*
3. SGH CLIN 442 *Peritoneal Dialysis (PD) – Peritonitis Management and Treatment*

5.2 PRESCRIPTION AND DOCUMENTATION

- Inpatients – intraperitoneal antibiotics must be prescribed in eMeds - Powerchart
- Outpatients – intraperitoneal antibiotics must be prescribed on the National Inpatient Medication Chart (NIMC)
- Telephone orders are permitted according to NSW Health PD2013_043 *Medication Handling in NSW Public Health Facilities*
- Refer to section 5.5 Table for the recommended intraperitoneal antibiotic dose and treatment duration

- Any prescription variation to recommended antibiotic dose and treatment duration, refer to SGH CLIN443 *Peritoneal Dialysis (PD) – Intraperitoneal Additives and Antibiotics*
- Renal medical officers or prescribing medical officers must obtain antibiotic approval and guidance from ID (Infectious Diseases) team as per *SGH-TSH CLIN444 Antimicrobial Stewardship and Antibiotics – Approval and Administration Process, St George and Sutherland Hospitals*

5.3 IP ADMINISTRATION

- Intraperitoneal (IP) administration of antibiotics are only carried out via continuous ambulatory peritoneal dialysis (CAPD).
- Patients on automated peritoneal dialysis (APD) requiring IP antibiotic treatment must be converted to CAPD.
- Inpatient or outpatient intraperitoneal administration of antibiotics – refer to the process outlined in the SGH CLIN443 *Peritoneal Dialysis (PD) – Intraperitoneal Additives and Antibiotics.*

  Note: IP antibiotics can only be administered by PD accredited RNs or RNs under the supervision of PD accredited RNs. PD accreditations required prior to administration of IP antibiotics are:
  - *Continuous Ambulatory Peritoneal Dialysis (CAPD) Freeline Solo Exchange as per assessment for (Appendix B)*
  - *Intra-Peritoneal (IP) Additive Loading and Administration as per assessment form (Appendix C)*
- Home – based IP administration of antibiotics – patients are to be trained on IP antibiotic administration until confident and competent to self-administer and to be provided with completed 'Treatment of PD infection at Home' form as per Appendix A.
  - *Automated peritoneal dialysis (APD) patients are also to be converted and trained on continuous ambulatory peritoneal dialysis (CAPD).*

5.4 PERITONEAL DIALYSIS SUPPORT

- PD team on X33770 or PD CNC on X33775 or page 1091 during hours of operation – Monday to Friday, 0730 to 1600
- 4 South (4S) ward (X33458 or X33446) is the primary contact for after-hours PD support, including weekends and public holidays.

5.5 ANTIBIOTICS RECOMMENDED FOR INTRAPERITONEAL (IP) ADMINISTRATION – DOSAGE, DURATION, COMPATIBILITY AND STABILITY

Dianeal – glucose based PD fluid

Extraneal – icodextrin based PD fluid

Antibiotic treatment dosage and duration In reference to: • SGH CLIN 357 *PDC and Extension set – Management of Contamination* • SGH CLIN 433 *PDC Infection – Exit Site and Tunnel Infection Management and Treatment* • SGH CLIN 442 *PD – Peritonitis Management and Treatment)*	Stability in PD fluid	Compatible additives in PD fluid Note: IP additive or antibiotic should be prepared using a separate syringes Note: Do not administer admixed intraperitoneal additives antibiotics if precipitation occurs	Special considerations Note: All intraperitoneal antibiotics will be administered through CAPD exchange as per SGH WPI 217 *CAPD Freeline Solo Exchange Procedure*
Ampicillin **Maximum dose: 1 gram/day divided into 250mg in each CAPD bag for 4 × CAPD exchanges per day for 14 – 21 days**	Short stability in 2L dianeal – administer immediately after mixing	Heparin sodium (compatible for 5 minutes only – administer immediately after mixing) Compatible with extraneal/icodextrin PD fluid	Incompatible with Gentamicin and Fluconazole Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Use 10 mL syringe, 10 mL water for injection and drawing up needle to dilute Ampicillin 1 g vial turning the Ampicillin solution to 1g/10mlL 2. Discard the 7.5 mL of Ampicillin solution 3. Inject the remaining 2.5 mL of Ampicillin solution using 21G needle into the centre of the PD fluid bung 4. Shake and invert PD fluid bag thoroughly 5. Administer via CAPD 6. Dwell for 6 hours only before next dose

Cefepime (fourth generation cephalosphorin) **Maximum dose: 1 gram/day for 14-21 days**	Stable in 2L dianeal for 14 days if the solution is refrigerated at <4°C temperature	Compatible with extraneal/icodextrin PD fluid (stable for 7 days at 4°C and 2 days in room temperature at 20°C)	Incompatible with Gentamicin and Ciprofloxacin Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Use 10 mL syringe, 10 mL water for injection and drawing up needle to dilute Cefepime 1 g vial turning the Cefepime solution to 1g/10mL 2. Inject all the Cefepime solution using a 21G needle into the centre of the PD fluid bung 3. Shake and invert PD fluid bag thoroughly 4. Administer via CAPD 5. Dwell for 6-8 hours only
Ceftazidime (third generation cephalosphorin) **1 gram is for loading dose only** **Subsequent daily dose is 1 gram/day divided into 250mg in each CAPD bag for 4 × CAPD exchanges per day for 14 – 21 days**	1 gram is stable in 2L dianeal for: • 6 days refrigerated at 4°C • 16 hours in room temperature (≤25°C) • 2 hours in higher temperature (>26°C) 250 mg is stable in 2L dianeal for: • 7 days refrigerated at ≤4°C • 4 days in room temperature (≤25°C)	Compatible with Vancomycin in ≥1L dianeal Compatible with extraneal/icodextrin PD fluid (stable for 2 days in room temperature ≤25°C) **Vancomycin, aminoglycosides and cephalosporins can be mixed in the same dialysis solution bag without loss of bioactivity (only certain aminoglycosides and cephalosporins can be administered together e.g. cefazolin and gentamicin*	Incompatible with Vancomycin in <1L dianeal Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Use 10 mL syringe, 10 mL water for injection and drawing up needle to dilute Ceftazidime 1 g vial turning the Ceftazidime solution to 1g/10mL 2. **1 gram loading dose:** Inject all the Ceftazidime solution using a 21G needle into the centre of the PD fluid bung Or **Subsequent 250 mg dose:** a. Discard the 7.5 mL of Ceftazidime solution b. Inject the remaining 2.5 mL of Ceftazidime solution using a 21G needle into the centre of the PD fluid bung 3. Shake and invert PD fluid bag thoroughly 4. Administer via CAPD 5. Dwell for 6 hours only before next dose

Ceftriaxone (third generation cephalosphorin) **Maximum dose: 1 gram/day for 14-21 days**	1 gram is stable in 2L dianeal for: • 24 hours in room temperature (≤23°C) Or • 6 hours in higher temperature (37°C)	No compatibility information – do not mix with other IP additives	Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Use 10 mL syringe, 10 mL water for injection and drawing up needle to dilute Ceftriaxone 1 g vial turning the Ceftriaxone solution to 1g/10mL 2. Inject all the Ceftriaxone solution using a 21G needle into the centre of the PD fluid bung 3. Shake and invert PD fluid bag thoroughly 4. Administer via CAPD 5. Dwell for 6-8 hours only
Cephazolin (first generation cephalosphorin) **1 gram is for loading dose only** **Subsequent daily dose is 1 gram/day divided into 250mg in each CAPD bag for 4 × CAPD exchanges per day for 14 – 21 days**	1 gram is stable in 2L dianeal for 2days at 38°C 250mg is stable in 2L dianeal for 2 days at 38°C	Compatible with extraneal/icodextrin PD fluid (stable for 7 days in room temperature ≤25°C) Compatible with Heparin and Vancomycin Compatible with Gentamicin: • Combination of 250mg Cephazolin and Gentamicin in dianeal is stable for 2days in room temperature (≤25°C) • Combination of 1g Cephazolin and Gentamicin in dianeal has short stability – administer immediately after mixing **Vancomycin,*	Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Use 10 mL syringe, 10 mL water for injection and drawing up needle to dilute Cephazolin 1 g vial turning the Cephazolin solution to 1g/10mL 2. **1 gram loading dose:** Inject all the Cephazolin solution using a 21G needle into the centre of the PD fluid bung Or **Subsequent 250 mg dose:** a. Discard the 7.5 mL of Cephazolin solution b. Inject the remaining 2.5 mL of Cephazolin solution using a 21G needle into the centre of the PD fluid bung 3. Shake and invert PD fluid bag thoroughly 4. Administer via CAPD 5. Dwell for 6 hours only before next dose

		aminoglycosides and cephalosporins can be mixed in the same dialysis solution bag without loss of bioactivity	
Ciprofloxacin **Maximum dose of 200 mg/day divided into 50 mg in each CAPD bag for 4 × CAPD exchanges per day for 14 – 21 days** ***OR give oral 250mg BD as per ISPD guidelines***	50 mg is stable in 2L dianeal for: • 14 days refrigerated at 4°C • 7 days in room temperature (≤25°C) • 2 days in higher temperature (>26°C)	Compatible with Ceftriaxone (observe and do not administer if precipitation occurs) *Note: For **ORAL** administration of ciprofloxacin – Administer first and 2 hours away from sevelamer, calcium, oral iron, zinc preparations, sucralfate, magnesium-aluminium antacids and/or milk to prevent chelation interactions reducing quinolone absorption*	Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Ciprofloxacin bag may come in 100mg/50mL or 200mg/100mL solution 2. Alcohol swab the rubber bung on Ciprofloxacin bag 3. Use 25 mL syringe and drawing up needle to aspirate 25 mL from Ciprofloxacin bag 4. Replace drawing-up needle with 21G needle 5. Alcohol swab the rubber bung on dialysis fluid 6. Inject the 25 mL Ciprofloxacin solution into the centre of the PD fluid bung 7. Shake and invert PD fluid bag thoroughly 8. Administer via CAPD 9. Dwell for 6 hours only before next dose
Fluconazole **Daily 200 mg until PD catheter is removed** **Note: *It is recommended to arrange for urgent PD catheter removal for confirmed fungal peritonitis***	Unknown stability in dianeal – best to administer immediately after mixing		Incompatible with Ampicillin, Ceftazidime, Ceftriaxone Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Fluconazole vial may come in 100mg/50mL or 200mg/100mL solution 2. Use 2 x 50 mL syringes with drawing up needles to aspirate the 200 mg/100 mL Fluconazole solution 3. Inject all the 200mg/100 mLl Fluconazole solution using 21G needles into the centre of the PD fluid bung

			4. Shake and invert PD fluid bag thoroughly 5. Administer via CAPD 6. Dwell for 6 – 8 hours only
Gentamicin (Aminoglycoside) **Maximum dose 40mg/day for 14-21 days. Usually administered in the last CAPD bag exchange for night time dwell** *Note:* 1. *Take serum trough level after 3 days of daily treatment* 2. *For daily serum trough level if patient is on daily Gentamicin for ≥3 days* 3. *Withhold gentamicin if serum trough level is >1 mg/L* 4. *For regular hearing and vestibular function testing if gentamicin treatment is ≥5 days*	Short stability in 2L dianeal or extraneal – administer immediately after mixing	Compatible with extraneal/icodextrin PD fluid – administer immediately after mixing Can be mixed with Vancomycin and certain Cephalosphorins i.e. cefazolin & ceftazidime without loss of bioactivity **Vancomycin, aminoglycosides and cephalosporins can be mixed in the same dialysis solution bag without loss of bioactivity (only certain aminoglycosides and cephalosporin's can be administered together e.g. cefazolin and gentamicin* Can be mixed with Heparin (observe and do not administer if precipitation occurs)	Incompatible with Flucloxacillin and Heparin Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Gentamicin ampoule comes in 80mg/2mL solution 2. Alcohol swab the Gentamicin ampoule and break top to open 3. Use 3 mL syringe and drawing up needle to aspirate all content of Gentamicin ampoule 4. Discard 1 mL of Gentamicin solution 5. Inject the remaining 1 mL Gentamicin solution using a 21G needle into the centre of the PD fluid bung 6. Shake and invert PD fluid bag thoroughly 7. Administer via CAPD 8. Dwell for 6 hours only

Meropenem **Maximum dose: 1 gram/day for 14 – 21 days**	No stability information, once reconstituted, administer immediately		No incompatibility information – do not mix with other IP additives Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Meropenem comes in 500 mg vial 2. Using a 20 mL syringe & drawing up needle, dilute each Meropenem vial with 20mL (2 x 10 mL) water for injection. Repeat this process until the required Meropenem dose is diluted. 3. Inject all the diluted Meropenem solution using 21G needle into the centre of the PD fluid bung 4. Shake and invert PD fluid bag thoroughly 5. Administer via CAPD 6. Dwell for 6 – 8 hours only
Vancomycin **15 – 30 mg/kg to a maximum of 2 grams every for 21 days** *Note* • *Check trough vancomycin level on day 3 – 5* • *Patient should receive another dose if trough serum levels is <15mg/mL. Adjust repeat dose based on trough serum level* • *Timing of repeated dosing should be based on trough serum level and is likely to be every 3 – 5 days.*	2 grams is stable in 2 Litres dianeal for 8 hours at 37°C	Compatible in extraneal/icodextrin Can be mixed with Gentamicin and certain Cephalosphorins i.e. cefazolin & ceftazidime without loss of bioactivity **Vancomycin, aminoglycosides and cephalosporins can be mixed in the same dialysis solution bag without loss of bioactivity (only certain aminoglycosides and cephalosporin's can be administered together e.g.*	Incompatible with Ciprofloxacin Incompatible with Ceftazidime in <1L dianeal Prescribe, prepare and administer as per SGH CLIN443 *PD – Intraperitoneal Additives and Antibiotics:* 1. Vancomycin comes in 500 mg vials 2. Using a 20 mL syringe and drawing up needle, dilute each vancomycin vial with 20mL (2 x 10 mL) water for injection. Repeat this process until the required vancomycin dose is diluted. 3. Inject all the diluted Vancomycin solution using a 21G needle into the centre of the PD fluid bung 4. Shake and invert PD fluid bag thoroughly 5. Administer via CAPD 6. Dwell for 6-8 hours only

Levels are not required if dosing is weekly;		*cefazolin and gentamicin* Can be mixed with Heparin (observe and do not administer if precipitation occurs) Compatible with Ceftazidime in ≥1L dianeal	

6. Cross References	NSW Health PD2013_043 *Medication Handling in NSW Public Health Facilities* NSW Health PD2017_013 *Infection Prevention and Control Policy* NSW Health PD2016_058 *User applied Labelling of Injectable Medicines, Fluids and Lines* NSW Health PD2021_033 *Patient Identification Bands* Australian Commission on Safety and Quality in Health Care *National Standard for User Applied labelling of Injectable Medicines, Fluids and Lines* Australian Commission on Safety and Quality in Healthcare *Guidelines for using the National Inpatient Medication Chart 7/2009* NHMRC *Australian Guidelines for the prevention and control of Infection in Healthcare* NSW Health PD2020_049 *Clinical and Related Waste Management for Health Services* SESLHDPR/267 *Medicine: Continuity of Management and Documentation* SESLHDPD/271 *Aseptic Technique* SGH-TSH CLIN027 - *Aseptic Technique - Competency and Education Requirements* SGH-TSH CLIN444 Antimicrobial Stewardship and Antibiotics – Approval and Administration Process, St George and Sutherland Hospitals SGH CLIN520 *Acute Anaphylaxis- Management of the Adult Inpatient SGH* SGH CLIN 357 *Peritoneal Dialysis Catheter (and Extension set) – Management of Contamination* SGH CLIN 433 *Peritoneal Dialysis (PD) Catheter Infection – Exit Site and Tunnel Infection Management and Treatment* SGH CLIN 442 *Peritoneal Dialysis (PD) – Peritonitis Management and Treatment* SGH CLIN443 *Peritoneal Dialysis (PD) – Intraperitoneal Additives and Antibiotics* SGH WPI 217 *Continuous Ambulatory Peritoneal Dialysis (CAPD) Freeline Solo Exchange Procedure*
7. Keywords	Peritoneal Dialysis, Intraperitoneal antibiotics, Intraperitoneal additives
8. Document Location	Renal, Peritoneal Dialysis
9. External References	Bailie, G., & Kane, M. (1995). Stability of drug additives to peritoneal dialysate. *Peritoneal Dialysis International, 15*(8), 328-335. Ballinger, A. P., Suetonia; Wiggins, Kathryn; Craig, Jonathan; Johnson, David; Cross, Nicholas; Strippoli, Giovanni (2014). Treatment for peritoneal dialysis-associated peritonitis. *Cochrane Database of Systematic Reviews, 4*. doi: 10.1002/14651858.CD005284.pub3

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	Australasians with Renal Impairment [cited 2015 March]; Available from: http://www.cari.org.au/Dialysis/dialysis%20peritonitis/dialysis_peritonitis.html
10. Consumer Advisory Group (CAG) approval	Not applicable
11. Implementation and Evaluation Plan	**Implementation:** The document will be published on the SGH-TSH business rule webpage and distributed via the monthly SGH-TSH CGD report. Inservices **Evaluation:** IMS+ Monitoring
12. Knowledge Evaluation	**Q1: What are the important considerations for IP antibiotics?** *A1: IP antibiotics dosing and duration are different from IV and oral, check allergy list and if first – time dose, ascertain IP antibiotic stability in PD fluid and compatibility with other IP additives.* **Q2: Who can administer IP antibiotics?** *A2: PD accredited RNs or RNs under the supervision of PD accredited RNs.* **Q3: How are IP antibiotics administered?** *A3: Via CAPD only. Patients on APD requiring IP antibiotic treatment must be converted to CAPD.*
13. Who is Responsible	Director of St George and Sutherland Renal Service Nursing Unit Manager, Dialysis Unit

Approval for: **Peritoneal Dialysis – Intraperitoneal Antibiotics Dosage, Duration, Compatibility and Stability**	
Specialty/Department Committee	Committee: Peritoneal Dialysis Committee Chairperson: Franziska Pettit, Staff Specialist Date: 26.08.2021
Nurse Manager (SGH)	Christine Day, Nurse Manager Medicine Date: 01.09.2021
Medical Head of Department (SGH)	George Mangos, Department Head Renal Services Date: 26.08.2021
Safe Use of Medicines Committee (SGH)	Chairperson: A/Prof Winston Liauw Date: 08.02.2022
Antimicrobial Stewardship (AMS)	Chairperson: Pam Konecny Date: 20.06.2022
Executive Sponsor	George Mangos, Department Head Renal Services Date: 26.08.2021
Contributors to ClBR	**Contribution**: Sonia Enggist, Medicines Information Pharmacist

Revision and Approval History				
Revision Date	Revision number	Reason	Coordinator/Author (Position)	Revision Due
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General Manager's Ratification
Paul Darcy (SGH) Date: 26.11.2021