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I. BACKGROUND/PURPOSE

This is an adaptation of international peritonitis guidelines in peritoneal dialysis (PD) populations with modifications for SHC patients.

II. DEFINITIONS

- A. Continuous ambulatory peritoneal dialysis (CAPD): manual exchanges (typically dispersed throughout the day) of peritoneal dialysis
- B. Continuous cycler-assisted peritoneal dialysis (CCPD): automated (machine-assisted) exchanges of peritoneal dialysis bags at night, with an occasional manual exchange during the day
- C. Peritonitis: abdominal pain and/or cloudy effluent with peritoneal fluid (after 2 hour dwell) WBC > 100 k/ μ L with 50% PMNs, and/or culture positivity (**See peritonitis diagnosis section for rare exceptions)

III. PROCEDURES/GUIDELINES

A. Peritonitis Diagnosis

- 1) Peritonitis fluid sample
 - i. If a patient has an existing indwelling solution that has been dwelling anywhere from 2 to 8 hours, may use sterile technique to sample* (Note color and turbidity).
 - ii. If patient does not have any indwelling solution, 1 L of dialysate should be infused and permitted to dwell a minimum of 2 hours and then drained for sampling (Note color and turbidity).
 - iii. May use drained effluent bag brought from home for sampling if patient can confirm that dialysate dwelled for at least 2 hours and instructions provided by CAPD nurses were followed.
 - iv. MD should examine the exit site (using mask and gloves): the patient could have a tunneling infection, PD catheter may need to be removed.

* Sampling of PD fluid should only be done by dialysis nurses. Specific 150 mL sampling bags manufactured by Baxter should be connected to the patient's transfer set or in rare cases, may drain entire indwelling solution into an effluent bag and obtain sample using a syringe from the effluent bag port.

- 2) Fluid sample should be tested for all of the following:
 - a. Cell count with differential
 - b. Gram Stain
 - c. Culture (this sample will be inoculated by lab techs at Stanford into aerobic and anaerobic sets of blood culture bottles)
- 3) Confirm peritonitis diagnosis with 2 of the following criteria:
 - a. abdominal pain and/or cloudy dialysis effluent
 - b. Peritoneal dialysis fluid with WBC count 100 k/ μ L with >50% PMNs**
 - c. Positive dialysis effluent culture

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***Note: in some cases even if WBC count is less than 100 k/μL but PMNs are predominant and/or fluid is cloudy, treatment may be considered until culture results return*

B. Peritonitis treatment evaluation

- 1) Repeat cell count with differential and culture, on Day 3 (72 hours) post- treatment.
- 2) Sample used to assess treatment response must be obtained from 1L of dialysate fluid that has been instilled and dwelled for at least 2 hours. (As a standard approach, use the effluent from the overnight CCPD treatment).

C. Peritonitis Management

- 1) Do not delay antibiotics for culture data if high clinical suspicion as delaying antibiotics can increase mortality.
- 2) Prioritize obtaining microbiological specimens upon presentation as soon as possible.
- 3) Empiric antibiotic selection
 - a. Empiric intraperitoneal (IP) regimen consists of **vancomycin + ceftazidime**
*Consider previous cultures and sensitivities
- 4) Route of antibiotic administration: Intraperitoneal (IP) route is preferred unless patient has features of systemic sepsis in which case Intravenous (IV) route should be utilized without delay.

Note: if both intravenous (IV) and intraperitoneal (IP) antibiotic therapies are ordered, the appropriate route for the patient's clinical status and indication should be clarified with primary and nephrology treatment teams to avoid duplication of therapy, supratherapeutic drug levels, and toxicities.

- a. Intraperitoneal (IP):
 - i. IP administration of antibiotics is the preferred route for treating peritonitis due to high IP drug concentrations achieved with significantly enhanced absorption during peritonitis.
 - ii. For SHC patients, intermittent dosing (1 daily exchange) via CCPD is advised.
 - iii. IP antibiotics must be instilled for a minimum of 6 hours
 1. ALL patients undergoing peritonitis treatment with IP antibiotics should have one exchange of peritoneal dialysate (preferably the last fill dialysate solution) with antibiotics dwelling for at least 6 hours.
 - iv. Recommended IP Intermittent dosing of antimicrobials

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Antimicrobial	Dose (Added to 1 exchange per day only)	Recommended frequency (dwell at least 6 hours)
Aztreonam (For Beta-lactam allergy)	2000 mg	Daily
Cefazolin	15mg/kg without residual renal function 20mg/kg with residual renal function (Max dose = 2g)	Daily
Cefepime	1000 mg	Daily
Ceftazidime	1000 mg without residual renal function 1500 mg with residual renal function	Daily
Ceftriaxone	1000 mg	Daily
Fluconazole	200 mg	Daily
Gentamicin (concern for multi-drug resistant organisms (MDRO)*)	0.6 mg/kg	Daily
Meropenem	1000 mg	Daily
Vancomycin	15-30 mg/kg (Max dose = 2g)	Every 5-7 days (based on vancomycin levels)

*See ISPD guidelines for comprehensive list of antibiotics and recommendations continuous (all exchanges) dosing

*Risk factors for MDROs: community acquired (prior IV antibiotics use within 90 days, known colonization), hospital acquired (prior IV antibiotics use within 90 days, 5 or more days of hospitalizations prior to onset, acute renal replacement therapy prior to onset, septic shock, known colonization)

v. Vancomycin management:

1. Recommended IP vancomycin dose is 15-30mg/kg every 5-7 days adjusted based on vancomycin levels (target = 15-20 mg/L). In general higher doses (30 mg/kg) are recommended at start of IP dosing unless patients have received IV vancomycin recently.
2. **After the initial dose of IP vancomycin, remove vancomycin from the last fill bag on day 2, begin monitoring vancomycin levels**

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on Day 3 (every 2-3 days).

3. Pharmacists will assist nephrology service but nephrology service will be primarily responsible for the management of vancomycin dosing and monitoring.
 - a. MD will place “vancomycin dose-by-level placeholder” order (available in CCPD and CAPD epic order sets)
 - b. Pharmacists will peripherally monitor vancomycin dosing and enter intervention documentation (iVents) daily for internal communication.
 - c. Pharmacists will communicate recommendations with the nephrology team regarding subsequent dosing and/or monitoring
 - vi. Nephrology providers will enter IP antibiotic orders by 2 pm to allow dialysis RN and pharmacy time for preparation.
- 5) **Treatment duration for bacterial peritonitis:**generally 21 days with exception for longer duration for *acinetobacter*, *pseudomonas* spp and *stenotrophomonas* spp and shorter duration for streptococci and CoNS (14 days)
 - 6) For culture negative peritonitis – consider continuation of empiric antibiotics for 14 days if patient clinically improving.
 - 7) **Secondary antifungal prophylaxis** with one of the following agents should be initiated for PD patients receiving antibiotics for duration of antibiotics + 7 days
 - a. **Nystatin suspension – swish and swallow 5 mL of 100,000 units/mL oral suspension 4 times daily (preferred prophylaxis to minimize risk of azole resistance and toxicity).**
 - b. Fluconazole tablets – 200 mg PO on day 1, followed by 100 mg PO daily (Note: fluconazole may interact with medications such as tacrolimus).
2. Refractory and relapsing peritonitis
 - a. **Definitions:**
 - i. **Refractory:** persistently cloudy bags or persistent dialysis effluent w/ leukocyte count >100 after 5 days of appropriate antibiotics
 - ii. **Relapsing:** episode occurring within 4 weeks of completion of therapy with the same organism or on sterile episode
 - iii. **Recurrent:** episode occurring within 4 weeks of completion of therapy but with a different organism

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- iv. **Repeat:** episode occurring more than 4 weeks after completion of therapy with the same organism
 - b. Management should be individualized based on patient specific criteria. Catheter removal may be necessary.
3. Fungal peritonitis
- a. Immediate catheter removal is recommended with consultation among inpatient/outpatient nephrology providers.
 - b. Treatment with appropriate anti-fungals for at least 14 days after catheter removal is warranted.

I. REFERENCES

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II. RELATED DOCUMENTS / PROCEDURES

- A. PCM: Care and Management of Patients on Peritoneal Dialysis

III. DOCUMENT INFORMATION

- A. Original Author/Date
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1. Antibiotic Subcommittee 12/2018, 01/2024
 2. Pharmacy & Therapeutic Committee 01/2019, 02/2024
 3. Nephrology Department 02/2024

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