Prevention of PD Peritonitis: Best Practices



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A collaboration between Northwest Kidney Centers and UW Medicine

Objectives

- 1. Use a case-based format to review key principles for the prevention of peritonitis in patients treated with PD
- Review key clinical practice guidelines and literature supporting current recommendations for the prevention of PD peritonitis

Peritonitis remains Achilles heel for PD

- The most common infection in PD patients
- Major cause of morbidity and mortality in PD
 - Increased incidence of transfer to in-center HD
 - Responsible for up to 41% of transfers
 - Increased risk for hospitalization and mortality
 - Patient pain & enhanced burden of treatment
 - Injury to peritoneal membrane leading to short-term UF problems & long-term scarring



Li PK-T et al. PDI 2022;42(2): 110-153

Special Series/Guidelines

ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment

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Abstract

Peritoneal dialysis (PD)-associated peritonitis is a serious complication of PD and prevention and treatment of such is important in reducing patient morbidity and mortality. The ISPD 2022 updated recommendations have revised and clarified definitions for



Peritoneal Dialysis International 2022, Vol. 42(2) 110–153 © The Author(s) 2022

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PERITONEA DIALYSIS INTERNATIONAL

Key components for peritonitis prevention

- Establish a CULTURE of infection prevention!
- Catheter-related factors & exit site care
- Patient training and technique
- Wet contamination protocols
- Prophylactic antibiotics for certain procedures
 - Dental procedures
 - Colonoscopy & GYN procedures
- Fungal prophylaxis
- Avoiding hypokalemia and H2 receptor antagonists

Establishing a culture of infection prevention



ANTIBIOTIC

INFECTION PREVENTION AND CONTROL CONTRIBUTES TO ACHIEVING SUSTAINABLE DEVELOPMENT COALS and could save millions at lives







Encourage active sand patient-centered communication in the PD unit around infection prevention

Recruit and maintain adequate numbers of staff, train and retrain in infection prevention, invest in staff professional development



Monitor infections and make action plans to reduce their frequency (use PDSA framework)



Fastidious hand hygiene, PPE use when appropriate for both patients and staff 100% of the time



Translate up to date evidence and clinical practice guidelines into specific infection prevention and control protocols

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Case 1: Mr. R

- 65 year old male with history of CVA and persistent dysarthria, type 1 DM, and ESRD on PD x 9 months.
- No history of peritonitis
- Presents with pain, erythema, and small amount of pus at his PD catheter exit site



PD catheter Exit Site Infection (ESI): Purulent discharge with or without erythema of the skin at the catheter-epidermal interface

Risk of peritonitis greatly increased after ESI



Days after initial diagnosis ESI

 Post-hoc analysis of RCT comparing antibiotic ointments for prevention of ESI

- 203 adult PD patients followed for 18 months
- 40% of patients had DM2
- 44 ESIs in 34 patients
- <u>87 peritonitis episodes in</u>
 <u>57 patients</u>

Strong association between ESI and subsequent risk of peritonitis in PD patients at least out to 60 days

Van Diepen AT, et al. CJASN 2012;7(8):1266-71

Principles in Fashioning Exit Site to prevent ESI and Peritonitis

- Should be away from skin creases, and folds
- Should be clearly visible to the patient to perform daily exit site care
- Inserted through the abdominal wall with least amount of tubing stress
- At least one inch from the superficial cuff
- Generally achieved when planned with patient both upright and supine



Crabtree J. Kidney Int Suppl 2006; 70: S27-37

Where Is It Relative to the Belt-Line? Need to Determine Before Patient Sedated



Belt line above the Umbilicus: Exit site below the umbilicus

Belt line below the Umbilicus: Exit site above the umbilicus

Crabtree J. Kidney Int Suppl 2006; 70: S27-37

Is the Exit Site Visible? Particularly Important for the Obese





Should be visible for a patient to perform daily exit=site care





Photo credit: Dr. John Crabtree

No Sutures or Staples At Exit Site!





Photo credit: Dr. John Crabtree

Long-Term Exit Site Care

- Exit site should be cleansed at least twice weekly and every time after a shower
 - Just use soap and water no cleansing agent has been shown to be superior with respect to preventing catheter-related infections
 - Thorough pat exit site dry with clean towel (not towel used to dry body)
- Daily application antibiotic to the exit site
 - This is critical, not optional!
 - <u>Gentamicin</u> is superior to mupirocin for prevention of gram peritonitis, and similar to mupirocin for prevention of gram + peritonitis
- If patients wish to swim (no lakes or rivers), cover exit site with ostomy bag and do exit site care immediately thereafter

Szeto et al, Perit Dial Int 2017; 37: 141-154 Bernandini et al, J Am Soc Nephrol 2005; 16

Case 1 revisited - Mr. R



Catheter superficial cuff extrusion

- Patient underwent superficial cuff shaving and wound packing by PD surgeon
- Wound grew MSSA
- Treated with antibiotics x 2 weeks
- Never developed
 peritonitis

Photo credit: Mr. Rivara

PD Catheter ESI Management

Management:

- Send swab for gram stain and culture
- Empiric therapy with gram positive coverage depending on local antibiogram or patient's past history of methicillin resistant organisms
- Adjust treatment based on isolate
- Generally treat for two weeks; Pseudomonas x 3 weeks
- Simultaneous removal and replacement of catheters for refractory exit site infections



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Case 1 revisited (again) – Mr. R

- Returns to PD center to meet with his primary RN after ESI
- Confesses he hadn't been using antibiotic ointment daily or consistently doing hand hygiene with exit site care
- You notice that he has some hand dexterity issues which you hadn't notice previously
- What should the PD clinic team do?

Assessment of PD exchange technique and knowledge

 "We <u>recommend</u> that PD exchange technique and knowledge be regularly reassessed and updated, <u>with an emphasis on direct</u> <u>inspection of practice of PD technique</u>." (1C)

Indications for PD Retraining

Following prolonged hospitalization

Following peritonitis and/or catheter infection

Following change in dexterity, vision, or mental acuity

Following change in caregiver for PD exchange

Following change to a different supplier or type of connection

Following other interruptions in PD (i.e. a period on in-center HD)

Li PK-T et al. PDI 2022;42(2): 110-153

Importance of training (and retraining!)

150 incident PD patients in China



P<0.01 for technique inspection versus usual care

Xu Y et al, NDT 2020, 35(4):676-686

191 Italian PD patients observed at home and followed for peritonitis incidence



RR of peritonitis 60% higher in nonadherent group.

Russo et al, Kidney Int 2006;70:S127

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Case 2: Ms. P

 62 year old female who recently initiated PD 4 months ago, lives alone, calls and tells you that she is in the middle of doing a manual PD exchange, that she made the connect between the catheter and solution bag, but thinks there may have been touch contamination.



- What should she (and you!) do?
- Key question: Was the clamp on the transfer set open or closed?

Contamination of the PD system

@NephroSeeker, Cristina Popa @NSMCInternship



- We <u>sugge</u> system to
- Some exai
 - Cephales
 - Alternation

PD PERITONITIS : WET vs DRY CONTAMINATION

Dry contamination - outside a closed PD system - disconnection distal to a closed clamp



nent team if

on of the PD

Wet contamination

- open system
- contaminated dialysis fluid is infused

Examples:

- leaks from dialysate bags
- leaks or breaks in tubing proximal to the tubing clamp
- catheter administration set was left open for
- an long period
 - breach of aseptic technique

PD System

hens:

Wet contamination is associated with incident peritonitis

- Retrospective cohort study of 296 patients at 1 high-volume Hong Kong PD unit
- 548 episodes of PD system contamination
 - 246 dry contamination
 - 302 wet contamination
- 17 total peritonitis episodes after contamination
 - All in wet contamination group
 - None in dry contamination group
- Only 1 patient who received prophylactic antibiotics developed peritonitis

Incidence of Peritonitis in Patients Receiving or Not Receiving Prophylactic Antibiotics after Wet Contamination					
Patient	Antibiotic prophylaxis				
group	Yes	No	TOTAL		
No peritonitis	181	104	285		
Peritonitis	1	16	17		
TOTAL	182	120	302		

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Case 3: Ms. S

- 54 year old Spanish-speaking female, ESRD on PD for the past 15 months, presents to the ED with complaints of 2 days of bright red blood per rectum. Exam in the ED revealed no external hemorrhoids. Hgb had decreased from 10 g/dL to 8.8 g/dL. She is hemodynamically stable.
- GI saw patient in the ED and recommended non-urgent outpatient colonoscopy. They ask you if the patient needs prophylactic antibiotics and/or modification of her PD prior to the procedure.

Invasive GI and GN procedures in PD patients

ISPD 2022 peritonitis guidelines:

- "We suggest antibiotic prophylaxis prior to colonoscopy (2C) and invasive gynecological procedures (2D).
 - No established regimen. Some options:
 - IV cefazolin + IV metronidazole (or piperacillin-tazobactam)
 - Oral ampicillin 1000mg + ciprofloxacin 500mg + metronidazole 250mg
- "We suggest drainage of PD fluid to keep the abdomen empty before endoscopic gastrointestinal or instrumental gynecological procedures (2D)."
 - Rational is to enhance host defense

What about upper endoscopy and dental procedures?

- Very little data (mostly case-reports and a small case series) assessing the risk of peritonitis after upper endoscopy (gastroscopy).
 - One single-center observational study of 408 gastroscopy procedures among 216 PD patients found a 3.9% incidence of peritonitis within 1 week.
- Perhaps even less data regarding dental procedures. One option:
 - Oral amoxicillin 2 grams, 2 hours prior to the procedure





Fungal prophylaxis

- From ISPD guidelines (2022):
 - "We recommend that anti-fungal prophylaxis be co-prescribed whenever PD patients receive an antibiotic course, regardless of the indication for the course (1B)."
- 2 possible regimens:
 - Oral nystatin: 500,000 units 4x/day
 - Oral fluconazole: 200mg QOD or 100mg daily

No data on how long an antibiotic course needs to be to justify anti-fungal prophylaxis

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Case 4: Ms. M

- 46 year old Spanish-speaking female with ESRD secondary to type 2 diabetes. Her PD prescription is: 4 cycles x 1.8L over 9 hours, last fill x 1.5 liters with 1 daytime exchange.
- Despite potassium chloride supplementation at 20meq/day, her serum potassium has been 3.4 to 3.6 meq/L over the past few months.
- Should you be more aggressive regarding potassium supplementation?

More aggressive potassium supplementation reduces peritonitis risk in PD patients





167 patients at 7 PD centers in Thailand Randomized to:

1) proactive potassium supplement (goal 4-5 mEq/L)

2) reactive (supplement when <3.5 mEq/L)

Primary outcome: time to first peritonitis

Pichitport et al. Am J Kidney Dis 2022;80(5)

Avoiding H2 blockers to prevent peritonitis

- "We suggest that avoiding or limiting the use of histamine-2 receptor antagonists may prevent enteric peritonitis (**2C**).
- Retrospective cohort study of 691 incident PD patients at single center in Spain
- Primary exposures:
 - H2 antagonist use
 - PPI use
- Primary outcomes:
 - Enteric peritonitis
 - Mortality

	HR	95% CI	P-value
Enteric peritonitis			
PPI	1.61	0.98, 2.51	0.06
H2A	1.67	1.02, 2.80	0.04
Infectious mortality			
PPI	0.68	0.65, 1.82	0.75
H2A	1.78	1.01, 3.21	0.049

Perez-Fontan M, et al. PLOS one 2016;11(2):e0148806

Key Take-Home Points

- 1. Infection prevention is a key major focus for any PD program
- Some key core principles for prevention of ALL infections
 Establish a <u>CULTURE</u> of infection prevention
- 3. There are key evidence-based measures to prevent peritonitis in PD patients
 - Catheter factors, exit site care, patient training, contamination protocols, antibiotic prophylaxis, avoiding hypokalemia & H2 blockers

Questions?



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