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Peritonitis Management
The Good, the Bad and the Ugly

USMP/IMG2/16-0001(2) 3/17

- This program is sponsored by, and on behalf of, Baxter Healthcare Corporation
- I am employed by Baxter Healthcare Corporation as a Clinical Educator in the Baxter Renal Sales Organization

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Objectives

Upon completion of this session, you will be able to:

- Outline a brief history of peritonitis and its influence on PD therapy through the years
- Describe the difference between suboptimal versus optimal access site locations, the impact of using sutures to anchor PD catheter, and when cloudy effluent is a confirmation of infectious peritonitis
- Describe the importance of being able to calculate peritonitis rates
- Identify key recommendations for preventing PD-related peritonitis using the latest updates from the International Society of Peritoneal Dialysis (ISPD)

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Historical Overview of Peritonitis

Achilles Heel of Peritoneal Dialysis

Common and Serious Complication

Deterrent to the Therapy

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Historical Overview of Peritonitis

Year	Technology / Event	Infection Rates
Late-1940s	High rate of infection with continuous peritoneal lavage	-
1940	-	-
1951	Intermittent Peritoneal Lavage Nylon Catheter	PD infection rates = 5.2-7.5 episodes/pt yr
1964	Long-term Intermittent Peritoneal Dialysis Silicone rubber catheter-PD	Infection rates = 0.23-1.2 episodes/pt yr
1976	Bottled dialysate for CAPD	peritonitis rates = 4.6 episodes/pt yr
1978	Plastic dialysate bags	peritonitis rates = 1.2-6.3 episodes/pt yr
1988	Straight connecting tubes replaced w Y-set	-

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Historical Overview of Peritonitis₄

- United States Renal Data System (USRDS) – do not capture peritonitis rates - no national data base for comparison
- In 2005 – The University of Missouri reported a clinically significant decline in the rate of peritonitis over 28-year period⁴
 - Retrospective chart review of all PD patients followed over 28 years from 1977 - 2004
 - N – 682 for a total follow-up duration of 15,435 patient-months
 - Initial rate of peritonitis in 1977 – 5.8 episodes /patient year

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Historical Overview of Peritonitis₄

Year	Rate (episodes/patient year)
78	5.8
79	3.7
80	1.4
81	1.6
82	1.3
83	0.9
84	0.9
85	1.0
86	1.0
87	0.8
88	0.7
89	0.6
90	0.6
91	0.6
92	0.6
93	0.6
94	0.5
95	0.7
96	0.5
97	0.5
98	0.6
99	0.4
00	0.5
01	0.3
02	0.3
03	0.2
04	0.4

Peritonitis rate at the University of Missouri/Dialysis Clinics Inc. 1977-2004

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Historical Overview of Peritonitis₆

Good clinical outcomes can be achieved when a dedicated group of professionals continuously work to improve the care of PD patients.⁶

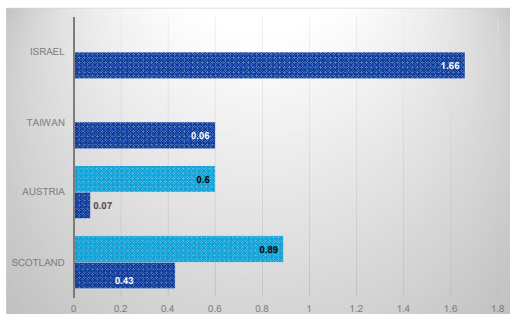
Year	Peritonitis Episodes/Patient Year
83	0.95
84	0.85
85	0.8
86	0.75
87	0.7
88	0.65
89	0.6
90	0.55
91	0.5
92	0.45
93	0.4
94	0.35
95	0.3
96	0.25
97	0.2
98	0.15
99	0.1
00	0.15
01	0.2
02	0.25
03	0.3
04	0.35
05	0.35

Peritonitis in episodes per dialysis year at risk at the dialysis unit affiliated with the University of Pittsburgh

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Historical Overview of Peritonitis

Variation in Peritonitis Rates By Country

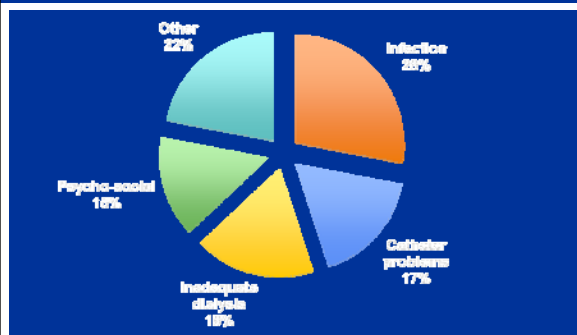


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THE IMPACT OF PERITONITIS ON THERAPY

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Causes of PD Dropout₃



Adapted from: Mujais S, Story K. Peritoneal dialysis in the US: Evaluation of outcomes in contemporary cohorts. *Kidney Int* 2006;70 (Suppl 103):S21-S26. USMP/IMG2/16-0001(2) 3/17 | 20

Peritonitis Impact on the Therapy₉

- Results in catheter removal in 22% cases overall
- Results in transfer to HD in 18% of cases overall
- Complicated by relapse in 14% of cases overall
- Results in death in 2-6% of cases overall
- Adverse changes to peritoneal membrane
- Rare contributor to Encapsulating peritoneal sclerosis (EPS)

Mehrotra R, et al. The current state of peritoneal dialysis. JASN 2016; 27:epub.
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Suboptimal Exit-Site Creation



Image courtesy of John Crabtree MD
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Catheter Placement



Preoperative Postoperative

Image courtesy of John Crabtree MD

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Sutures Used As an Anchoring Stitch



Image courtesy of John Crabtree MD

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No One Size / Location Fits All!

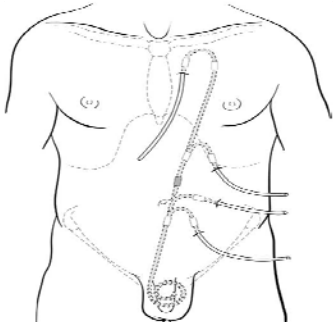



Image: Crabtree JH. Kidney Int. 2006;70(suppl 103):S27-S37.

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Peritonitis or Not?




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Confirming the Diagnosis of Peritonitis

Clinical presentation and diagnosis of peritonitis³

Minimal of 2 of the following:

- Clinical features consistent with peritonitis: abdominal pain and / or cloudy effluent
- Dialysis effluent white cell count >100/ μ L (after a dwell time of 2 hrs) with > 50% polymorphonuclear (PMN) or neutrophils
- Positive dialysis effluent culture



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Peritonitis Rates



A PD unit that does not readily know its own peritonitis rates is like a ship at sea without a map. *Dr. Steven Guest*

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Peritonitis Rates

- Monitor – at least on a yearly basis (recommendation)
 - Overall peritonitis rates
 - Peritonitis rates of specific organisms
 - The percentage of patients per year who are peritonitis free
 - Antimicrobial susceptibilities of the infecting organisms
- Standardly reported as number of episodes per patient-year (suggestion)
- Organism-specific peritonitis rates be reported as absolute rates (suggestion)


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Peritonitis Rates

- Peritonitis rates should be no more than 0.5 episodes per patient year at risk
- Only episodes that develop from the first day of PD training should be counted
- Relapsing peritonitis should be counted as a single episode
- Peritonitis that develops while hospitalized and PD performed by a nurse should be counted

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How to Calculate Peritonitis Rates: Episodes per Patient Year



- **Step 1 – Total number CAPD/APD patient days at risk / 365 days per year = patient years experience**
- **2000 days/365 days per year = 5.5 years**
- **Step 2 – Number of episodes of peritonitis / Number of years experience = episodes per patient year**
- **2 episodes of peritonitis / 5.5 patient years = 0.36 episodes per patient year**

Ox Calculate - Access Care and Complications Management
Appendix - Peritoneal Rate Calculations

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Objectives

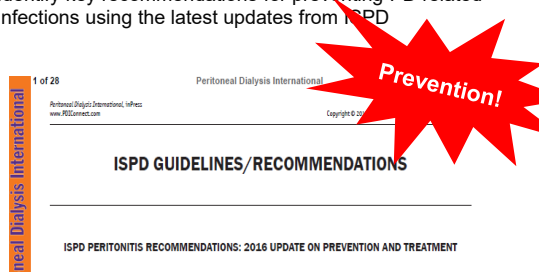
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Objective 4

Identify key recommendations for preventing PD related infections using the latest updates from ISPD



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ISPD GUIDELINES/RECOMMENDATIONS

ISPD PERITONITIS RECOMMENDATIONS: 2016 UPDATE ON PREVENTION AND TREATMENT

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Prevention of Peritonitis

- Catheter
 - Placement
 - Design
- Connection Methods
- Training programs
- Dialysis Solution
- Exit Site Care
- Bowel and Gynecological Source Infections
- Modifiable Risk Factors
- Continuous Quality Improvement
- Secondary Prevention

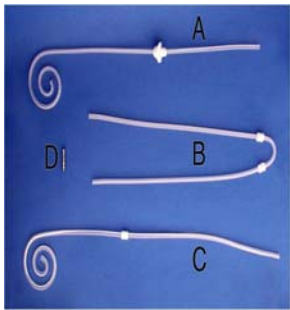
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Catheter Placement

- Catheter Placement
 - Determine location prior to surgery (surgeon and or training nurse; or both)
- Constipation free
- Proper skin preparation and cleansing
- Systemic prophylactic antibiotics
 - 3 of 4 randomized controlled trials (RCT)–reduces the incidence of *early* peritonitis
 - Single dose of intravenous antibiotics–decreases the risk of subsequent infection
- No significant differences in peritonitis with insertion technique

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Catheter Design



- No specific recommendations on catheter design for prevention of peritonitis
- Double-cuffed catheters – are associated with lower peritonitis rates than single-cuffed catheter
- Downward direction of tunnel and exit site – often advocated for the prevention of peritonitis

Image courtesy of John Crabtree MD

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Connection Methods

"Flush before fill"

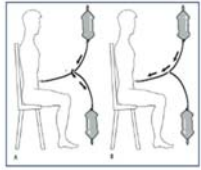



Image courtesy of S Guest MD

- Results in lower peritonitis rates than traditional spike systems
- Due to conflicting results – APD versus CAPD should not be based on risk of peritonitis

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Training Programs



ISPD committee recommends:

- Established curriculum
- Qualified and experienced nurse
- Test patient's practical skills – end of training
- Home visit
- Retraining after initial training

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Indications for Retraining

- Following prolonged hospitalization
- Following peritonitis and or catheter infection
- Following change in dexterity, vision or mental acuity
- Following change to another supplier or different type of connection
- Following other interruption in PD

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Exit-Site Care

- Topical disinfection with Povidone-iodine compared to simple soap and water cleansing or no treatment
 - Yielded no reduction in risk of peritonitis
- Daily topical application of antibiotic (mupirocin or gentamycin) cream or ointment to exit site
 - Mupirocin - effective in reducing Staph Aureus exit site infections (ESIs) and possibly peritonitis – 72% and 40% respectively
 - Hypochlorite solution to topical mupirocin may further reduce rate of peritonitis – recent study in pediatric patients
 - Mupirocin resistance with intermittent use

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Exit-Site Care

- Daily application of gentamycin cream to exit site
 - Highly effective in reduction of ESI caused by pseudomonas species
 - As effective as topical mupirocin in reducing S. aureus ESIs
 - Some observational studies suggest changing from mupirocin to gentamycin is associated with an increase in ESIs caused by Enterobacteriaceae, Pseudomonas species and probably non-tuberculous mycobacteria
 - Gentamycin should be considered an acceptable alternative to mupirocin for prophylactic application at the ES
- ESIs and peritonitis rates similar with patients receiving antibacterial honey to ES and those treated with intranasal mupirocin

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Exit-Site Care

- Topical triple ointment was not superior to topical mupirocin in the prophylaxis of PD-related infections
- ESIs were markedly reduced with ciprofloxacin otologic solution to the ES compared to simple soap and water cleansing only
- Oral rifampicin for prophylactic – not routinely advocated
- Prompt treatment of exit-site or catheter tunnel infection
- Meticulous hand hygiene

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Bowel and Gynecological Source Infections

- Peritonitis commonly follows invasive interventional procedures – (e.g. colonoscopy, hysteroscopy, cholecystectomy)
 - Suggestion - Antibiotic prophylaxis prior to colonoscopy and invasive gynecologic procedures
- Constipation and enteritis – associated with peritonitis due to enteric organisms
- Hypokalemia – associated with an increase risk of enteric peritonitis
 - No compelling evidence that treatment reduces the rate of peritonitis
 - Observational data suggest – regular lactulose use reduces peritonitis rate

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Modifiable Risk Factors For Peritonitis

- Transient bacteremia – dental procedures
 - Single dose prophylactic antibiotics *may be* reasonable
- Hysteroscopy with biopsy and women with vaginal fistula and leakage
 - Prophylactic antibiotics – non-significant reduction in peritonitis rates
- Wet contamination
 - 2-day course of oral antibiotics – no widely accepted standard regimen
- Animals should be excluded from space where PD is being performed

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Continuous Quality Improvement



- Each facility should have a CQI program
- Multidisciplinary team
- Regular meetings
 - Examine all PD-related infections
 - Identify root cause of each episode
 - Identify problems, develop solutions and evaluate results
- Preliminary data suggest CQI programs reduce peritonitis rates

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Secondary Prevention

- Anti-fungal prophylaxis
- Use of CQI team
- Replacement of catheter in patients with relapsing or repeat peritonitis

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Summary

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11. OXMD – Access Care and Complication Management – Appendix – Peritonitis Rate: Episodes per patient year (Image)

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