



The 4Rs of Peritonitis: Recurrent, Relapsing Repeat and Refractory

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Scope of contents

- Definition, microbiology and outcomes in 4Rs
(recurrent, relapse, repeat, and refractory PN)
- Treatment and prevention to reduce peritonitis
(PN) episodes
- Information of PN from Thai PD First



Definitions of Recurrent, Relapsing, Repeat, Refractory

| Terms | Time | Organism |
|-------------------|---|--|
| Recurrent | occur less than 4 weeks after end of complete treatment of previous episode | different organism from previous episode |
| Relapse | occur less than 4 weeks after end of complete treatment of previous episode | same organism or with a negative culture |
| Repeat | occur more than 4 weeks after end of complete treatment of previous episode | same organism from previous episode |
| Refractory | failure of effluent to clear after 5 days of appropriate antibiotics | |



Different clinical implication between relapse and recurrent peritonitis

PD patients with relapsing PN

- develop antibiotic resistance during treatment resulting in a different antibiotic susceptibility pattern

- source of relapse: catheter through either biofilm or tunnel infection

- consider catheter removal

PD patients with recurrent PN

- impaired immunity by first episode, leading to episode of PN

from a completely different organism, implying a different cause

- treated successfully without catheter removal

Recurrent and Relapsing Peritonitis: Causative Organisms and Response to Treatment

Cheuk-Chun Szeto, MD, FRCP, Bonnie Ching-Ha Kwan, MBBS, MCP(UK), Kai-Ming Chow, MBChB, MRCP(UK), Man-Ching Law, BN, RN, Wing-Fai Pang, MBChB, MRCP(UK), Kwok-Yi Chung, MBChB, MRCP(UK), Chi-Bon Leung, MBChB, FRCP(Edin), and Philip Kam-Tao Li, MD, FRCP

Am J Kidney Dis 2009; 54: 702-10

Relapsing and Recurrent Peritoneal Dialysis–Associated Peritonitis: A Multicenter Registry Study

Michael Burke, MD,^{1,2} Carmel M. Hawley, MMedSci,^{1,2} Sunil V. Badve, MD,^{1,2} Stephen P. McDonald, PhD,^{1,3} Fiona G. Brown, PhD,^{1,4} Neil Boudville, MMedSci,^{1,5} Kathryn J. Wiggins, MD,^{1,6} Kym M. Bannister, MD,^{1,7} and David W. Johnson, PhD^{1,2}

Am J Kidney Dis 2011; 58: 429-36

| | | |
|--|--|--|
| Contents | Szeto CC. Am J Kidney Dis 2009; 54: 702-10 | Johnson D. Am J Kidney Dis 2011; 58: 429-36 |
| Number of centers | single center | multicenters (ANZDATA) |
| Objectives | compare causative organisms and outcomes among relapse, recurrent, and first PN episode | examine causative organisms, predictors and outcomes among relapse, recurrent first PN without relapse or recurrence |
| Number of patients in each types of PN | 157 patients with relapse, 125 patients with recurrent, and 764 patients with first PN episode | 365 patients with relapse, 165 patients with recurrent, 2,021 patients with first PN without relapse or recurrence |
| Outcomes | primary response rate, complete cure rate, mortality rate | catheter removal, permanent transfer to HD, hospitalization, death |

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| Contents | Szeto CC. Am J Kidney Dis 2009; 54: 702-10 | Johnson D. Am J Kidney Dis 2011; 58: 429-36 |
|--|---|--|
| Results: Types of causative organisms | <p>1. relapsing PN: more likely to have <i>Pseudomonas</i> spp (16.6% vs 9.4%) and culture negative (29.9% vs 16.4%) compared with first PN episode</p> <p>2. recurrent PN: more likely to have <i>Enterococcus</i> spp (3.2% vs 1.2%), other gram negative (27.2% vs 11.1%) or mixed bacterial overgrowth (17.6% vs 12.7%)</p> | <p>1. relapsing PN: more likely to have <i>S.aureus</i> and coagulase-negative staphylococci (48% of relapsing PN); less likely to have streptococci, fungi, or multiple organisms</p> <p>2. recurrent PN: more likely to have fungi (13% of recurrent PN); less likely to have <i>S.aureus</i>, coagulase-negative staphylococci and streptococci</p> |
| Results: Outcomes | <p>Recurrent group: significantly lower primary response rate, lower complete cure rate, and higher mortality rate compared with control and relapsing groups</p> | <p>Relapsing and recurrent PN: significantly higher rates of catheter removal and transfer to permanent HD therapy, but similar rates of hospitalization and death compared with first PN (control group)</p> |

**Repeated Peritoneal Dialysis–Associated Peritonitis:
A Multicenter Registry Study**

Am J Kidney Dis 2012, 59: 84-91

*Thulasi Thirugnanasambathan, MD,^{1,2} Carmel M. Hawley, MMed Sci,^{1,2}
Sunil V. Badve,^{1,2} Stephen P. McDonald, PhD,^{1,3} Fiona G. Brown, PhD,^{1,4}
Neil Boudville, MMed Sci,^{1,5} Kathryn J. Wiggins, MD,^{1,6} Kym M. Bannister, MD,^{1,3}
Philip Clayton, MD,^{1,7} and David W. Johnson, PhD^{1,2}*

Repeat Peritonitis in Peritoneal Dialysis: Retrospective Review of 181 Consecutive Cases

Clin J Am Soc Nephrol 2011; 6:827-33

Cheuk-Chun Szeto, Bonnie Ching-Ha Kwan, Kai-Ming Chow, Man-Ching Law, Wing-Fai Pang, Chi-Bon Leung, and Philip Kam-Tao Li

| | | |
|---|---|---|
| Contents | Szeto CC. Clin J Am Soc Nephrol 2011; 6:827-33 | Johnson D. Am J Kidney Dis 2012, 59: 84-91 |
| Number of centers | single center | multicenters (ANZDATA) |
| Objectives | compare causative organisms and outcomes among repeated, relapse, and nonrepeated PN (control group) and exclude culture-negative and polymicrobial episode while selecting control episodes | examine causative organisms and outcomes between repeated and nonrepeated PN |
| Number of patients in each types of PN | 181 patients with repeated, 91 patients with relapsed and 125 patients with nonrepeated PN (control group) | 245 patients with repeated PN, 824 patients with nonrepeated PN |
| Outcomes | primary response rate, complete cure rate, catheter removal rate, mortality rate | relapse, catheter removal, permanent transfer to HD, hospitalization, death |

| Contents | Szeto CC. Clin J Am Soc Nephrol 2011; 6:827-33 | Johnson D. Am J Kidney Dis 2012, 59: 84-91 |
|--|--|---|
| Results: Types of causative organisms | <p>1. repeated PN: 24% due to S.aureus compared with 5.5% in relapsing PN and 15% in non-repeated group (control group)</p> <p>2. rates of Pseudomonas and E.coli PN similar between repeated PN and relapsing PN</p> <p>3. fungal and mycobacterial PN happened almost exclusively in nonrepeated PN</p> | <p>1. S.aureus and coagulase-negative staphylococci were isolated more frequently in repeated PN</p> <p>2. Gram-negative, streptococcal and fungal organisms were recovered more frequently in nonrepeated PN</p> |
| Results: Outcomes | <p>1. repeated PN vs relapsing PN:</p> <ul style="list-style-type: none"> - significantly lower complete-rate in repeated PN compared with relapsing PN - similar rates in primary response rate, catheter removal rate, and mortality rate between repeated PN and relapsing PN <p>2. repeated PN vs nonrepeated PN</p> <ul style="list-style-type: none"> - higher primary response rate, lower rate of catheter removal and marginal lower mortality in repeated PN compared with nonrepeated PN - similar in complete cure rate between repeated PN and nonrepeated PN <p>3. Time lapse from previous episode of repeated PN: significantly high within 12 weeks</p> | <p>1. repeated PN vs nonrepeated PN</p> <ul style="list-style-type: none"> - higher relapse and lower hospitalization rates in repeated PN compared with nonrepeated PN - similar rates in catheter removal, hemodialysis transfer, and death rates between repeated PN and nonrepeated PN <p>2. Different probability of subsequent episodes PN between repeated PN vs nonrepeated PN</p> <ul style="list-style-type: none"> - highest probability of repeated PN in month 2 then progressive decreased to 14% by month 6 and constant at 13-16% until 2 years and decreased thereafter - nonrepeated PN more likely to develop subsequent episodes of PN at all times |

MICROBIOLOGY OF PERITONITIS IN PERITONEAL DIALYSIS PATIENTS WITH MULTIPLE EPISODES

PDI 2012;32: 316-21

Sharon J. Nessim,^{1,2} Rosane Nisenbaum,^{3,4} Joanne M. Bargman,⁵ and Sarbjit V. Jassal⁵

- ❑ Study in Canadian PD patients to determine microbiology of PN with multiple PN episodes
- ❑ Exclude relapsing or recurrent PN and PN episodes occurring within 60 days of previous episodes = select repeated and non-repeated PN

TABLE 3

Microbial Profile in Patients Experiencing at Least Two Infections with the Same Organism

| Variable | Value |
|-------------------------------|-------|
| Total episodes (<i>n</i>) | 181 |
| Organisms involved (%) | |
| CNS | 65.7 |
| <i>Staphylococcus aureus</i> | 12.2 |
| <i>Streptococcus viridans</i> | 12.2 |
| <i>Escherichia coli</i> | 6.0 |
| Others | 3.9 |

CNS = coagulase-negative *Staphylococcus*.

- ❑ Most common organisms causing repeated PN: CNS
- ❑ Having a first episode of CNS PN associated with an increased risk of subsequent CNS PN within 1 year of the earlier episode



Management of Peritonitis

- After initiate appropriate antibiotic, clinical PN should improve in 72 hours
- Failure of PD effluent to clear up after 5 days of appropriate antibiotics, catheter removal is indicated
- To avoid extended hospital stay, peritoneal membrane damage, increased risk of fungal PN, and excessive mortality: other indications for catheter removal
 - Relapsing peritonitis
 - Refractory exit-site and tunnel infection
 - Fungal peritonitis
 - Catheter removal may also be considered for: repeated PN mycobacterial PN, multiple enteric organisms

ISPD Peritonitis recommendations: 2016 Update on prevention and treatment



Simultaneous catheter replacement and removal for treatment of peritonitis

| Contents | Swartz R. <i>Kidney Int</i> 1991;40:1160 | Posthuma N. <i>NDT</i> 1998; 13:700 | Viron C. <i>PDI</i> 2019; 39:282 |
|-------------------------------------|---|--|--|
| Subjects | 36 patients with refractory PN or relapsing PN | 36 patients (40 procedures) who needed PD catheter removal due to catheter-related infection | 11 patients with relapsing PN or PN at high risk of relapse (study in France) |
| Results: Successful TK insertion | Success in 30 (83%) of 36 patients Fail in 6 (17%) of 36 patients (due to persistent infection- 2 cases and procedure complications - 4 cases) | Success in 32 (88.9%) of 36 patients Fail in 4 (11.1%) of 36 patients (2 cases developed PN within 30 days after procedure, 1 case had intraabdominal adhesions, 1 case required surgery due to severe GI bleeding 2 weeks after procedure) | Success in 9 (81.8%) of 11 patients Fail in 2 (18.2%) of 11 patients (due to intraperitoneal adhesions) |
| Subsequent PN | 7 (23.3%) of 30 successful cases had PN within 6 months following procedure | 28 peritonitis episode (PN rate 1 per 20.3 months) 1 case removed catheter due to refractory PN | No cases of PN caused by same organism after catheter removed |
| Subsequent catheter longevity | Ranged from 4 to 62 months | Not mentions | At 1 year, 7 (63.6%) of 11 patients still on PD |



Other adjunctive treatment of Peritonitis

□ Intraperitoneal urokinase:

- a retrospective study found that IP urokinase with oral rifampicin, in addition to conventional antibiotics, resulting in catheter salvage 64% of patients with CoNS infection
(PDI 2009; 29:548-53)
- RCT studies failed to show benefit of IP urokinase for treatment of refractory PN *(J Nephrol 2005; 18:204)*
(Adv Perit Dial 2000; 16: 233) (NDT 1994; 9: 797)
- A RCT study showed that simultaneous catheter removal and replacement superior to IP urokinase in reducing relapsing PN episodes



Other adjunctive treatment of Peritonitis

Antibiotic lock on Tenckhoff catheter

- Report cases with relapsing PN (due to culture negative, E.coli and Pseudomonas spp)
- Promising results
- Issues need to address before using antibiotic lock
 - prolonged dwell
 - consider antibiotic lock if PN well controlled by IP antibiotic
 - timely removal of Tenckhoff catheter when PN not respond to IP antibiotic therapy
 - uncertain appropriate regimen of antibiotic lock in duration and frequency

1. Adv Perit Dial 1992;8:302-5 2. PDI 2017;37: 475 3. PDI 2019; 39:187



Risk factors of peritonitis

- Social and environmental factors such as pets, poor hygiene**
- Medical factors:**
 - **Obesity**
 - **Depression**
 - **Hypokalemia**
 - **Hypoalbuminemia**
 - **Invasive interventions**
 - **Comorbidity affect to change in dexterity**
 - **Bowel and gynecological source of infections**
- Dialysis-related:**
 - **Training**
 - **Wet contamination**
- Infection-related:**
 - **nasal S.aureus carrier status**
 - **previous ESI**

'EDUCATIONAL' DEPRIVATION IS ASSOCIATED WITH PD PERITONITIS

Usman Khalid, Aeliya Zaidi, Adrian Cheang, Szabolcs Horvath, Laszlo Szabo, Mohamed A. Ilham, and Michael R. Stephens **PDI 2018;38:251**

❑ To evaluate effect of economic deprivation on PN episodes

TABLE 6

2 or More Peritonitis Episodes in Least and Most Deprived Groups According to Domains

| Domain | Least deprived | Most deprived | P value (chi-square test) |
|---------------------------------|----------------|-----------------|---------------------------|
| Overall | 4 (7%) | 9 (15%) | 0.14 |
| Employment | 4 (7%) | 11 (19%) | 0.05 |
| Income | 4 (7%) | 9 (15%) | 0.14 |
| Education | 3 (5%) | 10 (17%) | 0.04 |
| Health | 4 (7%) | 11 (19%) | 0.05 |
| Community safety | 4 (7%) | 7 (12%) | 0.34 |
| Geographical access to services | 7 (12%) | 5 (8%) | 0.54 |
| Physical environment | 7 (12%) | 6 (10%) | 0.77 |
| Housing | 4 (7%) | 6 (10%) | 0.51 |

TABLE 7

Peritonitis Episodes Requiring Hospital Admission for Antibiotics in Least and Most Deprived Groups According to Domains

| Domain | Least deprived | Most deprived | P value (chi-square test) |
|---------------------------------|----------------|-----------------|---------------------------|
| Overall | 7 (12%) | 11 (19%) | 0.31 |
| Employment | 7 (12%) | 11 (19%) | 0.31 |
| Income | 7 (12%) | 11 (19%) | 0.31 |
| Education | 4 (7%) | 13 (22%) | 0.02 |
| Health | 8 (14%) | 13 (22%) | 0.23 |
| Community safety | 7 (12%) | 11 (19%) | 0.31 |
| Geographical access to services | 10 (17%) | 8 (14%) | 0.61 |
| Physical environment | 8 (14%) | 11 (19%) | 0.45 |
| Housing | 6 (10%) | 10 (17%) | 0.28 |

❑ Most deprived educational group experienced ≥ 2 PN episodes and higher rates of hospitalization than least deprived group

THE ASSOCIATION OF COGNITIVE IMPAIRMENT WITH PERITONEAL DIALYSIS-RELATED PERITONITIS

Jin-Lan Liao,¹ Yu-Hui Zhang,² Zi-Bo Xiong,¹ Li Hao,³ Gui-Ling Liu,³ Ye-Ping Ren,⁴ Qin Wang,⁵ Li-Ping Duan,⁵ Zhao-Xia Zheng,⁵ Zu-Ying Xiong,¹ and Jie Dong²

□ To investigate whether cognitive impairment contributed to risk of PD-related PN

TABLE 4

The Association Between Cognitive Impairment and PD-Related Peritonitis Using Competing Risk Models

| Variables | Model 1 ^a HR (95% CI) | P value | Model 2 ^b HR (95% CI) | P value |
|--------------------------------|-------------------------------------|---------|-------------------------------------|---------|
| Cognitive impairment | 1.498 (0.937, 2.396) | 0.092 | 1.514 (0.837, 2.740) | 0.170 |
| Executive dysfunction | 1.114 (0.713, 1.743) | 0.635 | 0.900 (0.538, 1.507) | 0.689 |
| Immediate memory dysfunction | 1.752 (1.086, 2.825) | 0.021 | 1.736 (1.064, 2.834) | 0.027 |
| Delayed memory dysfunction | 1.137 (0.678, 1.906) | 0.626 | 1.121 (0.638, 1.970) | 0.691 |
| Language ability dysfunction | 1.100 (0.617, 1.961) | 0.746 | 1.052 (0.553, 2.002) | 0.876 |
| Visuospatial skill dysfunction | 1.090 (0.71, 1.655) | 0.686 | 1.146 (0.649, 2.022) | 0.639 |

□ Immediate memory dysfunction was independently associated with a higher risk of PD-related PN

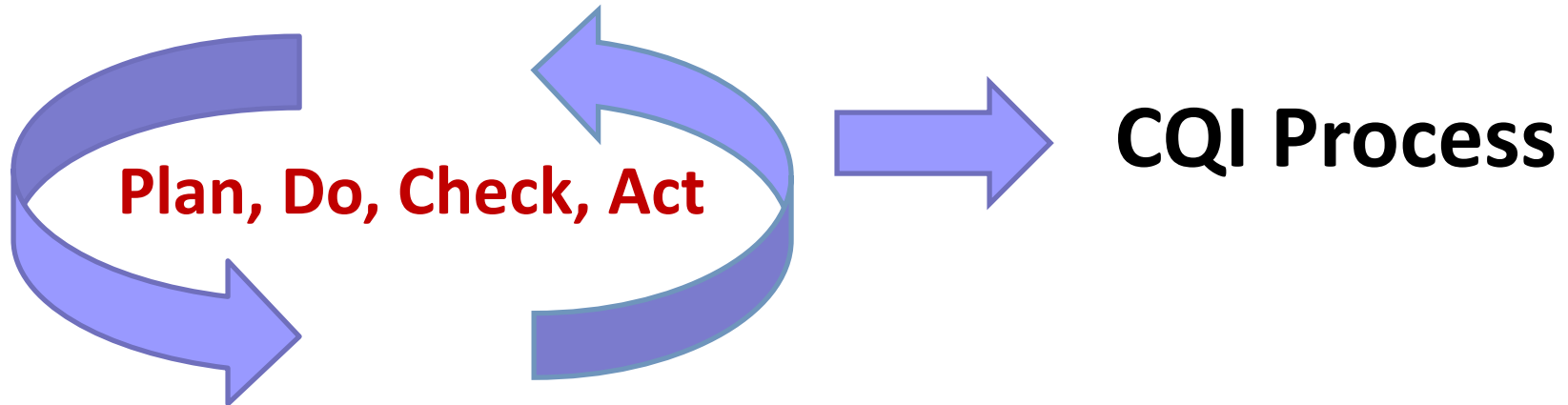
Contribution of biofilm to pathogenesis of PD infections

- ❑ To evaluate etiology of biofilms on PD catheters
- ❑ Study in 47 patients whom catheter was removed due to infectious and non-infectious causes
- ❑ Results: - Staphylococci (CNS and Staphylococcus aureus) and P.aeruginosa predominant species
 - 32% and 20% in infection group
 - 43.3% and 22.7% in non-infection group
- Colonization level in cuffs higher in catheter removed due to infectious vs. non-infectious causes
- Median microbial yield higher in cuffs than in silicone segment in both infectious and non-infectious groups



How to reduce peritonitis and 4Rs

Continuous quality improvement process



- Monitor incidence of PN rate: define goals
- Root cause analysis: determine etiology, risk factors of PN
- Design solutions: intervention direct against reversible etiology, risk factors to prevent another episodes of PN



RCA to determine risk of peritonitis

- Contamination:**
 - coagulase-negative Staphylococcal species usually associated with touch contamination
- Transmural migration of enteric organism:**
 - constipation, diarrhea, endoscopic or gynecological procedures
- Bacteremia: after dental procedures**
- Biofilm: relapsing CoNS peritonitis**



Processes of care to prevent PD-related PN

- Systemic prophylactic antibiotics before catheter insertion
- Topical antibiotics cream (mupirocin or gentamicin) apply at catheter exit site
- Prompt treatment of exit site or catheter tunnel infection
- Antibiotic prophylaxis prior to invasive procedures
- Antibiotic prophylaxis after wet contamination
- Regular check and treatment of S.aureus nasal carriers
- Home visit to detect problems with exchange technique, adherence to protocols, environmental and behavior issues
- Retraining in steps of PD exchange procedure



Indications for PD Re-training

- Following prolonged hospitalization
- Following peritonitis and/or catheter infection
- Following change in dexterity, vision, or mental acuity
- Following change to another supplier or a different type of connection
- Following other interruption in PD (e.g. period of time on hemodialysis)



https://dpex.thaicarecloud.org

DPEX

Database of Peritoneal dialysis in EXcel

ระบบฐานข้อมูลแบบสมัครใจ เพื่อช่วยเหลือหน่วยบริการในการ M&E และพัฒนาคุณภาพการบริการล้างไตทางช่องท้อง



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ประกาศข่าวจากผู้ดูแลระบบ

- Update DPEX Client Version 1.1.7 [Download](#)

Download โปรแกรม DPEX for Client

- MySQL 5.5.27 (32 Bit)
- MySQL 5.5.27 (64 bit)
- รวมติดตั้ง DPEX 32 bit (รวม Update 1.1.4)
- รวมติดตั้ง DPEX 64 bit (รวม Update 1.1.4)
- Star Project Setup
- DPEX 1.0.8 for test

DPEX Data Utilization

โครงการใช้ประโยชน์จากฐานข้อมูล DPEX เพื่อพัฒนาคุณภาพการบริการล้างไตทางช่องท้องและทราสรององค์ความรู้ด้านการบำบัดทดแทนไต

| |
|---------------------------|
| Age for Start PD |
| Mean Age of Start PD |
| Cause of CRF |
| Peritonitis Rate |
| Peritonitis Recurrent |
| Peritonitis Relapsing |
| Peritonitis Repeat |
| Exit-site infection Rate |
| Infection Cause |
| Drop Out Rate |
| Drop Out Cause |
| Death Rate |
| Death & Age |
| Survival Rate |
| Annual Report of Survival |
| Time on Therapy |
| Time on Therapy & Age |
| Culture Negative |
| Hemoglobin |
| Albumin |
| Admission |
| Permanent UR |



Analysis of patients on CAPD with peritonitis registered in DPEX during 2008-2018

**21,885 CAPD patients registered in DPEX
(92 centers from 253 centers = 36.4%)**

| Patients | Number (case) | Percent |
|---|----------------------|----------------|
| Patients without PN | 15,121 | 69.1 |
| Patients with 1 episode of PN | 3,825 | 17.5 |
| Patients with > 1 episode of PN | 2,939 | 13.4 |

Unpublished data from **D**atabase of **P**eritoneal dialysis in **EX**cel (DPEX)



Characteristics among patients without PN, with 1 episode, and with >1 episodes of PN

| Characteristics | Without PN | With 1 PN episode | With > 1 PN episodes |
|----------------------------------|---------------------|--------------------|----------------------|
| Total number | 15,121 cases | 3,825 cases | 2,939 cases |
| Gender: number | | | |
| Male | 7,736 (51.2%) | 1,992 (52.1%) | 1,511 (51.4%) |
| Female | 7,385 (48.8%) | 1,883 (47.9%) | 1,428 (48.6%) |
| Age at start PD (years) | | | |
| Median (IQR) | 57 (46, 65) | 57 (47, 65) | 57 (48, 65) |
| Diabetic status: number | | | |
| Diabetes | 7,181 (47.9%) | 1,745 (46.0%) | 1,396 (47.4%) |
| No diabetes | 7,797 (52.1%) | 2,050 (54.0%) | 1,543 (52.5%) |
| Educational level: number | | | |
| Illiterate or primary | 12,689 (83.9%) | 3,227 (84.4%) | 2,559 (87.1%) |
| Secondary or higher | 2,432 (16.1 %) | 598 (15.6%) | 380 (12.9%) |
| Payment system: number | | | |
| UC | 13,962 (92.3%) | 3,491 (91.3%) | 2,717 (92.4%) |
| Non-UC | 1,159 (7.7%) | 334 (8.7%) | 222 (7.6%) |



Outcomes among patients without PN, PN with 1 episode, and with >1 episodes of PN

| Outcomes | Total | Without PN | With 1 PN episode | With > 1 PN episodes | P value |
|---|---------------------|---------------------|--------------------|----------------------|-------------------|
| Total number | 21,885 cases | 15,121 cases | 3,825 cases | 2,939 cases | |
| Time on therapy: months | | | | | < 0.001 |
| Median (IQR) | 19 (8,38) | 16 (6, 33) | 24 (12, 43) | 35 (19, 55) | |
| Cumulative permanent hemodialysis: cases | | | | | < 0.001 |
| Number of HD | 3,759 (17.2%) | 2,095 (9.8%) | 778 (3.6%) | 805 (3.7%) | |
| Cumulative death: cases | | | | | < 0.001 |
| Number of death | 9,957 (45.5%) | 6,886 (31.5%) | 1,773 (8.1%) | 1,298 (5.9%) | |
| Survival time: months | | | | | < 0.001 |
| Median | 42 | 38 | 43 | 56 | |

Unpublished data from **D**atabase of **P**eritoneal dialysis in **EX**cel (DPEX)



Patterns of multiple episodes of PN in PD patients registered in DPEX during 2008-2018

2,266 PN episodes in PD patients with multiple episodes of PN and having data of organism

| Category of multiple PN | Episode | % |
|---|---------|------|
| Recurrent PN | 150 | 6.6 |
| Relapsing PN | 250 | 11.0 |
| Repeated PN | 997 | 44.0 |
| Multiple episodes of PN occurred after 4 weeks and culture no growth (non-repeated) | 869 | 38.4 |

Unpublished data from **D**atabase of **P**eritoneal dialysis in **EX**cel (DPEX)



Types of microbiology in multiple episodes of PN

| Type of microbial | Recurrent (%) | Relapse (%) | Repeat (%) | Non-repeat (%) |
|--|--------------------|--------------------|----------------------|----------------|
| Total number of episode | 150 | 250 | 997 | 869 |
| Staphylococcus spp (Staphylococcus aureus, CoNS) | 20 (13.3) | 28 (11.2) | 267 (26.8) | |
| Streptococcus spp | 11 (7.3) | 9 (3.6) | 205 (20.6) | |
| Enterococcus spp | 12 (8) | 9 (3.6) | 27 (2.7) | |
| Corynebacterium | 1 (0.7) | 1 (0.4) | 5 (0.5) | |
| Other gram positive microbial | 0 | 0 | 1 (0.1) | |
| Total gram positive microbial | 44 (29.3) | 47 (18.8) | 505 (50.7) ## | |
| Pseudomonas spp | 9 (6) | 9 (3.6) | 45 (4.4) | |
| E. coli | 15 (10) | 32 (12.8) | 191 (19.2) | |
| Klebsiella spp | 6 (4) | 4 (1.6) | 36 (3.6) | |
| Acinetobacter spp | 2 (1.3) | 1 (0.4) | 0 | |
| Other gram negative microbial | 24 (16) | 25 (10) | 100 (10.0) | |
| Total gram negative microbial | 56 (37.3) * | 71 (28.4) * | 372 (37.2) ## | |
| Fungal microbial | 35 (23.4) | 0 | 6 (0.6) | |
| Polymicrobial | 0 | 0 | 3 (0.3) | |
| Other microbial (not identify) | 15 (10) | 22 (8.8) | 111 (11.2) | |
| Culture no growth | 0 | 110 (44) ** | 0 | 869 (100) ** |

Unpublished data from Database of Peritoneal dialysis in EXcel (DPEX)



Abstract submission to APCM- ISPD Nagoya 2019

Objective: Fight to improve PDE culture no growth

The root cause analysis and management to improve culture-negative rates in patients on peritoneal dialysis with peritonitis: analysis from a single center

Nannapasra Sansuk¹, Prakai Sunyochwit¹, Siribha Changsirikulchai²

Angthong Hospital, ¹, Renal Division, Department of Medicine, Faculty of Medicine, Srinakharinwirot University, Thailand²

Purpose Culture negative rates in patients on peritoneal dialysis (PD) with peritonitis (PN) at Angthong hospital were 35.7% in 2014 and 47.5% in 2015 (report from Database of Peritoneal dialysis in Excel; DPEX). We performed the root-cause analysis (RCA) and process to improve culture-negative PN episodes.

Methods The procedure of specimen collection was reviewed and redesigned as the follow: flush PDF 2 L, add 1 L of PDF in abdomen for 2 hours, collect 20 ml of drained PDF and separate 10 ml each with changed needles into 2 bottles of hemoculture (Bactec). The time from collected specimen to laboratory room for culture has to be within 3 hours. The PD nurse tested the new procedure, trained method of specimen collection to nurses in wards and community-hospitals, designed flow chart of specimen collection method and prepared tool boxes of specimen collection kept in wards for usage.

Results There were culture-negative PN 9 from 79 PN episodes (11.39%) during 2016-March 2019. The culture-negative PN rate in 2016, 2017, 2018, January-March 2019 were 1 from 14 (7.14%), 3 from 26 (11.53%), 4 from 27 (14.81%), and 1 from 12 (8.3%) PN episodes, respectively. The causes of culture-negative PN were from prescribing antibiotic to patients because of sepsis before specimen collection 4 from 9 (44.44%) culture-negative PN episodes. The rest of culture-negative PN episodes were from insufficient skill and equipments for specimen collection at the community-hospitals.

Conclusion The culture-negative PN rates has been achieved to the rates recommended by ISPD from process of RCA.



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Objective: Fight to improve PDE culture no growth

The improvement of culture negative rate after changing the method of specimen collection in Pathum Thani Hospital

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Purpose: The report from Database of Peritoneal dialysis in EXcel (DPEX) showed the peritonitis with culture negative rate in January to October, 2018 at Pathum Thani Hospital was 23 from 33 episodes (69.7%). The aim of this study is to report the improvement of culture negative rate after reviewing and changing the method of specimen collection in peritoneal dialytic (PD) patients who had peritonitis.

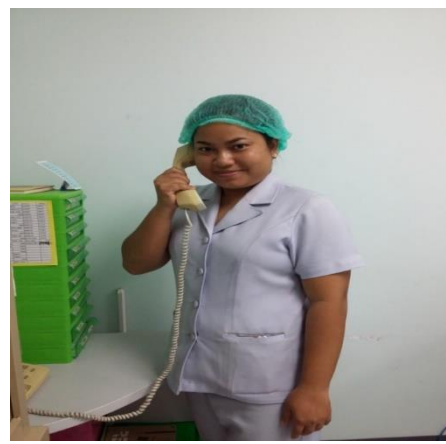
Methods: In the past, the 20 ml of cloudy PD fluid (PDF) in bag which PD patients brought from home was collected, separated to 10 ml each and kept in 2 sterile bottles. These 2 bottles were sent to laboratory room for culture. Cefazolin and ceftazidime were added in 1 exchange daily of 2 L PDF for 3 days while waiting for result of culture. The method of specimen collection was changed during November 2018 to January 2019 as the follows; flush PDF 2 L, add 1 L of PDF in abdomen for 2 hours, collect 20 ml of drained PDF and separate 10 ml each with changed needles into 2 bottles of hemoculture (Bactec). The time from collected specimen to laboratory room for culture has to be within 3 hours. The regimen of adding antibiotic into PDF is as same as those in previous protocol.

Results: There were 11 episodes of peritonitis which showed positive culture results in all cases. The culture negative rate was 0%.

Conclusion: The culture negative rate at Pathum Thani Hospital was much improved after changing the method of specimen collection.



Call Me Please: to prevent gram negative Peritonitis in CAPD patients with diarrhea



Group education, train hand washing, call to PD nurse



- Focus in hand washing
- Prescribe 2 days of oral antibiotics

Presentation in Hospital Accreditation Forum 2016



Results of CQI: Call Me Please

| Patients with peritonitis and history of diarrhea | Number |
|---|------------------|
| 1. Number of PD patients with diarrhea | 20 |
| 1.1 No peritonitis (%) | 12 (60%) |
| 1.2 Develop peritonitis (%) | 8 (40%) |
| 2. Number of PD patients with diarrhea receive training | 11 |
| 2.1 No peritonitis (%) | 8 (72.8%) |
| 2.2 Develop peritonitis (%) | 3 (27.3%) |
| 3. Number of PD patients with diarrhea, no training, no PN | 4 |



Minitest for testing the dexterity of patients and/or caregivers performing exchange procedure in peritoneal dialysis



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Background

- Patients on peritoneal dialysis (PD) or caregivers who perform exchange procedures increase in age every year.
- We designed the minitest protocol to test the dexterity of these subjects at the HRH Princess Maha Chakri Sirindhorn Medical Center (MSMC).

Objective

The objective of developing the minitest is to assess the dexterity of patients and/or caregivers.

Methods

- Patients on PD for at least 6 months were included in this test.
- The protocol of this minitest is composed of the evaluation in visual acuity, hand tremor and the rotation and transfer after connecting to the cap of the PD bags.
- The outcomes of each part of the minitest were reported

**Poster presented at PD Forum – 2018
Fight to improve gram positive PN
from touch contamination**

Results

- There were 160 from 168 patients who were tested with the minitest for dexterity.
- The mean (SD) age of patients was 56.9 (15.8) years.
- The mean (SD) time of dialysis vintage was 33.6 (26.5) months.
- The percentage of patients with diabetes was 59.1%.
- All of the patients had good vision and no hand tremor.
- The 13.8% of patients who rotated the transfer incorrectly after connecting to the cap of the PD bags were retrained and reevaluated.



Conclusion

The majority of our patients and/or caregivers have proper dexterity in performing the exchange procedure.



Poster presented at PD Forum - 2018

Minitest for dexterity is a KPI (process) which has to be performed once a year in every patients on CAPD



A 72 year old male on CAPD with multiple episode of PN

| Date | Event |
|------------------------------|--|
| 28 th Feb, 2011 | TK insertion |
| 1 st March, 2011 | Start small volume PD |
| 20 th March, 2011 | First episode of PN. PDF culture: E.coli, response to antibiotic prescribed to patient, duration of antibiotic 21 days (complete course of antibiotic on 10 th April), retrain and evaluate exchange procedure- correct performing exchange procedure |
| 22 nd May, 2011 | Second episode of PN (42 days from first episode PN). PDF culture: E.coli, response to antibiotic prescribed to patient, duration of antibiotic 21 days (complete course of antibiotic on 11 th June), retrain and evaluate exchange procedure- correct performing exchange procedure. No intraabdominal source for infection |
| 14 th June, 2011 | Third episode of PN (3 days from second episode PN). PDF culture: E.coli, response to antibiotic prescribed to patient, duration of antibiotic 21 days (complete course of antibiotic on 4 th July). Discuss with patient to consider for simultaneous TK removal and insertion- patient refused |
| 13 th July, 2011 | Fourth episode of PN (9 days from third episode of PN). PDF culture: E.coli Find cause of PN. Simultaneous TK removal and insertion date 22 nd July,2011 |



What was the cause of multiple episodes of PN?





Conclusions:

- ❑ Gram positive microbials especially Staphylococcus spp were common organisms found in repeated PN**
- ❑ Gram negative microbials and fungal peritonitis were common organisms found in recurrent PN**
- ❑ Culture no growth were frequently found in relapsing PN and non-repeated PN (Thailand)**
- ❑ Catheter removal should be performed in refractory PN including fungal PN**
- ❑ Each PD units should monitor and perform CQI process to reduce rates of PN**

THANK YOU FOR YOUR ATTENTION



สวัสดีค่ะ

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