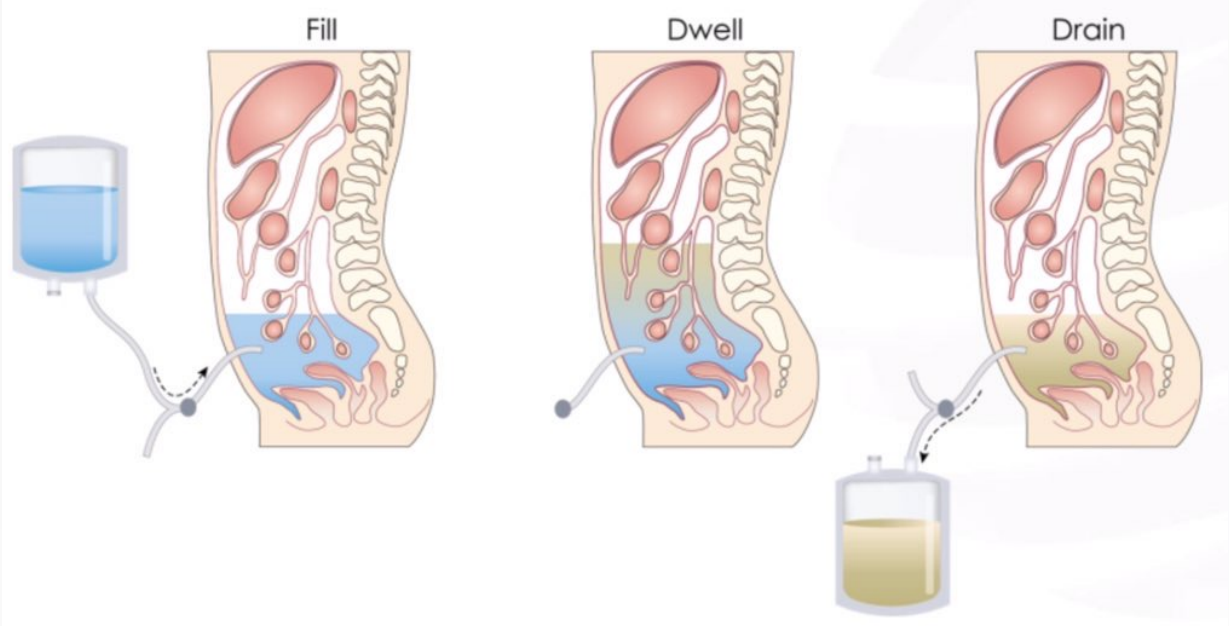
Practical point and order for capd

Contents

- How to prescribed PD
- Inadequate and how to adjusted prescription
- Complications and management
  - Peritonitis
  - Exit site and tunnel infection
  - UF failure and volume overload

Basic of peritoneal dialysis

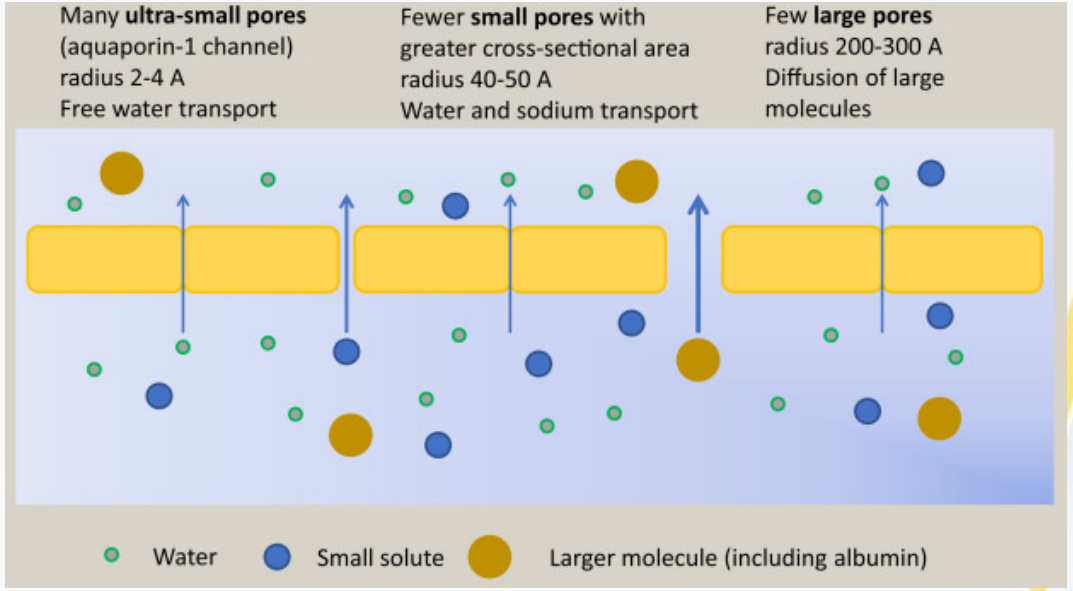
- Instilling the peritoneal cavity with sterile solutions through a permanent indwelling silicone-based catheter.
- The solution generate a chemical and osmotic gradient, facilitating the removal of toxins and water with PD fluid drainage.
- Majority of solutions used in PD are glucose based
- The exchange consists of 3 distinct phases: filling, dwelling, and draining.



Basic of peritoneal dialysis (continue)

- Transport occurs through pores of 3 different sizes:
  - Ultrasmall or aquaporin 1 (AQP1) pores: water
  - Small pores: water and small solutes
  - Large pores: macromolecules such as immunoglobulins and other proteins
- Areas of the peritoneal membrane that are surrounded by capillaries and in contact with dialysate. This is called the “effective peritoneal surface area”

Solute transfer is bidirectional.
❖ Urea, creatinine, and potassium diffuse from the bloodstream into the dialysate
❖ Glucose, lactate (+/- HCO3) diffuses from the dialysate into the peritoneal capillaries



Absolute contraindications for PD

- ผู้ป่วยที่มีผนังหน้าท้องเปิด ไม่สามารถค้างน้ำในช่องท้องได้ (omphalocele and gastroschisis) และไม่สามารถ แก้ไขได้
- ผู้ป่วยที่พิสูจน์พบว่ามีพังผืดภายในช่องท้องรุนแรง
- ผู้ป่วยที่ได้รับการตรวจยืนยันว่าสูญเสียการทำงานของเยื่อบุผนังช่องท้องจากพังผืด (documented loss of peritoneal function from fibrosis)
- สภาพจิตบกพร่องอย่างรุนแรง ที่ไม่สามารถควบคุมอาการได้ และอาจกระทบต่อการรักษาด้วยการท PD (ยืนยันจากจิตแพทย์)
- ผู้ป่วยที่มีช่องทางติดต่อระหว่างช่องท้องกับช่องปอด (Pleuroperitoneal fistula) ที่ไม่สามารถแก้ไขได้
- ผู้ป่วยที่มีไส้เลื่อนบริเวณหน้าท้องถุงอัณฑะที่ไม่สามารถผ่าตัดแก้ไข (inoperable abdominal wall hernia or inguinal hernia)

How to prescribed PD

Considerations !!!

- Patient's schedule and quality of life
  - CAPD VS APD
- Residual renal function
- Target of treatment (adequacy)
- Clearance
  - Optimized middle molecule clearance → dwell 24hrs/d (esp. in minimal RRF)
  - Optimized small molecule clearance → increase instilled volume
- Resources/reimbursement

What to prescribe?

DOSE

VOLUME

Most patients can tolerate a maximum fill volume of 1,250-1,500 mL/m_2 or about 2,000-2,500 mL per exchange.
(result in intraperitoneal hydrostatic pressures of <18 cm of H_2O)

6-8 L/day	> 9 L/day	1.5-2 L/session	> 2 L/session

Quiz 1

- 60 kg male patient with residual renal function
- 24hr urine vol = 1 L, 24hr urine urea = 150mg/dl, BUN 55 mg/dl
- V = 60 x 0.6 = 36 L
- Target KT/Vurea = 1.8
- Please calculate dialysate dose !!!

Answer

- 60 kg male patient with residual renal function (V = 60 x 0.6 = 36 L)
- 24hr urine vol = 1 L, 24hr urine urea = 150mg/dl, BUN 55 mg/dl
- Urine Urea clearance (KT) = U/P urea x volume = (150/55) x 1 = 2.72 L/d
- KT/Vurea (urine) = 2.72/36 = 0.07
- Target KT/Vurea = 1.8 —> daily KT/Vurea = 1.8/7 = 0.26
- Target KT/Vurea (dialysate) = 0.26 - 0.07 = 0.19
- Daily KT = 0.19 x 36 = 6.84 L (estimated require urea clearance per day)
- Volume = 6.8/(D/Purea) —> assume D/Purea = 1
- Volume = 6.8/1 = about 7 L /d

How to prescribed PD : CAPD

- Usually used 24hr/d
- After calculate dose
- Prescribe --> filled volume, frequency

- Initial prescription : 2 L x 3-4 cycles
- Example 10 L/d
  - 2.5L x 4 cycles (day 3, night 1)
  - 2L x 5 cycles (day 4, night 1)

How to prescribed PD : APD

- NIPD (8-12hrs) VS CCPD (24hrs)
- After calculate dose
- Prescribe --> filled volume, frequency

- Initial prescription :
  - NIPD : 10-12 L/d, Cycler time 8-10 hrs, Dwell vol 2 L, frequency 5 cycles
  - CCPD : 10-14 L/d, Cycler time 8-10 hrs, Dwell vol 2 L, frequency 5 cycles, day dwell 1-2 cycles

- Consider Icodextrin if high transport or long dwell

Adequacy

Adequate dialysis defined as “the administration of an effective dosage of dialysis capable of keeping a patient clinically asymptomatic, active and maintaining a good correction of the altered metabolic and homeostatic components”

Factors affecting outcomes

Factor	Impact
Multimorbidity	Symptoms Polypharmacy Impaired physical function Impaired cognitive function Protein energy wasting
Age	Impaired physical function Impaired cognitive function Protein energy wasting Falls Dementia/Delirium Frailty
Dialysis-related	Symptoms Polypharmacy Volume status – potential volume overload or depletion Poor appetite Protein energy wasting Burden of dialysis Fatigue and malaise Pruritus Insomnia Infections
Psychosocial	Depression Anxiety Financial stress Social support Loss of employment Reduced time for life participation

Peritoneal Dialysis International 2020, Vol. 40(3) 244–253

Target (high-quality goal-directed dialysis)

- Health-related QOL
- Volume Status : maintain clinical euvolemia
- Nutritional Status : good appetite, monitored K, HCO_3, albumin and PO_4
- Small Solute Clearance : Kt/Vurea ≥ 1.7/wk (prescribed 1.8/wk)
- Residual Kidney Function : important for overall well-being and survival

Proposed target for high-quality goal-directed dialysis

Acid-base	Bicarbonate ≥ 24 meq/L
Albumin	Albumin (BCG) ≥ 3.8 g/dl
Blood pressure	Systolic BP 111 – 159 mmHg
Electrolytes	Potassium 4 – 5.4 meq/L Sodium ≥ 135 meq/L
Hemoglobin	≥ 11 g/dl
Minerals	Calcium (albumin-corrected) 8.5 – 10.1 mg/dl Magnesium ≥ 1.7 mg/dl Phosphorus ≤ 6.3 mg/dl
Volume status	Absence of rales and lower extremity edema

Teitelbaum I et al., CJASN 2020

When to consider ‘inadequate’

- Suggested by trends in high BUN or creatinine or appearance of uremic symptoms or volume overload

- Etiology
  - Poor compliance
  - Hypercatabolism
  - Loss of RKF (without increase in peritoneal solute removal)
  - Decrease in peritoneal transport
  - Increase in peritoneal transport

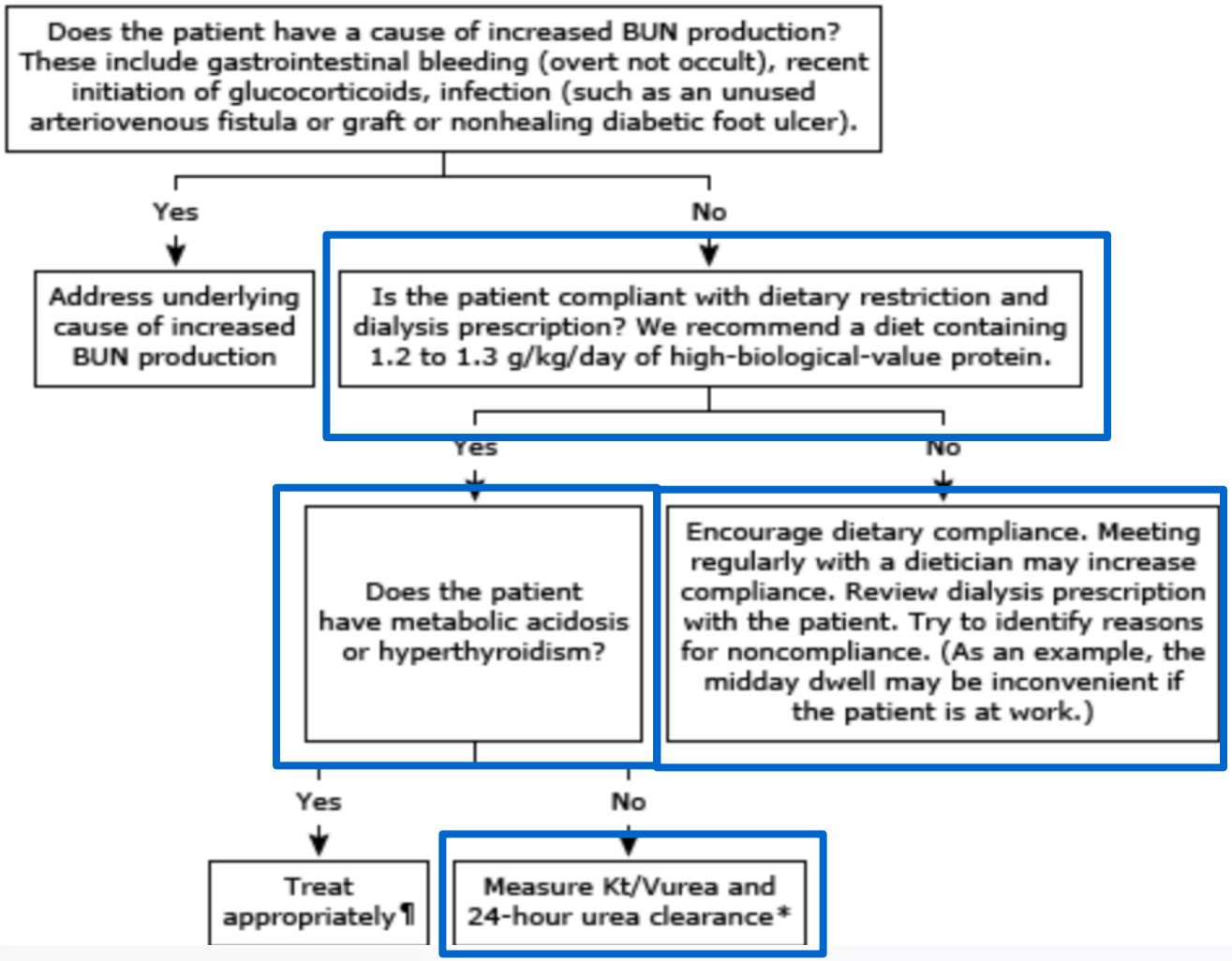
Identification of who are ‘inadequate’

Factor	Assessment methods
Poor patient well-being	Ask the patient Body weight changes (loss) Clinical assessment Hospitalization rate Questionnaires to assess quality of life, symptoms, depression
Poor volume control	Clinical assessment Blood pressure control Recording of achieved ultrafiltration by patient Measurement of urine volume
Poor solute removal	Blood tests Small solute clearance (Kt/V_{urea}; creatinine clearance) Nutrition assessment
Non-dialysis factors: comorbidities, frailty, protein-energy wasting	Frailty assessment Cognitive function assessment Nutrition assessment Hospitalization rate

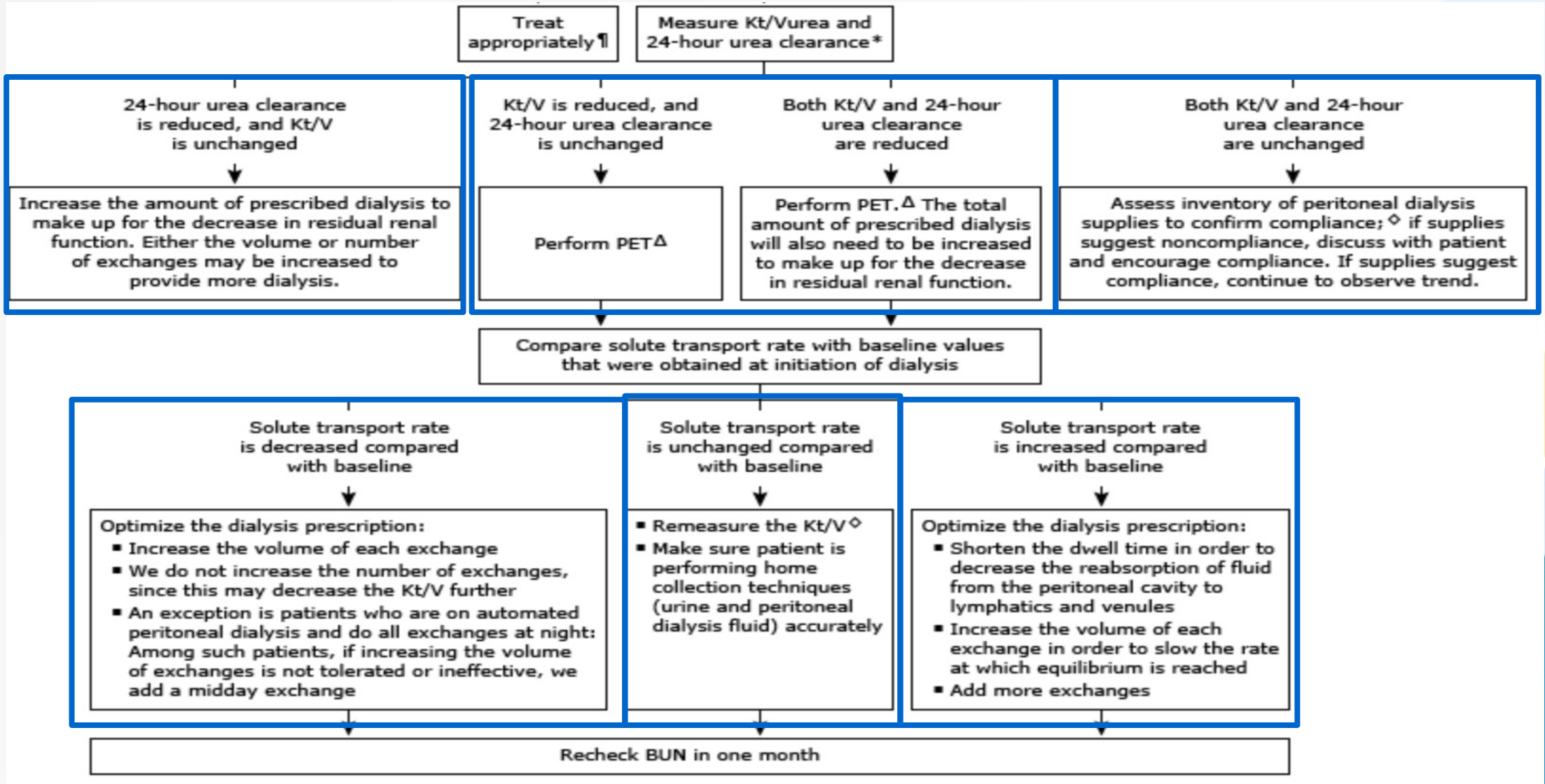
Factor	Suggests need to change dialysate type or increase prescription
Clinical features	Uraemic symptoms, such as increasing tiredness, loss of appetite, nausea, weight loss (recognising there could be other causes of individual symptoms) Symptomatic volume overload Poor nutritional status or clinical features of protein-energy wasting Hospitalization related to uraemia or volume overload Poor or worsening school performance Reduced energy level, physical activity or school attendance appropriate to child’s age
Residual kidney function	Decline in urine volume and/or renal small solute removal
Biochemical features	Hyperkalaemia Hyperphosphataemia Low plasma bicarbonate Worsening uraemia (rising urea and creatinine)

Peritoneal Dialysis International 2020, Vol. 40(3) 244–253

Evaluation and management of increasing BUN among patients on peritoneal dialysis



Evaluation and management of increasing BUN among patients on peritoneal dialysis (con')



How to increase peritoneal clearance in CAPD

- Increasing exchange volumes.
  - Disadvantage : back pain, abdominal distention, shortness of breath.
- Increasing the frequency of daily exchanges.
  - Increase frequency (less effective than volumes, especially CrCl)
  - Disadvantage : interfere with patient's lifestyle → noncompliance
- Increasing the tonicity of the dialysis solutions
  - Increase both ultrafiltration and clearance
  - Disadvantage : hyperglycemia, hyperlipidemia, obesity, and long-term peritoneal membrane damage

How to increase peritoneal clearance in APD

- Introduction of a day dwell (NIPD patients)
  - Disadvantage : long day dwell --> net fluid resorption
- Increase dwell volumes on cycler

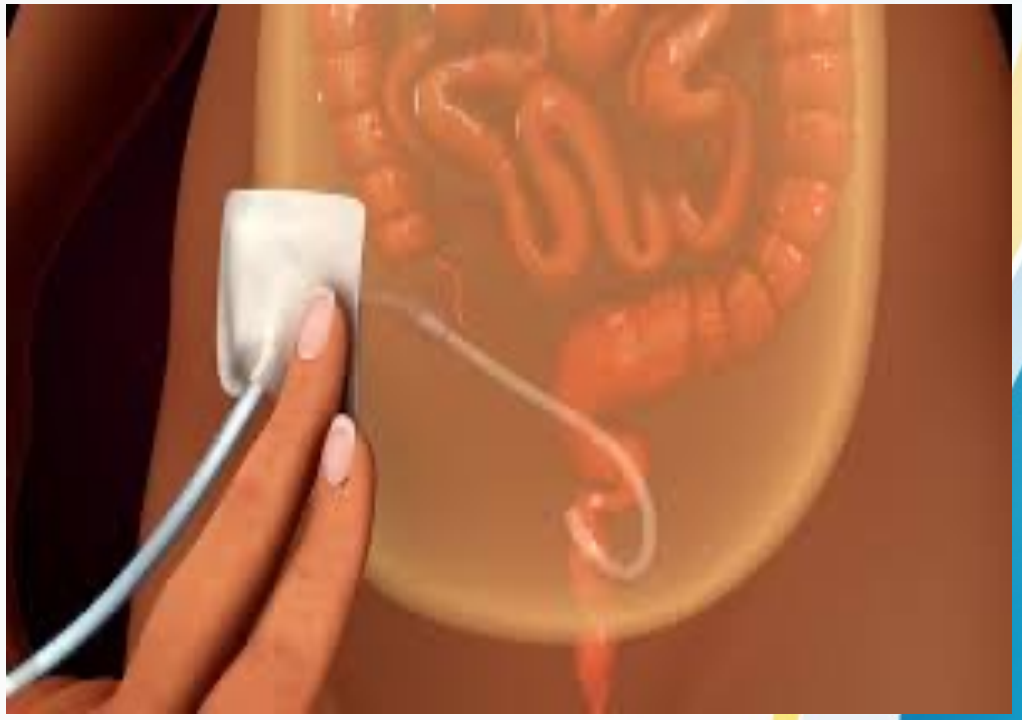
- Increase Time on cycler
- Increasing frequency of cycles
  - Disadvantage : more time spent for draining and filling
- Increasing dialysis solution tonicity

Prescription pitfalls in peritoneal dialysis

1. Loss of residual renal function
2. Noncompliance
3. High serum creatinine despite good clearances
    1. Noncompliance
    2. Discordance between Kt/V and CrCl (in APD)
    3. High creatinine generation (good prognosis)
4. Inappropriate switch from CAPD to APD
5. Inadequate attention to fluid removal

Common complications

- Peritonitis
- Exit site and tunnel infection
- Volume overload and UF failure



Peritonitis

Direct/major contributing cause of death of PD patients

- Aim of treatment :
  - Rapid resolution of inflammation
  - Preservation of peritoneal membrane function
- Severe and prolonged peritonitis lead to
  - Peritoneal membrane failure
  - Technique failure
  - Switching to hemodialysis

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Modifiable Risk Factors of Peritonitis

- **Social / Environmental**
  - Smoking
  - Living distantly from PD unit
  - Pets
- **Medical**
  - Obesity
  - Depression
  - Hypokalemia
  - Hypoalbuminemia
  - Absence of vitamin D supplementation
  - Invasive interventions (e.g. colonoscopy)
- **Dialysis-related**
  - Prior hemodialysis
  - PD against patient's choice
  - Training
  - Bioincompatible fluids
  - Wet contamination
- **Infection-related**
  - Nasal Staphylococcus aureus carrier status
  - Previous exit-site infection

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Diagnosis

At least 2 of the following are present (1C)

- Clinical features consistent with peritonitis i.e. abdominal pain and/or cloudy dialysis effluent
- Dialysis effluent WBC > 100/uL (after a dwell time of at least 2 hours), with > 50% PMN
- Identification of organism (Gram stain, culture)

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Differential diagnosis of cloudy effluent

- **Cellular causes**
  - PMN leucocytes
    - Culture-positive infectious peritonitis
    - Infectious peritonitis with sterile cultures Chemical peritonitis
    - Eosinophils
    - Dialysate eosinophilia Chemical peritonitis
  - Monocyte/macrophages -->Specimen taken from ‘dry’ abdomen
  - Red blood cells (Hemoperitoneum)
  - Malignant cells (Lymphoma, Peritoneal metastasis)
- **Non-cellular causes**
  - Fibrin
  - Triglycerides (milky white appearance) -->CCB, Lymphatic obstruction, Acute pancreatitis

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Pathway of infection

1) Intraluminal (30-40%) : errors in connection technique → infect via the catheter lumen (coag-neg staphylococci or diphtheroids.)
2) Periluminal (20-30%) : Bacteria on the skin enter via catheter tract. (Staphylococcus aureus or Pseudomonas aeruginosa.)
3) Bowel (20-30%) : Bacteria migrating across the bowel wall. (Escherichia coli and Klebsiella sp.)
4) Hematogenous (5-10%) (streptococci and staphylococci.)
5) Transvaginal (2-5%)

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Investigations

- Dialysis effluent should be drained and sent for cell count with differential, gram stain, and culture
  - Inoculation of 5-10 mL effluent in 2 (aerobic+anaerobic) blood-culture bottles
  - Centrifugation of 50 mL PDF at 3,000 g for 15 minutes → Resuspension in 3-5 mL and inoculation on solid culture media or standard blood-culture media.
  - The specimens should arrive at the laboratory within 6 hours.

•Abdominal X ray is generally not necessary.
•Peripheral blood culture is usually not necessary but should be obtained if the patient is clinically septic or on immunosuppression.

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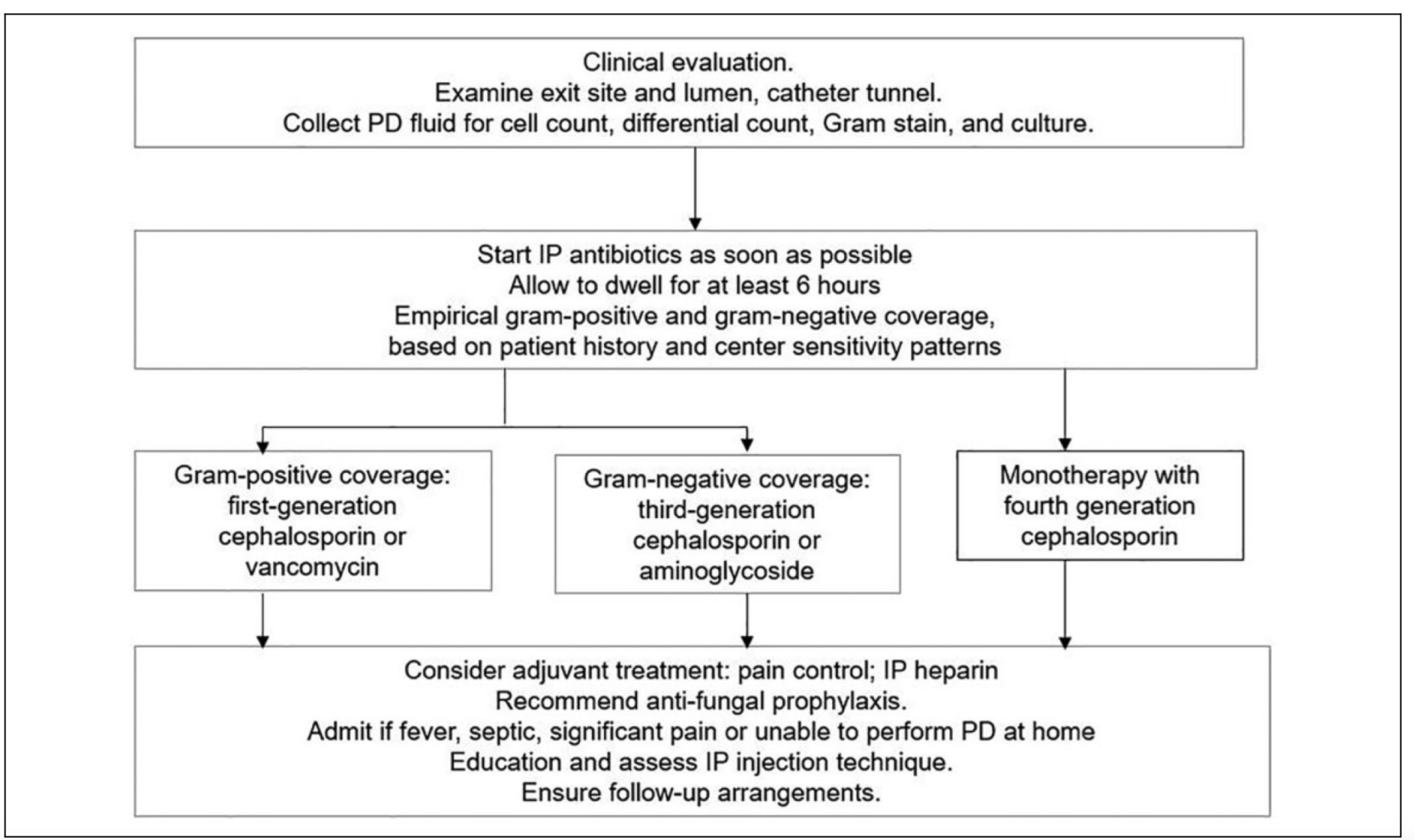
Management of peritonitis



Peritoneal Dialysis International 2022, Vol. 42(2) 110–153

Antibiotic IP Dosing Recommendations for Peritonitis Rx

	Intermittent (1 exchange daily)	Continuous (all exchanges)
Aminoglycosides		
Amikacin	2 mg/kg daily (252)	LD 25 mg/L, MD 12 mg/L (253)
Gentamicin	0.6 mg/kg daily (254)	LD 8 mg/L, MD 4 mg/L (255,256)
Netilmicin	0.6 mg/kg daily (233)	MD 10 mg/L (257)
Tobramycin	0.6 mg/kg daily (253)	LD 3 mg/kg, MD 0.3 mg/kg (258,259)
Cephalosporins		
Cefazolin	15–20 mg/kg daily (260,261)	LD 500 mg/L, MD 125 mg/L (254)
Cefepime	1,000 mg daily (262,263)	LD 250–500 mg/L, MD 100–125 mg/L (262,263)
Cefoperazone	no data	LD 500 mg/L, MD 62.5–125 mg/L (264,265)
Cefotaxime	500–1,000 mg daily (266)	no data
Ceftazidime	1,000–1,500 mg daily (267,268)	LD 500 mg/L, MD 125 mg/L (236)
Ceftriaxone	1,000 mg daily (269)	no data
Penicillins		
Penicillin G	no data	LD 50,000 unit/L, MD 25,000 unit/L (270)
Amoxicillin	no data	MD 150 mg/L (271)
Ampicillin	no data	MD 125 mg/L (272,273)
Ampicillin/Sulbactam	2 gm/1 gm every 12 hours (274)	LD 750–100 mg/L, MD 100 mg/L (253)
Piperacillin/Tazobactam	no data	LD 4 gm/0.5 gm, MD 1 gm/0.125 gm (275)
Others		
Aztreonam	2 gm daily (242)	LD 1,000 mg/L, MD 250 mg/L (243,244)
Ciprofloxacin	no data	MD 50 mg/L (276)
Clindamycin	no data	MD 600 mg/bag (277)
Daptomycin	no data	LD 100 mg/L, MD 20 mg/L (278)
Imipenem/Cilastatin	500 mg in alternate exchange (244)	LD 250 mg/L, MD 50 mg/L (236)
Ofloxacin	no data	LD 200 mg, MD 25 mg/L (279)
Polymyxin B	no data	MD 300,000 unit (30 mg)/bag (280)
Quinupristin/Dalfopristin	25 mg/L in alternate exchange[a] (281)	no data
Meropenem	1 gm daily (282)	no data
Teicoplanin	15 mg/kg every 5 days (283)	LD 400 mg/bag, MD 20 mg/bag (229)
Vancomycin	15–30 mg/kg every 5–7 days[b] (284)	LD 30 mg/kg, MD 1.5 mg/kg/bag (285)
Antifungals		
Fluconazole	IP 200 mg every 24 to 48 hours (286)	no data
Voriconazole	IP 2.5 mg/kg daily (287)	no data

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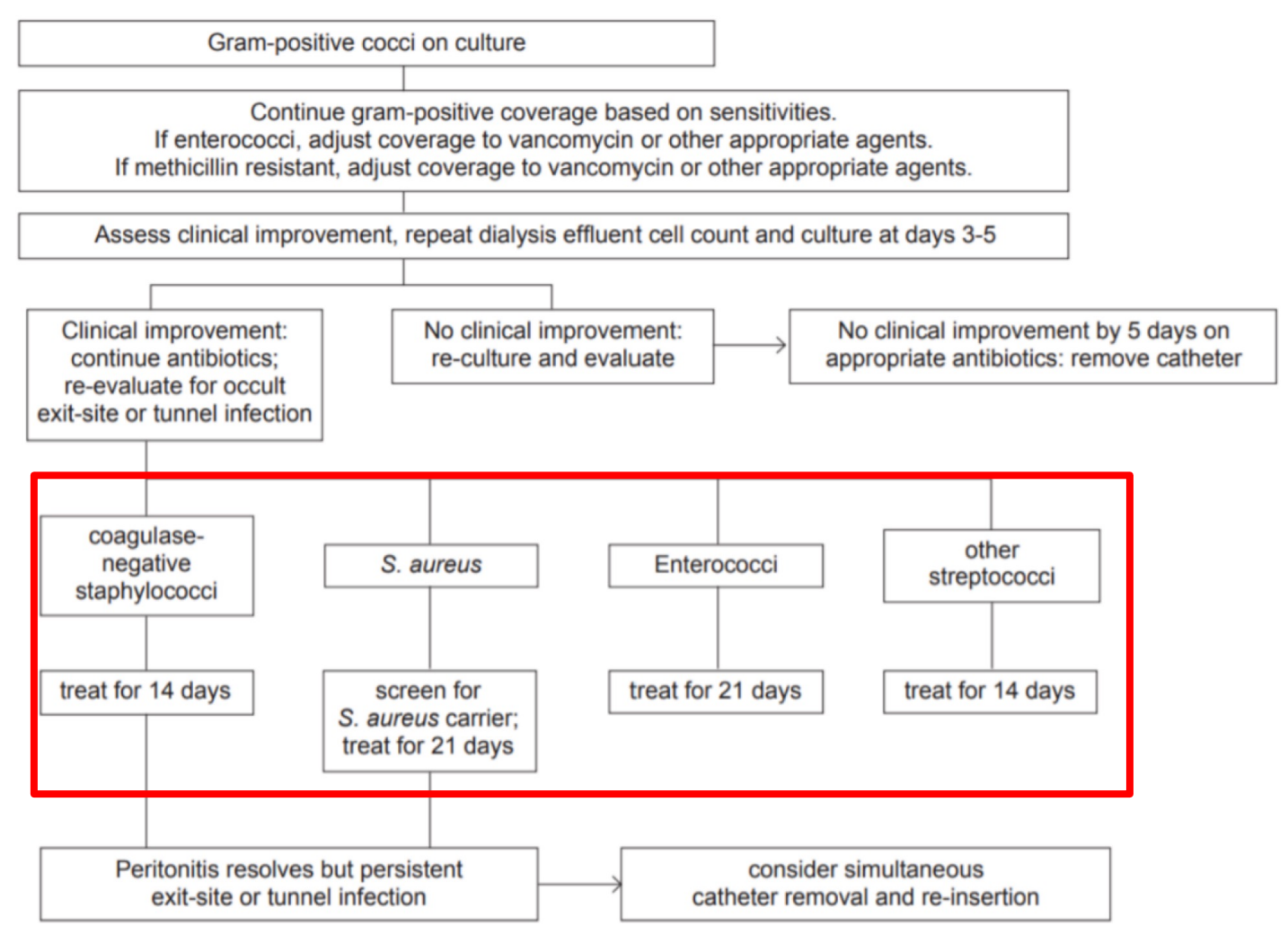
Management for gram +ve cocci



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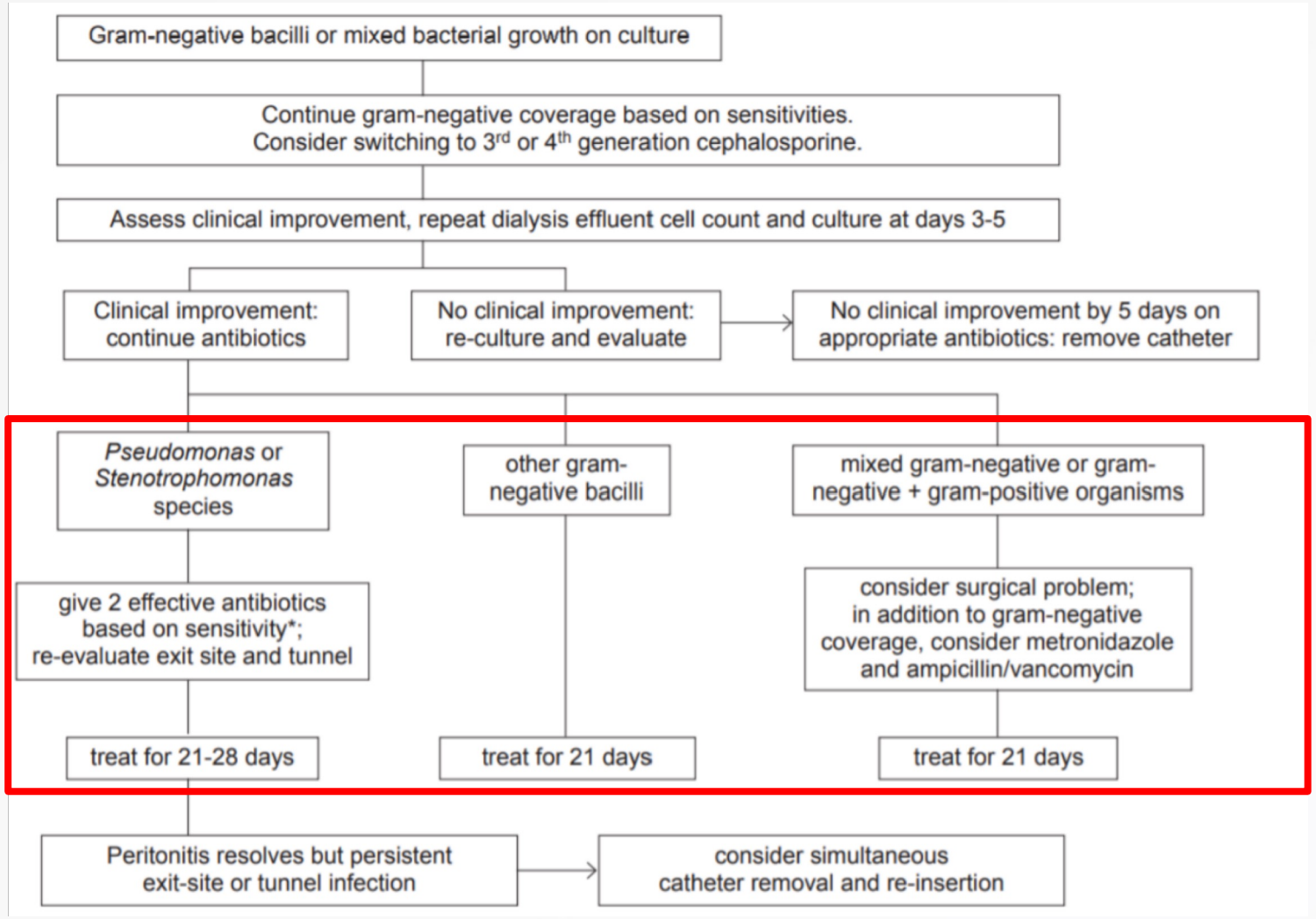
Management for gram -ve bacilli or mixed organisms



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Indications for catheter removal

- Refractory peritonitis (not response to appropriate antibiotic within 5 days)
- Relapsing peritonitis (within 4 wks, same organism)
- Fungal or mycobacterial peritonitis
- Peritonitis in association with intra-abdominal pathology
- Refractory exit-site and tunnel infection
- Exit-site infections that progress to/occur simultaneously with, peritonitis
- Culture-negative peritonitis with persistent symptoms + high WBC
- May also be considered for
  - Repeat peritonitis
  - Multiple enteric organisms

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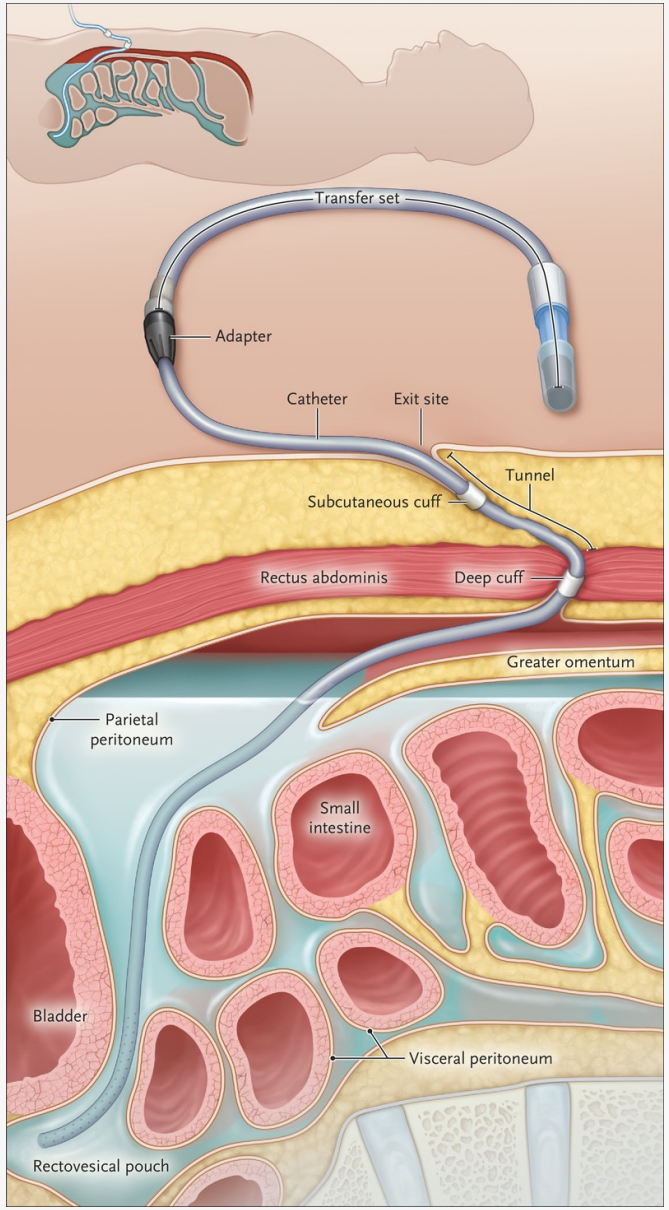
Exit site and tunnel infection



Exit site infection : Presence of purulent drainage, with or without erythema at the catheter-epidermal interface.
(if no pus --> early infection, allergic skin reaction, recently placed or after trauma)

Tunnel infection : Presence of clinical inflammation (erythema, swelling, tenderness or induration) with or without ultra-sonographic evidence of a collection along the catheter tunnel (Usually with an exit-site infection but could occur alone.)

ISPD Catheter-related infection recommendation:2023 UPDATE

Evaluation of the exit site

- Visual inspection : external exit site and sinus tract.
- Palpation : tunnel and cuff for induration and tenderness.
- Obtaining history : Have exit site practices been altered lately? When was the dressing last changed? Ideally should be cleansed at least 12 hrs before assessment
- Culturing any obvious drainage. Squeeze along tunnel and exit site if doubt.
- Comparing findings with previous exit site appearance.
- Using the exit site classification guide to document findings.

Exit site classifications

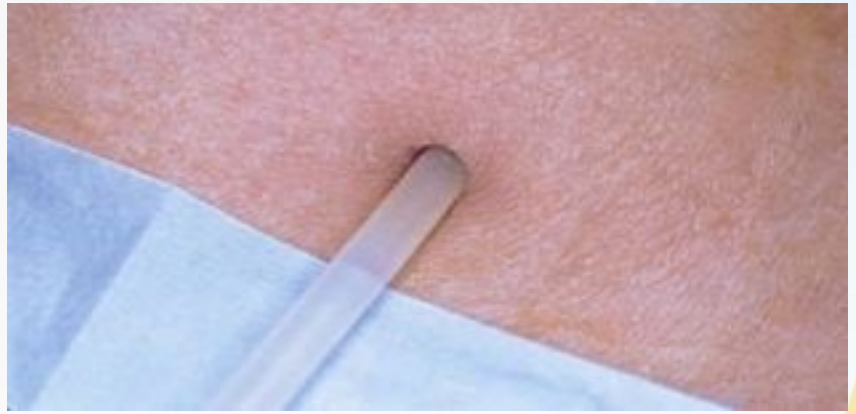
Grading of peritoneal catheter exit site based upon appearance

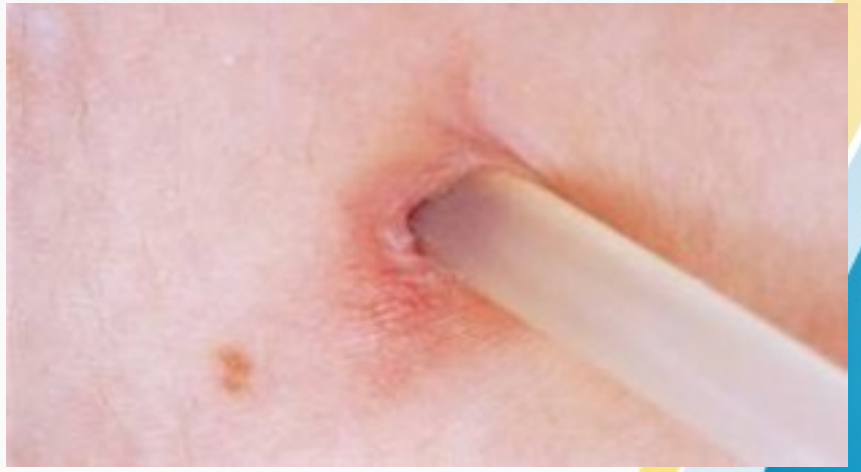
	Perfect	Good	Equivocal	Acute infection <4 weeks	Chronic infection >4 weeks	Cuff infection without exit infection
Pain/tenderness	None	None	None	May be present	Only if exacerbation	May be present over cuff
Color	Natural, pale pink or dark	Natural, pale pink, purplish or dark, bright pink <13 mm	Bright pink or red <13 mm	Bright pink or red >13 mm	Bright pink or red >13 mm only if exacerbation	Natural, pale pink, purplish or dark, bright pink
Crust	None or small, easily detached or specks of crust on dressing	None or small, easily detached or specks of crust on dressing	Present, may be large and difficult to detach	Present	Present, may be difficult to detach	Typically absent
Scab	None	None	None	May be present	May be present	Absent
Drainage	None	None	None even with pressure on sinus; dried exudate on dressing	Purulent or bloody, spontaneous or after pressure on sinus; wet exudate on dressing	Purulent or bloody, wet exudate on dressing	Chronic or intermittent Purulent, bloody, tenacious or "gluey"
Swelling	None	None	None	May be present	Occurs only if exacerbation	Cuff induration may be felt on palpation; negative ultrasound does not rule out the diagnosis
Granulation tissue	None	None	Plain or slightly exuberant	Slightly exuberant or "proud flesh" may be present	"Proud flesh" or slightly exuberant typically visible	None

Diagnosis : Exit site infection

Peritoneal catheter exit-site scoring system

	0 points	1 point	2 points
Swelling	No	Exit only; <0.5 cm	>0.5 and/or tunnel
Crust	No	<0.5 cm	>0.5 cm
Redness	No	<0.5 cm	>0.5 cm
Pain	No	Slight	Severe
Drainage	No	Serous	Purulent





Score ≥ 4 or purulent drainage

Management : Exit site infection

Gram stain and culture of exit-site drainage

Empirical antibiotics (Oral are as effective as IP)

- Always cover *S.aureus*
- History of *P.aeruginosa* exit-site infections
- Treated at least 2 wks of effective antibiotics except for *Pseudomonas* species and tunnel infection be treated at least 3 wks

Exit-site care

- Cleansed at least daily during exit-site infection (1C)
- Topical antibiotics

ISPD Catheter-related infection recommendation:2017 UPDATE

Oral antibiotics used in catheter-related infection

Table 1. First-line empirical oral antibiotics used in catheter-related infections.

Amoxicillin/clavulanate	500 mg/125 mg or 250 mg/125 mg BD
Cephalexin	250–500 mg BD
Cloxacillin or dicloxacillin	500 mg QID

BD: two times per day; QID: four times per day.

Table 2. Alternative oral antibiotics used in catheter-related infections.

Ciprofloxacin	500–750 mg daily
Clarithromycin	500 mg loading, then 250 mg BD
Clindamycin	300–450 mg TID to QID
Levofloxacin	250 daily or 500 mg every 48 h
Linezolid	600 mg BD for 48 h, then 300 mg BD 600 mg daily if used for NTM infection[90]
Moxifloxacin	400 mg daily
Rifampicin[a]	450 mg daily (for BW < 50 kg) 600 mg daily (for BW ≥ 50 kg)
Trimethoprim/sulfamethoxazole	80 mg/400 mg (one single-strength tablet) daily or BD[77] or 160 mg/800 mg (one double-strength tablet) daily

BD: two times per day; BW: body weight; QID: four times per day; TID: three times per day.

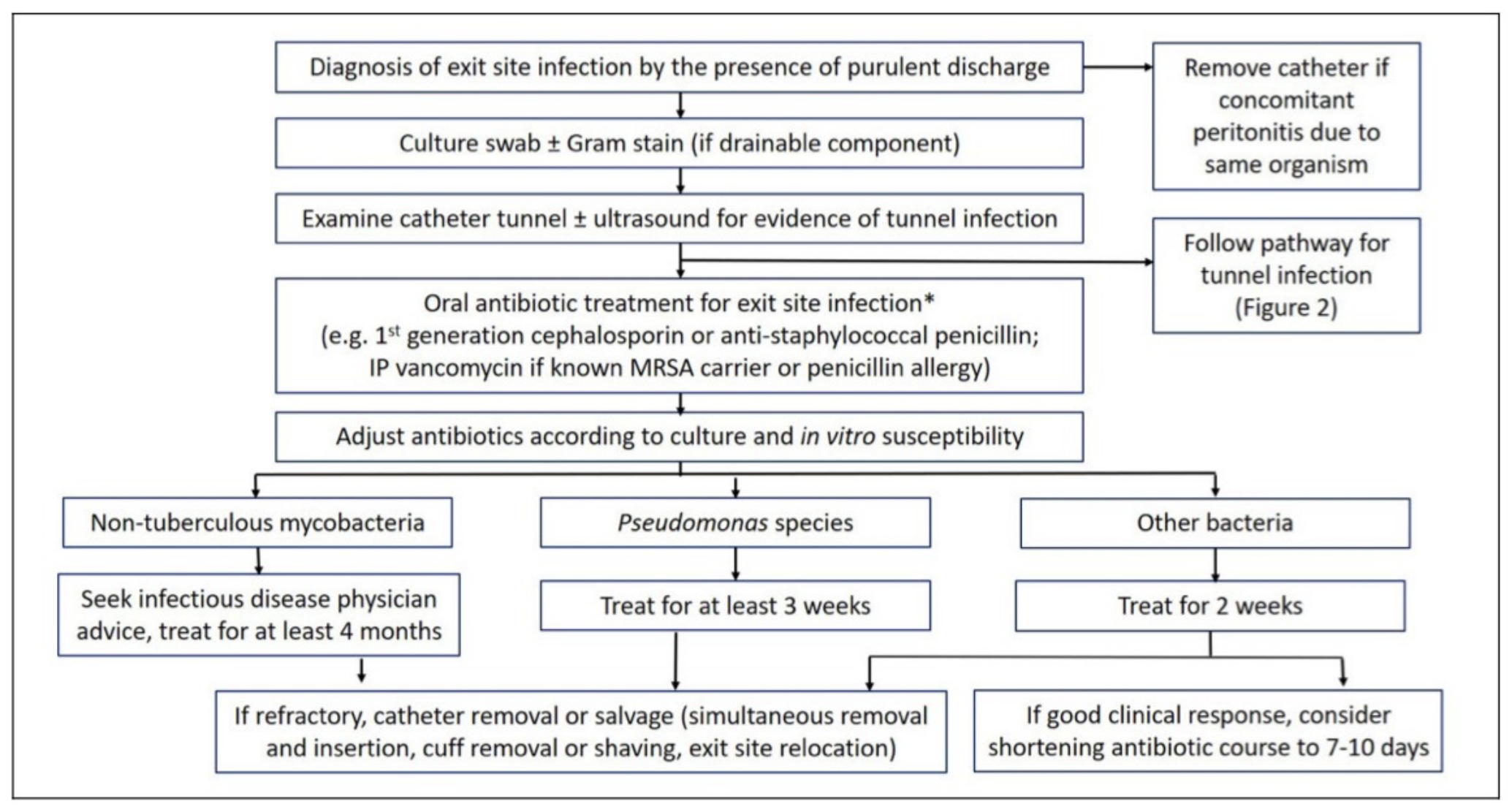
[a]Rifampicin is used for treating *S. aureus* synergistically with other antibiotics and should not be given as single-agent therapy.

- **Gram positive organism**
  - Treated with oral penicillinase-resistant (or broad-spectrum) penicillin or a first-generation cephalosporin.
  - Vancomycin if MRSA infections

- **Pseudomonas species**
  - Often require prolonged therapy with two antibiotics
  - Oral fluoroquinolones : first choice
  - If resolution is slow or recurrent → added second anti-pseudomonal drug.

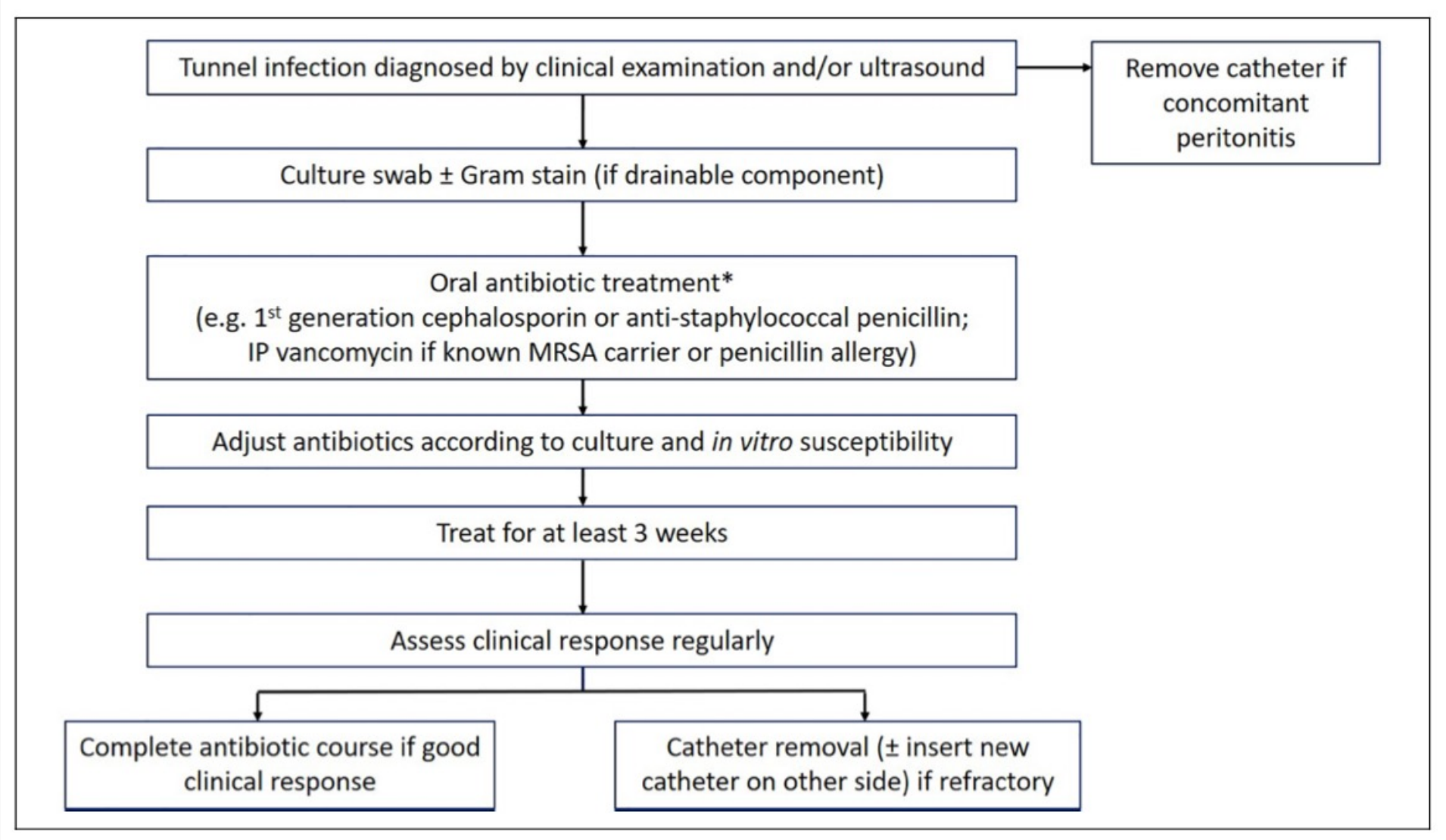
ISPD Catheter-related infection recommendation:2023 UPDATE

Exit site infection management



ISPD Catheter-related infection recommendation:2023 UPDATE

Tunnel infection management



ISPD Catheter-related infection recommendation:2023 UPDATE

UF failure and volume overload

Causes of volume overload in PD patients

- Input dependent : Excessive salt/water intake
- Output dependent :
  - Renal : Loss of RRF, Inadequate diuretics
  - PD “Inadequate UF condition” : Poor compliance, High plasma glucose, Inappropriate dialysate, Long dwell time, UF failure, Lymphatic reabsorption
  - Mechanical failure
- Others : Underlying disease (cardiac disease), drugs

UF failure (UFF)

- Defined as **fluid overload** in association with an **abnormal peritoneal membrane**
- **Definition :**
  - **Net UF volume <400 mL after 4 hrs dwell with 2 L of 4.25% dextrose**
  - **Net UF volume <100 mL after 4 hrs dwell with 2 L of 2.5% dextrose**

UFF should **not** be diagnosed

- If no clinical of significant fluid overload
- Until exclude catheter malfunction and leaks

Evaluation : History

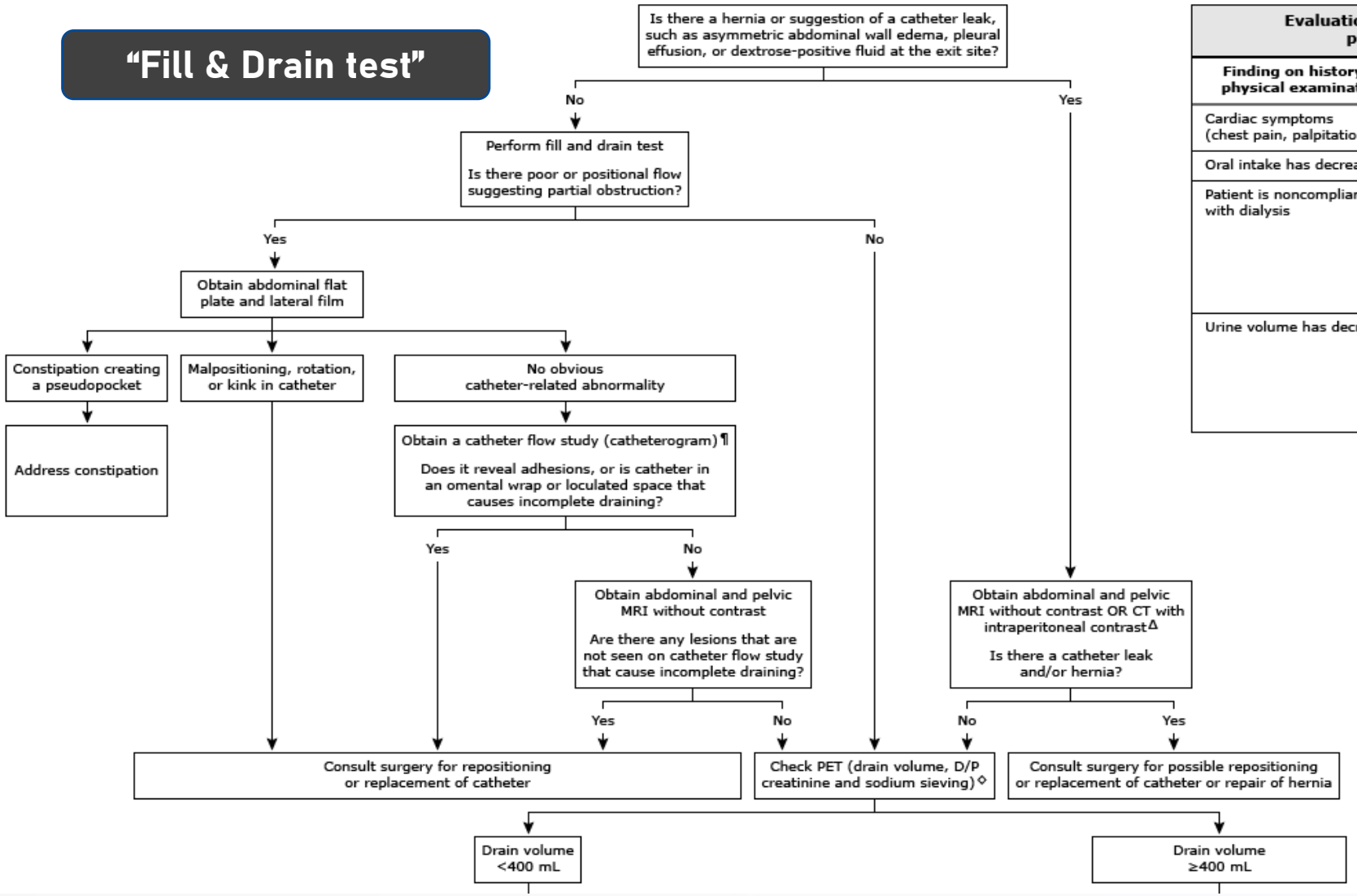
- S&S, severity of volume overload
- Intake, output (UF volume, urine)
- Food diary
- Dialysis compliance
- ประวัติเกี่ยวกับ PD เช่น ระยะเวลาล้างไต, ชนิดน้ำยา PDF, Hx of peritonitis
- If DM --> blood glucose
- ประวัติโรคหัวใจและหลอดเลือด
- ยา : NSAIDs, TZD, CCB
- S&S of inadequte

Evaluation : Physical examination

- Vital signs
- Signs of Hypervolemic state : JVP, lung crepitation, ascites, pleural effusion
- CVS system
- Abdomen : leakage, hernia
- Areas of retained fluid
- Signs of Inadequate dialysis

Evaluation of UFF
After excluding other causes that are unrelated to procedure

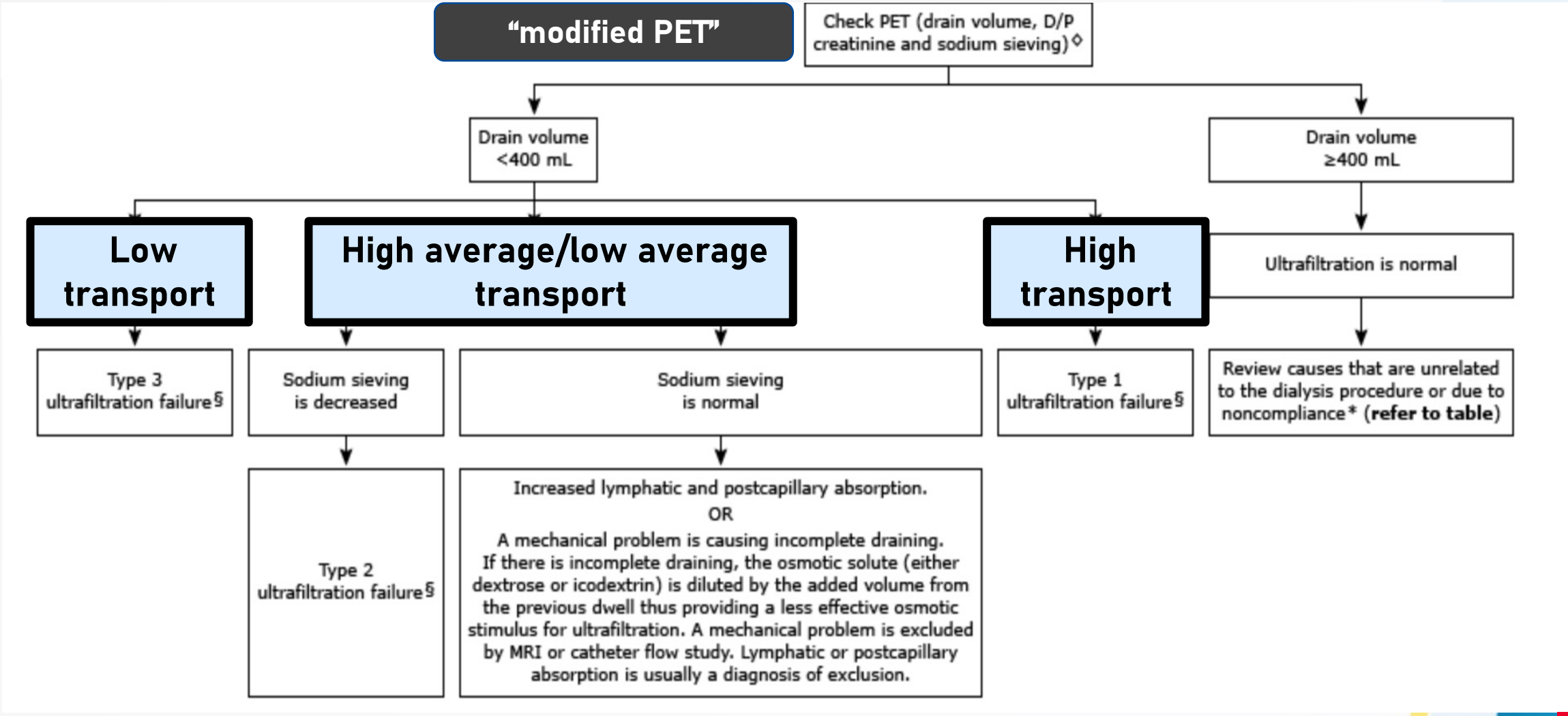
"Fill & Drain test"



Evaluation of causes that are unrelated to dialysis procedure or due to noncompliance

Finding on history or physical examination	Approach
Cardiac symptoms (chest pain, palpitations)	▪ Cardiology evaluation.
Oral intake has decreased	▪ Decrease target weight.
Patient is noncompliant with dialysis	▪ Review prescription with patient. ▪ Determine cause of noncompliance, if possible. ▪ Adjust prescription to make it easier to perform dialysis. Some dialysis regimens are difficult to perform accurately. As an example, a schedule that requires an exchange during the day may interfere with work and be omitted by the patient.
Urine volume has decreased	▪ Adjust dialysis prescription to provide more ultrafiltration. ▪ Increase diuretic dose. ▪ Check 24-hour creatinine clearance. ▪ Increase diuretic dose if residual kidney function has decreased.

Evaluation of UFF (con')



Type of UFF

- Type 1 (extremely rapid solute transport)
- Type 2 (loss of aquaporin function)
- Type 3 (decreased solute transport related to decreased functional surface area) both the D/P ratio and sodium sieving are decreased.
- Type 4 (increased lymphatic and postcapillary absorption) both the D/P values and sodium sieving are normal.

Normally, the rate of lymphatic absorption is approximately 1 mL/min, with hypervolemia potentially occurring with lymphatic absorption rates > 3 mL/min.

UFF and volume overload management (overall)

- Dietary sodium intake to <2 grams/day
- Fluid restriction
- Increased loop diuretics dose +/- combined diuretics
- Use higher concentration glucose PDF
- Use of icodextrin during a long dwell
- Shortening dwell time
- Blood sugar control

Additional Mx based on transport type

- Fast (high) transporters
  - short dwell times and avoid long dwells
  - Shift CAPD to APD
  - occasionally resting the peritoneum for 4-12 wks
- Slow (low) transporters (more difficult)
  - lysis adhesion
  - use 4.25% dextrose or icodextrin
  - high dose PD
  - often need to change to hemodialysis or combined therapy
- Increased lymphatic and postcapillary absorption
  - short dwell times
  - use 4.25% dextrose or icodextrin

Prevention of volume overload

- **Preserving residual renal function**
  - **ACEI and ARB :** preserve clearance and urine volume
  - **Use of high-dose loop diuretics**
  - **Avoidance** of nephrotoxins and intravascular depletion
  - Biocompatible PD solutions
  - Control optimal BP
- **Preservation of peritoneal membrane function**
  - Reduction in episodes of peritonitis
  - Avoidance of excessive exposure to high glucose conc. PDF
  - Avoid drug-associated EPS : beta blocker, chlorhexidine


Thank
You!