

# Complication of Peritoneal dialysis

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# Complication of Peritoneal Dialysis



# Infectious related complication

- Peritonitis.
- Infection at exit site.
- Infection at catheter tunnel.

# Peritonitis

- Peritonitis is common and serious complication of peritoneal dialysis (PD). Although less than 5% of peritonitis episodes result in death, peritonitis is the direct or major contributing cause of death in around 16% of PD patients .
- Peritonitis is a major cause of PD technique failure and conversion to long-term hemodialysis.
- Peritonitis rates have improved significantly in the past decade.
- Early detection and treatment with appropriate antibiotic coverage is imperative to prevent intra-abdominal and systemic complications.

# How to diagnose peritonitis

## Clinical feature

- Abdominal pain
- Fever
- Decrease ultra filtration and poor dialysis
- Change color of effluent ( cloudy )

## Biochemical feature

- $>100$  white cells/mm<sup>3</sup> (  $> 50\%$  polymorphs
- Gram stain
- PD fluid for C/S

**Eosinophilic peritonitis**

**Count  $> 15\%$**



# Rout of infection

- Touch – 41%
- Catheter related – 23%
- Enteric – 11%
- Insertion – 6%
- UTI/Diarrhoea – 4%
- Sepsis – 1%
- Unknown – 14%.

# Risk factor :-

- Physical limitations.
- Diabetes.
- Immunosuppression.
- Prior ABX therapy.
- Previous infections.
- Placement technique.
- Training.
- Environment.
- S.A. nasal carrier.
- Occupation.
- Hygiene.
- Attitude Technique.



**Table 3.** Indications for PD Retraining.

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- Following prolonged hospitalisation
  - 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 change in caregiver for PD exchange
  - Following other interruption in PD (e.g. period of time on haemodialysis)
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# TYPES OF PERITONITIS

- Cause specific peritonitis
- Time related peritonitis
- Out come related peritonitis

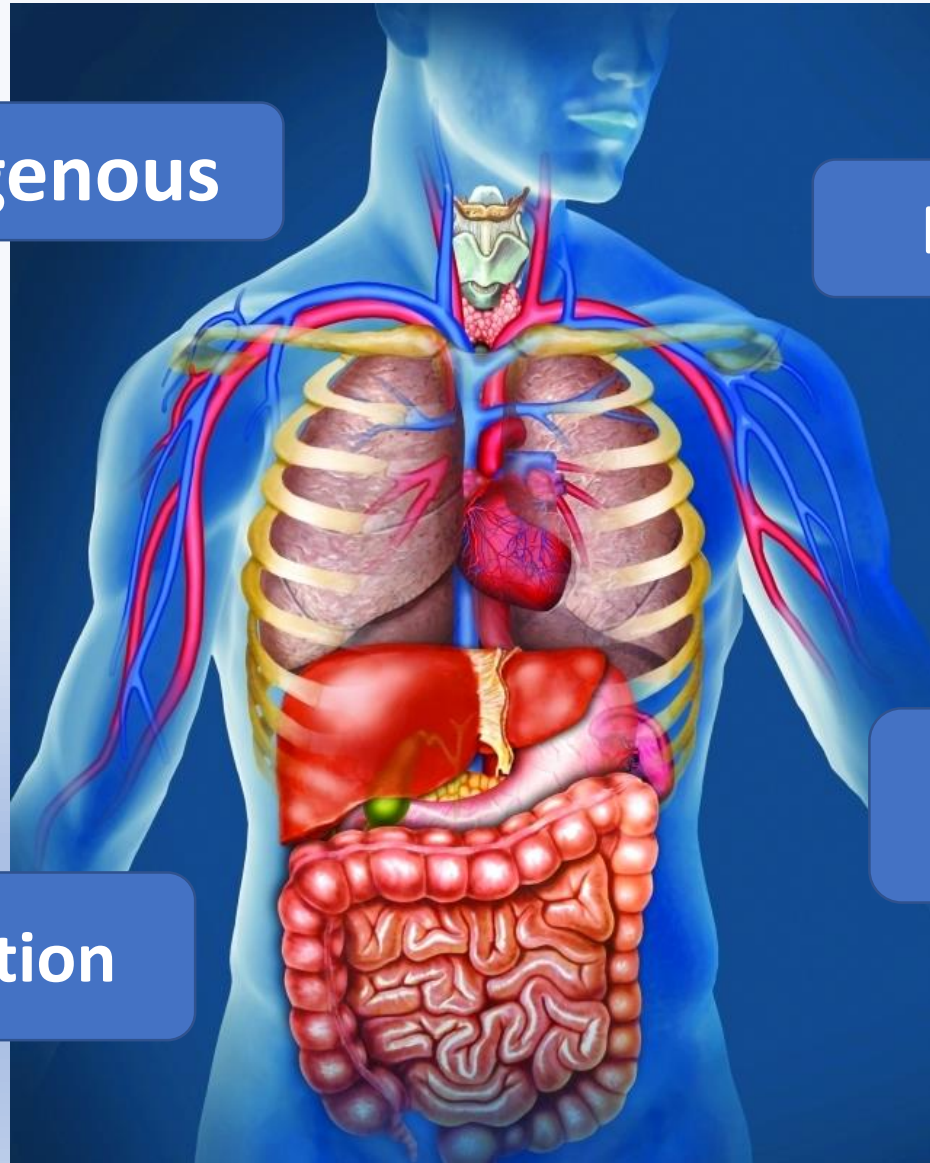
**Cause – specific  
peritonitis**

**Hematogenous**

**Enteral cause**

**Periluminal  
(Exit sit infection )**

**Ascending infection**



# TIME RELATED PERITONITIS

- **PRE-PD PERITONITIS**

Peritonitis episode that occurring after catheter insertion and prior to commencement of PD treatment

- **PD RELATED PERITONITIS**

Peritonitis occurs after PD commencement

- **PD-CATHETER INSERTION RELATED PERITONITIS**

An episode of peritonitis that occurs within 30 days of PD catheter insertion

# OUT COME SPECIFIC PERITONITIS

- Medical cure.
- Refractory peritonitis.
- Recurrent peritonitis.
- Relapsing peritonitis.
- Repeat peritonitis.
- Peritonitis associated cathetr removal.
- Peritonitis associated haemodialysis transfer.
- Peritonitis associated hospitalization .
- Peritonitis associated death.

**Table 1.** Outcome specific definition following peritonitis.

<b>Outcome</b>	<b>Definition</b>
Medical cure	Complete resolution of peritonitis together with NONE of the following complications: recurrent peritonitis, catheter removal, transfer to haemodialysis for $\geq 30$ days
Refractory	Peritonitis episode with persistently cloudy bags or persistent dialysis effluent leukocyte count $\times 10^9/L$ after 5 days of appropriate antibiotic therapy
Recurrent	Peritonitis episode that occurs within 4 weeks of completion of therapy of a prior episode with a different organism
Relapsing	Peritonitis episode that occurs within 4 weeks of completion of therapy <sup>a</sup> of a prior episode with the same organism or one sterile (culture negative) episode (i.e. specific organism culture negative followed by a specific organism or specific organism culture negative).
Repeat	Peritonitis episode that occurs more than 4 weeks after completion of therapy <sup>a</sup> with the same organism
Peritonitis-associated catheter removal	Removal of PD catheter as part of the treatment of an active peritonitis episode
Peritonitis-associated haemodialysis transfer	Transfer from PD to haemodialysis for any period of time as part of the treatment of a peritonitis episode
Peritonitis-associated death	Death occurring within 30 days of peritonitis onset or death during hospitalisation
Peritonitis-associated hospitalisation	Hospitalisation precipitated by the occurrence of peritonitis for the purpose of peritoneal dialysis delivery

# Organism

## Bacterial

### Gram positive

- *Staphylococcus* species
- *Corynebacterium* species
- *Enterococcus*
- *Streptococcus* species

### Gram Negative

- *Pseudomonas aeruginosa*
- (*E.coli*, *Proteus* or *Klebsiella*)

## fungus

### *Mycobacterial* *peritonitis*

# INITIAL EMPIRIC MANAGEMENT OF PD RELATED PERITONITIS

All PD patients who present with a cloudy PD drain bag require **IMMEDIATE** antimicrobial treatment

Gram – positive  
Coverage

Intra-peritoneal  
First generation  
cephalosporin ( Cefazolin)  
500 mg / L Day  
**OR**  
Vancomycin LD 1000  
mg/L every 4-5 D

Gram – negative  
Coverage

Intra-peritoneal  
Gentamicin  
8 mg/L / Day

Yeast coverage

Oral antifungal



# SUBSEQUENT MANAGEMENT OF PD RELATED PERITONITIS: DIRECTED BY CULTURE RESULTS

## Gram-positive

Culture negative

- Stop gentamicin
- Continue IP vancomycin OR Cefazolin for 14 days .

Staphylococcus species  
Corynebacterium  
species

- Stop IP gentamicin
- Continue IP vancomycin or as directed Frequency: weekly Duration: 14 days

Enterococcus

- Continue IP vancomycin or as directed Dose: 2 grams Frequency: weekly Duration: 21 days
- Continue IP gentamicin 40 mg Frequency: each day Duration: 7 days

Streptococcus species

- Stop IP gentamicin
- Continue IP vancomycin or as directed Frequency: weekly Duration: 14 days

# SUBSEQUENT MANAGEMENT OF PD RELATED PERITONITIS: DIRECTED BY CULTURE RESULTS

Pseudomonas  
Aeruginosa

- Stop IP vancomycin
- Used oral ciprofloxacin or IP cefepime or ceftazidime + oral ciprofloxacin for 3 week

Gram-negative  
Organism ( E.coli,  
Proteus or Klebsiella )-  
Single species isolated

- Stop IP vancomycin.
- Used if IP ceftazidime or IP cefizidim or oral ciprofloxacin for 2 week.

Multiple enteric organism Or  
Mixed growth peritonitis

- Surgical evaluator
- IV metronidazole + IP vancomycin or IP gentamycin for 3 week.

Fungal peritonitis

- Immediate Cather removal required
- Antifungal treatment should be continue for 2 week after catheter removed.

Mycobacterial peritonitis

- Consider catheter removal
- With use of antituberculus treatment
- Exclude Milary TB.

# High-risk peritonitis

(MSSA or MRSA) with exit site /tunnel infection

Seriously consider catheter removal in refractory exit site infection (ESI)  
Adjuvant Treatment continue antimicrobials for at least 14 days after catheter removal

*Pseudomonas aeruginosa* with exit site /tunnel infection

- Seriously consider catheter removal in refractory ESI  
Adjuvant Treatment continue antimicrobials for at least 14 days after catheter removal

Fungal peritonitis

- **IMMEDIATE** catheter removal required
- Consult with an Infectious Diseases physician  
Adjuvant Treatment commence antifungal therapy for 10-14 days after catheter removal

Polymicrobial Gram-negative enteric organisms

- Consider enteric source and investigate source of contamination
- Systemic antimicrobial therapy usually required  
Adjuvant Treatment continue antimicrobials for at least 14 days after catheter removal

*Mycobacterial peritonitis*

- Seriously consider catheter removal
- Consult with an Infectious Diseases physician  
Adjuvant Treatment continue antimicrobials for at least 14 days after catheter removal

**TABLE 5**  
**Intraperitoneal Antibiotic Dosing Recommendations for Treatment of Peritonitis**

	Intermittent (1 exchange daily)	Continuous (all exchanges)
<b>Aminoglycosides</b>		
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)
<b>Cephalosporins</b>		
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
<b>Penicillins</b>		
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)
<b>Others</b>		
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 <sup>a</sup> (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 <sup>b</sup> (284)	LD 30 mg/kg, MD 1.5 mg/kg/bag (285)
<b>Antifungals</b>		
Fluconazole	IP 200 mg every 24 to 48 hours (286)	no data
Voriconazole	IP 2.5 mg/kg daily (287)	no data

LD = loading dose in mg; MD = maintenance dose in mg; IP = intraperitoneal; APD = automated peritoneal dialysis.

<sup>a</sup> Given in conjunction with 500 mg intravenous twice daily (281).

<sup>b</sup> Supplemental doses may be needed for APD patients.

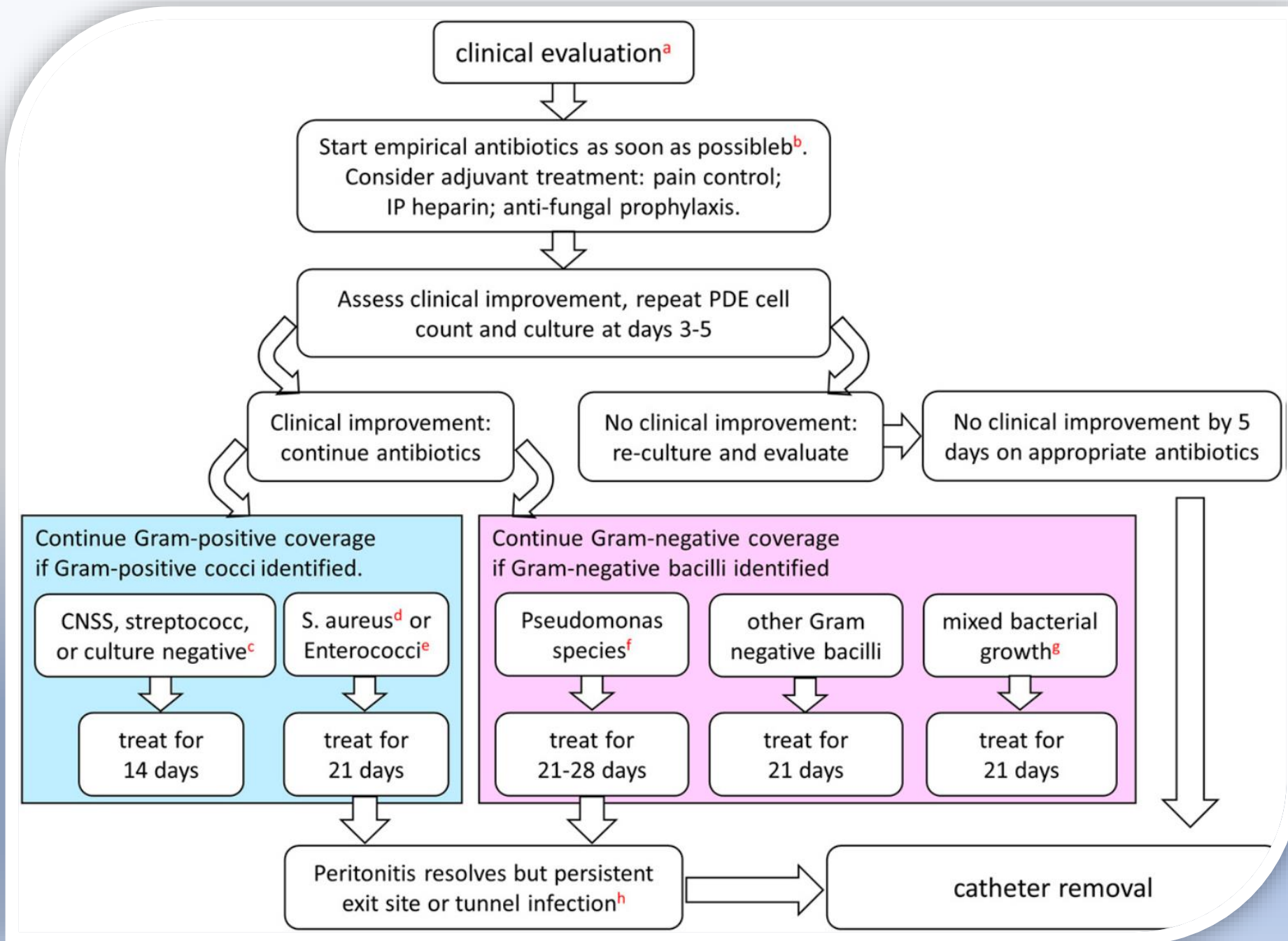
# Additional treatment for peritonitis

- Heparin 1000-2000unit IP (it prevents fibrin formation, reduce adhesion, it dose not cross membrane)
- Oral antibiotics.
- Add rifampicin for staph. aureus infection.

# Monitoring and response to treatment

- If patient is ill admit to hospital and monitoring the temp. WBC, CRP and dialysate appearance.
- Day 3           if poor clinical response re-cultur.
- Day 4           if poor clinical response check C/S and change antibiotics.
- Day 5           if still poor response (persistent cloudy fluid, high fever and positive CRP)

*Remove the catheter*





# INDICATIONS FOR CATHETER REMOVAL FOR PERITONEAL DIALYSIS-RELATED INFECTIONS

- Refractory peritonitis
- Relapsing peritonitis
- Refractory exit-site and tunnel infection
- Fungal peritonitis

**Catheter removal may also be considered for**

- repeat peritonitis
- mycobacterial peritonitis
- multiple enteric organisms

# Prevention PD related peritonitis

- The latest **ISPD** guideline makes a few specific recommendations on evidence-based strategies for the prevention of peritonitis.

## **Primary prevention**

- Systemic prophylactic antibiotics before PD catheter insertion.
- Disconnect systems with a “flush before fill” design for CAPD.
- PD training by nursing staff with the appropriate qualifications and experience.
- Daily topical application of antibiotic cream or ointment to the catheter exit site.
- Prompt treatment of exit site or catheter tunnel infection.
- Antibiotic prophylaxis before colonoscopy or invasive gynecologic procedures.

## **Secondary prevention**

- Antifungal prophylaxis during antibiotic therapy.
- Determine the cause and possible interventions.

# EXIT-SITE AND TUNNEL INFECTIONS

**Exit-Site Infection:** Is defined as purulent and/or bloody drainage from the exit site which may be associated with erythema, tenderness, granulation tissue.

**Tunnel Infection:** It is defined as erythema, edema, and/or tenderness over the subcutaneous pathway.

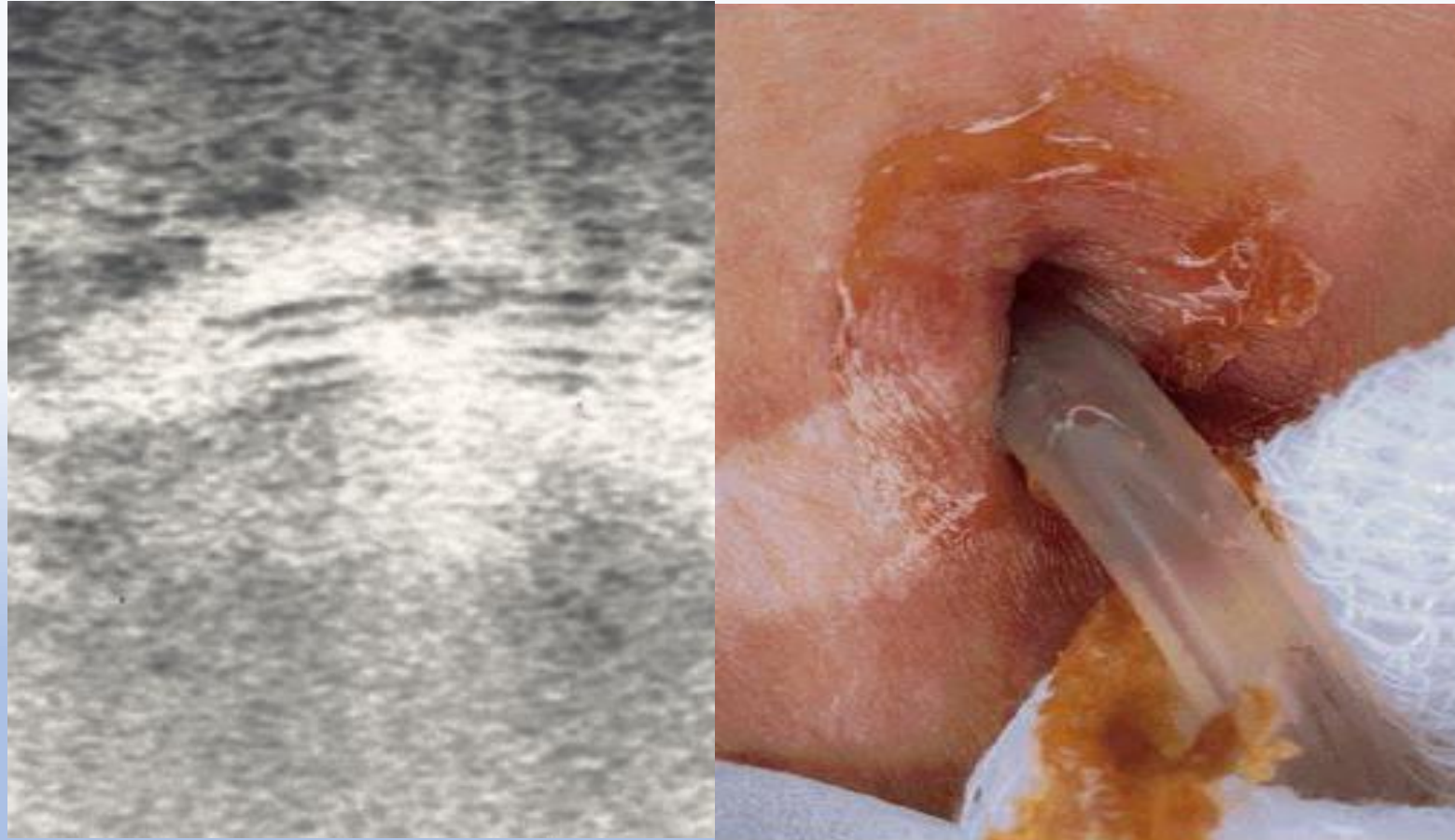
**Pathogens:** Staph. aureus is responsible for the majority of exit-site and tunnel infections.

# Twardowski's classification of the exit site appearance

- Perfect.
- Good.
- Equivocal.
- Acutely infected.
- Chronically infected.



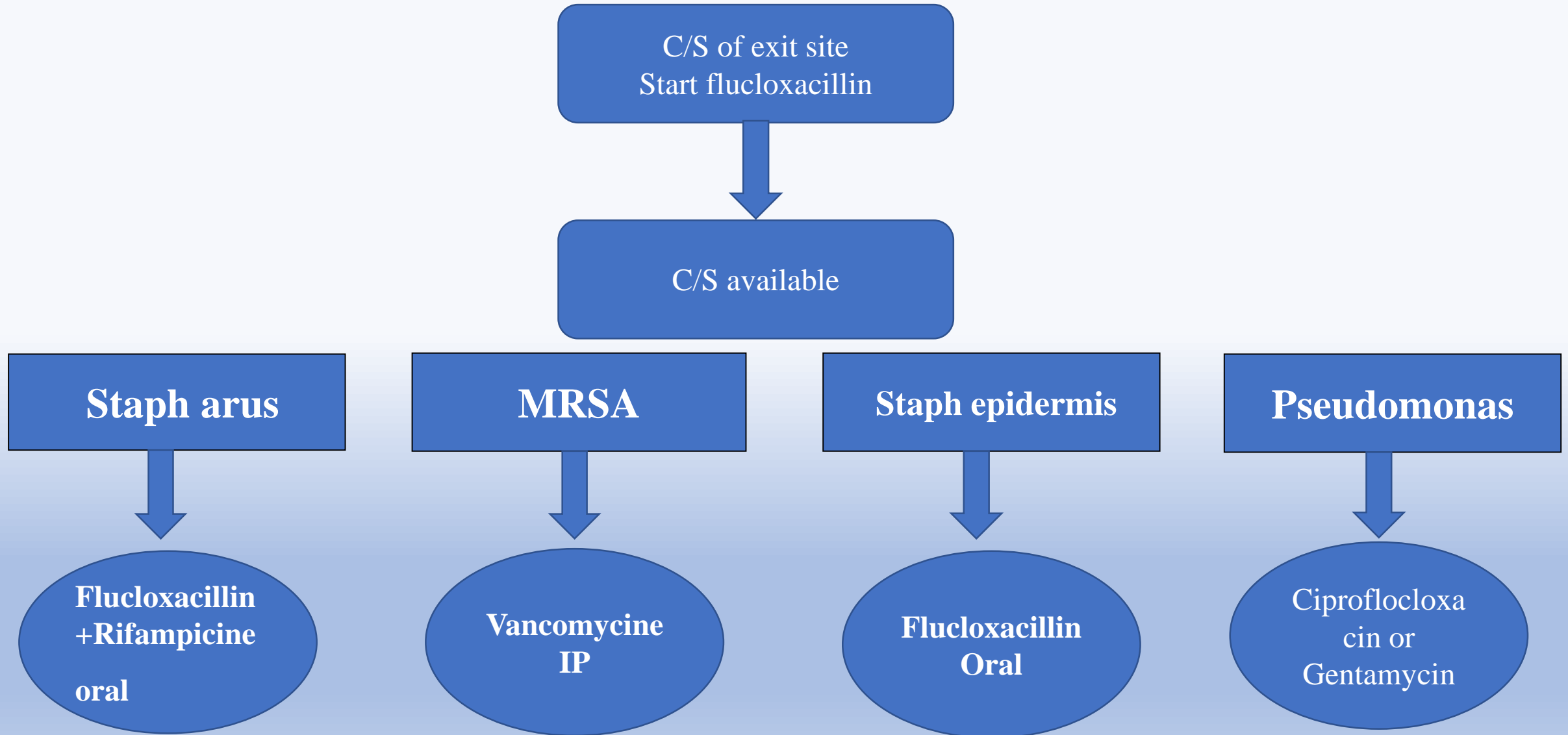
# Tunnel Infection



# Treatment recommendations of infected exit site

- Erythema alone - topical chlorhexidine or hydrogen peroxide.
- Dressing changes twice daily.
- Early antibiotic treatment in acute infection.
- Cauterization (silver nitrate).
- Prolonged treatment in chronic or recurrent infection.
- Catheter removal
  - persistent recurring infection
  - pseudomonas infection

# Treatment of Exit-Site and Tunnel Infections





# Prevention of exit site infection

- Epithelialisation around cuff (leave it alone).
- Correct regimes for cleaning and hand hygiene.
- Check for nasal Staph aureus carriage – treat 5 days with nasal mupirocin.
- Review regularly.

# NON- Infectious complication

## □ Complication related to increase intrabdominal pressure :-

- Hernia
- Dialysate leak
- Hydrothorax

## □ Complication related inflow :-

- Malfunction peritoneal catheter
- Pain during inflow
- Constipation
- Bleeding

## □ Complication related to solution and water transfer:-

- Weight gain
- Over load
- Electrolyte imbalance
- Hyperglycemia
- Hypertriglyceridemia

# Conclusion

- Peritoneal dialysis is successful as temporary renal replacement therapy in patient with renal stage renal disease and bridge to renal transplantation .
- PD related peritonitis is an emergency , early detection and treatment is essential .
- ISPD guide line summarized number of measures with provide efficacy for prevention and management PD related peritonitis .
- ISPD suggest that the rate of peritonitis be reported as number of episodes per patient-year and recommend that the over all peritonitis rate no more than 0.4 episodes per year at risk.

THANK YOU