Paediatric Peritoneal Dialysis Peritonitis Protocol 2013 Update

This protocol is based on the 2012 International Society of Peritoneal Dialysis Guidelines & Recommendations

Peritoneal Dialysis International 2012; 32:sp32-86

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Diagnosis of Peritonitis

- Peritonitis should be suspected in a PD patient with cloudy effluent, +/- fever and abdominal pain.

- Any suspected case should have an urgent PD effluent sample sent for cell count & differential, gram stain, culture & sensitivity.

  – PD effluent sample MUST be collected in a sterile fashion *see further detail on page 4

  – If PD fluid cloudy/patient symptomatic, send a sample to lab irrespective of the dwell time, if more equivocal signs (or equivocal results from first sample) ensure that the fluid sample sent has had an intraperitoneal dwell time of at least 2 hours.

- Peritonitis is diagnosed if effluent cell count white cell count (WCC) ≥ 100/mm^3 & ≥ 50% neutrophils (polymorphonuclear leucocytes)

  – Strong clinical suspicion for peritonitis with with WCC <100: if neutrophils ≥ 50%, BUT WCC <100 consider treating whilst awaiting culture result, or continue close observation and repeat cell count next day.

- Consider hospital admission if: concerns regarding sepsis, age <2yrs, current or recent immunosuppressive therapy, associated exit site or tunnel infection, provision of adequate analgesia.

- Only nurses, parents or caregivers trained in peritoneal dialysis procedures may perform bag exchanges, collect effluent samples, or add antibiotics to dialysate.

Peritoneal Fluid Sample

- Sample to be obtained using a manual bag drain or sample bag placed between drain line & drain bag while on APD.

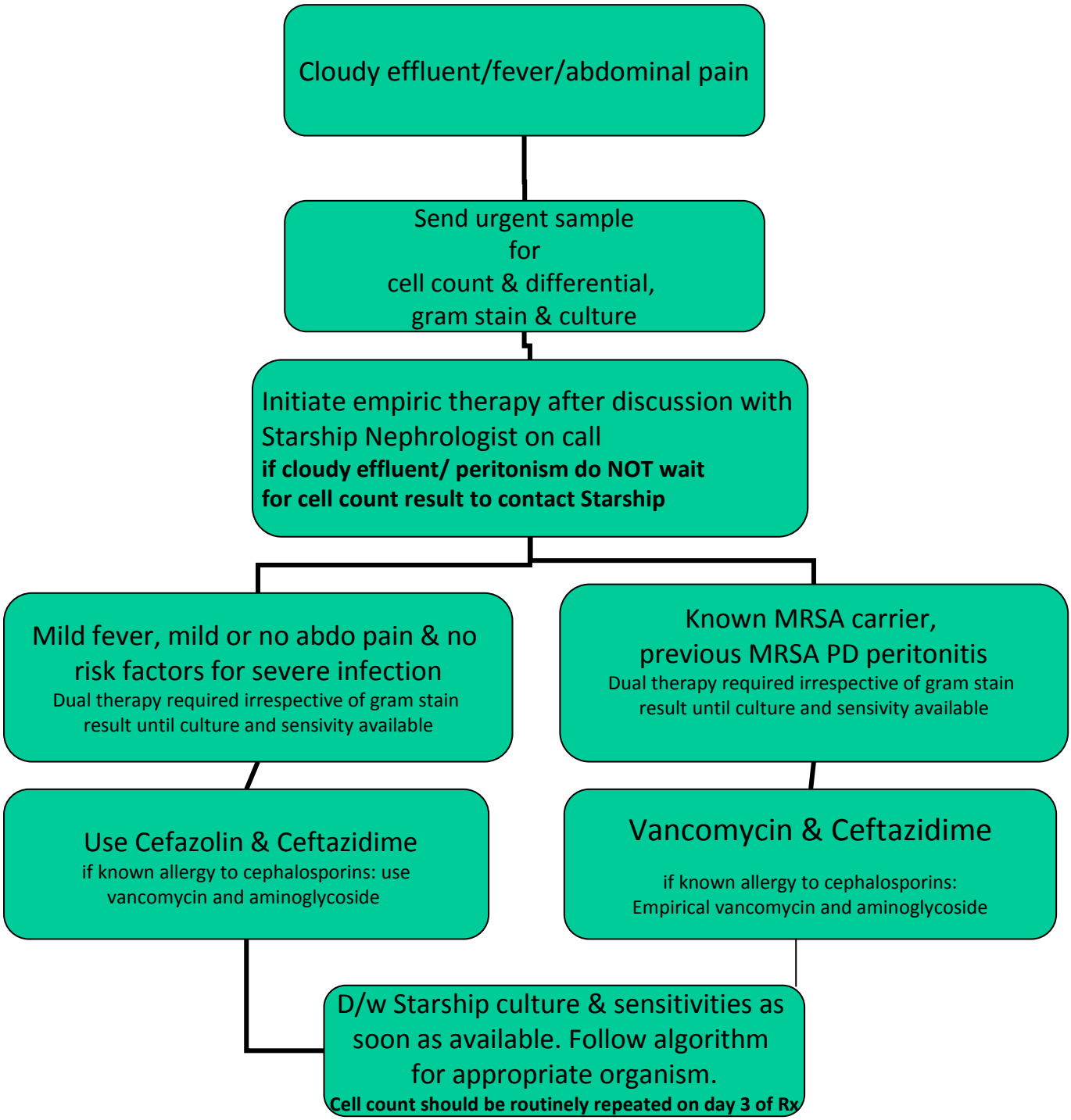
- **<u>DO NOT</u> take the sample from the APD drain bags.** These bags are reused & can give spurious results.

- Withdraw 20ml of dialysate and inject into 2-3 blood culture bottles. Also send the remaining fluid in the bag to the lab for analysis. This will provide 2 results.

- If the peritoneum is empty, instil the usual fill volume (or 75% if severe abdominal pain) and allow to dwell for a minimum of 1-2 hrs before draining and sending a sample.

- If results from the first sample are indeterminate, send a repeat sample ensuring a minimum intraperitoneal dwell time of 2 hours.

Initial presentation with suspected peritonitis



Antibiotic dosing recommendations

- Administration should be via *intraperitoneal* (IP) route unless specified otherwise.
- Loading doses should be administered and left to dwell for 4-6 hours.
- These concentration related doses require use of the usual patient specific dwell volume (i.e., approximately 1100ml/m^2 body surface area).

  NB. If patients require reduced fill volume due to severe abdominal pain, discuss antibiotic dosing with on call Nephrologist as this will need adjusting.

Empiric antibiotic doses

Antibiotic	**Continuous therapy**		**Intermittent Therapy (NOT RECOMMENDED FOR CEPHALOSPORINS)**
	Loading dose (4-6 hour dwell)	**Maintainance dosing**	
Cefazolin	500mg/l	125mg/l	15mg/kg q24hrs
Ceftazadime	500mg/l	125mg/l	20mg/kg q24hr
Vancomycin			30mg/kg (max 2g) loading dose (min 6 hr dwell) then monitor vanc levels q 4-5 days & give 15mg/kg doses (min 6 hr dwell) thereafter when serum level is (or is anticipated to be)<15mg/L. Aim to maintain level 15-25mg/L. NB if significant residual renal function consider giving 35mg/kg loading dose AND check levels from day 2.

Antibiotic dosing recommendations

TABLE 5
Antibiotic Dosing Recommendations[a] for the Treatment of Peritonitis

Antibiotic type	Therapy type: Continuous[b] Loading dose	Continuous[b] Maintenance dose	Intermittent[b]
Aminoglycosides (IP)[c]			
Gentamicin	8 mg/L	4 mg/L	
Netilmycin	8 mg/L	4 mg/L	Anuric: 0.6 mg/kg
Tobramycin	8 mg/L	4 mg/L	Non-anuric: 0.75 mg/kg
Amikacin	25 mg/L	12 mg/L	
Cephalosporins (IP)			
Cefazolin	500 mg/L	125 mg/L	20 mg/kg
Cefepime	500 mg/L	125 mg/L	15 mg/kg
Cefotaxime	500 mg/L	250 mg/L	30 mg/kg
Ceftazidime	500 mg/L	125 mg/L	20 mg/kg
Glycopeptides (IP)[d]			
Vancomycin	1000 mg/L	25 mg/L	30 mg/kg; repeat dosing: 15 mg/kg every 3–5 days
Teicoplanin[e]	400 mg/L	20 mg/L	15 mg/kg every 5–7 days
Penicillins (IP)[c]			
Ampicillin	—	125 mg/L	—
Quinolones (IP)			
Ciprofloxacin	50 mg/L	25 mg/L	—
Others			
Aztreonam (IP)	1000 mg/L	250 mg/L	—
Clindamycin (IP)	300 mg/L	150 mg/L	—
Imipenem–cilastin (IP)	250 mg/L	50 mg/L	—
Linezolid (PO)	<5 Years: 30 mg/kg daily, divided into 3 doses 5–11 Years: 20 mg/kg daily, divided into 2 doses ≥12 Years: 600 mg/dose, twice daily		
Metronidazole (PO)	30 mg/kg daily, divided into 3 doses (maximum: 1.2 g daily)		
Rifampin (PO)	10–20 mg/kg daily, divided into 2 doses (maximum: 600 mg daily)		
Antifungals			
Fluconazole (IP, IV, or PO)	6–12 mg/kg every 24–48 h (maximum: 400 mg daily)		
Caspofungin (IV only)	70 mg/m² on day 1 (maximum: 70 mg daily)	50 mg/m² daily (maximum: 50 mg daily)	

IP = intraperitoneally; IV = intravenously; PO = orally.

[a] Adapted from Li *et al.* (7), *The Renal Drug Reference Guide* (171), and Taketomo *et al.* (172).

[b] For continuous therapy, the exchange with the loading dose should dwell for 3–6 hours; all subsequent exchanges during the treatment course should contain the maintenance dose. For intermittent therapy, the dose should be applied once daily in the long-dwell, unless otherwise specified.

[c] Aminoglycosides and penicillins should not be mixed in dialysis fluid because of the potential for inactivation.

[d] In patients with residual renal function, glycopeptide elimination may be accelerated. If intermittent therapy is used in such a setting, the second dose should be time-based on a blood level obtained 2–4 days after the initial dose. Re-dosing should occur when the blood level is <15 mg/L for vancomycin, or <8 mg/L for teicoplanin. Intermittent therapy is not recommended for patients with residual renal function unless serum levels of the drug can be monitored in a timely manner.

[e] Teicoplanin is not currently available in the United States.

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Adjunctive Therapy

- Administer Heparin IP 500iu/l until complete resolution of dialysate cloudiness.

- Administer prophylactic oral Nystatin for duration of antibiotics. Dose 10,000units/kg/day divided q6-8hourly. Maximum 500,000units per dose.

- Ensure adequate analgesia.

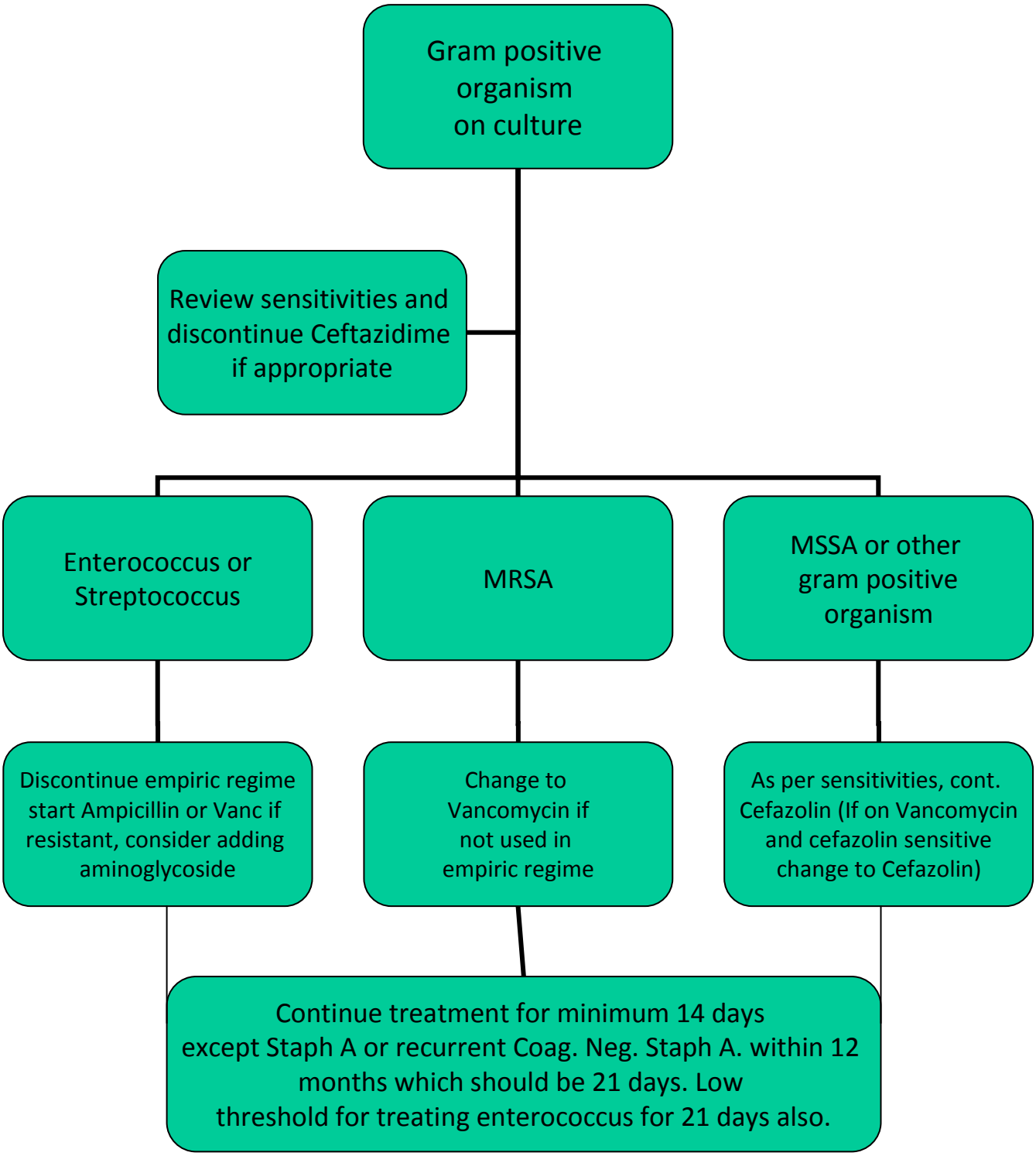
Modifying CCPD Therapy

- The last dwell volume should be increased to the usual overnight cycle dwell volume. (Approximately 1100ml/m^2 body surface area.) This is to ensure the patient receives the correct concentration of antibiotics during the day dwell.

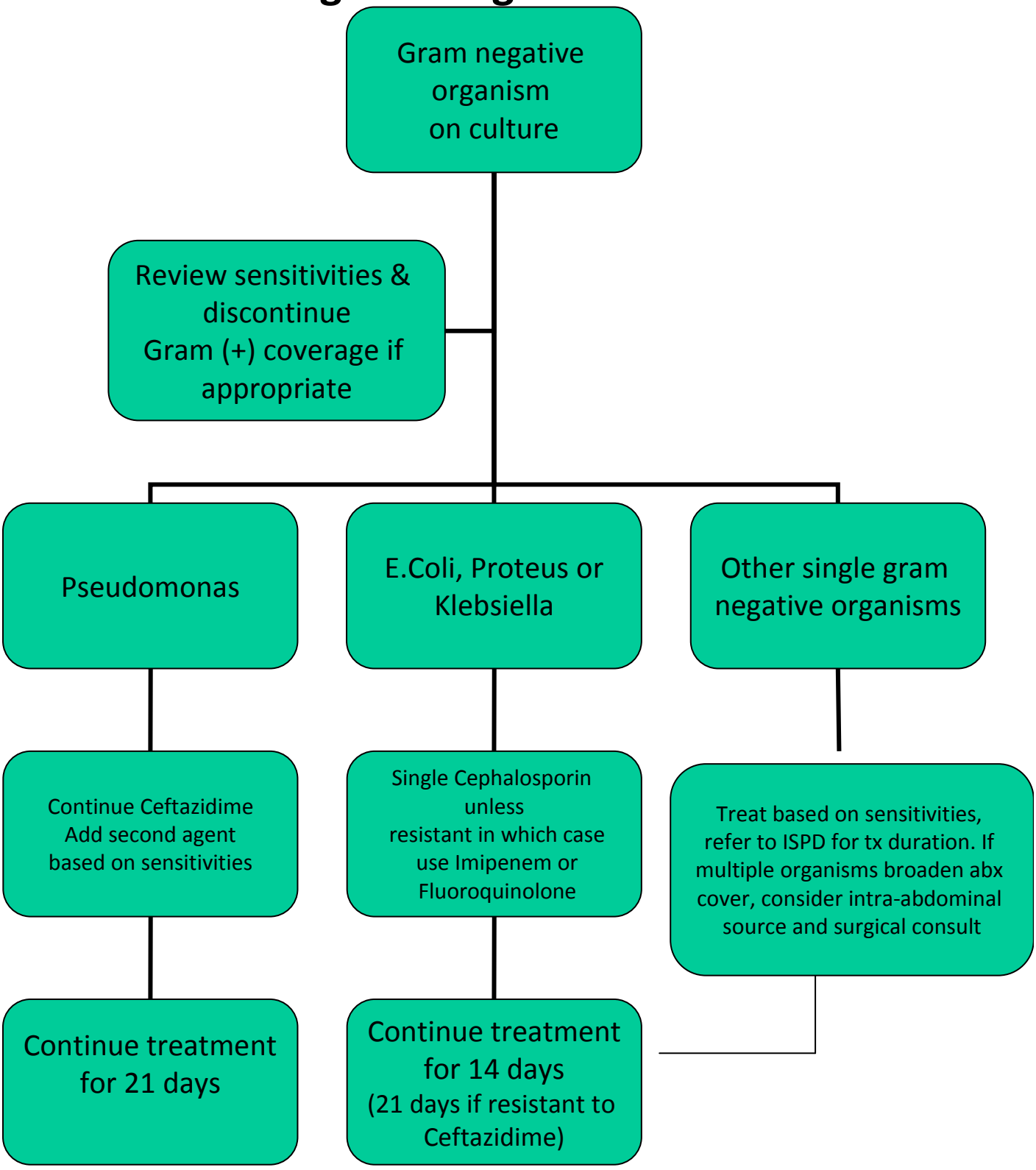
- If severe pain initially, may decrease dwell volumes by up to 25%, but antibiotic dosing should be adjusted to ensure correct mass of antibiotic received by patient (d/w nephrologist on call).

- APD dwell times to be set at a minimum of 2-3 hours until the peritoneal effluent clears. (APD pts will often already have a pre programmed peritonitis script on their card)

Gram positive organism on culture



Gram negative organism on culture



Treatment of Culture Negative Peritonitis

- If the initial cultures remain sterile at 72 hours and signs and symptoms of peritonitis are improved, the combined empiric antibiotic therapy prescribed to cover both gram positive and gram negative organisms should be continued for 14 days.

- If culture negative and no clinical improvement, repeat cell count and culture at 72 hours. If no improvement in cell count nor clinically, ensure contact renal service and consider special testing for unusual/fastidious organisms. Consider adding rifampicin 10mg/kg/day orally (max 650mg or 450mg if <50kg for 5-7 days).

- Catheter removal at 5 days if no improvement and continue antibiotic cover for 14 days after removal.

Treatment of Fungal Peritonitis

- Fungal peritonitis has a high morbidity and mortality rate. Treatment usually requires urgent removal of the Tenckhoff catheter. Please contact the Starship nephrologist on call as soon as a diagnosis of fungal peritonitis is made.

Relapsing Peritonitis

- Defined as reoccurrence of peritonitis with the same organism as the preceding episode within 4 weeks of completion of antibiotic therapy.

- Consider a fibrinolytic agent if relapse is not explained by an extraluminal cause such as a tunnel infection or intra-abdominal abscess (suggested protocol: drain patient then instill 5ml of 1000IU/mL Urokinase into PD catheter, clamp for 2h then aspirate and recommence dialysis, 1-2 doses total q24h).

- Use empiric antibiotic therapy until culture and susceptibilities known, then review.

- PD catheter should be removed as soon as peritonitis controlled by antibiotic therapy if relapsing peritonitis is associated with a persistent or recurrent tunnel infection, or is a second episode of relapsing peritonitis.

Recurrent Peritonitis

- Defined as reoccurrence of peritonitis with a different organism from the preceding episode within 4 weeks of completion of antibiotic therapy.

- Treat as per the usual initial empiric therapy guideline modifying therapy once culture and sensitivities known.

Intermittent Antibiotic Dosing

- Intermittent antibiotics are the only doses prescribed per kg not per litre of dialysate. The dose for a 2 litre manual bag needs to be calculated and added that will give the prescribed concentration in mg/kg when the usual patient fill volume is inflowed.

  – e.g: To administer 30mg/kg Vancomycin to a 13kg child with a usual fill vol of 600ml:

    30mg x 13 kg = 390mg

    2000ml / 600 = 3.3

    Add 3.3 x 390mg = 1287mg Vancomycin

    in a 2 litre bag to give 390mg in a 600ml

    fill.

    (NB. Intermittent dosing not recommended for cephalosporins)

Evaluation of response to treatment

- Clinical response to the initial antibiotic treatment should be evaluated daily. An improvement in clinical status, reduction of effluent cloudiness and cessation of fever and abdominal pain within 72 hrs of therapy is considered successful.

- If response is slow or not evident within 72hours of commencement of antibiotic therapy, a further effluent sample should be sent for cell count, differential and culture. Please contact the Starship Nephrologist on call.

- Special attention should also be taken to review volume status and electrolytes during peritonitis as changes to PD prescription may be required due to altered membrane characteristics.

Indications for PD Catheter Removal

- Fungal peritonitis.
  - Minimal period of 2-3 weeks between removal and insertion of a new catheter

- A first episode of relapsing peritonitis associated with a persistent tunnel infection with the same bacteria.
  - Timing of replacement discussed on individual basis.

- Any second episode of relapsing peritonitis.
  - Simultaneous removal and replacement of catheter after clearing of the peritoneal fluid (WCC<100/mm^3).

- Refractory exit site and tunnel infection
  - Timing of replacement discussed on individual basis.

- Refractory bacterial peritonitis (WCC>100 after 5/7 appropriate antibiotic therapy) .
  - Minimal period of 2-3 weeks between removal and insertion of a new catheter.

PD Catheter Related Infections

- Diagnosis of exit site infection (ESI) is made with a score of 2 or greater with pericatheter swelling, redness and tenderness in the presence of a pathogenic organism or 4 or greater regardless of culture results.

- Tunnel infection is defined by redness , swelling and tenderness along the subcutaneous portion of the catheter with or without purulent drainage from exit site. Score of 6 or greater.

Exit site scoring system

Indication	0	1	2
Swelling	No	Exit only (<0.5cm)	Incl. part of or entire tunnel
Crust	No	<0.5cm	>0.5cm
Redness	No	<0.5cm	>0.5cm
Pain on pressure	No	Slight	Severe
Secretion	No	serous	purulent

PD Catheter Related Infections

- Exit site infection - Oral antibiotic to be given once culture and sensitivities known for a minimum of 2 weeks.

- Staph. aureus to be treated with a 3 week course of oral antibiotic as well as topical mupirocin BD to the exit site for 7 days.

- Tunnel infections to be treated with IV antibiotics for a minimum of 2 weeks. Consider PD catheter removal if infection not resolving.

Staph. aureus prophylaxis

- All PD patients to use intranasal Mupirocin BD first 5 days of the month.

- If a patient has a Staph. Aureus exit site infection, stop intranasal Mupirocin and switch to daily Mupirocin at the exit site.

- NB. If recurrent pseudomonas exit site infection consider topical gentamicin ointment to exit site.

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Prophylactic Antibiotics for Line Contamination

- In case of line contamination i.e.;
  - Hole in catheter or extension line.
  - Disconnection of the extension line from the catheter.
  - End of catheter or a connecting line has been contaminated and PD was continued with a subsequent inflow.
  - Any situation in which their has been an opportunity for organisms to knowingly enter the peritoneum.

- Treatment should consist of both a sterile extension line change and antibiotic prophylaxis as soon as possible to reduce the risk of peritonitis.

- Repair catheter and/or replace extension line if indicated.

- Send cell count and culture pre antibiotics and follow the peritonitis protocol if indicated
- Administer as a single dose the initial empiric loading doses of Cefazolin 500mg/l and Ceftazidime 500mg/l to dwell for a minimum of 6hrs. (Use usual patient fill volume.)

Slide 19

11 pg 43 and 45 of ispd re touch contam
Tim Prestidge, 10/12/2012