Children's Health Ireland

Crumlin | Temple Street | Tallaght | Connolly

CHI Nursing Practice Guideline on the management of Peritonitis in Peritoneal Dialysis

Area of use:	All of organisation ☐	CHI at Connolly ☐	CHI at Crumlin ☒
	CHI at Herberton ☐	CHI at Tallaght ☐	CHI at Temple Street ☒
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0	October 2015	N/A	Lisa Edwards/Fiona Mc Hugh
1	May 2018	Routine review	Eavan Flynn
2	September 2023	Update	Lorna Donnellan

Please note practice variation

None

CONTENTS

1.0 Introduction

Peritonitis is inflammation of the thin layer of tissue that covers the abdomen and abdominal organs usually caused from fungal or bacterial infections. It is a common and serious complication of peritoneal dialysis. Peritonitis contributes to major morbidity because of the loss of peritoneal membrane function and technique failure, particularly in children with repeated episodes of peritonitis. It requires prompt medical attention. Early diagnosis and treatment is essential (ISPD 2022).

Dwell time is the duration of time the dialysate is sitting (dwelling) in the peritoneum.

2.0 Purpose of the guideline

The purpose of this document is to standardise procedures in the care of children with suspected peritonitis and to ensure safe evidence based practice. This document will guide health care professionals to care for, recognise and treat peritonitis. It will provide Health Care Professionals (HCPs) with the knowledge base required to care for a child with peritonitis, ensuring safe, effective and quality care is delivered to our patients.

3.0 Procedure

ISPD (2022) recommends that peritonitis should always be diagnosed when at least 2 of the following are present:

- **Clinical features consistent with peritonitis i.e. abdominal pain, pyrexia, and cloudy effluent.**
- **Dialysis effluent with WCC >100 x 10^6/L and over 50% polymorph cells after a dwell time of over 2 hours.**
- **Positive dialysis effluent culture**

Note: the dwell time for a sample may vary depending on how acutely unwell the patient is and as per Consultant Nephrologist.

- Physical examination should include a thorough assessment of the PD exit site. A tunnel infection may occur in the presence of an exit site infection. Take a swab of exit site if it appears infected.
- On examination, the abdominal pain is typically generalised in peritonitis. Localised tenderness should raise suspicion of underlying surgical pathology. Consider possibilities of another diagnosis e.g. constipation, appendicitis, menstruation, or gastroenteritis.

4.0 TAKING A SAMPLE (SEE APPENDIX 1 AND 2)

- All PD patients presenting with pyrexia, abdominal pain, or cloudy PD fluid must have a sample of PD fluid taken to out rule peritonitis. An exception to this rule is if a patient has a temperature less than 38.5 degrees Celsius and there is a clear focus for illness e.g. tonsillitis, a sample may not be required. This must be discussed with the Nephrology team.
- Blood cultures must also be taken. All PD samples must be sent to the laboratory for urgent microscopy, cell count, differential, gram stain and culture. If out of hours, telephone the haematologist on call to run the PD sample urgently.
- ISPD (2022) recommend that all patients with cloudy PD fluid should be presumed to have peritonitis until it has been out ruled as cloudy effluent almost always represents infectious peritonitis. Aim for PD sample of **50 mls**. If less than 50 mls is obtained, send sample. A repeat sample may be necessary depending on the results. Clinical judgement from the nephrology team should always guide initiation of therapy (ISPD, 2022).
- The following tables are a guide on how and when to get a sample.

PERITONITIS POSSIBLE BUT UNLIKELY
If a patient has a temperature less than 38.5 degrees celsius with <u>NO</u> clear focus of other illness and is clinically stable: • If day time dwell - apply sample bag to catheter and immediately obtain sample volume. Send sample for urgent microscopy. If patient had night off dialysis and day dwell in peritoneum has been longer than 24 hours, drain peritoneum and follow step below – i.e *if no day time dwell*. • If no day time dwell - instil patient's normal fill volume of Physioneal 1.36% and drain after 2 hours. Send for urgent microscopy. (See appendix on how to take a sample using a twin bag). • If collecting a sample whilst patient is on the Claria machine - Apply the sample bag to drainage line. Keep sample bag clamped; when drain occurs, allow 70 mls (if low flow cassette) and 100mls (if standard cassette) to drain into drainage bag before opening the clamp on the sample bag. Dwell time may be shorter in this patient therefore; the clinician should use the percentage of polymorphonuclear (PMN) cells rather than the absolute WCC to diagnose peritonitis. A proportion above 50% PMN is strong evidence of peritonitis even if the WCC is less than 100 x 10^6. • If drainage fluid looks cloudy, treat as definite peritonitis. Follow the table below. Initiate antibiotics immediately. Do not wait for results.

PERITONITIS DEFINITE OR STRONGLY SUSPICIOUS

If patient has temperature more than or equal to 38.5 °C and/or moderate to severe abdominal pain and/or cloudy PD fluid:

NOTE: If patient is displaying signs of sepsis (Refer to sepsis 6 protocol) or if the child's presentation requires urgent medical assessment to identify source of infection, start IV antibiotics without delay. If sepsis is secondary to peritonitis, start IV Vancomycin and IV Ciprofloxacin* without delay.**

- If day time dwell - apply sample bag to catheter and immediately drain. Send for urgent microscopy. If patient had night off dialysis and day dwell in peritoneum has been longer than 24 hours drain peritoneum and follow step below – 'if no day time dwell'.
- If no day time dwell - instil patients 75% - 100% of normal fill volume of Physioneal 1.36% and allow dwell for 5 minutes. Send for urgent microscopy.
- If collecting a sample whilst the patient is on the Claria machine - keep sample bag clamped, when drain occurs allow 70 mls – if low flow cassette, and 100 mls – if standard cassette, to drain into drainage bag before opening clamp on sample bag. A manual drain may be required via the Claria machine to obtain an urgent sample.
- Treatment must be initiated within one hour of arriving to ward. Do not wait for results to start treatment. An exception to this is if the fluid from the drain appears clear and there is strong suspicion of other illness, waiting for results is permitted.
- If delay in administering intraperitoneal antibiotics, give IV vancomycin and IV ciprofloxacin immediately***.

*** Note: Recent HPRA drug safety alert re long-term effects of quinolones. Ensure parents adequately informed and consented prior to treatment

5.0 CONTAMINATION EPISODE (SEE APPENDIX 3 AND 4)

- If a contamination episode occurs by accidental disconnection during PD treatment or if break in line (for example, a hole in the solution bag, leak in tubing), treatment should consist of both a sterile transfer set change, sample and antibiotic prophylaxis as soon as possible to reduce the risk of peritonitis.
- If an immediate contamination episode has occurred at the navy tip and the blue twist clamp on the transfer set has been clamped, antibiotics and PD specimen are not required. A change of transfer set only is required in this instance.
- **WCC above 100 x 10^6/L** with over 50% polymorphonuclear cells – initiate treatment immediately.

- **WCC 50-100 WBC X 10^6/L** and symptomatic of peritonitis - initiate treatment immediately.
- **WCC below 50 x 10^6/L** and asymptomatic of peritonitis – treatment not indicated.
- **WCC below 50 x 10^6/L** and symptomatic discuss with Consultant Nephrologist.
    - **NOTE -** Polymorphonuclear (PMN) cells (neutrophils or eosinophils) indicate the presence of inflammation, with peritonitis being the most likely cause. The normal peritoneum has very few polymorphonuclear cells. A percentage above 50% is strong evidence of peritonitis (ISPD 2016).

6.0 TREATMENT FOR PERITONITIS (SEE APPENDIX 3)

MEDICATION	DOSE
Vancomycin*	25mg/L of PD fluid
Ciprofloxacin**	25mg/L of PD fluid
Preservative free heparin (1000units/ml)	500units/L of PD fluid

Treatment consists of gram positive and gram negative cover.

***If vancomycin allergy: give IP teicoplainin 20mg/L of PD fluid.**

****If ciprofloxacin allergy: give IP ceftazadime 125 mg/L of PD fluid.**

Consult with Microbiologist/Infectious dieseases if patient has MRGNB/VRE regarding treatment options.

- If patient has a history of multi resistant organisms, consult with nephrology and ID team re treatment.
- Oral antifungal medication must be prescribed to all patients on PD receiving antibiotics. The majority of fungal peritonitis episodes are preceded by courses of antibiotics. ISPD guidelines recommend nystatin (Mycostatin®) prophylactically – 100,000 international units QDS. Must be started within 24 hours.
- Consider continuous dialysis for 24-48 hours. Dwell time may be adjusted according to biochemistry / how severe the peritonitis (may require longer dwells) / or if fluid overloaded (may require shorter dwells).
- After 48 hours of treatment, the patient should show signs of clinical improvement. The effluent should be visibly inspected to ensure clearing is occurring. Send repeat PD sample at 48 hours to ensure patient is responding to treatment.

If peritonitis positive (based on WCC and symptoms) but culture is negative after 48 hours – Complete 2 weeks of IP vancomycin and PO ciprofloxacin* (after receiving IP ciprofloxacin x 48hours).**

If culture positive - Modify IP antibiotics depending on sensitivities as per Nephrology and ID team.

- Administer pain relief as necessary. Administer IP lidocaine **1%** (1ml/L of PD fluid) on discussion with renal team to relieve abdominal pain.
- Oral ciprofloxacin*** BD can be commenced after 48 hours of treatment instead of IP ciprofloxacin. Oral ciprofloxacin must not be given within 2 hours of phosphate binders as they can reduce the absorption of ciprofloxacin by up to 50%. Ensure the parents are informed to observe for and report any signs of candida (thrush). Prophylactic nystatin (Mycostatin®) must be prescribed until 48 hours after stopping antibiotics.

***Note: Recent HPRA drug safety alert re long-term effects of quinolones. Ensure parents adequately informed and consented prior to treatment

7.0 INDICATIONS FOR CATHETER REMOVAL

- **Refractory peritonitis –** defined as failure of the PD effluent to clear up after 5 days of appropriate antibiotics. Catheter removal is indicated in all cases of refractory peritonitis or earlier if the patients clinical condition is worsening.
- **Fungal peritonitis** - Catheter removal is indicated immediately if fungi are identified by microscopy in the PD effluent. Anti-fungal agents should be commenced immediately and continued for two weeks. Treatment for fungal peritonitis is oral Fluconazole 6mgs/kg 24 hourly (max 200mgs).
- **Relapsing peritonitis** – defined as an episode of peritonitis that occurs within 4 weeks of completion of antibiotics which is caused by the same organism that occurred in the preceding episode of peritonitis. Catheter removal is indicated in all cases of relapsing peritonitis (ISPD 2022).

Catheter removal should also be considered for:

- Recurrent episodes of peritonitis
- Mycobacterial peritonitis
- Multiple enteric organisms

8.0 Applicable to

It is the responsibility of the Renal Clinical Nurse Specialists and the Clinical Nurse Education Facilitators to implement guidelines into practice. Each staff member has a role to play in adhering to these guidelines when caring for a patient with suspected peritonitis.

- **All Staff:** Adhere to all policies and procedures relevant to their area of work.
- **Line Manager/Head of Department:** to ensure their staff are aware of and compliant with all policies and procedures relevant to their area of work.
- **Quality Department:** Manage all completed policies and procedures via Q-Pulse.

9.0 Monitoring and Evaluation

This procedure shall be reviewed and updated at least every three years by the Author in order to determine its effectiveness and appropriateness. It shall be assessed and amended as necessary during this period to reflect any changes in best practice, law, substantial organisational change and professional or academic change.

In order to ensure the effectiveness of this policy and procedure the Author shall complete an audit annually to review and monitor compliance with this policy and procedure. The Author must further provide a systematic process for the reporting and investigation of compliance breaches, or potential breaches, to enable proactive prevention in the future.

10.0 Communication and Training

It is the responsibility of the Renal Clinical Nurse Specialists and the Clinical Nurse Education Facilitators to implement guidelines into practice. Each staff member has a role to play in adhering to these guidelines when caring for a patient with suspected peritonitis.

11.0 Stakeholder involvement

Dr Atif Awan	Consultant Nephrologist	CHI
Dr Michael Riordan	Consultant Nephrologist	CHI
Dr Clodagh Sweeney	Consultant Nephrologist	CHI
Dr Maria Stack	Consultant Nephrologist	CHI
Dr Mary Waldron	Consultant Nephrologist	CHI
Dr. Niamh Dolan	Consultant Nephrologist	CHI
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12.0 Appendix

Appendix 1. How to obtain a peritoneal dialysis sample using a Twin bag of Physioneal 1.36%

Equipment

- Twin bag physioneal 36%
- Connection shield x2
- Drainage bag (3L empty bag system)

- Minicap
- 2 Blue clamps
- Azowipes
- Antimicrobial hand wash solution
- Drip stand
- Digital scales
- Claria machine or heater plate to warm solution.

Procedure

- Wash hands with antimicrobial handwash and dry thoroughly.
- Clean machine and work surface with azowipes.
- Turn on machine at back.
- Decontaminate hands with alcohol gel and ensure hands are dry.
- Open twin bag packaging and check
- Volume c) Expiry date e) Solution is clear
- Concentration d) Leaks f) Seals are intact
- Place bag on empty heater plate to warm solution for 10 minutes. Do not break seal. Then hang bag on drip stand- now break the green middle seal to mix all of the fluid into the bottom chamber.
- Peel open connection shield and leave in packet.
- Ensure all of the fluid is now fully mixed in the bottom chamber of the bag.
- Decontaminate hands with alcohol gel and ensure hands are dry.
- Apply connection shield to the end of the twin bag line.
- Remove minicap from the child's catheter and connect twin bag- do not break the green seal at the patient's line.
- Open the patient's catheter clamp and drain peritoneum into drainage bag.
- When fully drained, close PD catheter twist clamp.
- Ensuring patients PD catheter is still clamped, break seal on bag of fluid and prime the line. Once line is fully primed clamp the fill line and drain line (Patient's PD catheter is still clamped).
- Now hang the bag on the digital scales and note the weight shown.
- Open clamp on catheter and fill line of twin bag and fill the child with the appropriate amount of fluid. Note that the weight will reduce on the digital scales for example if you want to fill the patient with 300mls and the starting weight of the bag was 2.1kg you will clamp the fill line when the scales reads 1.8kg.
- Close patient clamp, clamp fill line (drain line is already clamped). Disconnect patient using the disconnect procedure.
- Allow to dwell for requested time as per Consultant Nephrologist.
- Wash hands with antimicrobial handwash and dry thoroughly.
- Open connection shield and sample bag packaging leaving connection shield inside the packaging.
- Decontaminate hands with alcohol gel and ensure hands are dry.
- Connect the drainage bag to connection shield and attach to patient's PD catheter using non touch technique.
- Decontaminate hands with alcohol gel ensuring hands are dry.
- Drain patient following dwell time by opening patient's PD catheter twist clamp and letting fluid drain into the drainage bag.
- Disconnect patient using the standard disconnect procedure- do not drop the sample bag.

- Using a clinell® wipe, clean sample bag port.
- Using a 50 ml syringe, obtain a 50ml sample and insert directly into the PD specimen container.
- Send sample for WCC, differential count, gram stain and culture.
- Measure all fluid removed and document accordingly.

Appendix 2 Taking a peritoneal dialysis sample on the Claria machine

Equipment

- Sample bag
- Clinell wipes
- 50ml syringe
- Pink blunt needle
- PD specimen container
- Antimicrobial handwash
- Alcohol gel

Procedure

- Wash hands with antimicrobial handwash and dry thoroughly.
- Clean trolley and gather equipment required
- Wash hands with antimicrobial handwash and dry thoroughly.
- Open sample bag and keep in packaging
- Decontaminate hands using alcohol gel ensuring hands are dry.
- Attach sample bag to Y port on drainage line using non touch technique. Keep the cap from both the sample bag and y-port sample line and leave in packaging to ensure no contamination as these can be reapplied to the line and bag after sample is taken.
- Keep sample bag clamped. When drain occurs allow 70mls – if low fill cassette, and 100mls – if standard cassette, to drain into drainage bag before opening clamp on sample bag and clamping drain line. This is to ensure that the sample obtained comes directly from the peritoneum and not from the fluid that has been resting in the drainage bag.
- When the bag is full, close clamps. Observe effluent for clarity.
- Decontaminate hands using alcohol gel ensuring hands are dry.
- Disconnect sample bag from line and reapply the cap to the sample line. Place sample bag cap back on to sample bag.
- Wash hands with antimicrobial handwash and dry thoroughly and apply gloves. Clean sample port with a clinell wipe allowing 30 seconds for it to dry. Obtain 50ml sample using pink needle and syringe and insert into PD specimen container.
- Send for WCC, differential count, gram stain and culture.

Appendix 3 Adding medication to PD fluid

MEDICATION	DOSE
Preservative free heparin	**500iu/L of PD fluid**
Lignocaine	**1ml/L of PD fluid**
Vancomycin	**25mg/L of PD fluid**
Ciproflaxacin	**25mg/L of PD fluid**
Potassium chloride in renal patients ➢ **K+ less than 3mmol/L** ➢ **K+ less than 2.5mmol/L**	 **4mmol/L of PD fluid** **5mmol/L of PD fluid**
Potassium chloride in cardiac patients	

➢ K+ less than 5mmols	3mmols/L of PD fluid
➢ K+ less than 4.5mmols	3.5mmols/L of PD fluid
➢ K+ less than 4.0mmols	4mmols/L of PD fluid

Equipment

- Peritoneal dialysis bags
- Clean trolley and tray
- Appropriate size syringes to draw up medication
- Pink blunt needles
- Blue needles
- Clinell® wipes
- Medication

Procedure

- Work out dose / calculations.
- Wash hands with antimicrobial handwash and dry thoroughly.
- Open PD packaging and leave in plastic cover – check drug name, expiry date, leaks etc.
- Clean tray.
- Decontaminate hands with alcohol gel. Apply gloves if drawing up antibiotics for own protection.
- Attach needles to syringes using ANTT.
- Using alcohol wipe, swab top of medication bottles
- Draw up medication as per clinibee app.
- Replace pink needle with blue needles.
- Decontaminate hands using alcohol gel ensuring hands are dry.
- Remove bung from PD bags and clean bung with alcohol wipe for 30 seconds and allow to dry for 30 seconds.
- Add medication to bags. Seals are broken post insertion of medication.
- Add labels identifying medication has been added to the bags.

Appendix 4 Set change procedure

A set change is performed every 6 months or if a contamination episode has occurred.

Equipment

- Dressing pack
- 1 new transfer miniset
- 5ml syringe
- 1 pink needle
- 10ml vial of 0.9% sodium chloride
- Betadine antiseptic solution
- 1 new minicap
- 1 sterile clamp
- Sterile gloves
- Clinell® wipes
- Timer
- Sample bag and connection shield (if contamination episode occurred and twist clamp was open)

Procedure

- Wash hands with antimicrobial handwash and dry thoroughly.
- Clean trolley in preparation for sterile field.
- Decontaminate hands using alcohol gel ensuring hands are dry.
- Open out sterile field on to trolley and open sterile gloves, needle, syringe, minicap, clamp and transfer miniset on sterile field.
- Pour betadine into large section on sterile tray.
- Wash hands with antimicrobial handwash and dry thoroughly.
- Apply sterile gloves.
- Draw up 5mls of 0.9% sodium chloride and prime miniset, clamp the line and apply minicap.
- Place sterile drape under the child's catheter and extension line.
- Using one piece of gauze to hold the catheter, clean connection site with betadine soaked gauze.
- Place the container of betadine onto sterile towel and fully submerge the connection. Soak for three minutes.
- Remove from the betadine and disconnect the old extension set from the catheter, discard and connect the new set securely.
- If a sample is required the sample bag and connection shield should be already connected to the line ready to obtain a sample straight after connection.
- If peritoneum is dry then refer to how to take a sample using a twin bag.

Appendix 5

Repairing a split tenckhoff Catheter

Equipment

- Dressing pack
- 1 new miniset
- 5ml syringe
- 1 pink needle
- 10ml vial of 0.9% sodium chloride
- Betadine antiseptic solution
- 1 new minicap

- 2 sterile clamps
- Sterile scissors
- Sterile gloves
- Clinell® wipes
- Hibiscrub/Betadine handwash solution
- Timer
- Titanium connector

Procedure

- Wash hands with antimicrobial handwash and dry thoroughly.
- Ensure there is a clamp above the split.
- Clean trolley and gather equipment.
- Decontaminate hands using alcohol gel ensuring hands are dry.
- Open out sterile field on trolley and open sterile gloves, scissors, pink needle, syringe, minicap, clamps, new miniset, titanium connection, sample bag and connection shield on to sterile field.
- Pour betadine into large section on sterile tray.
- Wash hands with antimicrobial handwash and dry thoroughly.
- Apply sterile gloves
- Draw up 5mls of 0.9% sodium chloride and prime miniset, clamp the line and apply connection shield and sample bag. Attach titanium connector to line.
- Place sterile drape under the child's catheter and extension line.
- Using one piece of gauze to hold the catheter, clean split with betadine soaked gauze.
- Place the container of betadine onto sterile towel and fully submerge the connection. Soak for three minutes.
- Remove from the betadine and using a sterile scissors cut just above the split.
- Place cone shaped titanium connector onto line- 2 pieces of titanium connector to be used.
- Pick up the new miniset which has the titanium connector and insert into the freshly cut line.
- Ensure that the 2 pieces of titanium connectors are screwed tightly together.
- Once fully secure remove the clamp and untwist the patient's twist clamp to allow fluid to drain from the peritoneum into the sample bag and collect sample as per procedure.
- If peritoneum is dry then refer to how to take a sample using a twin bag.

The patient will need intra peritoneal antibiotics for 48 hours until result of PD sample

12.0 Key Stakeholders

NAME	TITLE
Dr Atif Awan	Consultant Nephrologist
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