Standardizing Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture

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Table of Contents

Background

Peritonitis – A Serious Complication

- Peritonitis remains one of the most serious complications of peritoneal dialysis
- Accurate microbiological diagnosis is critical, it guides timely and effective antibiotic therapy
- Proper diagnosis helps prevent Tenckhoff catheter loss and reduces mortality
- Microorganism cultivation is essential for detecting peritonitis and ensuring effective treatment

From Benchmark to Guideline Implementation

- According to ISPD 2022 guidelines, culture-negative peritonitis should not exceed 15% of all episodes (Li et al., 2022)
- At the Renal Unit of United Christian Hospital, our culture-negative rate was 11.8% between November 2023 and October 2024
- Although this is below the benchmark, we targeted further reduction to enhance patient safety and care quality
- A Guideline for the Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture was developed and implemented in the UCH Renal Unit since November 2024.

Contributing Factors

- Inadequate dwell time — less than 2 hours before sampling, bacteria count may not reach detectable concentration in the PD effluent, it led to under-diagnosis(Li et al., 2022; Fung et al., 2022).
- Delayed transport — samples should be reached the laboratory within 6 hours . The microorganisms in the sample can degrade or die if left too long before processing, it lead false negative or unreliable result (Li et al., 2022).
- Non-standardized collection procedures — lead to contamination or poor sample quality

These factors highlighted the need for a structured nursing guideline to standardize Peritoneal Dialysis Fluid (PDF) collection and handling.

Aim and Objectives

Aim

- To standardize the collection and handling of PDF samples, supporting improved patient outcomes

Objectives

- Standardize PDF collection and handling procedures to ensure specimen integrity
- Minimize contamination and reduce false-positive or false-negative results to improve diagnostic reliability

Implementation Roadmap

Flow of Delivery to Staff (1)

1. Briefing to all renal nurses
- CQI Team members introduce rationale and importance
- Share ISPD benchmark and UCH data

2. Guideline introduction
- Present step-by-step procedure
- Highlight critical points (dwell time, transport, swabbing)

3. Staff Training Video introduction
- Video Demonstration
- Show the steps of procedure
- Pause for discussion and Q&A

Flow of Delivery to Staff (2)

4. Hands-On Practice

- Provide simulation to staff with required items
- Nurses practiced the procedure under supervision

5. Feedback

- Immediate feedback provided to reinforce accuracy and confidence

Guideline of Collection CAPD Fluid for Culture

Title: Standardizing Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture

Background

Microorganism cultivation is a vital aspect of detecting and diagnosing peritoneal dialysis-related peritonitis. Accurate identification of the pathogen is crucial for prescribing effective antibiotics to prevent fatal outcomes. The International Society for Peritoneal Dialysis (ISPD) guidelines 2022 recommend that the proportion of culture-negative peritonitis cases should not exceed 15% benchmark of all peritonitis episodes (Li et al., 2022).

In our UCH renal unit, approximately 10% of patients experience culture-negative peritoneal dialysis peritonitis each year, which is already below the recommended benchmark. Despite this, the incidence of culture-negative cases is aimed to be further reduced, and existing quality of care is expected to be enhanced. To achieve this, developing a standardized nursing guideline for collecting and handling Peritoneal Dialysis Fluid (PDF) samples is proposed in order to ensure accurate and reliable microbiological testing. For accurate culture results, the dwelling time of PDF should not be less than 2 hours and the sample should be sent to the laboratory within 6 hours after the PDF is drained out from patient(Li et al., 2022).

Aims:

This CQI project aims to standardize the process of collecting and handling Peritoneal Dialysis Fluid samples, thereby contributing to better patient outcomes.

Objective:

1. To ensure accuracy and reliability of the sampling dialysate fluid culture result.
2. To prompt diagnosis of peritonitis to facilitate early detection and treatment for the patients.
3. To optimize antibiotic therapy and improve patient outcomes.
4. To minimize contamination and false-positive or false-negative results.

Implementation:

1. Develop a standardized nursing guideline for collecting and handling PDF samples.
2. Educate nursing staff on the proper procedure for collecting and sending PDF samples for culture.
3. Implement the new guideline and monitor compliance.
4. Evaluate the impact of the standardized procedure on the incidence of culture-negative peritonitis cases.

Expected Outcome:

1. Reduction in the rate of culture-negative peritonitis cases below the current level.
2. Enhanced accuracy and reliability of microbiological testing.
3. Improved quality of care for peritoneal dialysis patients.

Guideline on Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture

Preparation

1. Specimen culture bottle x 1
   (Additional use aerobic and anaerobic culture bottle during non-office hours and public holiday)
2. 20ml syringe and 21G disposable needle x 1
3. Kidney dish and tray
4. Recapping device x1
5. Alcohol pads with 70% isopropyl x 2
6. A piece of 5cm adhesive tape
7. Gloves and mask

Procedure:

Container: Culture Bottle

1. Confirm correct patient identification before the procedure.
2. Check the expiry date and integrity of all necessary consumables.
3. Wash hands.
4. Wear gloves and a mask.
5. Shake and mix well the peritoneal dialysis effluent in drainage bag.
6. Open the cover of culture bottle.
7. Swab the tubing near the drainage bag with a 70% isopropyl alcohol pad for about 1 inch.
8. Swab the same area again with a new 70% isopropyl alcohol pad, then allow it to air dry.
9. Aspirate 20 ml of dialysis effluent with a syringe from the swabbed area of the drainage bag tubing.
10. Recap the needle with a recapping device.
11. Seal the aspirated site of the tubing with adhesive tape.
12. Disconnect the needle from the syringe.
13. Inject the dialysis effluent into the culture bottle and cover it.
14. Place the syringe and the needle into a kidney dish, then discard all sharps into a sharps box.
15. Verify correct patient identification with the specimen and send to laboratory.

Container: Aerobic and Anaerobic Bottle

1. Confirm the correct patient identification before the procedure.
2. Check the expiry date and integrity of all necessary consumables .
3. Wash hands.
4. Wear gloves and a mask.
5. Shake and mix the peritoneal dialysis effluent well in the drainage bag.
6. Remove the flip from the bottle and swab the rubber stopper with 70% isopropyl alcohol pad ,then allow it to air dry.
7. Swab the tubing near the drainage bag with a 70% isopropyl alcohol pad for about 1 inch.
8. Swab the same area again with a new 70% isopropyl alcohol pad, and allow it to air dry.
9. Aspirate 20 ml of dialysis fluid with a syringe from the swabbed area of the drainage bag tubing.
10. Recap the needle with a recapping device.
11. Seal the aspirated site of the tubing with adhesive tape.
12. Inject 10 ml of dialysis fluid into the aerobic and anaerobic bottles respectively.
    (Refer to the instructions for the aerobic and anaerobic bottles regarding the volume of sampling.)
13. Place the syringe with the needle into a kidney dish, then discard all sharps into a sharps box.
14. Verify the correct patient identification with the specimen and send it to the laboratory.

Reference:

Li KT, Chow KM, Cho Y, Fan S, Figueiredo AE, Harris T, Kanjanabuch T, Kim YL, Maderoll M, Malyszko J, Mehrotra R, Okpenchi IG, Perl J, Piraino B, Runnergar N, Teitelbaum I, Wong J KW, Yu X, Johnson DW (2022). ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment, *Peritoneal Dialysis International*,42(2)110–153

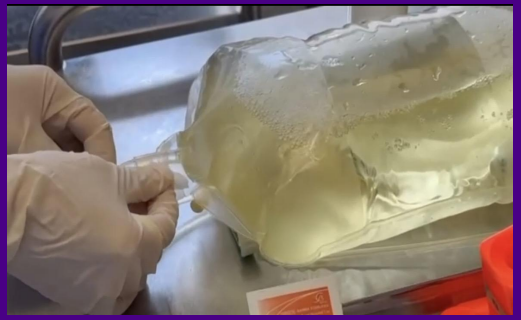
Instructional video demonstration

Key Guideline Steps (1-4)

1. Verify patient identity

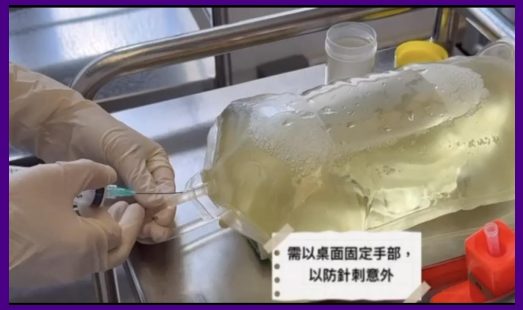
2. Hand hygiene, gloves & mask

3. Mix effluent in drainage bag



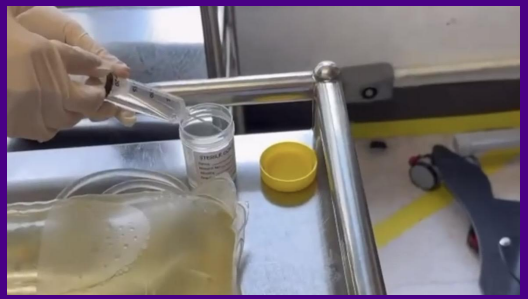
4.Double alcohol swabbing
(70% isopropyl)

Key Guideline Steps (5-8)



5. Aspirate 20 ml of PDF

6. Seal tubing, safe sharps disposal



7. Inject into culture bottle

8. Re-verify patient identity then send to laboratory

Audit Form

- Audit form on the Collection of CAPD Fluid for Culture
- 15 steps in the procedure

UCH Renal Unit

Audit Form on the Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture

Standard Statement: To ensure accuracy and reliability of the sampling dialysate fluid culture result.

Procedure	Source of information	Yes	No	NA	Remarks
1. *Confirm correct patient identification before the procedure.	AP/AN/CR/O				
2. *Check the expiry date and integrity of all necessary consumables .	AP/AN/CR/O				
3. *Wash hands.	AP/AN/CR/O				
4. *Wear gloves and a mask.	AP/AN/CR/O				
5. *Shake and mix well the peritoneal dialysis effluent in drainage bag.	AP/AN/CR/O				
6. Open the cover of culture bottle.	AP/AN/CR/O				
7. *Swab the tubing near the drainage bag with a 70% isopropyl alcohol pad for about 1 inch	AP/AN/CR/O				
8. *Swab the same area again with a new 70% isopropyl alcohol pad, then allow it to air dry.	AP/AN/CR/O				
9. Aspirate 20 ml of dialysis effluent with a syringe from the swabbed area of the drainage bag tubing.	AP/AN/CR/O				
10. *Recap the needle with a recapping device.	AP/AN/CR/O				
11. Seal the aspirated site of the tubing with adhesive tape.	AP/AN/CR/O				
12. *Disconnect the needle from the syringe.	AP/AN/CR/O				
13. *Inject the dialysis effluent into the culture bottle and cover it.	AP/AN/CR/O				
14. *Place the syringe and needle into a kidney dish, then discard all sharps into a sharps box.	AP/AN/CR/O				
15. *Verify correct patient with the specimen and send to laboratory.	AP/AN/CR/O				

- Symbol * is critical point. If there is a failure in this step, the assessment result will be marked as failed.
- Please circle the appropriate source of information: AP-Ask Patient; AN- Ask Nurse; CR-Check Record; O- Observe
- Put ✓ in the appropriate column, NA= Not available
- If answer of procedure step is "No", the reasons would be recorded in remark.
- Compliance percentage:_____

Remarks:

_____

_____

Auditor: _____(Name and signature) Auditee:_____(Name and signature)

Assessment Date: _____ 1st issue by UCH in 10/2024

Critical Points of the Audit Form

Critical Points *(must not fail):*

- Confirm Correct Patient Identification
- Check Expiry Date & Integrity of Consumables
- Perform Hand Hygiene
- Wear Gloves & Mask
- Shake/Mix Effluent in Drainage Bag
- Swab Tubing with 70% Alcohol Pad (Twice, Air Dry)
- Recap Needle with Device
- Disconnect Needle Safely
- Inject Effluent into Culture Bottle & Cover
- Discard Sharps Properly
- Verify Patient-Specimen Match Before Sending to Lab

Failure in any critical step = AUDIT FAIL!

Results: Audit Report

UCH Renal Unit

Audit Report on Collection of Continuous Ambulatory Peritoneal Dialysis Fluid for Culture

Standard Statement: To ensure accuracy and reliability of the sampling dialysate fluid culture result.

Procedure	Source of information	Yes	No	NA	Compliance Rate %
1. *Confirm correct patient identification before the procedure.	AP/AN/CR/O	62	0	0	100
2. *Check the expiry date and integrity of all necessary consumables .	AP/AN/CR/O	62	0	0	100
3. *Wash hands.	AP/AN/CR/O	62	0	0	100
4. *Wear gloves and a mask.	AP/AN/CR/O	62	0	0	100
5. *Shake and mix well the peritoneal dialysis effluent in drainage bag.	AP/AN/CR/O	62	0	0	100
6. Open the cover of culture bottle.	AP/AN/CR/O	62	0	0	100
7. *Swab the tubing near the drainage bag with a 70% isopropyl alcohol pad for about 1 inch	AP/AN/CR/O	62	0	0	100
8. *Swab the same area again with a new 70% isopropyl alcohol pad, then allow it to air dry.	AP/AN/CR/O	62	0	0	100
9. Aspirate 20 ml of dialysis effluent with a syringe from the swabbed area of the drainage bag tubing.	AP/AN/CR/O	62	0	0	100
10. *Recap the needle with a recapping device.	AP/AN/CR/O	62	0	0	100
11. Seal the aspirated site of the tubing with adhesive tape.	AP/AN/CR/O	62	0	0	100
12. *Disconnect the needle from the syringe.	AP/AN/CR/O	62	0	0	100
13. *Inject the dialysis effluent into the culture bottle and cover it.	AP/AN/CR/O	62	0	0	100
14. *Place the syringe and needle into a kidney dish, then discard all sharps into a sharps box.	AP/AN/CR/O	62	0	0	100
15. *Verify correct patient with the specimen and send to laboratory.	AP/AN/CR/O	62	0	0	100

- Symbol * is critical point. If there is a failure in this step, the assessment result will be marked as failed.
- Please circle the appropriate source of information: AP-Ask Patient; AN- Ask Nurse; CR-Check Record; O- Observe
- Put ✓ in the appropriate column, NA= Not available
- If answer of procedure step is "No", the reasons would be recorded in remark.

Compliance Rate = $\frac{930 \times 100}{930}$ = 100 %

Audit period: 1st October 2024 to 21th October 2024

Audit report prepared by APN Mok Wing Sze on 28th October 2024

4

01 Total Nurses Audited: 62

02 Audit Steps: 15 steps assessed

03 Total procedures Audited: 930

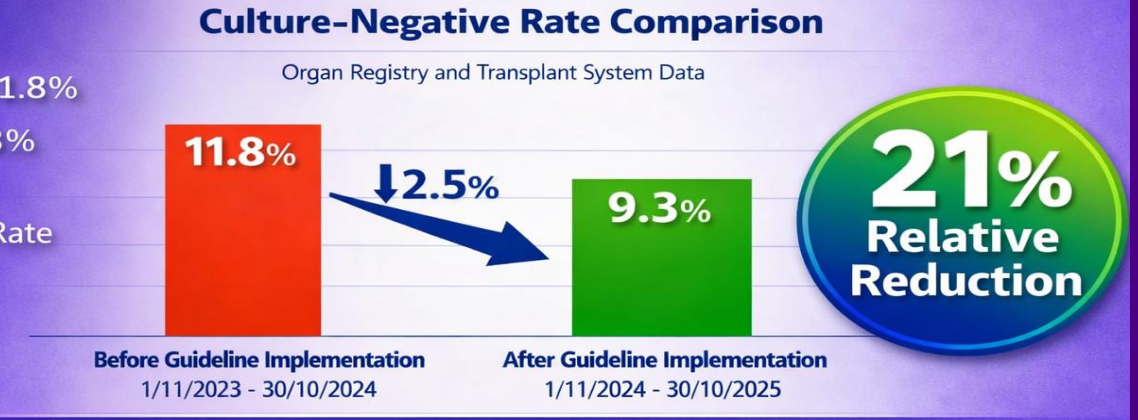
04 Compliance: 930/930

05 Compliance Rate: 100%

06 Critical Points: All fully met

Results: Culture-Negative Rate Reduction

- Before Guideline: 11.8%
- After Guideline: 9.3%
- **21% Reduction** in culture-negative Rate



- Absolute reduction: **11.8 – 9.3** = **2.5** percentage points
- Relative reduction: (2.5 ÷ 11.8) × 100 = **21%**

Reduced Infection Risk
- Lower culture-negative rate enhances detection

Faster, Accurate Diagnosis
- Positive results more promiment

Improved Patient Outcomes
- Reliable cultures enable timely treatment

21% Relative Reduction in Culture-Negative Rate

Guideline Sustainability Plan

To ensure long term adherence, followings are the key strategies:

- ✓ **New staff Training Video:** Require all new renal nurses to complete the instructional video as mandatory viewing
- ✓ **Regular Audit:** Perform regular nursing audits on the procedure to ensure the compliance
- ✓ **Monthly Tracking:** Monitor and present the culture-negative rate at Renal Business Meeting monthly for ongoing feedback
- ✓ **Hospital-Wide Sharing:** Share guidelines, audit form and instructional video with other hospital to promote adoption.

Impact of Guideline Implementation

Clinical Outcome

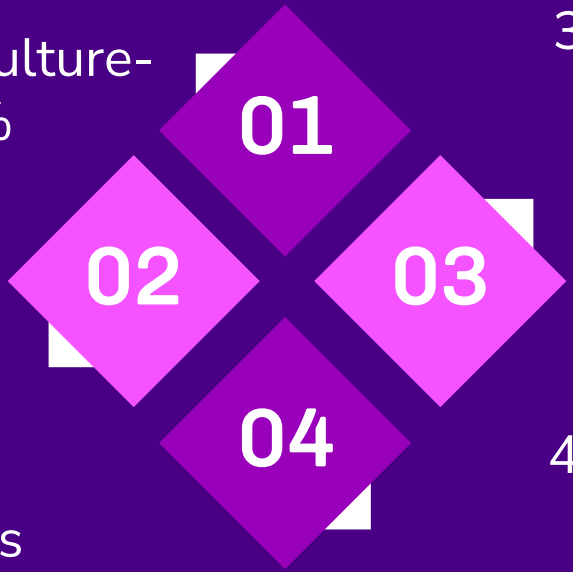
- Better specimen integrity
- Fewer culture-negative cases
- More reliable diagnosis
- Improved patient outcomes

Nursing Competence

- Stronger skills & confidence
- Meet international standards

Conclusion

1. Relative reduction in culture-negative rate was 21%



3.Nursing skills and confidence were strengthened

2. Reliable cultures enable faster diagnosis and targeted treatment

4. Sustainability was ensured through regular audits, ongoing training, and alignment with ISPD standards.

Reference

Fung, WWW, & Li, PKT (2022). Recent advances in novel diagnostic testing for peritoneal dialysis-related peritonitis. *Kidney Research and Clinical Practice, 41*(2), 156-164

Li KT, Chow KM, Cho Y, Fan S, Figueiredo AE, Harris T, Kanjanabuch T, Kim YL, Maderoll M, Malyszko J, Mehrotra R, Okpenchi IG, Perl J, Piraino B, Runnergar N, Teitelbaum I, Wong J KW, Yu X, Johnson DW (2022). ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment, *Peritoneal Dialysis International,42(*2)110–153

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- Mr. Yeung CP (RN)

THANK YOU

Do you have any questions?

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