PERITONEAL DIALYSIS (PD) – PERITONEAL EQUILIBRATION TEST (PET)

Cross references	NSW Health PD2017_013 *Infection Prevention and Control Policy* NSW Health PD2017_026 *Clinical and Related Waste Management for Health Services* NHMRC *Australian Guidelines for the prevention and control of Infection in Healthcare* SGH-TSH CLIN027 *Aseptic Technique - Competency and Education Requirements* SGH-TSH CLIN411 *Venepuncture And Blood Collection – Accreditation Guidelines* SGH PD WPI 217 *Continuous Ambulatory Peritoneal Dialysis (CAPD) Freeline Solo Exchange Procedure* SGH PD WPI 216 *Automated Peritoneal Dialysis (APD) Connection And Disconnection Procedure – Claria Dialysis Machine* SGH PD WPI 143 *Peritoneal Dialysis (PD) – Manual Drain With A Drain Bag (Ultra Set)*
1. Purpose	To ensure the process of peritoneal equilibration testing (PET) is performed correctly and according to best practice guidelines

2. Process

Peritoneal Equilibration Test or PET is the assessment of peritoneal membrane transport function (of fluid and solutes) in patients on PD. This test determines solute equilibration and peritoneal membrane transport rates through measurement of dialysate to plasma ratio at specific times during dialysate dwell. Initial PET should be completed between 4 to 8 weeks after commencement of maintenance PD therapy. Repeat or subsequent PETs may be requested by the renal doctors if a change in peritoneal membrane transport function is suspected or when clinically indicated.

2.1 DEVICES

2.1.1 Equipment

- PET form (see Appendix A)
- PET Patient Information Sheet (see Appendix B or C)
- Alcohol swabs
- Micropore tape
- Patient Labels
- Tourniquet
- Cotton Balls
- Pathology request forms
- Patient labels

2.1.2 Key parts

- Drawing-up needle (18G)
- 23 G needle
- 21 G needle
- Specimen jars
- 20mL syringe
- Vacutainer Needle
- Vacutainer Needle Adapter
- Biochemistry blood tube
- PD fluid
- Minicap

2.1.3 Key site

- Rubber bung on PD fluid/drain bag
- Abdominal PD catheter

2.2 PREPARATION

1. Schedule PET 4 weeks after commencement of maintenance PD. It is ideal for PET to be completed between 4 to 8 weeks after commencement of maintenance PD therapy. The result from PET will assist the clinician to determine the type of PD therapy best suited for a patient.
2. Educate the patient and/or carer on the importance of and preparation for PET by explaining and providing the following:
   a. PET information sheet (for APD or CAPD patients – see Appendix B & C);
   b. For APD patients – patient must accept & confirm a PET specific APD program in Claria PD machine the day before the test
3. The day before the PET test, the patient will:
   a. For APD patients:
      i. Dialyse using a PET specific APD program with 2.5% PD fluid

         Note: Do not combine different strength PD fluid. Use 1.5% PD fluid only for patients unable to tolerate 2.5%
      ii. Complete the APD therapy with last fill for 4 – 8 hours before PET to dwell PD fluid for 4 – 8 hours (for) before the test

         Note: Abort PET if dwell time for last fill PD fluid is < 4 hours or > 8hours
   b. For CAPD patients:
      i. 8 – 12 hours before PET - attend to last CAPD exchange using 2.5% PD fluid to dwell PD fluid for 8 – 12 hours before the test

         Note: Only use 1.5% PD fluid for patients unable to tolerate 2.5%

         Note: Abort PET if last CAPD exchange dwell time is < 8 hours or > 12 hours

2.3 PROCEDURE

1. Before commencing PET, weigh the patient and record on PET form (see Appendix A);
2. Ensure overnight dwell time is appropriate (8 – 12 hours for CAPD patients or 4 – 8 hours for APD patients):
    a. Note the time the last evening bag was instilled for CAPD patients or the time when the APD therapy ended;
    b. Note start time of first drain for PET;
    c. Calculate overnight dwell time and record on PET form.
3. Perform a CAPD exchange as per SGH PD WPI 217 *Continuous Ambulatory Peritoneal Dialysis (CAPD) Freeline Solo Exchange Procedure*. Use the same PD fluid strength used overnight to fill the patient:
    a. Drain out all PD effluent and record weight of drain bag on PD form
    b. Collect PD effluent sample from drain bag using aseptic technique ensuring all the key parts/sites are protected:
        i. Wear PPE as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
        ii. Alcohol swab the rubber bung on drain bag;
        iii. Attach drawing up needle to 20 mL syringe;
        iv. Push needle into the centre of the bung on drain bag;
        v. Aspirate 20 mL PD effluent and transfer to patient labelled specimen jar marked as “overnight PD fluid”
    c. Patient to lie down on a bed to start filling. Record start time of fill on PET form.
    d. Patient to roll from side to side every 2 minutes whilst filling.
    e. Record end time of fill on PET form.
    f. Collect another PD effluent sample using aseptic technique ensuring all the key parts/sites are protected:
        i. Once patient is full, drain out 200mL PD effluent into the empty PD fluid bag.
        ii. Shake and invert PD fluid bag thoroughly
        vi. Alcohol swab the rubber bung on PD fluid bag;
        vii. Attach 23 G needle to 20 mL syringe;
        viii. Push needle into the centre of the bung on drain bag;
        ix. Aspirate 20 mL PD effluent and transfer to patient labelled specimen jar marked as “0 hour PD fluid”
        iii. Infuse the remaining 180 mL PD effluent back into the patient
    g. Remove gloves
    h. Perform hand hygiene
    i. Open a new minicap
    j. Perform hand hygiene
    k. Don sterile gloves
    l. Disconnect patient using non-touch disconnection technique
    m. Apply a new minicap to catheter using non-touch technique
    n. Secure the catheter in place with micropore tape

o. Discard used equipment as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
p. Remove gloves and PPE
q. Perform hand hygiene
r. Dwell PD fluid for 2 hours

4. After dwelling PD fluid for 2 hours:
   a. Perform hand hygiene
   b. Wear PPE as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
   c. Collect patient's blood as per SGH-TSH CLIN411 *Venepuncture And Blood Collection – Accreditation Guidelines*

      Note: Send patient's blood to pathology with a patient labelled pathology request form for serum albumin, urea, creatinine and glucose tests.
   d. Collect another PD effluent sample using aseptic technique ensuring all the key parts/sites are protected:
      i. Perform hand hygiene
      ii. Don sterile gloves
      iii. Connect patient to a PD fluid (Freeline solo) bag
      iv. Drain out 200mL PD effluent into the drain bag
      v. Shake and invert drain bag thoroughly
      vi. Alcohol swab the rubber bung on drain bag
      vii. Attach 23 G needle to 20 mL syringe;
      viii. Push needle into the centre of the bung on drain bag;
      ix. Aspirate 20 mL PD effluent and transfer to patient labelled specimen jar marked as "2 hour PD fluid"
      x. Infuse the remaining 180 mL PD effluent back into the patient
      xi. Remove gloves
      xii. Perform hand hygiene
      xiii. Open a new minicap
      xiv. Perform hand hygiene
      xv. Don sterile gloves
      xvi. Disconnect patient using non-touch disconnection technique
      xvii. Apply a new minicap to catheter using non-touch technique
      xviii. Secure the catheter in place with micropore tape
      xix. Discard used equipment as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
      xx. Remove gloves and PPE
      xxi. Perform hand hygiene
      xxii. Dwell PD fluid for further 2 hours (making it a total of 4 hours dwell time).

5. On the 4th hour of dwell, drain out all PD effluent and collect sample using aseptic technique ensuring all the key parts/sites are protected:
   a. Wear PPE as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
   b. Perform hand hygiene

c. Don sterile gloves
d. Connect patient to a CAPD Freeline solo bag (for CAPD patients or APD patients with day dwell) or Ultraset bag (for APD patients without day dwell) as per SGH PD WPI 217 *Continuous Ambulatory Peritoneal Dialysis (CAPD) Freeline Solo Exchange Procedure* or SGH PD WPI 143 *Peritoneal Dialysis (PD) – Manual Drain With A Drain Bag (Ultra Set)*

   Note: For patient connecting to CAPD – use PD fluid strength as per patient's regular PD regimen
e. Record start time of drain on PET form
f. Drain out all PD effluent and record weight of drain bag on PD form
g. Record end time of drain on PET form
h. Shake drain bag thoroughly
i. Alcohol swab the rubber bung on drain bag
j. Attach 21 G needle to 20 mL syringe;
k. Push needle into the centre of the bung on drain bag;
l. Aspirate 20 mL PD effluent and transfer to patient labelled specimen jar marked as "4 hour PD fluid"
m. For CAPD patients or APD patients with day dwell – run PD fluid into the patient as required. When fill is complete, twist close the catheter valve until it clicks
n. Open a new minicap
o. Perform hand hygiene
p. Don sterile gloves
q. Disconnect patient using non-touch disconnection technique
r. Apply a new minicap to catheter using non-touch technique
s. Secure the catheter in place with micropore tape
t. Discard used equipment as per NSW Health PD2017_013 *Infection Prevention and Control Policy*
u. Remove gloves and PPE
v. Perform hand hygiene

6. Send all 4 x patient labelled specimen jars containing varying times of PD effluent sample (marked as: overnight, 0 hour, 2 hour and 4 hour PD fluid) with a patient labelled pathology request form for urea, creatinine and glucose tests.
7. The day after PET, the nurse will:
   a. Record blood and PD fluid test results on PET form (Appendix A)
   b. Enter results in Adequest (in Sharesource Remote Monitoring platform) to calculate the PET result i.e. peritoneal membrane transport type & rate of the patient
   c. Document PET result in RISC, eMR and patient notes
   d. Analyse PET result against patient's current PD regimen
   e. Inform Nephrologist of PET result and determine the optimal PD regimen for patient
   f. Educate and inform patient of PET result and of any recommendation for PD regimen change or update

3. Network file	Renal, Peritoneal Dialysis
4. External references / further reading	Blake, P. G., Bargman, J. M., Brimble, K. S., Davison, S. N., Hirsch, D., McCormick, B. B., . . . Tonelli, M. (2011). Clinical Practice Guidelines and Recommendations on Peritoneal Dialysis Adequacy 2011. *Peritoneal Dialysis International, 31*(2), 218-239. doi: 10.3747/pdi.2011.00026 Brown, E. A., Blake, P. G., Boudville, N., Davies, S., de Arteaga, J., Dong, J., . . . Warady, B. (2020). International Society for Peritoneal Dialysis practice recommendations: Prescribing high-quality goal-directed peritoneal dialysis. *40*(3), 244-253. doi:10.1177/0896860819895364 Boudville, N., & de Moraes, T. P. (2020). 2005 Guidelines on targets for solute and fluid removal in adults being treated with chronic peritoneal dialysis: 2019 Update of the literature and revision of recommendations. *Perit Dial Int, 40*(3), 254-260. doi:10.1177/0896860819898307 Dombros, N., Dratwa, M., Feriani, M., Gokal, R., Heimburger, O., Krediet, R., . . . Verger, C. (2005). European best practice guidelines for peritoneal dialysis. 7 Adequacy of peritoneal dialysis. *Nephrology, Dialysis and Transplantation, 20 Suppl 9*, ix24-ix27. doi: 10.1093/ndt/gfi1121 Gokal, R., & Chan, C. K. (2004). Adequacy targets in peritoneal dialysis. *Journal of Nephrology, 17 Suppl 8*, S55-67 K/DOQI Clinical practice guidelines for peritoneal adequacy, update 2006. (2006). *American Journal of Kidney Disease*, 48 Suppl 1, S91-97. doi: 10.1053/j.ajkd.2006.05.016 Johnson, D., Brown, F., Lammi, H., & Walker, R. (2005). The CARI guidelines. Dialysis adequacy (PD) guidelines. *Nephrology (Carlton), 10 Suppl 4*, S81-107. doi: 10.1111/j.1440-1797.2005.00465_1.x Lo, W. K., Bargman, J. M., Burkart, J., Krediet, R. T., Pollock, C., Kawanishi, H., & Blake, P. G. (2006). Guideline on targets for solute and fluid removal in adult patients on chronic peritoneal dialysis. *Peritoneal Dialysis International*, 26(5), 520-522 Mehrotra, R., Ravel, V., Streja, E., Kuttykrishnan, S., Adams, S. V., Katz, R., . . . Kalantar-Zadeh, K. (2015). Peritoneal Equilibration Test and Patient Outcomes. *Clin J Am Soc Nephrol, 10*(11), 1990-2001. doi:10.2215/CJN.03470315 Misra, M., & Khanna, R. (2014). The Clinical Interpretation of Peritoneal Equilibration Test. *Seminars in Dialysis, 27*(6), 598-602. doi: 10.1111/sdi.12285 Ponferrada, L. P., & Van Stone, J. C. (1995). Peritoneal dialysis kinetics. *Advances in Renal Replacement Therapy, 2*(4), 341-348 Romani, R. F., Waniewski, J., Kruger, L., Lindholm, B., & Nascimento, M. M. (2019). Comparison of three PET methods to assess peritoneal membrane transport. *Braz J Med Biol Res, 52*(8), e8596. doi:10.1590/1414-431X20198596 Struijk, D. G. and Krediet, R. T. (2003). European best practice guidelines: adequacy in peritoneal dialysis. *Contrib Nephrol*(140), 170-175 Tang, Y., Zhong, H., Diao, Y., Qin, M., & Zhou, X. (2014). Peritoneal transport rate, systemic inflammation, and residual renal function determine peritoneal protein clearance in continuous ambulatory peritoneal dialysis patients. *International Urology and Nephrology*. doi: 10.1007/s11255-014-0744-8 Twardowski, Z. j., Nolph, K. O., Khanna, R., Prowant, B. F., Ryan, L. P.,

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5. Specialty/department committee approval	Peritoneal Dialysis Committee Dr Franziska Pettit, Staff Specialist Signature: 20.05.20
6. Department head approval	Dr George Mangos, Department Head Renal Services Signature: 20.05.20
7. Executive sponsor approval – Nurse Manager	Christine Day, Nurse Manager Medicine Signature: 28.05.20

Revision and Approval History

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Feb 2017	1	Anna Claire Cuesta (PD CNC)	Feb 2020
May 2020	2	Anna Claire Cuesta (PD CNC)	May 2023

Appendix A

Peritoneal Equilibration Test (PET)			
Patient's Addressograph		Date	
		Weight	
OVERNIGHT EXCHANGE			
% DEXTROSE USED		DWELL TIME	
VOLUME INFUSED		DIALYSATE UREA	
VOLUME DRAINED		DIALYSATE CREATININE	
4 HOUR PET			
% DEXTROSE USED			
VOLUME INFUSED		FILL TIME	
VOLUME DRAINED		DRAIN TIME	
RESULTS			
	UREA	**CREATININE**	**GLUCOSE**
SERUM 120 min			
PDF 0 MIN			
PDF 120 MIN			
PDF 240 MIN			
PERITONEAL MEMBRANE TYPE		D/P CREATININE at 4 HOURS	

Appendix B

PATIENT NAME_____

MRN_____

DATE_____

or affix Patient Identification Label here

PATIENT INFORMATION SHEET

PERITONEAL EQUILIBRATION TEST (PET)

for APD Patients

PET (Peritoneal Equilibration Test) is used to determine the peritoneal membrane function. PET result will indicate the transport rate of fluid and solutes through the peritoneal membrane. It will guide the nephrologist and PD nurses to recommend the type of PD regimen that is best suited to you.

PET is generally performed within the first 3 months of starting your maintenance dialysis. PET may be repeated to monitor changes in the peritoneal membrane i.e. when maintenance dialysis is not removing fluid or solutes as well as before. You will be advised by the nephrologist or PD nurse when a repeat PET is needed.

How to prepare for the test?

1. **The day before the test:**
   a. PD nurse will phone you to provide a PET specific APD program
   b. Confirm the PET specific APD program using the "Confirming New Program or Configuration" printed in blue sheet as a guide.
   c. Set up the PD machine with full strength 2.5 % (green) PD fluid (preferred PD fluid strength)
      Note: If you are unable to tolerate 2.5% PD fluid, please use full strength 1.5% (yellow) PD fluid.
      Note: Do not mix different strength PD fluid
   d. Start your dialysis at 8 pm
   e. At the end of therapy, the APD machine will provide a last fill and leave 2 Litres of PD fluid in your peritoneum – **DO NOT DO A MANUAL DRAIN** before disconnection.
      Note: The last fill 2 Litres of PD fluid in your peritoneum must dwell for 4 – 8 hours before PET
      Note: PET will be aborted if dwell time for last fill is < 4 hours or > 8hours

2. **On the day of the test:**
   a. Present yourself to the PD unit – 9 South St Kogarah, at 8 a.m. sharp
   b. PD nurse will collect PD fluid samples from you at the beginning and at 2 hours interval until the 4th hour
   c. Blood will also be collected from you at the 2nd hour
   d. The test will take approximately 5 hours to complete

3. **After the test:**
   a. PD nurse will change the PET specific APD program to your maintenance APD program
   b. Upon returning home, confirm usual APD program using the "Confirming New Program or Configuration" printed in blue sheet as a guide.
   c. Dialyse as usual (using your maintenance APD program and regular PD fluid strength)

PET result will be forwarded by the PD nurse to the Nephrologist. You will be informed of the result. You will also be informed if and when your PD regimen must be changed to improve your dialysis.

 Peritoneal Dialysis Unit 2020

Appendix C

PATIENT NAME_____

MRN_____

DATE_____

or affix Patient Identification Label here

PATIENT INFORMATION SHEET

PERITONEAL EQUILIBRATION TEST (PET)

for CAPD Patients

PET (Peritoneal Equilibration Test) is used to determine the peritoneal membrane function. The PET result will indicate the transport rate of fluid and solutes through the peritoneal membrane. It will guide the nephrologist and PD nurses to recommend the type of PD regimen that is best suited to you.

PET is generally performed within the first 3 months of starting your maintenance dialysis. PET may be repeated to monitor changes in the peritoneal membrane i.e. when maintenance dialysis is not removing solutes or fluid as well as before. You will be advised by the nephrologist or PD nurse when a repeat PET is needed.

How to prepare for the test?

1. **The night before the test:**
   Complete your last CAPD exchange at 12 midnight using 2.5% (green bag) PD fluid. This is to ensure your last CAPD exchange has a dwell time of 8 – 12 hours only before the test starts.

   Note: If you are unable to tolerate 2.5% (green bag) PD fluid, use 1.5% (yellow bag) PD fluid and inform the PD nurse

   Note: PET will be aborted if dwell time for last CAPD exchange is < 8 hours or > 12 hours

2. **On the day of the test:**
   a. Skip the first CAPD exchange
   b. Present yourself to the PD unit – 9 South St Kogarah, at 8 a.m. sharp
   c. PD nurse will attend to the first CAPD exchange using the same PD fluid strength and volume you used the night before
   d. PD nurse will collect PD fluid samples from you at the beginning and at 2 hours interval until the 4th hour
   e. Blood will also be collected from you at the 2nd hour
   f. The test will take approximately 5 hours to complete

PET result will be forwarded by the PD nurse to the Nephrologist. You will be informed of the result. You will also be informed if and when your PD regimen must be changed to improve your dialysis.

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