

## SECTION G PERITONEAL DIALYSIS

Prospective audit of the incidence of peritoneal dialysis (PD) associated peritonitis, adequacy of dialysis and causes of technique failure have been reported the Scottish Renal Registry (SRR) by all adult renal units in Scotland since 1999. The data collection was previously every 6 months, but from 2017 has been reported as the full year.

The PD population has fallen further in Scotland with 182 prevalent adult patients on PD at the end of 2017 with 75% using APD.

<b>G1 Number of patients treated with PD during 2017 and PD population with % APD at end 2017</b>				
<b>Renal unit</b>	<b>Total treated by PD 2017</b>	<b>PD population end 2017</b>	<b>APD population end 2017</b>	<b>APD % end 2017</b>
ARI	38	21	8	38
XH	47	27	26	96
DGRI	16	5	5	100
GLAS	81	45	40	89
MONK	36	18	12	67
NINE	30	16	14	88
RAIG	25	9	1	11
RIE	57	30	20	67
VHK	25	11	10	91
<b>Scotland</b>	<b>355</b>	<b>182</b>	<b>136</b>	<b>75</b>

G1 shows that a total of 355 patients were on PD at some point during 2017, reflecting the relatively high turnover of patients.

<b>G2 Number of patients treated with PD during 2017 and PD population with % APD at end 2017</b>											
Renal unit	New	From HD	Transfer in	From Tx	Total in	Death	To Tx	To HD	Transfer out	Re-covered	Total out
ARI	44	24	4	8	<b>80</b>	7	28	50	0	1	<b>86</b>
XH	56	11	2	1	<b>70</b>	35	18	30	0	0	<b>83</b>
DGRI	27	3	3	4	<b>37</b>	11	11	24	2	1	<b>49</b>
GLAS	106	53	2	17	<b>178</b>	39	50	90	3	1	<b>183</b>
MONK	47	14	1	4	<b>66</b>	12	15	34	1	1	<b>63</b>
NINE	41	23	2	1	<b>67</b>	12	12	37	1	0	<b>62</b>
RAIG	34	23	2	3	<b>62</b>	2	16	49	1	1	<b>69</b>
RIE	67	23	5	5	<b>100</b>	21	24	46	2	5	<b>98</b>
VHK	40	11	0	1	<b>52</b>	12	15	39	0	0	<b>66</b>
<b>Scotland</b>	<b>462</b>	<b>185</b>	<b>21</b>	<b>44</b>	<b>712</b>	<b>151</b>	<b>189</b>	<b>399</b>	<b>10</b>	<b>10</b>	<b>759</b>

G2 shows the source of patients starting PD and reasons for stopping PD 2013-2017; the proportions have stayed remarkably similar for the last 10 years, with 53% stopping because of technique failure (transfer to HD), 25% transplanted and 20% dying whilst on PD.

<b>G3 PD associated peritonitis rates in adult renal units 2000-2017</b>											
	2000-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Months between episodes	19.9	18.5	18.7	18.8	23.4	27.0	22.1	24.2	19.9	15.8	17.0

Peritonitis rates remain high in Scotland, with an overall rate of 1 episode every 17.0 months in 2017 (Figure G3 ) with almost all units experiencing an increase in peritonitis rates in 2016-2017. The definition of PD associated peritonitis used by the SRR can be found on the SRR website:

<http://www.srr.scot.nhs.uk/Projects/Projects3.html#periton>

<b>G4 PD associated peritonitis in adult renal units 2013-2017</b>				
<b>Unit</b>	<b>No. of peritonitis episodes</b>	<b>Total patient months on PD</b>	<b>Peritonitis rate (months between episodes)</b>	<b>Peritonitis rate (episodes per PD treatment year)</b>
ARI	71	1613	22.7	0.53
XH	95	2303	24.2	0.50
DGRI	34	734	21.6	0.56
GLAS	125	2847	22.8	0.53
MONK	54	810	15.0	0.80
NINE	42	1145	27.3	0.44
RAIG	70	806	11.5	1.04
RIE	118	1765	15.0	0.80
VHK	65	1137	17.5	0.69
<b>Scotland</b>	<b>674</b>	<b>13160</b>	<b>19.5</b>	<b>0.61</b>

MONK, RAIG, VHK and RIE have peritonitis rates across the 5 years that are worse than the minimum standard specified by the Renal Association 2010 Guideline (<1 episode per 18 months). The Renal Association updated guideline (published June 2017) recommends that peritonitis rates should be less than 0.5 episodes per patient year. All units except NINE have peritonitis rates  $\geq 0.5$  episodes per patient year and so fail to meet this revised standard (Figure G4). Peritonitis may occur as a single episode, or may be followed by further episodes which are described as relapse, recurrent or repeat according to the definition agreed by the International Society for Peritoneal dialysis (ISPD) and available on the SRR website:

<http://www.srr.scot.nhs.uk/Projects/Projects3.html#periton>

The SRR reports peritonitis rate using all episodes of peritonitis (which will result in a higher overall rate). The ISPD recommend omitting relapsed episodes from rate calculations; using these criteria the rate by unit for the 2017 audit period is shown in G5. The outcome of peritonitis by unit is also shown. In 2017, 74% of peritonitis episodes were cured, 24% resulted in PD catheter removal, and 2% resulted in patient death. When comparing peritonitis outcome data it is important to note that different organisms are associated with different cure rates, and different units may vary in their threshold for removing a PD catheter in the context of peritonitis. The UK Renal Association suggests 80% as the primary cure minimum target.

<b>G5 Proportion of patients experiencing peritonitis, type and outcome of peritonitis by unit (2017 data only)</b>										
<b>Unit</b>	<b>Proportion of patients experiencing peritonitis per unit</b>		<b>Type of peritonitis</b>					<b>Outcome of Peritonitis</b>		
	<b>Number patients treated with PD during audit period</b>	<b>% Patients developing peritonitis</b>	<b>Single episode</b>	<b>Recurrent</b>	<b>Relapse</b>	<b>Repeat</b>	<b>Peritonitis rate excluding repeat/recurrent/relapsed</b>	<b>% Cure</b>	<b>% Catheter Removed</b>	<b>% Death</b>
ARI	38	11	12	0	0	1	28.8	69	31	0
XH	47	32	15	1	0	2	21.7	88	6	6
DGRI	16	25	4	0	0	1	18.4	100	0	0
GLAS	81	26	24	0	1	5	20.4	83	17	0
MONK	36	36	14	1	0	0	14.8	53	47	0
NINE	30	20	6	0	2	0	34.0	50	38	12
RAIG	25	48	17	2	1	2	7.1	54	46	0
RIE	57	33	19	2	2	1	19.2	63	33	4
VHK	25	44	14	0	3	4	11.5	76	24	0
<b>Total</b>	<b>355</b>	<b>33</b>	<b>125</b>	<b>6</b>	<b>9</b>	<b>16</b>	<b>18.1</b>	<b>74</b>	<b>24</b>	<b>2</b>

The organisms cultured vary between units. The culture negative rate 2013-2017 remains high at 25%, above the Renal Association suggested standard of less than 20%. The culture negative rate varies from 4.8-52% between unit. This has prompted a review of PD fluid culture technique in Scottish PD Units at a meeting in October 2017 to ensure all are following recommended sampling and culture methods.

**G6 Rate (PD treatment months between episodes) of causative organisms of PD peritonitis in adult renal units 2013-2017**

Renal unit	Staph aureus	Coagulase negative staph	Gram-negative bacilli	Fungi	Other	Culture negative	Total Rate
ARI	538	90	101	1613	90	108	22.7
XH	192	256	192	0	192	47	24.2
DGRI	367	122	92	0	61	122	21.6
GLAS	219	95	150	569	98	98	22.8
MONK	58	0	135	405	116	32	15.0
NINE	143	104	164	0	82	573	27.3
RAIG	73	50	81	0	47	50	11.5
RIE	104	93	126	1765	38	84	15.0
VHK	190	37	76	0	162	227	17.5
<b>Scotland</b>	<b>153</b>	<b>94</b>	<b>123</b>	<b>1196</b>	<b>81</b>	<b>78</b>	<b>19.5</b>

2017 is the first year the SRR have reported the rate and causative organisms of PD catheter exit site infections. Exit site infection was defined as clinical evidence of infection with positive growth on an exit site swab.

**G7 Rate and causative organism of PD catheter exit site infections in 2017**

Renal unit	Staph aureus	Pseudo-monas	Coliforms	Other	Total	Treatment Months	Rate (months between episodes)
ARI	-*	-	-	-	-	375	-
XH	6	4	2	3	15	390	26.0
DGRI	1	0	0	0	1	92	92.0
GLAS	27	0	0	4	31	595	19.2
MONK	0	1	0	0	1	222.4	222.4
NINE	4	0	0	0	4	204	51.0
RAIG	12	1	0	5	18	150	8.3
RIE	2	0	0	0	2	422	211.0
VHK	2	0	1	1	4	207	51.8
<b>Scotland</b>	<b>54</b>	<b>6</b>	<b>3</b>	<b>13</b>	<b>76</b>	<b>2657.4</b>	<b>35.0</b>

\* Means there were no cases.

**G8 Number of patients with total (peritoneal and renal) creatinine clearances (litres/week/1.73m<sup>2</sup>) in each 6 months audit period 2013-2016 and full year of 2017 with percentage of patients with inadequate (<50) and borderline (50-60) creatinine clearances**

Year	Adequacy						% < 50	% 50-60
	< 50	50-60	61-70	>70	Unassessed	Total		
2013a	16	30	33	92	112	283	<b>5.7</b>	<b>10.6</b>
2013b	23	31	34	84	52	224	<b>10.3</b>	<b>13.8</b>
2014a	25	29	27	79	44	204	<b>12.3</b>	<b>14.2</b>
2014b	25	29	30	88	34	206	<b>12.1</b>	<b>14.1</b>
2015a	28	28	19	73	59	207	<b>13.5</b>	<b>13.5</b>
2015b	25	27	26	74	61	213	<b>11.7</b>	<b>12.7</b>
2016a	23	28	21	76	49	197	<b>11.7</b>	<b>14.2</b>
2016b	24	25	18	74	70	211	<b>11.4</b>	<b>11.8</b>
2017	33	34	27	124	141	359	<b>9.2</b>	<b>9.5</b>
<b>Total</b>	<b>222</b>	<b>261</b>	<b>235</b>	<b>764</b>	<b>622</b>	<b>2104</b>	<b>10.6</b>	<b>12.4</b>

\* a refers to first 6 months and b refers to second 6 months of each year

Most units wait at least 2 months after starting PD before performing an initial PD adequacy test. Not all units routinely test adequacy every 6 months. If more than one adequacy was performed in a given audit period, the most recent is reported. The proportion of patients with inadequate dialysis (i.e. below 50 litres/week/1.73m<sup>2</sup>) has remained fairly stable for the last 5 years.

The residual urine volume at the time of adequacy testing is presented for the first time in this report in G9. Of the 66% of patients with a residual urine volume reported, 12.8% are functionally anuric (urine output <100mls in 24 hours).

### G9 Residual urine volume at the time of 24 hour urine collection for most recent adequacy check (2017 data)

Unit	Number of patients with reported urine volume	% of patients with urine volume reported	% of patients with given residual urine volume in mls per 24 hours			
			<100	101-500	501-1000	>1000
ARI	32	78.0	15.6	25.0	18.8	31.3
XH	30	57.7	20.0	13.3	16.7	33.3
DGRI	8	50.0	12.5	25.0	25.0	37.5
GLAS	58	66.7	13.8	36.2	20.7	19.0
MONK	20	55.6	0.0	0.0	30.0	70.0
NINE	24	77.4	12.5	4.2	54.2	25.0
RAIG	23	85.2	13.0	26.1	21.7	30.4
RIE	33	57.9	15.2	30.3	21.2	33.3
VHK	17	68.0	5.9	17.6	35.3	41.2
<b>Scotland</b>	<b>250</b>	<b>66.3</b>	<b>12.8</b>	<b>22.0</b>	<b>24.8</b>	<b>31.6</b>

### G10 Cause (number and percentage) of technique failures in each adult renal unit 2013-2017

Unit	Peritonitis		Access*		Under-dialysis		Poor UF**		High IP***		Wish HD		Stop Dial		Total
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
ARI	19	42	2	4	12	27	1	2	4	9	6	13	1	2	45
XH	4	13	3	10	7	23	4	13	4	13	8	27	0	0	30
DGRI	4	18	1	5	12	55	0	0	1	5	4	18	0	0	22
GLAS	30	33	4	4	22	24	5	5	9	10	19	21	2	2	91
MONK	20	59	4	12	4	12	1	3	1	3	4	12	0	0	34
NINE	14	36	5	13	9	23	4	10	3	8	3	8	1	3	39
RAIG	23	52	3	7	7	16	0	0	4	9	7	16	0	0	44
RIE	25	44	5	9	6	11	2	4	3	5	11	19	5	9	57
VHK	18	45	5	13	7	18	1	3	2	5	5	13	2	5	40
<b>Scotland</b>	<b>157</b>	<b>39</b>	<b>32</b>	<b>8</b>	<b>86</b>	<b>21</b>	<b>18</b>	<b>4</b>	<b>31</b>	<b>8</b>	<b>67</b>	<b>17</b>	<b>11</b>	<b>3</b>	<b>402</b>

\* Includes exit site/tunnel infection and failure of PD access.

\*\* Poor ultrafiltration.

\*\*\* Complications of high intraperitoneal pressure (eg leaks).

The causes of technique failure have remained consistent overall in Scotland, with 39% caused by peritonitis, but there is variation between units.

Since 2016 an annual PD Meeting, with representation from all units, has examined PD Audit Data in more detail. Each meeting has focussed on one area of variation between units, hoping to identify reasons for variance and share best practice. Future reports hope to assess whether there is any noticeable overall improvement in outcomes, and reduction in variance between units.