

Peritoneal Dialysis in Italy: the 8th GDPD-SIN Census 2022 – 2nd Part: the Centers

Census

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ABSTRACT

Objectives. The results are presented of the 8th National Census (Cs-22) of the Peritoneal Dialysis Project Group of the Italian Society of Nephrology relating to the characteristics of the Centers in Italy which used PD in 2022.

Materials and methods. The 227 non-pediatric centers which used Peritoneal Dialysis (PD) in 2022 took part. The data requested were sent in aggregate form. For the first time, the resources available and training were investigated as well as home visits. The Centers have been divided into Quartiles according to the number of prevalent PD patients at 31/12/2022.

Results. Centers with a smaller PD program (<9 pts) are characterized by 1. smaller overall size – 2. fewer personnel (doctors/nurses) dedicated to PD – 3. greater recourse to external personnel for training – 4. Less incremental prescription and evaluation of peritoneal permeability – 5. higher drop-out to HD in particular for choice/impossibility to continue and for adequacy/catheter-related issues. A lower peritonitis rate was recorded in Centers with a more extensive PD program (≥25 pts). Home visits are carried out regularly by a small minority of Centers.

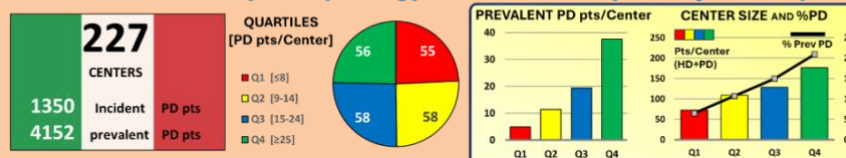
Conclusions. The analysis shows an association between size of Center PD program and available resources, PD modality and outcome.

Graphical abstract



Peritoneal Dialysis in Italy: the 8th GDPD-SIN Census 2022
 2nd Part: the Centers

Italian Society of Nephrology's Peritoneal Dialysis Project Group



Centers with a smaller PD program are characterized by

1. FEWER personnel (doctors/nurses) dedicated to PD (% of Centers with)
2. GREATER recourse to external personnel for training (% of Centers with)
3. LESS incremental prescription (% of incident pts in incremental PD)
4. HIGHER drop-out to HD (event/100 pt-year)

	Q1	Q2	Q3	Q4
Personnel dedicated to PD (%)	52	55	79	88
Recourse to external personnel for training (%)	52	41	51	27
Incremental prescription (% of incident pts)	27	29	42	34
Drop-out to HD (event/100 pt-year)	23	13	13	9

KEYWORDS: Peritoneal Dialysis, Center effect, technique failure

Background

Besides results pertaining to peritoneal dialysis (PD), the Peritoneal Dialysis Project Group Census also investigates a number of organizational aspects, which were broadened in the last edition relating to 2022 to the resources available for PD (premises and dedicated personnel) and training. The PD results were published recently in this Journal [1]. In this second part, the characteristics are reported of the 227 Centers which used PD in 2022 and which have remained virtually the same over almost 20 years, in other words a minority of the Dialysis Centers in Italy.

The first Italian Society of Nephrology Census relating to 2004 had shown that PD was used in 64.3% of the non-pediatric public Centers (209 out of 325 Centers) and practically unused in all the 286 private Centers surveyed at the time. The use of PD was conditioned by whether the Center was public or private (absent in the latter), size of Center and HD bed occupancy (the greater the size and pressure on HD places, the greater the use of PD). In turn, the presence of private Centers – significant in some areas – reduces the size of the public Centers, reinforcing the negative effect on the use of PD.

However, there were large public Centers with a high HD bed occupancy rate which were not using PD, while it was used – even extensively – by others with opposite characteristics. Clearly, alongside the structural factors given there was also a fourth element conditioning the use of PD: the Center’s “policy”. This aspect was investigated by means of a 2007 questionnaire, also carried out by the PD Study Group, the results of which have never been published though. The methodology and breadth of the survey make it quite unique, still today. In an attempt to understand the state of affairs in Italy, it seemed to us only right to retrieve its results, attaching them to this paper.

Materials and methods

The methodology of the Census was described at great length in the recent paper published in this Journal, which can be referred to [1]. The characteristics of the Centers surveyed were the existence of premises for PD, the presence of medical and nursing personnel dedicated to PD (whose sole or exclusively attributed activity is PD), training methods in terms of both who performs it and where it is carried out, the performance of PET and lastly home visits.

As with other similar analyses, to facilitate the interpretation of the results the Centers have been divided into quartiles (Table 1) based on the number of prevalent patients on PD at 31/12/2022.

QUARTILE	PREVALENT ON DP		CENTERS	%
	MIN (from)	MAX (to)		
Q1	1	8	55	24,2
Q2	9	14	58	25,6
Q3	15	24	58	25,6
Q4	25	112	56	24,7
			227	

Table 1. Division into quartiles of the 227 PD Centers surveyed based on number of prevalent patients on PD at December 31st 2022.

The groups were then compared for “structural” characteristics (size and percentage use of PD, geographical distribution, presence of dedicated personnel and spaces, training methods, home visits and performance of PET), for “use” of PD (manual or automated modality, incremental PD, assisted PD) and for “results” obtained (drop-out and turnover, peritonitis).

The Census represents a snapshot of the situation relating to PD in Italy. The statistical analysis (chi-square) was therefore limited to any differences between the groups.

Results

STRUCTURAL CHARACTERISTICS OF THE CENTERS

Size of Center and percentage use of PD

Table 2 shows the structural characteristics of the Centers divided into the 4 quartiles of PD prevalence. The size of Centers was assessed by considering the total number of dialysis patients (HD + PD) at 31/12/2022, and as a result limited to the 183 Centers which provided HD prevalence data. As can be seen (Table 2), as the overall size of the Center increases, not only the number but also the percent proportion of PD patients with respect to total dialysis patients rise from 6.5% in Centers with a minimal PD program (Q1, 1-8 PD patients per Center) to 20.9% in “large” Centers (Q4, ≥25 patients). Although it is not certain, the estimate can be considered valid as the number of PD patients per Center (“PD PTS per CENTER”) is practically superimposable on those recorded in all 227 Centers (Table 2).

ALL PD CENTERS				CENTERS WITH HD PREVALENCE AVAILABLE						
	CENTERS	PD PREVAL.	PD PTS per CENTER	CENTERS	PD PREVAL.	HD PREVAL.	PD PTS per CENTER	HD PTS per CENTER	TOT PTS per CENTER	%PD
Q1	55	265	4.8	45	213	3063	4.7	68.1	72.8	6.5
Q2	58	662	11.4	46	535	4466	11.6	97.1	108.7	10.7
Q3	58	1124	19.4	47	903	5134	19.2	109.2	128.4	15.0
Q4	56	2101	37.5	45	1661	6279	36.9	139.5	176.4	20.9
ITALY	227	4152	18.3	183	3312	18942	18.1	103.5	121.6	14.9

Table 2. Percentage use of PD and size of Center. The analysis was only possible for the 183 Centers which provided HD prevalence data. The missing Centers were equally distributed among the 4 groups, and the size of PD program was found to be practically superimposable (“PD PTS per CENTER”). The overall size of the Center is given in the “TOT PTS per CENTER” column: the sum of HD and PD prevalent patients.

The distribution of the Centers in Figure 1 shows how there are some significantly-sized Centers where the use of PD is limited, and other smaller Centers using it in a high percentage of patients, confirming the finding of the first SIN Census.

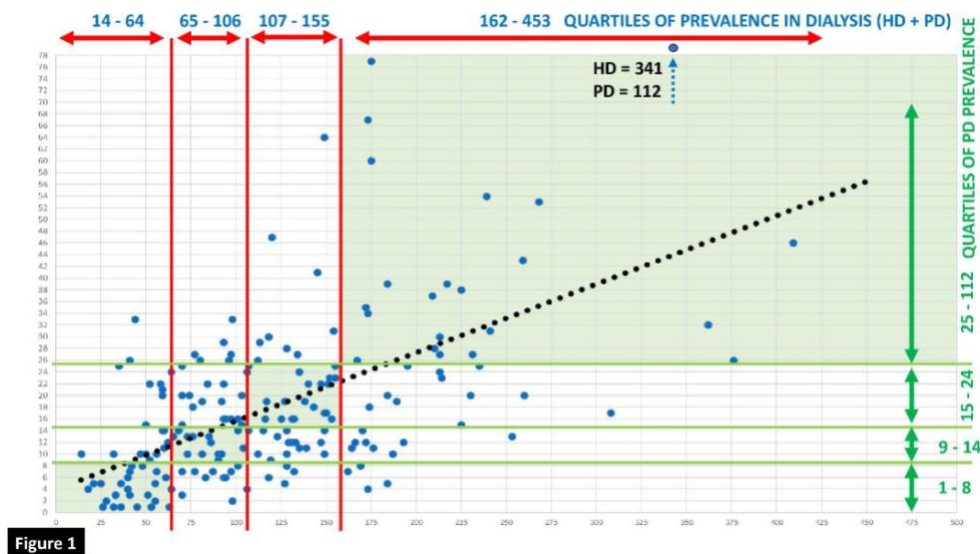


Figure 1. Distribution of the 183 Centers which also provided HD data. PD prevalence by size of Center (HD and PD). The lines define the quartiles of the 2 variables.

Geographical distribution

The geographical breakdown of the Centers by size, which was already partly analyzed in the previous paper, shows how PD programs are more widespread in Centers in the North.

While the number of the Centers using PD per million inhabitants (pmp) is practically superimposable (Table 3), varying only a little from the national average of 3.9 PD Centers pmp, those located in the NORTH follow a greater number of patients (21.9 ±16.5 patients per Center) than the others. It follows that PD prevalence pmp in the NORTH (81.7 PD patients pmp) is also higher than in the Centers in Central Italy (72.9 PD patients pmp) and in the SOUTH and ISLANDS where it is practically identical (55.22 and 55-20 PD patients pmp respectively) (Table 3). However, an examination of the Centers which also sent data for HD confirm (Table 4) the finding of some 20 years ago. The Centers in the SOUTH and ISLANDS which use PD are on average smaller, in terms of both overall size and PD program, but with a higher percentage of PD patients (Table 4).

	CENTERS (no.)	POPULATION (inhabit.)	PD PREVAL. (no of pts)	PD PREVAL. (pmp)	CENTERS (pmp)	PD PREVAL. per CENTER	
						MEAN (±DS) (no. of pts)	MEDIAN (no. of pts)
NORTH	102	27,349,747	2235	81.7	3.7	21.9±16.5	19
CENTER	54	11,693,240	853	72.9	4.6	15.8±12.0	12
SOUTH	47	12,894,027	712	55.2	3.6	15.1±13.1	13
ISLANDS	24	6,377,044	352	55.2	3.8	14.7±13.9	10
ITALY	227	58,314,058	4152	71.2	3.9	3.3 ±14.8	15

Table 3. Geographical distribution of the Centers in the 4 macro regions of Italy and their size of PD program. The regional breakdown and population are 2022 ISTAT (Italian National Institute of Statistics) data, the prevalence is at 31/12/2022. pmp = per million population; THE REGIONS OF ITALY AS DEFINED BY ISTAT – NORTH = Valle d’Aosta, Piemonte, Lombardia, Trentino Alto Adige, Friuli Venezia Giulia, Veneto, Emilia Romagna, Liguria – CENTER = Toscana, Marche, Umbria, Lazio – SOUTH = Abruzzo, Molise, Puglia, Campania, Basilicata, Calabria – ISLANDS = Sicily, Sardinia.

	CENTERS		PREVALENCE (no.)		SIZE	PD/CENTER	%PD
	no.	%	HD	PD			
NORTH	83	81.4	11588	1751	160.7	21.1	13.1
CENTER	51	94.4	4210	821	98.6	16.1	16.3
SOUTH	29	61.7	2057	443	86.2	15.3	17.7
ISLANDS	20	83.3	1087	297	69.2	14.9	21.5
ITALY	183	80.6	18942	3312	121.6	18.1	14.9

Table 4. Characteristics of the Centers in the 4 macro areas of Italy which also sent data relating to HD. “SIZE” = total number of patients (HD+PD) on dialysis at 31/12/2022 – “PD/CENTER” = prevalent PD patients per Center – “%PD” = mean percentage PD prevalence in the Centers.

Resources dedicated to PD

Most of the Centers (95.1%) have facilities dedicated to PD whatever the size of their PD program, while there are significant differences with regard to the personnel – both medical and nursing – dedicated to PD (Table 5).

In particular, nearly half the small Centers (48.1%) have no one member of staff – either medical or nursing – as a point of reference (“everyone can handle PD as well”). This percentage drops to 12.5% in the Centers with an extensive PD program (Table 5).

	CENTERS	FACILITIES	DOCTORS	NURSES	BOTH	NONE	DOCTOR OR NURSE (%)
Q1	54*	49	20	23	15	26	51.9
Q2	58	54	19	30	17	26	55.2
Q3	57*	56	32	44	31	12	78.9
Q4	56	55	36	45	41	7	87.5
ITALY	225	214	107	142	104	71	68.4
		NS	p<0.005	p<0.00005			p<0.00005

Table 5. Resources for PD in the 227 Centers which use it. For the personnel, dedicated professionals are considered to be doctors and nurses who are engaged exclusively with PD, but also those who, in particular in the “small” Centers, are assigned the exclusive task of handling it. “Both” refers to the Centers where there are both medical and nursing personnel dedicated to PD (the difference between “Doctors” plus “Nurses” and “Both” provides the number of Centers which have only the Doctor or Nurse as dedicated PD professional). “None” refers to the Centers which have no dedicated PD professionals. * Two Centers (Q1 and Q3) did not provide information on Training.

Activities

The activities considered by the Census are training, home visits and the performance of PET.

Training. Training is carried out by in-Center personnel in 57.3% of the Centers, by external personnel in 11.6% and by both in 31.1%. The contribution of external personnel is lower in the large and medium-small Centers (Q4 and Q2, 26.8% and 41.4% of Centers respectively) and greater in the Centers with a small or medium-large PD program (Q1 and Q3, 51.9% and 50.9% of Centers respectively) (Table 6). The place where the training takes place more frequently is the Center (52.4% of cases), partly at home and partly in the Center in 37.8% of cases and only at home in 9.8% of the Centers (Table 6). The location of the training depends on the provider. In fact, when the training is performed by in-house personnel (57.3% of the Centers) it takes place mostly in the Hospital (80.6% of cases), while in the Centers in which only or partly external personnel are involved (42.7% of the Centers) the training is performed exclusively or partly at home (85.4% of the Centers, p<0.000001) (Figure 2).

	PROVIDER					PLACE OF TRAINING			
	CENTERS	CENTER	EXTERNAL	BOTH	% CENTER	CENTER	HOME	BOTH	% HOME
Q1	54*	26	7	21	48.1	27	5	22	50.0
Q2	58	34	11	13	58.6	36	5	17	37.9
Q3	57*	28	5	24	49.1	20	6	31	64.9
Q4	56	41	3	12	73.2	35	6	15	37.5
ITALY	225	129	26	70	57.3	118	22	85	47.6
					p<0.03				p<0.001

Table 6. The Provider and Place where the Training takes place. The Provider can be “Center” personnel only, “External” personnel only, or “Both” if it is performed in the Center by both in-house and external personnel. The absolute values and percentages refer to the Centers and NOT to the number of Trainings. * Two Centers did not provide information on Training. “% CENTER” is the percentage of Centers in which the Training is performed by in-house personnel. “% HOME” is the percentage of Centers which perform the Training – exclusively or partly – at home.

Home visits. The home visits (HV) program once the PD has started is in keeping with training practice. They are not envisaged by the majority of the Centers (55.2%), with no significant differences between the 4 groups (Table 7), while only a minority of the remainder carry them out regularly following a pre-defined program (8.5%). In the other Centers they are basically performed when necessary. With respect to previous years, the percentage of the Centers with no HV program once PD has started has increased (48.5% in 2016), while the percentage of the number of the Centers with a regular HV program remains unchanged, as an absolute value as well (Figure 3).

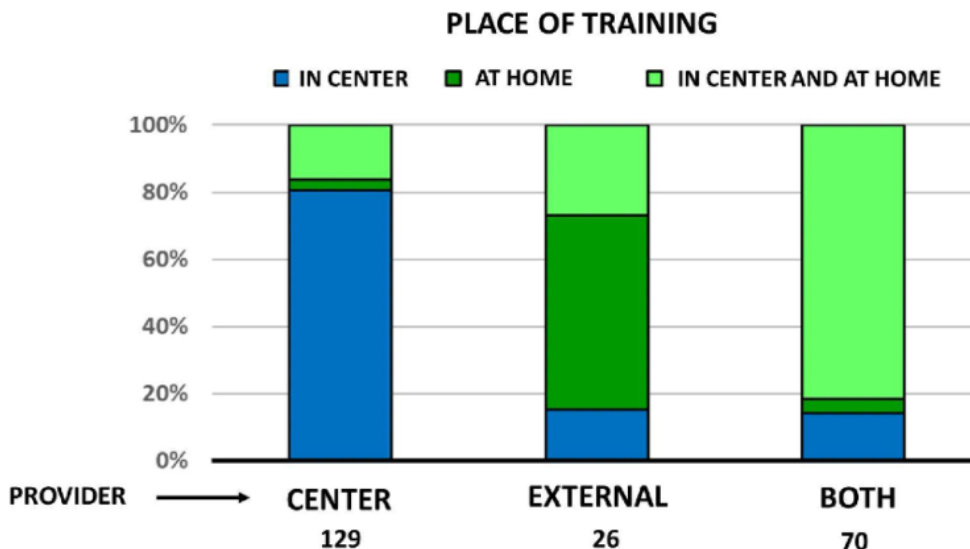


Figure 2. Training divided by provider. The place (home, hospital or both) where it is carried out is given for each provider.

FREQUENCY OF HOME VISITS					
	CENTERS	NOT ENVISAGED	VARIABLE	REGULAR	% NO
Q1	53	25	25	3	47.2
Q2	57	32	21	4	56.1
Q3	57	30	22	5	52.6
Q4	56	36	13	7	64.3
ITALY	223	123	81	19	55.2

Table 7. Frequency of home visits after PD has started. The question was answered by 223 of the 227 Centers considered. The difference between the groups was NOT significant. Variable frequency is to be understood as meaning “only during the initial period”, which was not further specified, “at the start when needed” and lastly “only if necessary”. “Not envisaged” means they are not considered by the Center for PD follow-up.

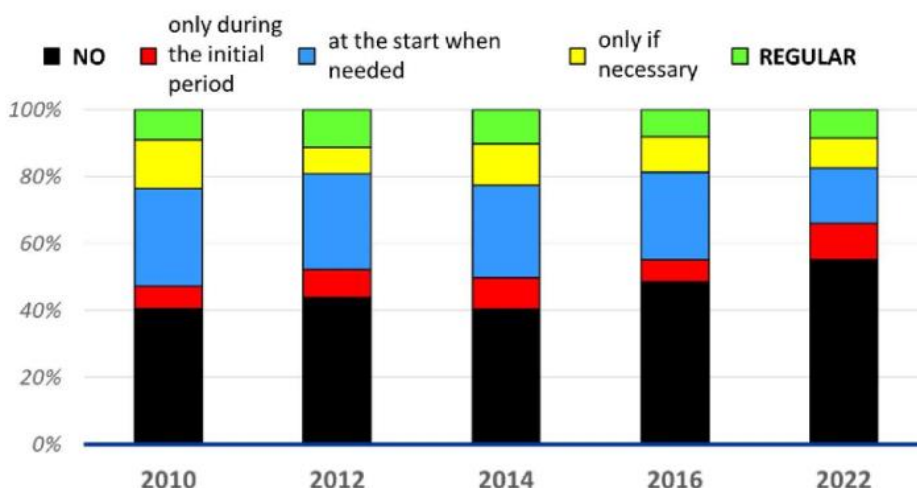


Figure 3. Home visits over time. The data relating to 2019 are incomplete. The home visits considered are those carried out once PD has started, i.e. excluding those during training.

PET. Evaluation of the peritoneal membrane by PET is not performed by 11.9% of the Centers, mostly the smaller ones (NO PET – Q1 = 18.2%; Q2 = 13.8%; Q3 = 12.1%; Q4 = 3.6% – p = N.S.), although the difference is not statistically significant.

PD MODALITY*CAPD/APD and incremental PD in incident patients*

Overall, the most used PD modality in incident patients is CAPD (52.1%), but with a significant difference between the groups according to size of PD program: the smaller Centers mostly use APD, while CAPD is the most widely-used modality in the larger Centers ($p < 0.005$). This is partly associated with incremental prescription, for which CAPD is preferred, with its use rising as size of Center increases (Table 8). Lastly, admissions from HD and Tx increase (percentage-wise with respect to total admissions) as PD program size grows, although not significantly.

	INCIDENT PATIENTS							OTHER ADMISSIONS		
	CENTERS	CAPD	APD	TOT	% CAPD	INCR	% INCR	from HD/Tx	TOT IN	% from HD/Tx
Q1	55	38	54	92	41,3	25	27,2	12	104	11,5
Q2	58	104	120	224	46,4	65	29,0	33	257	12,8
Q3	58	240	164	404	59,4	170	42,1	55	459	12,0
Q4	56	321	309	630	51,0	217	34,4	126	756	16,7
ITALIA	227	703	647	1350	52,1	477	35,3	226	1576	14,3
					P<0,005		P<0,005			N.S.

Table 8. PD modality (CAPD and APD) and incremental prescription (“INCR”) at the start of treatment by size of PD program. On the right, admissions from HD and transplant (Tx), and their percentage weight on the total of admissions to PD recorded in 2022.

The percentage of late referrals to PD was shown NOT to differ significantly among the groups (Q1 = 5.4% – Q2 = 8.0% – Q3 = 11.4% – Q4 = 7.9% – $p = \text{N.S.}$)

CAPD/APD and assisted PD in prevalent patients

APD is confirmed as the most used PD modality for prevalent patients, but – as with incident patients – significantly more so in the smaller Centers (Table 9). Recourse to assisted PD, on the other hand, is greater in the smaller Centers, in particular in the second quartile compared to the fourth. Overall it is used in 26% of prevalent patients in the Centers with fewer than 15 prevalent PD patients, and in 19.8% of patients in the Centers with a higher prevalence. No significant difference emerged between the Quartiles with regard to type of caregiver, with a family member being confirmed as the most commonly-involved caregiver in Italy (86.3%) (Table 9).

	PREVALENT PTS – TYPE OF PD					PREVALENT PTS – ASSISTED PD					
	CENTERS	CAPD	APD	TOT	% CAPD	RSA	FAM.	CARER	IP	TOT ASS. PD	% ASS. PD
Q1	55	98	167	265	37.0	3	47	2	5	57	21.5
Q2	58	261	401	662	39.4	2	165	14	3	184	27.8
Q3	58	513	611	1124	45.6	20	212	18	2	252	22.4
Q4	56	931	1170	2101	44.3	15	334	31	5	385	18.3
ITALY	227	1803	2349	4152	43.4	40	758	65	15	878	21.1
					p<0.01	N.S.					p<0.0001

Table 9. PD modality (CAPD and APD) and assisted PD in prevalent PD patients at 31/12/2022. “RSA” = nursing home, facility for the elderly – “FAM.” = family-member caregiver – “CARER” = live-in carer, paid assistant – “IP” = nurse (or other healthcare worker) who performs the dialysis at the patient’s home – “% ASS. PD” represents the percentage of prevalent patients on assisted PD.

OUTCOME

Peritonitis

Although the incidence of peritonitis was lower in the larger Centers, it was substantially superimposable. The percentage of negative cultures was not significantly different either (Table 10).

	CENTERS	PERITONITIS	INCIDENCE	NEGATIVE	% NEGATIVE
Q1	54	50	0.186	7	14.0
Q2	58	115	0.185	23	20.0
Q3	58	221	0.209	35	15.8
Q4	56	310	0.156	69	22.3
ITALY	226	696	0.176	134	19.3

Table 10. Episodes of peritonitis (total and culture-negative peritonitis) and size of Centers. The peritonitis rate is expressed as episodes per patient year. “% NEGATIVE” is the percentage of culture-negative peritonitis out of total episodes (N.S.). Only one Center did not provide data on peritonitis.

Drop-out from PD

The average duration of PD, taken from the Replacement Index (ratio between Prevalent patients at 31/12/2022 and all admissions recorded in 2022, expressed in years) was higher in the larger Centers (RI – Q1 = 2.5 equivalent to 30.6 months; Q2 = 2.6 equivalent to 30.9 months; Q3 = 2.4 equivalent to 29.4 months; Q4 = 2.8 equivalent to 33.3 months).

Causes of drop-out from PD. In 2022 a total of 464 patients were transferred to HD, 400 died and 296 received a transplant for a total of 29.3 drop-outs from PD per 100 patient-years. Mortality was significantly different, while a higher number of transplants and in particular Drop-Outs to HD were recorded in small Centers (Table 11).

	CENTERS	PREV.	EVENTS			EVENTS / 100 PT-YEARS		
			TRANSF	DEATH	TX	D-O	DEATH	TX
Q1	55	265	64	30	35	22.9	10.8	12.5
Q2	58	662	80	49	49	12.9	7.9	7.9
Q3	58	1124	140	120	61	13.2	11.3	5.8
Q4	56	2101	180	201	151	9.0	10.1	7.6
ITALY	227	4152	464	400	296	11.7	10.1	7.5
						p<0.00001	N.S.	p<0.001

Table 11. Drop-out from PD due to transfer to HD (TRANSF), death and transplant (Tx) during 2022 divided by size of Centers.

As regards the specific causes of transfer to HD, in the small Centers (subject to a higher drop-out to HD) the main cause is choice or impossibility to continue, followed by catheter and dialysis adequacy issues. Confirming the validity of this is peritonitis as cause of drop-out which, like incidence of peritonitis, is also essentially superimposable in the different quartiles (Table 12).

	CENTERS	TOT. TRANSF	EVENTS			ep/100 pt-years		
			PERITON.	CAT./ADEQ.	CH./IMP.	PERITON.	CAT./ADEQ.	CH./IMP.
Q1	55	64	9	27	28	3.2	9.7	10.0
Q2	58	80	22	37	21	3.5	6.0	3.4
Q3	58	140	25	60	55	2.4	5.7	5.2
Q4	56	180	53	76	51	2.7	3.8	2.6
ITALY	227	464	109	200	155	2.8	5.1	3.9
						p<0.05		

Table 12. Drop-out from PD for transfer to HD (TRANSF), death and transplant (Tx) during 2022 divided by size of Centers. “PERITON.” = peritonitis; “CAT./ADEQ.” = malfunctioning or infected catheter/adequacy both clearance and UF; “CH./IMP.” = choice or impossibility to continue.

Discussion

The limitations of the Census were already extensively discussed in part one [1].

The results of the 2022 Census confirm the findings of the first SIN Census in 2004. The use of PD is proportional in percentage terms to the size of Center and, as emerges from the geographical distribution of the Centers, lower wherever there are more private Centers, although the few Centers which do use it in these regions do so to a greater than average extent (see Annex – Questionnaire).

From an organizational point of view, smaller Centers are characterized first and foremost by fewer personnel dedicated to PD, either exclusively or – in the smaller Centers – as PD point of reference even though they certainly (Annex – Questionnaire) perform other activities. In the Centers in which there are no dedicated personnel, the “everyone does everything” principle most probably applies and in the end recourse to external personnel is necessary for training, the most important part of a PD program. Indeed, the Centers with a limited PD program rely more for training on external personnel, whose role – if any – in PD patient follow up was not however investigated. Though a positive aspect of training performed by external personnel or in combination is that it is carried out at home, this ends up “separating” PD patients even more from their Center. Lastly, another characteristic of the Centers with a limited PD program is less incremental prescription, and therefore greater use of APD.

Finally it is confirmed how home visits after starting on PD are carried out regularly only by a tiny minority of Centers.

Mortality is substantially superimposable in the different groups, while drop-out to HD is significantly higher in the Centers with a modest PD program, in which the main cause of drop-out to HD is patient choice and/or impossibility to continue. The latter term however, as discussed in the first part, is ambiguous as it can refer not only to loss of self-sufficiency but also clinical causes, to which inaccurate patient selection or insufficient follow up can contribute. Drop-out for adequacy due to catheter-related causes is also higher in smaller Centers. Peritonitis rates seem to be lower in the Centers with an extensive PD program, but drop-out for this cause is substantially similar.

Conclusions

In the public Centers in Italy which use PD the resources deployed, the modality of use and drop-out are associated (negatively) with size of PD program. In turn, the size of PD program is influenced by well-known factors which, as illustrated in “The Questionnaire” annex also condition – though only partly – the opinions Nephrologists in Centers not using PD have of this modality. There are therefore many reasons for the limited use of PD which are not justified by the results obtained and its potential, or by the prospect of having to treat increasingly fragile patients with ever more limited resources.

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