

CHAPTER 12

**CHRONIC PERITONEAL DIALYSIS
PRACTICES**

Sunita Bavanandan
Anita Bhajan Manocha

12.1: PERITONEAL DIALYSIS PRACTICES

12.1: Mode of Peritoneal Dialysis (Tables 12.1.1 to 12.1.4)

In 2005, CAPD remained the commonest mode of peritoneal dialysis (PD) (93%). However, there was increased utilization of automated peritoneal dialysis (APD) or continuous cycling peritoneal dialysis (CCPD) regimes from $\leq 1\%$ in earlier years to 4% in 2005. This trend was likely related to an increased number of paediatric patients on APD with special reduction in cost of APD for children. Most patients (90%) were on the Baxter disconnect system. The majority of patients (94%) were on 4 exchanges per day but there is a trend for an increased percentage of patients on 3 exchanges a day from 1% to 2%. This may be a reflection of more aggressive management of advanced chronic kidney disease, with earlier initiation of dialysis allowing for the practice of incremental dialysis. Most patients (90%) use a fill volume of 2L.

Table 12.1.1: Chronic Peritoneal Dialysis Regimes, 1997-2005

PD regime	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
Standard CAPD	440	94	492	93	577	96	633	97	755	98
DAPD	26	6	32	6	16	3	16	2	17	2
Automated PD/ CCPD	4	1	6	1	6	1	5	1	2	0
TOTAL	470	100	530	100	599	100	654	100	774	100

PD regime	2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%
Standard CAPD	837	97	1155	97	1212	96	1271	93
DAPD	24	3	33	3	39	3	45	3
Automated PD/ CCPD	3	0	5	0	13	1	50	4
TOTAL	864	100	1193	100	1264	100	1366	100

Table 12.1.2: CAPD Connectology, 1997-2005

CAPD Connectology	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
UVXD	27	5	10	2	3	1	0	0	0	0
Baxter disconnect	461	93	511	95	347	58	235	39	436	57
B Braun disconnect	10	2	18	3	248	41	370	61	324	43
Fresenius disconnect	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0
TOTAL	498	100	539	100	598	100	605	100	760	100

CAPD Connectology	2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%
UVXD	0	0	0	0	0	0	0	0
Baxter disconnect	719	87	1040	87	1144	88	1252	90
B Braun disconnect	93	11	7	1	14	1	0	0
Fresenius disconnect	11	1	154	13	145	11	111	8
Others	0	0	1	0	0	0	28	2
TOTAL	823	100	1202	100	1303	100	1391	100

Table 12.1.3: CAPD Number of Exchanges per day, 1997-2005

No. of Exchanges/ day	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
2	0	0	2	0	0	0	2	0	1	0
3	3	1	4	1	4	1	1	0	5	1
4	454	97	508	96	579	97	624	96	735	95
5	12	3	16	3	13	2	23	4	31	4
TOTAL	469	100	530	100	596	100	650	100	772	100

No. of Exchanges/ day	2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%
2	0	0	4	0	6	0	3	0
3	11	1	14	1	12	1	25	2
4	834	96	1138	96	1225	95	1279	94
5	28	3	32	3	53	4	48	4
TOTAL	873	100	1188	100	1296	100	1355	100

Table 12.1.4: CAPD Volume per Exchange, 1997– 2005

Volume per Exchange (L)	1997		1998		1999		2000		2001	
	No.	%	No.	%	No.	%	No.	%	No.	%
1	24	5	25	5	19	3	25	4	32	4
2	444	95	496	95	557	96	595	95	711	95
3	0	0	0	0	2	0	7	1	9	1
TOTAL	468	100	521	100	578	100	627	100	752	100

Volume per Exchange (L)	2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%
1	37	4	40	3	42	3	52	4
2	793	94	1090	94	1154	92	1192	90
3	14	2	31	3	63	5	86	6
TOTAL	844	100	1161	100	1259	100	1330	100

12.2: ACHIEVEMENT OF SOLUTE CLEARANCE AND PERITONEAL TRANSPORT

The median delivered weekly Kt/V has remained unchanged at 2.1 since 2003, with 58% of patients achieving K/DOQI recommended Kt/V of more than or equal to 2.0. Compared to 2004 there has been a widening in the gap between the highest and lowest performing centers with more than 8-fold variation in terms of the percentage of patients in each center achieving a Kt/V of > 2.0 per week. Half of the centers were able to have up to 53.5% of their patients achieving the K/DOQI target although this percentage has been declining since 2003. This may reflect changes in practice due to results of the ADEMEX trial and indeed 75% of patients achieved the lower target proposed by ADEMEX which was 1.8 (Tables and figures 12.2.1 and 12.2.2)

Table 12.2.1: Distribution of delivered KT/V, CAPD patients 2003-2005

Year	No of Subjects	Mean	SD	Median	LQ	UQ	% patients ≥ 2.0 per week
2003	790	3.7	19.9	2.1	1.8	2.5	59
2004	1069	2.8	9.9	2.1	1.8	2.5	61
2005	1124	3.3	13.7	2.1	1.8	2.5	58

Figure 12.2.1: Cumulative distribution of delivered KT/V, CAPD patients 2003-2005

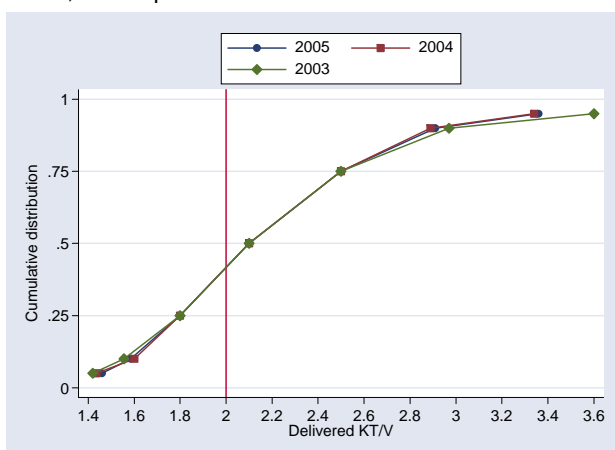


Figure 12.2.2: Variation in proportion of patients with KT/V ≥ 2.0 per week among CAPD centres 2005

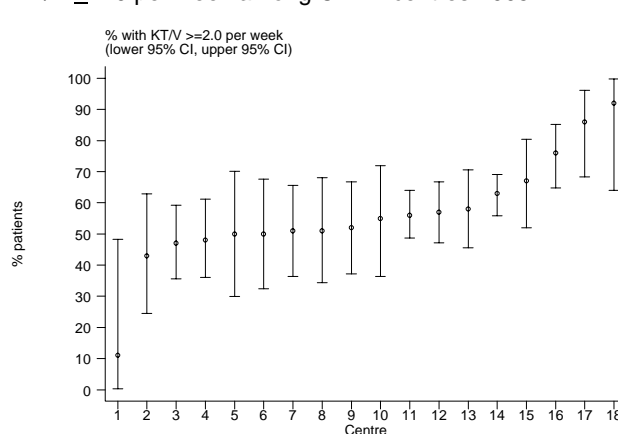


Table 12.2.2: Variation in proportion of patients with KT/V ≥ 2.0 per week among CAPD centres 2005

Year	No. of centres	Min	5th Centile	LQ	Median	UQ	95th Centile	Max
2003	14	0	0	51	59	62	73	73
2004	17	43	43	53	56	67	85	85
2005	18	11	11	50	53.5	63	92	92

Low average transport status was commonest (41%) among incident PD patients followed by high average transport status (37%). This pattern of distribution of peritoneal transport status remains unchanged amongst the prevalent PD patients. However, high PET status becomes more common in prevalent compared to new PD patients (13% versus 10%).

Table 12.2.3: Peritoneal transport status by PET D/P creatinine at 4 hours, new PD patients 2003-2005

PET	2003		2004		2005	
	No.	%	No.	%	No.	%
Low	10	6	67	15	69	12
Low average	85	51	187	41	246	41
High average	62	37	176	38	223	37
High	11	7	29	6	62	10
TOTAL	168	100	459	100	600	100

* New PD patients=patients commencing dialysis since 2003

Table 12.2.4: Peritoneal transport status by PET D/P creatinine at 4 hours, prevalent PD patients 2003-2005

PET	2003		2004		2005	
	No.	%	No.	%	No.	%
Low	10	3	40	9	44	13
Low average	175	44	180	42	130	39
High average	172	43	168	39	118	35
High	39	10	41	10	42	13
TOTAL	396	100	429	100	334	100

*Prevalent PD patients=patients commencing dialysis before 2003

12.3: TECHNIQUE SURVIVAL ON PD

CAPD fared worse compared with haemodialysis in terms of technique survival with Kaplan-Meier cumulative survival curves diverging as early as 6 months. One- and two- year technique survival for CAPD was 81% and 63% respectively as compared to haemodialysis (89% and 81%). Median technique survival was less than 36 months. Overall these trends in technique survival remain unchanged by year of entry (Tables and figures 12.3.1 and 12.3.2).

The best technique survival rate is seen in the youngest age group between 1-14 years and the worst in the oldest age group aged >65years (Table and figure 12.3.3). Diabetics have a poorer technique survival than the non-diabetics (Table and figure 12.3.4). However, there is no gender difference (Table and figure 12.3.5).

Table 12.3.1: Unadjusted technique survival by Dialysis modality, 1996-2005

Dialysis modality Interval (months)	CAPD			HD			All Dialysis		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	2374	90	1	15266	94	0	17640	94	0
12	1980	81	1	13066	89	0	15046	88	0
24	1300	63	1	9515	81	0	10813	78	0
36	769	47	1	6881	72	0	7650	69	0
48	439	35	1	4822	65	0	5261	61	0
60	267	29	1	3303	59	1	3569	55	0
72	147	21	1	2188	53	1	2335	49	1
84	89	17	1	1330	48	1	1417	43	1
96	39	12	1	716	43	1	754	39	1
108	13	9	1	278	40	1	290	35	1
120	-	-	-	17	37	1	17	33	1

* No. = Number at risk SE=standard error

Figure 12.3.1: Unadjusted technique survival by Dialysis modality, 1996-2005

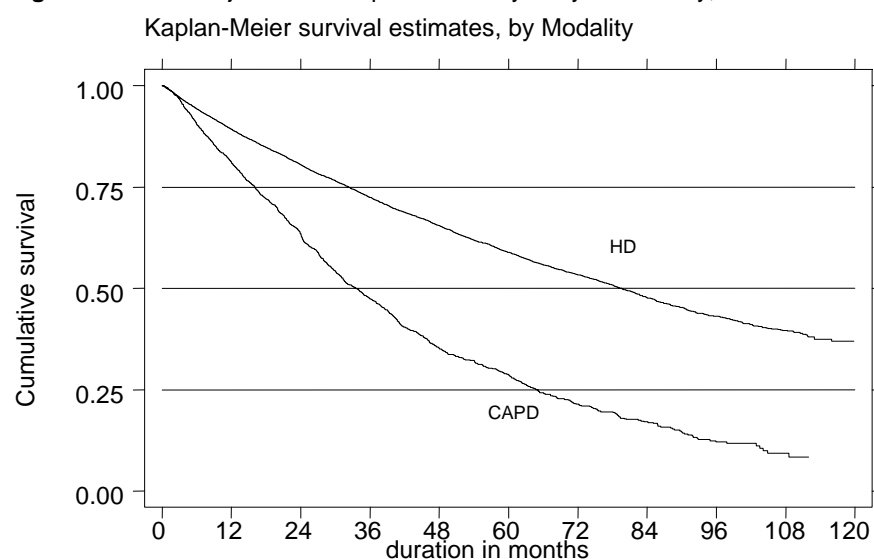


Table 12.3.2: Unadjusted technique survival by year of entry, 1996-2005

Year Interval (months)	1996			1997			1998			1999		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	200	91	2	187	94	2	144	92	2	188	89	2
12	178	81	3	170	88	2	127	83	3	174	84	3
24	139	67	3	141	74	3	96	65	4	116	57	3
36	105	51	3	101	55	4	75	51	4	77	38	3
48	68	35	3	76	42	4	59	41	4	56	28	3
60	53	28	3	57	32	3	45	32	4	49	25	3
72	35	18	3	44	25	3	35	25	4	36	18	3
84	27	15	3	32	18	3	31	25	4	-	-	-
96	16	9	2	24	14	3	-	-	-	-	-	-
108	13	7	2	-	-	-	-	-	-	-	-	-

Year Interval (months)	2000			2001			2002			2003		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	206	91	2	303	90	2	341	92	1	369	89	2
12	185	81	3	264	80	2	292	80	2	332	80	2
24	138	63	3	197	61	3	227	63	3	253	63	2
36	101	46	3	151	47	3	164	47	3	-	-	-
48	78	36	3	106	34	3	-	-	-	-	-	-
60	67	31	3	-	-	-	-	-	-	-	-	-

Year Interval (months)	2004			2005		
	No.	% Survival	SE	No.	% Survival	SE
6	299	89	2	146	90	2
12	265	80	2	-	-	-

* No. = Number at risk SE=standard error

Figure 12.3.2: Unadjusted technique survival by year of entry, 1996-2005

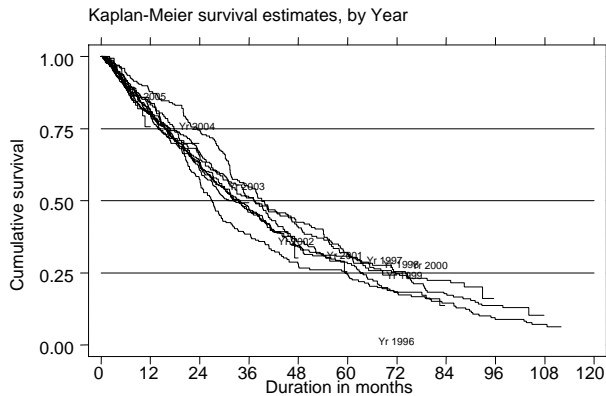


Figure 12.3.3: Unadjusted technique survival by age, 1996-2005

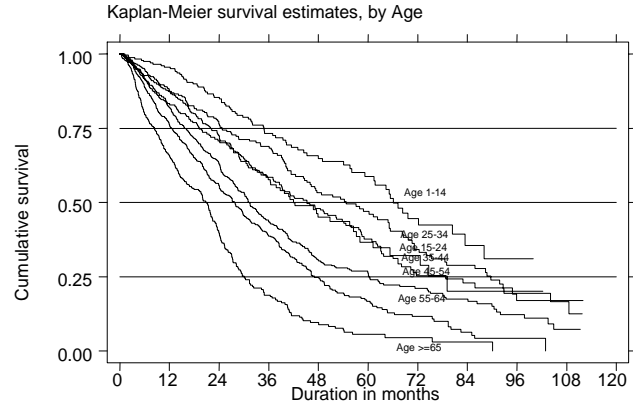


Table 12.3.3: Unadjusted technique survival by age, 1996-2005

Age group (years) Interval (months)	<=14			15-24			25-34			35-44		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	220	97	1	222	92	2	234	93	2	346	95	1
12	195	96	1	182	83	2	209	87	2	294	87	2
24	144	85	3	117	71	3	156	76	3	208	72	2
36	104	73	3	70	58	4	115	69	3	140	59	3
48	66	65	4	36	45	4	77	53	4	82	48	3
60	44	59	4	20	37	5	54	47	4	49	38	3
72	22	45	5	11	32	5	34	34	4	25	25	4
84	10	35	6	5	20	7	27	29	4	16	23	4
96	4	31	7	3	20	7	12	19	4	9	17	4
108	-	-	-	-	-	-	7	17	4	5	17	4
120	-	-	-	-	-	-	-	-	-	-	-	-

Age group (years) Interval (months)	45-54			55-64			>=65		
	No.	% Survival	SE	No.	% Survival	SE	No.	% Survival	SE
6	573	92	1	503	89	1	282	80	2
12	481	82	2	403	76	2	221	66	3
24	315	63	2	259	56	2	108	40	3
36	169	44	2	139	39	2	40	19	2
48	98	31	2	68	25	2	16	10	2
60	66	26	2	32	17	2	8	6	2
72	38	21	2	18	12	2	5	5	2
84	25	17	2	8	6	2	3	3	2
96	13	12	2	3	4	2	-	-	-
108	3	7	3	-	-	-	-	-	-
120	-	-	-	-	-	-	-	-	-

* No. = Number at risk SE=standard error

Table 12.3.4: Unadjusted technique survival by Diabetes status, 1996-2005

Diabetes status Interval (months)	Non-Diabetic			Diabetic		
	No.	% Survival	SE	No.	% Survival	SE
6	1443	93	1	933	86	1
12	1243	87	1	737	73	1
24	876	74	1	424	49	2
36	583	61	1	186	29	2
48	344	47	2	96	19	1
60	213	39	2	56	14	1
72	126	30	2	22	9	1
84	79	25	2	11	6	1
96	36	18	2	4	4	1
108	12	14	2	2	2	2
120	-	-	-	-	-	-

* No. = Number at risk SE=standard error

Figure 12.3.4: Unadjusted technique survival by Diabetes status, 1996-2005

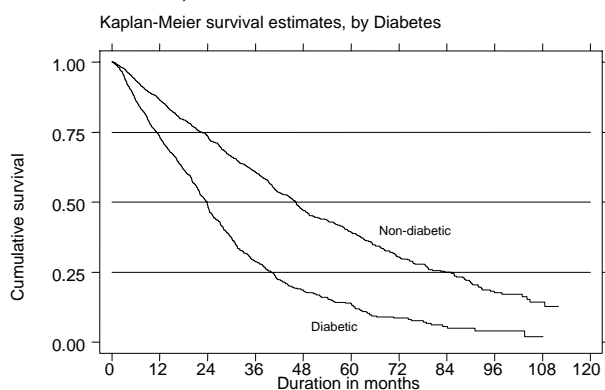


Figure 12.3.5: Unadjusted technique survival by Gender, 1996-2005

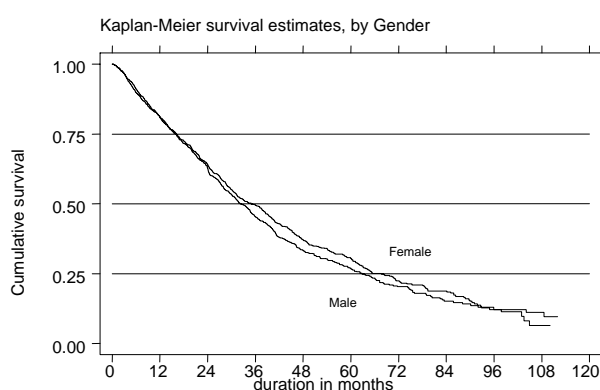


Table 12.3.5: Unadjusted technique survival by Gender, 1996-2005

Gender Interval (months)	Male			Female		
	No.	% Survival	SE	No.	% Survival	SE
6	1198	91	1	1179	90	1
12	987	81	1	994	81	1
24	650	63	1	653	64	1
36	364	45	2	407	49	2
48	199	33	2	240	37	2
60	122	27	2	146	31	2
72	67	20	2	81	22	2
84	36	15	2	54	19	2
96	17	12	2	23	12	2
108	3	7	2	11	11	2
120	-	-	-	-	-	-

* No. = Number at risk SE=standard error

12.4: PD PERITONITIS

The median peritonitis rate is 35 patient-months per episode which is in keeping with the continuing trend for improvement seen over the preceding years. There was however an almost 3-fold variation between centres with the highest and lowest peritonitis rates i.e. 23.3 vs 64.8 patient-months/episode. Gram-negative organisms accounted for 35% of peritonitis episodes while 32% were due to gram positive organisms. The culture-negative rate remained relatively unchanged at 30% (Table 12.4.2). There is a trend for increased peritonitis rates with increasing age and diabetic status but gender does not appear to have any influence.

Table 12.4.1: Variation in peritonitis rate (pt-month/epi) among CAPD centres 2005

Year	No. of centres	Min	5 th Centile	LQ	Median	UQ	95 th Centile	Max
2000	12	10.9	10.9	17.8	21.7	26.9	1019.7	1019.7
2001	11	13.4	13.4	19.3	23	30.9	53.1	53.1
2002	13	15.1	15.1	20.2	25.3	36.2	47.6	47.6
2003	13	12.5	12.5	22.8	30.1	40.3	253	253
2004	15	0	0	23.2	32	41.7	47.4	47.4
2005	15	23.3	23.3	26.8	35	46.6	64.8	64.8

* Criteria for combination of centres with less than 10 subjects not applied

Figure 12.4.1: Variation in peritonitis rate (pt-month/ epi) among CAPD centres 2005

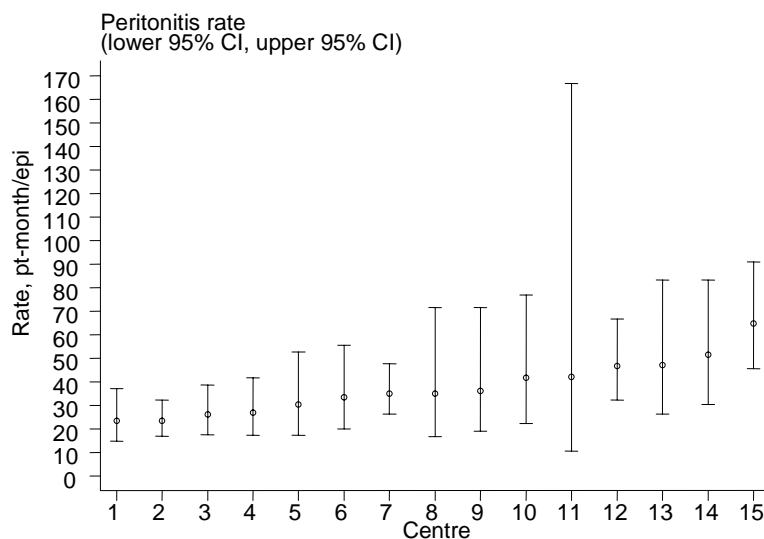


Table 12.4.2: Causative organism in PD peritonitis, 2000-2005

Microorganism	2000		2001		2002		2003		2004		2005	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
(A) Gram Positives												
Staph. Aureus	35	11	41	13	62	17	45	12	51	14	42	13
Staph Coagulase Neg.	39	13	34	11	41	11	52	14	43	12	47	15
Strep	12	4	13	4	9	2	11	3	11	3	6	2
Others	4	1	6	2	7	2	15	4	4	1	8	2
(B) Gram Negatives												
Pseudomonas	19	6	14	4	22	6	20	5	28	8	27	8
Others	45	15	56	18	67	19	75	21	83	22	86	27
(C) Polymicrobial	9	3	10	3	8	2	3	1	2	1	0	0
(D) Others												
Fungal	19	6	21	7	12	3	12	3	15	4	7	2
Mycobacterium	6	2	4	1	1	0	3	1	4	1	2	1
Others	2	1	14	4	14	4	13	4	8	2	3	1
(E) No growth	119	39	99	32	118	33	115	32	123	33	96	30
TOTAL	309	100	312	100	361	100	364	100	372	100	324	100

Table 12.4.3: Factors influencing peritonitis rate, 2000-2005

Factors	N (No. at risk)	Annualised rate: Epi/ pt-year	(95% CI)
Age (years):			
<=14	68	0.424	(0.343, 0.523)
15-24	38	0.451	(0.339, 0.6)
25-34	82	0.437	(0.368, 0.52)
35-44	94	0.467	(0.392, 0.555)
45-54	143	0.53	(0.46, 0.61)
55-64	120	0.577	(0.493, 0.675)
>=65	50	0.718	(0.562, 0.918)
Gender:			
Male	281	0.504	(0.455, 0.56)
Female	314	0.5	(0.456, 0.548)
Diabetes:			
No	412	0.471	(0.435, 0.511)
Yes	183	0.603	(0.529, 0.687)