

Νεφρολογικό Τμήμα ΓΝ Πτολεμαΐδας
ΕΓΚΕΦΑΛΟΣ ΚΑΙ ΝΕΦΡΟΣ
10-11/11/2023

Γνωσιακή λειτουργία στην περιτοναϊκή κάθαρση.

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Μέθοδοι υποκατάστασης νεφρικής λειτουργίας

ΜΕΤΑΜΟΣΧΕΥΣΗ



ΑΙΜΟΚΑΘΑΡΣΗ



ΠΕΡΙΤΟΝΑΙΚΗ ΚΑΘΑΡΣΗ



Γνωσιακή Λειτουργία - Cognition Function

Γνωσιακή Λειτουργία (Cognition Function)

Προσοχή,
Αντίληψη,
Μνήμη,
Γλώσσα,
Σχεδίαση,
Επίλυση προβλήματος,
Λήψη απόφασης
Πολλαπλές εργασίες



Γνωσιακή Δυσλειτουργία (Cognition Impairment)

- (1) Normal cognitive aging
- (2) Mild cognitive impairment
- (3) Major cognitive impairment
(Dementia)

γνωσιακή δυσλειτουργία → καθημερινή δραστηριότητα

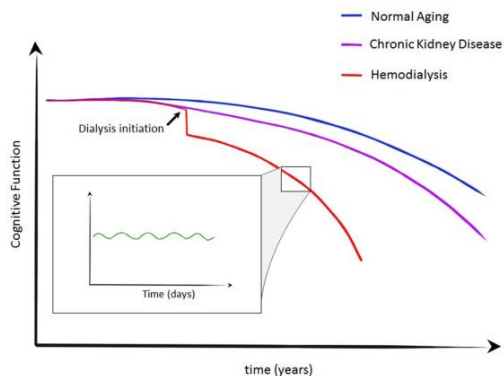
*Diagnostic and Statistical Manual of Mental Disorders,
5th Edn. American Psychiatric Association (2013).*

Cognition in Advanced Kidney Failure I

A COMMON BUT POORLY RECOGNIZED PROBLEM

1839, *Journal of Practice Medicine*:

“ . . . reciprocal action of the brain on the kidney and the kidney on the brain, has long been known.”
Dr. Thomas Addison



- ✓ για κάθε 10 ml/min/1,73m² μείωση του ΡΣΔ σε > 55 ετών
➔ 11% αύξηση στον επιπολασμό έκπτωσης ΓΛ
- ✓ eGFR < 45 mL/min/1,732: ΓΛ μειώνεται σημαντικά
- ✓ eGFR < 15mL/min: επιπολασμός κυμαίνεται από 27-77%

Γενικό πληθυσμό: επιπολασμός 12% (68,5–78,3 ετών)

Karakizlis H. BMC Nephrol. (2021) 22:205.

*ΡΣΔ: ρυθμός σπειραματικής διήθησης

*ΓΛ: γνωσιακή λειτουργία

Crowe K. Front. Neurol. 12:787370.

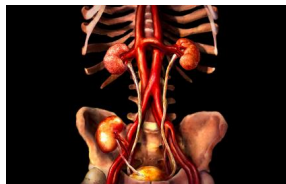
Cognition in Advanced Kidney Failure 2

A COMMON BUT POORLY RECOGNIZED PROBLEM

Επιπτώσεις



Self Efficacy
Engagement with
health care
Decision making
Quality of Life



Mortality
Dialysis withdrawal
Depression & Stress
Hospitalisation



**Παράγοντες
κινδύνου**



Age
Vascular Disease
Diabetes
Depression & Sleep
Disorders



Uremia
Inflammation
Structural Changes
Dialysis



Crowe K. Front. Neurol. 12:787370.

Cognition in Peritoneal Dialysis

Complex activities - Lifestyle changes - Adaptation to dialysis - Medication regimens

All above are partly dependent on normal cognitive function self-monitoring, self-care

Most patients who choose peritoneal dialysis

- ✓ independent and capable of self-administering dialysis and medications



- ✓ *a need to assess patients' ability to choose and maintain PD therapy before and regularly after dialysis therapy initiation*

Kalirao, P. (2011). AJ of Kidney Diseases, 57(4), 612–620.

Prevalence and Risk factors of Cognitive Impairment

Peritoneal
Dialysis

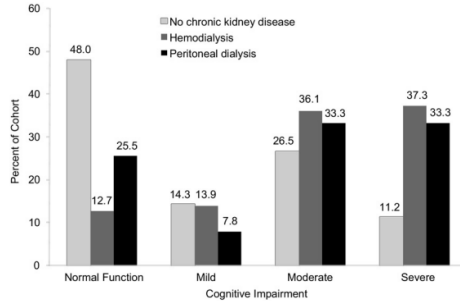
Vs

Non-CKD,
Pre-CKD,
Hemodialysis,
Transplantation

Cognitive Impairment in Peritoneal Dialysis Patients

51 PD compared with 338 HD and 101 controls without CKD
 9 validated neuropsychological tests

Cognitive Impairment: 75% PD patients (50%: moderate, 50%: severe)



PD: > 2.5 times more likely than non-CKD and as was HD moderate to severe cognitive impairment

*dementia in people without ESRD
 > 65 years old: 10%, > 85 years old: 35%-40%

*PD cohort was on average 11 years younger than the HD cohort (57.5 vs 68.5 years)

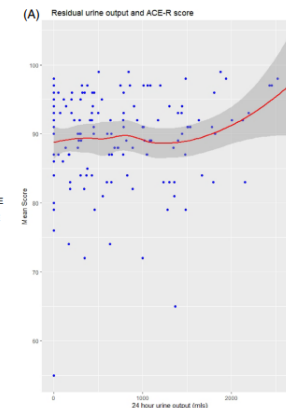
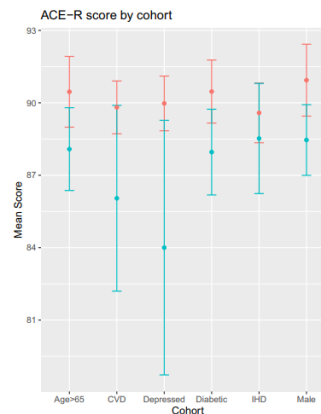
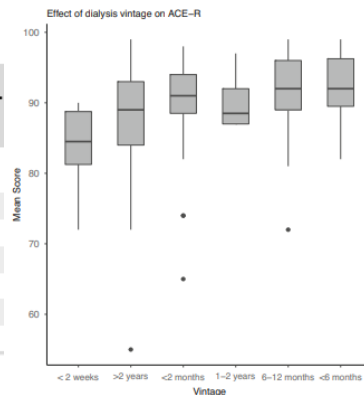
Variables	OR (95% CI)
Age	
<55 y	1.00 (reference)
55-64 y	2.76 (0.74-10.35)
≥65 y	2.54 (0.66-9.68)
Diabetes	
No	1.00 (reference)
Yes	1.37 (0.89-2.12)
Stroke	
No	1.00 (reference)
Yes	1.47 (0.84-2.59)
Race	
White	1.00 (reference)
African American	3.47 (1.55-7.77)
Other	3.36 (1.16-9.72)
Education	
>12 y	1.00 (reference)
<8 y	4.85 (1.78-13.21)
8-12 y	1.71 (1.11-2.64)
Sex	
Men	1.00 (reference)
Women	0.85 (0.56-1.28)
Cohort	
Non-CKD	1.00 (reference)
HD	3.16 (1.91-5.24)
PD	2.58 (1.02-6.53)

Frequency and risk factors for cognitive dysfunction in peritoneal dialysis patients

149 PD patients at a single center between 2016 and 2020
Neurocognitive screening (ACE-R and MMSE)

Addenbrooke's Cognitive Examination – Revised (ACE-R)
incorporated Mini-Mental State Examination (MMSE)

Score/ domain	Normative reference	Entire PD cohort	
		Raw score (95% confidence interval)	One sample t test- p value
ACE-R Total	93.65 (5.10)	89.2 (88.1–90.3)	<0.001
Attention	17.85 (0.52)	17.7 (17.6–17.8)	0.03
Memory	23.89 (2.46)	22.4 (21.9–22.9)	<0.001
Language	24.95 (1.57)	24.6 (24.3–24.9)	0.04
Fluency	11.55 (2.06)	10.1 (9.6–10.5)	<0.001
Visuospatial	15.39 (0.97)	14.6 (14.3–14.9)	<0.001
MMSE	28.49 (1.47)	28.7 (28.4, 28.9)	0.17

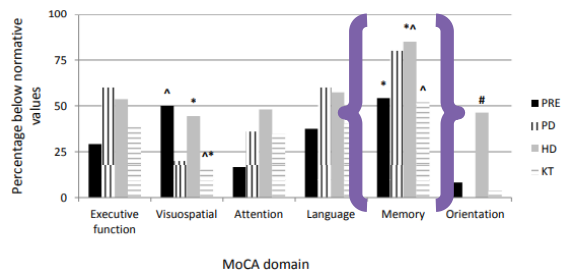


Risk factors: age, female gender, diabetes, depression, PD > 12m

MMSE is ineffective in detecting subtle NCI in this population
compared with ACE-R

Comparison of the extent and pattern of cognitive impairment among pre-dialysis, dialysis and transplant patients: a cross sectional study from Australia

Observational cross sectional study compare the extent of CI and the types of cognitive deficits
155 patients eGFR < 30 ml/min per 1.73m²



	PRE n=24	PD n=25	HD n=54	KT n=52	Total n=155	P value
Cognitively impaired, Proportion, n, (%)	4 (16.7) ^a	12 (48.0)	30 (55.6) ^{ab}	10 (19.2) ^b	56 (36.1)	<0.001*
Total MoCA score Mean (95% CI)	27.07 (25.55-28.58) ^a	24.80 (23.32-26.28)	23.12 (22.11-24.13) ^{ab}	26.77 (25.74-27.80) ^b	25.23 (24.58-25.88)	<0.001*

Memory → directly impact on patient's ability to learn and recall information provided

Dialysis,
Age ≥65,
Male gender,
Diabetes,
Cerebrovascular disease

High Prevalence of Leukoaraiosis in Cerebral Magnetic Resonance Images of Patients on Peritoneal Dialysis

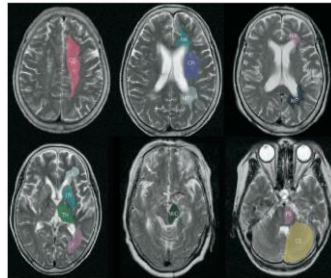
a large vascular ischemic component combined with neurodegenerative pathologic states

57 PD patients relatively young (mean age, 48.4 years) without diabetes / cerebrovascular disease

✓ prevalence of leukoaraiosis was significantly greater in PD than controls (68.4% v 17.5%; $P < 0.001$)

Leukoaraiosis presence

Old age,
poorly controlled Hypertension,
PD procedure itself and/or ESRD



Increased risk of stroke,
Disability,
Cognitive impairment decline

*ποσοστό απώλειας όγκου είναι συνήθως 0,5% ανά έτος μετά την ηλικία των 40 ετών

Kim CD. American Journal of Kidney Diseases, Vol 50, No 1 (July), 2007: pp 98-107

Prevalence of cognitive impairment among peritoneal dialysis patients: a systematic review and meta-analysis

- ✓ a search of the literature on CI in PD patients published between 1 Jan 1980 and 25. April 2019
- ✓ 8 studies were included and the relevant data from 1736 patients (PD – controls)

Variables	Number of studies included	Coefficient (95% CI)	R ² analogue	p value
PD first policy (reference group: yes)	8	-0.897 (-2.543-0.749)	0	0.29
Prevalence of DM	7	-0.212 (-7.801-7.377)	0	0.96
Sex ratio (male: female)	7	-1.663 (-3.128-0.795)	0	0.24
Mean age in years	8	-0.014 (-0.112-0.090)	0	0.79
Study design (reference group: prospective study)	8	-0.251 (-1.851-1.350)	0	0.76
Publication year (reference: on or before 2014)	8	0.251 (-1.350-1.851)	0	0.76
Mean PD duration in months	8	0.002 (-0.061-0.065)	0.08	0.95

- ✓ Risk factors for CI: **older age, female sex and lower education**
- ✓ Potential reversible factors for CI: *electrolytes disturbances, depression and vitamin D deficiency.*
- ✓ CI was associated with a **higher risk of hospitalization**, mostly due to PD-related peritonitis.

Prevalence of Cognitive Impairment in Peritoneal Dialysis Patients and Associated Factors

Cognitive impairment					
PD patients (n = 6)			controls (n = 4)		
<65 years (n = 3)	≥65 years (n = 3)	p value	<65 years (n = 1)	≥65 years (n = 3)	p value
23%	60%	0.14	10%	60%	0.02

p: asymptotic significance level in two-sided χ^2 test.

Variable	PD patients		p value*
	CI (n = 6)	NCI (n = 12)	
ACE III test			
Total score, mean±SD (min, max)	78.5±11.6 (61–88)	94.8±2.7 (89–99)	0.018
Attention, mean±SD (min, max)	91.5±10.4 (72–100)	94±8.7 (72–100)	0.626
Memory, mean±SD (min, max)	60.8±8.9 (46–73)	94.8±6.3 (81–100)	0.00
Fluency, mean±SD (min, max)	62±24.5 (28–86)	88.9±7.6 (79–100)	0.042
Language, mean±SD (min, max)	91±11 (77–100)	98.3±2.7 (92–100)	0.165
Visuospatial, mean±SD (min, max)	86.5±18 (56–100)	94.8±9.9 (75–100)	0.327

*Two-tailed significance level in Student's t test.

15 Control group: CI more common in ≥65 years
 18 PD group: may occur earlier (<65 years)

a significant trend for PD patients with CI to score lower in the domains of **memory** and **verbal fluency**

			ACE III total score (%)	Attention (%)	Memory (%)	Verbal fluency (%)	Language (%)	Visuospatial (%)
PD patients (n = 18)	Years of education	Pearson correlation Significance	0.78**	0.19	0.63**	0.84	0.73**	0.56*
	Dialysis duration (months)	Pearson correlation Significance	0.00	0.45	0.005	0.00	0.00	0.02
Controls (n = 15)	Years of education	Pearson correlation Significance	-0.19	-0.08	-0.33	-0.05	-0.08	0.2
	Dialysis duration (months)	Pearson correlation Significance	0.46	0.76	0.18	0.84	0.75	0.93

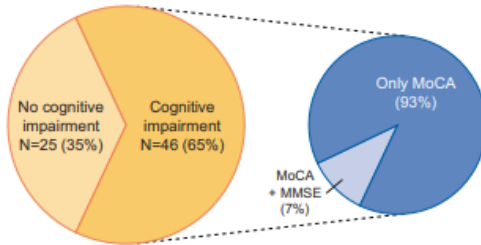
**Two-tailed significance level, p ≤ 0.01. *Two-tailed significance level, p ≤ 0.05.

no correlation between the duration of dialysis and the results of the ACE III test,

Prevalence of mild cognitive impairment in automated peritoneal dialysis patients

71 patients on APD
Mean age: 42 years,
Mean dialysis duration: 17 months

Mini Mental State Examination (MMSE)
Montreal Cognitive Assessment (MoCA)



CI (mild deterioration) was present in 7%: MMSE and 68%:MoCA, and 4 and 37% in the healthy controls

Diabetes more frequently
Higher serum glucose
Lower serum phosphorus

Variable	B	95% CI	P-value
Education (years)	0.53	0.19–0.87	0.003
Serum sodium (mmol/L)	0.56	0.04–1.08	0.03
Serum creatinine (mg/dL)	0.48	0.06–0.91	0.03
Age (years)	-0.10	-0.20–0.00	0.05

Older age,
Less education
Lower serum sodium
Lower serum creatinine

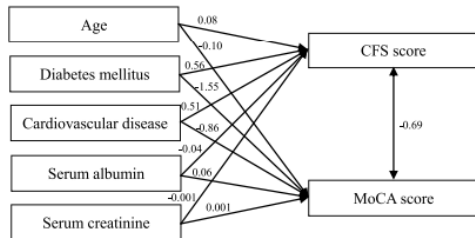
Coexisting Frailty and Cognitive Impairment in Patients on Continuous Ambulatory Peritoneal Dialysis

784 CAPD patients started to enroll from 2014 to 2016 and ended follow-up by 2017

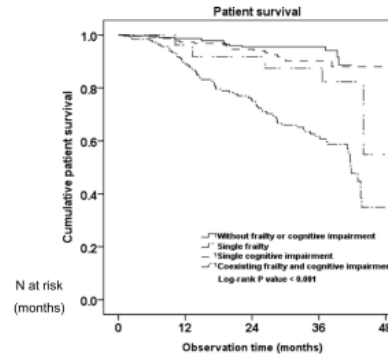
Cognitive impairment: 55.5%

Frailty: 27.6%

Frailty + Cognitive Impairment: 23.9%



CFS score: associated with MoCA score
($\beta = -0.69$, $P < 0.001$)



Coexisting frailty and cognitive impairment was associated with

1. decreased patient survival rate
2. increased peritonitis rate

Frailty: Clinical Frailty Scale (CFS), and
Cognitive function: Montreal Cognitive Assessment (MoCA).

Cognitive Changes in Peritoneal Dialysis Patients: A Multicenter Prospective Cohort Study

	Baseline	2-y Follow-up	P
3MS score	84.8 ± 12.2	83.1 ± 14.8	0.006 ^a
Cognitive impairment	58 (19.8%)	70 (23.9%)	0.2
Trail-A, s	65 [49-90]	56 [41-80]	<0.001 ^a
Trail B, s	144 [103-227]	144 [102-193.5]	0.03 ^a
Immediate memory score	74.0 ± 18.1	76.6 ± 18.4	0.01 ^a
Delayed memory score	89.3 ± 17.7	87.8 ± 20.5	0.2
Visuospatial skill score	86.7 ± 23.7	91.2 ± 19.9	0.004 ^a
Language ability score	93.5 ± 13.7	94.6 ± 14.1	0.2

458 PD patients were enrolled and followed up for 2 years.

CI prevalence increased from 19.8% to 23.9%

Executive function, immediate memory, visuospatial skill improved

Variable	3MS Score		Trail-A (s)		Trail-B (s)		Immediate Memory Score		Delayed Memory Score		Visuospatial skill Score		Language Ability Score	
	β (SE)	P	β (SE)	P	β (SE)	P	β (SE)	P	β (SE)	P	β (SE)	P	β (SE)	P
Age	-0.12 (0.05)	0.01 ^a	0.65 (0.19)	<0.001 ^a	1.59 (0.45)	<0.001 ^a	-0.20 (0.07)	0.006 ^a	0.13 (0.07)	0.07	-0.10 (0.08)	0.2	-0.02 (0.06)	0.7
Female sex	0.46 (1.20)	0.7	-2.98 (4.99)	0.6	-1.56 (11.34)	0.9	2.02 (1.85)	0.3	-2.05 (1.87)	0.3	-2.17 (2.21)	0.3	0.83 (1.53)	0.6
BMI (kg/m ²)	-0.25 (0.18)	0.2	1.25 (0.70)	0.08	1.20 (1.60)	0.5	-0.01 (0.27)	0.9	-0.21 (0.27)	0.5	-0.55 (0.32)	0.09	-0.20 (0.22)	0.4
DM	-0.36 (1.56)	0.8	19.38 (6.44)	0.003 ^a	46.94 (14.42)	0.001 ^a	-4.56 (2.43)	0.06	-1.70 (2.47)	0.5	1.43 (2.94)	0.6	-0.37 (2.01)	0.9
CVD	1.02 (1.53)	0.5	10.50 (6.20)	0.09	3.04 (14.20)	0.8	2.32 (2.40)	0.3	0.78 (2.44)	0.7	-1.27 (2.85)	0.7	0.12 (2.00)	0.9
Depression score	-0.14 (0.07)	0.04 ^a	-0.07 (0.27)	0.8	0.03 (0.61)	0.9	-0.22 (0.10)	0.03 ^a	-0.30 (0.11)	0.005 ^a	-0.19 (0.12)	0.1	-0.20 (0.09)	0.02 ^a
Educational level	2.86 (0.65)	<0.001 ^a	-5.82 (2.55)	0.02 ^a	-17.70 (5.70)	0.002 ^a	2.64 (0.98)	0.007 ^a	3.54 (1.03)	0.001 ^a	5.21 (1.21)	<0.001 ^a	1.45 (0.79)	0.07
hs-CRP (mg/L)	-0.05 (0.05)	0.4	0.33 (0.25)	0.2	0.53 (0.55)	0.3	-0.11 (0.09)	0.2	-0.17 (0.10)	0.09	0.03 (0.11)	0.7	-0.06 (0.07)	0.4
SNa (mmol/L)	-0.02 (0.07)	0.8	-0.08 (0.27)	0.8	-0.46 (0.61)	0.5	-0.05 (0.11)	0.7	-0.24 (0.11)	0.03 ^a	-0.30 (0.12)	0.02 ^a	-0.01 (0.09)	0.9
SAlb (g/L)	0.64 (0.11)	<0.001 ^a	-0.07 (0.46)	0.9	0.70 (1.04)	0.5	-0.13 (0.17)	0.5	0.90 (0.18)	<0.001 ^a	0.80 (0.21)	<0.001 ^a	0.44 (0.14)	0.003 ^a

Lower serum albumin level
Advanced age,
Lower education,
Diabetes
Depression
Hyponatremia

An association of cognitive impairment with diabetes and retinopathy in end stage renal disease patients under peritoneal dialysis

Liao J-L. (2017) PLoS ONE 12(8): e0183965

- ✓ Diabetes and retinopathy: risk factors of CI
- ✓ 424 clinically stable PD patients were enrolled

Variables	Total	non DM	DM	DM and Retinopathy	P
N (%)	424	307(72.4%)	36 (8.5%)	81(19.1%)	—
SMS score	83.4score	84.3score	85.5score ¹	79.1score ¹	0.004
Cognitive impairment	113(27.4%)	72(24.2%)	7(21.2%) ²	34(42%) ²	0.004
Trail's A,s	88.1ls A,	82.0ls A,	92.6ls A,	109.9s A,s ²	0.008
Trail's B,s	207.4s B,s1	191.8s B,s3	204.9s B,s	268.0s B,s1 ²	0.001
Executive dysfunction	127(32%)	73(25.2%)	13(41.9%)	41(53.9%) ²	<0.001
Immediate memory score	73.1diate	74.9diate	70.0diate	67.7diate ²	0.003
Impaired immediate memory	275(67.2%)	185(62.7%)	26(76.5%)	64(80.0%) ²	0.007
Delayed memory score	88.5yed m	88.5yed m	89.4yed m	87.0yed m	0.66
Impaired delayed memory	83(21.3%)	62(21.8%)	7(22.6%)	14(18.9%)	0.85
Language ability score	92.4uage	93.2uage	92.4uage	89.2uage	0.08
Impaired language ability	69(16.8%)	43(14.5%)	8(23.5%)	18(22.5%)	0.13
Visuospatial skill score	85.2ospat	87.8ospat	84.3ospat	75.6ospat ²	<0.001
Impaired visuospatial skill	194(48.9%)	129(44.3%)	16(51.6%)	49(65.3%) ²	0.005

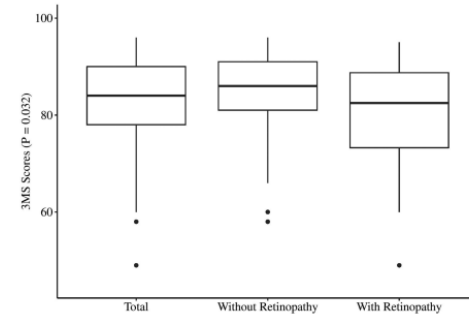
PD Patients with DM and Retinopathy had **significantly higher** prevalence of CI compared with patients in non-DM group.

DM and retinopathy rather than DM only were significantly associated with increased risk for CI, ORs 2.09[1.11,3.92]

Retinopathy is associated with impaired cognition in patients undergoing peritoneal dialysis

Liao J.(2023) Renal Failure, 45:2, 2258989

- ✓ a relationship between retinopathy and cognition with and without CKD
- ✓ a cross-sectional design 107 PD participants



Retinopathy was associated with global CI.

Retinopathy: a valuable primary screening tool for assessing the risk of cognitive decline.

Self-Care Peritoneal Dialysis Patients with Cognitive Impairment Have a Higher Risk of Peritonitis in the Second Year

Comparison of Clinical Features and 2-Year Outcomes Between PD Patients With and Without Cognitive Impairment at First Year

	Whole group			Self-care PD group		
	With CI (n=23)	Without CI (n=120)	p value	With CI (n=16)	Without CI (n=98)	p value
Age in years, mean	66.1±9.3	57.9±13.4	0.006 ^a	64.5±9.1	55.5±12.9	0.008 ^a
Different age strata, n (%)						
<65	10 (43.5)	85 (70.8)		8 (50)	75 (76.5)	
65-74	6 (26.1)	19 (15.8)	0.03 ^b	5 (31.3)	15 (15.3)	0.09 ^b
74-85	7 (30.4)	16 (13.3)		3 (18.8)	8 (8.2)	
Female, n (%)	16 (70.0)	53 (44.2)	0.03 ^b	10 (62.5)	48 (49.0)	0.32 ^b
HK-MoCA at 1 year, mean	14±5.1	25±3.5	<0.001 ^a	14±5.4	25±3.3	<0.001 ^a
Education						
Illiterate	3 (13.0)	16 (13.3)		2 (12.5)	11 (11.2)	
Primary	7 (30.0)	23 (19.2)	0.62 ^b	3 (18.8)	15 (15.3)	0.97 ^b
Secondary	9 (39.1)	50 (41.7)		7 (43.8)	42 (42.9)	
Tertiary	4 (17.4)	31 (25.8)		4 (25.0)	30 (30.6)	
Baseline comorbidities						
DM, n (%)	13 (0.57)	51 (42.5)	0.22 ^b	9 (56.3)	39 (40.0)	0.22 ^b
HL, n (%)	22 (95.7)	109 (90.8)	0.69 ^b	15 (93.8)	90 (91.8)	1.0 ^b
Hyperlipidemia, n (%)	15 (65.0)	72 (60)	0.64 ^b	12 (75.0)	58 (59.2)	0.28 ^b
IHD, n (%)	2 (8.7)	22 (18.3)	0.37 ^b	2 (12.5)	18 (18.4)	0.73 ^b
Previous stroke, n (%)	2 (8.7)	15 (12.5)	1.0 ^b	2 (12.5)	10 (10.2)	0.68 ^b
PVD, n (%)	7 (30.4)	12 (10)	0.008 ^b	5 (31.3)	6 (6.1)	0.002 ^b
Use of sedative medications ^d , n (%)	6 (26.1)	39 (32.5)	0.53 ^b	4 (25.0)	32 (32.7)	0.77 ^b
Clinical outcomes in the second year						
PD-related peritonitis, n (%)	11 (47.8)	23 (19.2)	0.003 ^b	7 (43.8)	20 (20.4)	0.04 ^b
Suffered from both peritonitis and exit-site infection, n (%)	6 (26.1)	8 (6.7)	0.004 ^b	4 (25.0)	7 (7.2)	0.049 ^b
PD-related peritonitis rates (episodes per year)	0.64	0.25	0.004 ^c	0.50	0.27	0.048 ^c
With exit-site infection, n (%)	9 (39.1)	51 (42.5)	0.76 ^b	7 (43.8)	39 (30.6)	0.79 ^b
Exit-site infection rates (episodes per year)	0.39	0.42	0.80 ^c	0.44	0.42	0.90 ^c
Unplanned hospitalization rates (episodes per year) ^e	1.85	1.32	0.05 ^c	1.66	1.19	0.08 ^c
With emergency admissions ^e , n (%)	17 (73.9)	59 (49.2)	0.03 ^b	12 (75.0)	42 (42.9)	0.03 ^b
Number of emergency admissions ^e , median (IQR)	1 (0-3)	0 (0-2)	0.05 ^c	1 (0-3)	0 (0-2)	0.07 ^c
Duration of admissions ^e , median (IQR)	5 (0-18)	1 (0-9)	0.03 ^c	5 (0-23)	0 (0-8)	0.04 ^c

Increasing age,
Female sex,
Anemia,
PVD presence

Comparison of Self-Care PD Patients With and Without Peritonitis in the Second Year

	With peritonitis (n=27)	Without peritonitis (n=86)	p value
Age in years, mean	60.2±11.4	55.7±13.1	0.12 ^a
Different age strata, n (%)			
<65	18 (66.7)	64 (74.4)	
65-74	6 (22.2)	14 (16.3)	0.72 ^b
74-85	3 (11.1)	8 (9.3)	
HK-MoCA at 1 year, mean	22±6.8	24±4.9	0.07 ^a
Cognitive impairment at 1 year, n (%)	7 (25.9)	9 (10.5)	0.04 ^b
Smoking status, n (%)			
Non-smoker	19 (70.4)	68 (79.1)	
Ex-smoker	7 (25.9)	16 (18.6)	0.64 ^b
Chronic smoker	1 (3.7)	2 (2.3)	
Depression ^c , n (%)	2 (7.4)	2 (2.3)	0.24 ^b
Usage of sedative medications, n (%) ^d	9 (33.3)	27 (31.4)	0.85 ^b
Albumin at first year (g/dL), mean	36.7±4.4	35.3±3.8	0.13 ^a
Exit-site infection in the second year, n (%)	10 (37.3)	36 (41.9)	0.66 ^b
Exit-site infection rate in the second year (episodes per year)	0.26	0.89	0.85 ^c

CI at 1 year on self-care PD is associated with a higher risk for PD-related **peritonitis** in the 2nd year.

Cognitive assessment should be part of the overall assessment in older PD patients

Shea YF. *Peritoneal Dialysis International*, Vol. 39, pp. 51-58

Sleep Disorders and Cognitive Impairment in Peritoneal Dialysis: A Multicenter Prospective Cohort Study

- ✓ the relationship between sleep disorders and CI, and predictors for declining cognitive function
- ✓ a multicenter prospective cohort study
- ✓ 458 clinically stable PD patients - followed up for 2 years.

	All participants (n = 458)	Participants who completed the 2 assessments (n = 293)		p
		baseline	2 years later	
3MS score	84.7±12.3	84.8±12.2	83.1±14.8	0.006**
Cognitive impairment	90 (19.7)	58 (19.8)	70 (23.9)	0.161
Trail-Making Test A duration, s	65.5 (47.25-95)	65 (49-90)	56.0 (41.0-80.0)	<0.001***
Trail-Making Test B duration, s	150 (106-233)	144 (103-227)	144.0 (102-193.5)	0.025*
Immediate memory score	74.0±17.9	74.0±18.1	76.6±18.4	0.010*
Delayed memory score	89.3±17.0	89.3±17.7	87.8±20.5	0.155
Visuospatial skill score	86.0±23.5	86.7±23.7	91.2±19.9	0.004**
Language ability score	93.3±13.1	93.5±13.7	94.6±14.1	0.207
Insomnia score	3.0±2.4	3.0±2.5	3.3±2.4	0.087
Restless legs syndrome score	1.6±6.0	1.6±5.8	1.9±6.7	0.416
Excessive daytime sleepiness score	8.5±4.7	8.3±4.5	9.6±5.5	<0.001***
Possible narcolepsy	21 (4.7)	10 (3.4)	16 (5.5)	0.189
Sleepwalking and nightmares	85 (19.1)	56 (19.6)	49 (16.9)	0.610
Possible rapid eye movement behavior disorder	32(7.2)	20 (6.8)	26(8.9%)	0.337

Sleep disorders were common among PD patients (excessive daytime sleepiness, Insomnia)

Prevalence of CI increased from 19.8 to 23.9%.

Possible narcolepsy was associated with general CI

During follow-up, sleepwalking and nightmares were associated with higher risks of **declined delayed memory**

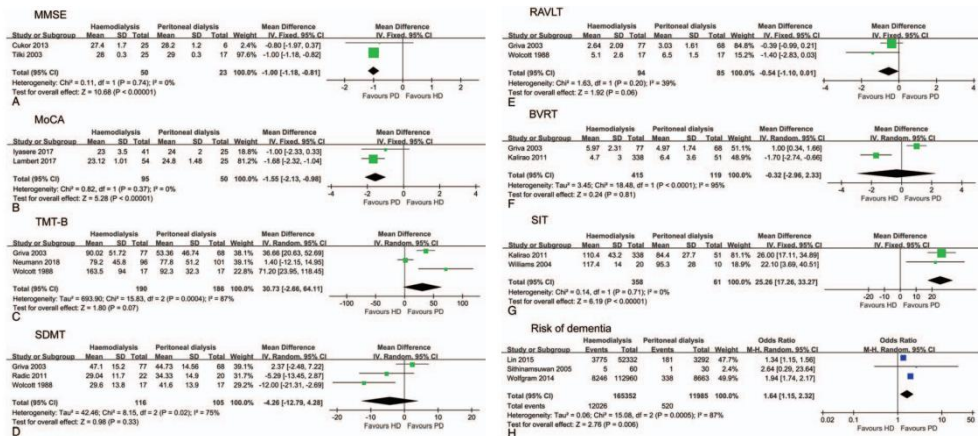
Sleep disorders: Insomnia, Restless legs syndrome, Sleep apnea syndrome, Excessive daytime sleepiness, Narcolepsy, Sleep walking and nightmares, Rapid eye movement behavior disorders

Zhao et al. DOI: 10.1159/000502355

The comparison of cognitive function and risk of dementia in CKD patients under peritoneal dialysis and hemodialysis

15 cohort or cross-sectional studies comparing cognitive functions using neuropsychological tests

By qualitative analysis, more studies are inclined to PD compared with HD with better cognitive functions.



By quantitative analysis, PD showed better performance in the tests of

1. Mini-Mental State Examination (MMSE),
2. Montreal Cognitive Assessment (MoCA),
3. Stroop interference test

PD exhibited lower risk of dementia compared with HD.

Cognitive Dysfunction and Health-Related Quality of Life in Patients with End-Stage Renal Disease Undergoing Hemodialysis in Comparison with Patients Undergoing Peritoneal Dialysis: A Cross-Sectional Study

- ✓ cross-sectional study, 265 patients who received hemodialysis or peritoneal dialysis
- ✓ CF: MoCA – HRQOL: SF-36 and KDTA

Variable	Model 1 [β (95% CI)]	Model 2 [β (95% CI)]	Model 3 [β (95% CI)]
MOCA	-8.35 (-9.85 to -6.86)***	-7.16 (-8.61, -5.70)***	-7.02 (-8.87, -5.26)***
SF-36	-10.12 (-11.94 to -8.45)***	-9.00 (-10.73, -7.28)***	-8.67 (-10.76, -6.58)***
KDTA	-8.67 (-10.10 to -7.23)***	-7.64 (-9.05, -6.24)***	-7.55 (-9.25, -5.85)***

PD patients: worse cognitive dysfunction and worse HRQOL compared to HD patients

MoCA: Montreal Cognitive Assessment

SF-36: Kidney Disease Quality of 36-Item Short Form Survey

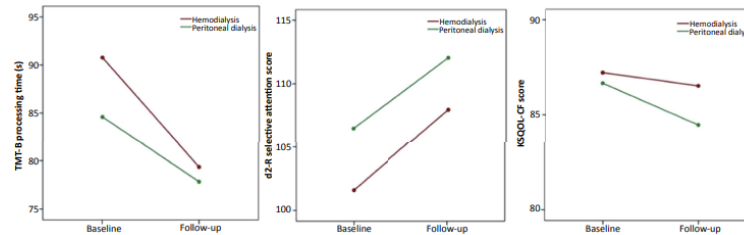
KDTA: Kidney disease-related quality of life assessment

Zeng B. Med Sci Monit 2022; 28:e934282

Peritoneal dialysis is associated with better cognitive function than hemodialysis over a one-year course

271 patients (96 hemodialysis VS. 101 peritoneal dialysis patients)

Peritoneal dialysis was associated with better outcomes than hemodialysis at baseline and follow-up



PD as the gentler, more continuous, and potentially more efficient dialysis modality might be more beneficial for restoring CF.

Executive functioning: Trail Making Test-B

Attention: d2-Revision-Test

QoL: Kidney Disease Quality of Life Short Form

Cognitive Function (KDQOL-CF)

Neumann D. Kidney International (2018) 93, 430–438

Cognitive Impairment in Peritoneal Dialysis

Self-monitoring and Self-care are partly dependent on normal cognitive function

Risk factors

Depression,
Hyponatremia,
Vitamin D deficiency,
Diabetes,
Daily prolonged exposure
to the high glucose load,
Inflammation,
Malnutrition,
Diffuse vasculopathy,
Midabdominal obesity,
Metabolic syndrome



Cognitive impairment

Risk of peritonitis
Hospitalization
Mortality
Medical costs
Treatment compliance
Need for dialysis assistance
Transfer to HD

Crowe K. Front. Neurol. 12:787370.



Συμπέρασμα

1. Η γνωσιακή δυσλειτουργία είναι καλά αναγνωρισμένη ως **ανεξάρτητος προγνωστικός παράγοντας θνησιμότητας** σε άτομα υπό ΠΚ και μπορεί να επηρεάσει αρνητικά την ικανότητα λήψης αποφάσεων και την κρίση τους
2. Η γνωσιακή λειτουργία θα πρέπει να αξιολογείται **τακτικά** στους ΠΚ ασθενείς **ανεξάρτητα από την ηλικία** τους.
3. Ιδιαίτερη προσοχή πρέπει να δοθεί στην ανίχνευση και τα **προληπτικά μέτρα ήπιας** γνωστικής εξασθένησης σε ασθενείς υπό ΠΚ.

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Εγκέφαλος και Νεφρός



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ΥΠΟ ΤΗΝ ΑΙΓΙΔΑ



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