Long-Term Costs, and Hospitalization Rates of Planned Hemodialysis Versus Peritoneal Dialysis in Taiwan: A National Cohort Study

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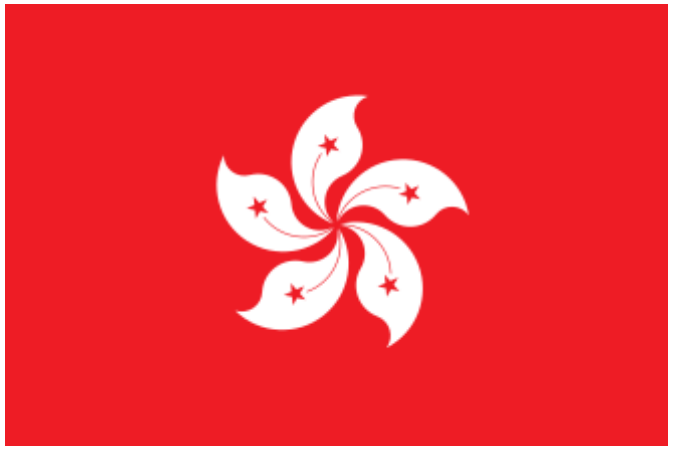
Background

Peritoneal dialysis (PD) is widely regarded as **more cost-effective** than **hemodialysis (HD),**leading to **PD-favoring policies in several countries**.

Karopadi AN, Mason G, Rettore E, Ronco C. Cost of peritoneal dialysis and haemodialysis across the world. Nephrol Dial Transplant. 2013;28(10):2553-2559.
Nyokabi P, Wanjau K, Kweyu E, et al. A systematic review and quality assessment of economic evaluations in end-stage kidney disease. Sci Rep. 2024;14:18488.
Liu FX, Gao X, Inglese G, Chuengsaman P, Pecoits-Filho R. A global overview of the impact of peritoneal dialysis first or favored policies. Perit Dial Int. 2015;35(4):406-420.
Li PKT, Ng JK-C, McIntyre C. Peritoneal dialysis first policy in Hong Kong for 35 years: global impact. Nephrology (Carlton). 2022;27(11):873-881.

PD-favoring countries



Hong Kong

Thailand

Spain

Mexico

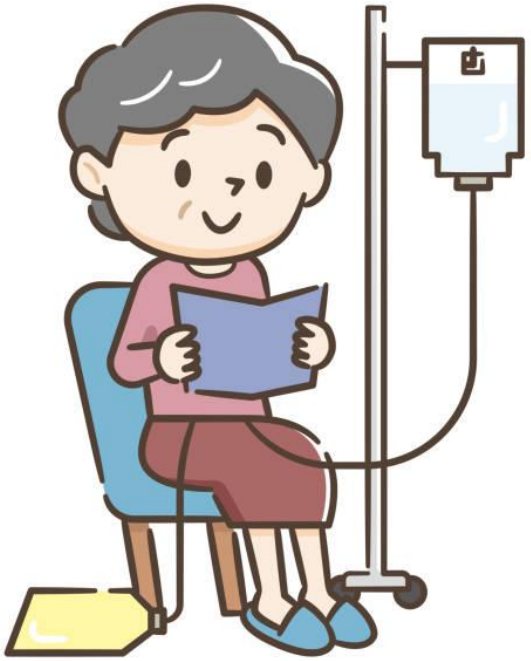
South Africa

UK

Brazil

Taiwan's PD favoring policies

1 point=1 NTD



1 point≈0.9 NTD

Is it really cost-effective?

Aim of the study

We conducted a nationwide cohort study in Taiwan to evaluate the influences long-term cost and hospitalization rate among patients receiving HD and PD.

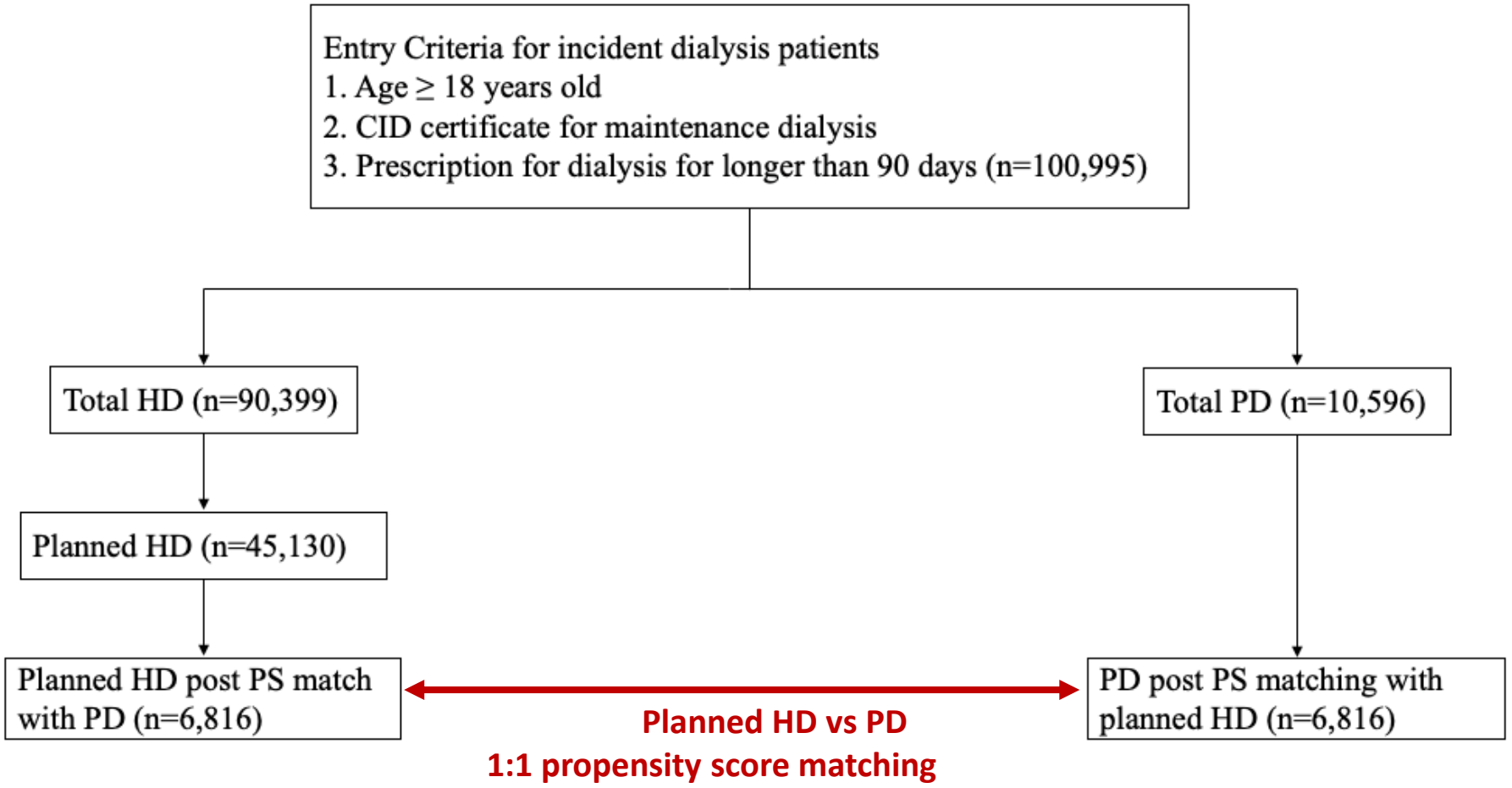
Methods

- **Design:** Retrospective, population-based study (2013–2021)
- **Data source:** National Health Insurance Research Database

(outpatient, ambulatory, inpatient; no lab results)

- **Index date:** Dialysis initiation
- **IRB:** KMUHIRB-E(II)-20250378

Methods: study flowchart



“Planned HD”

Definition:

(1) No double-lumen catheter use/insertion within ±1 month of 1st HD

(2) peripheral vascular had been created before index day

. **Start dialysis in a stable condition avoid make HD appear worse**

. **Reduces baseline differences and selection bias in PD–HD comparisons**

Quinn RR, Hux JE, Oliver MJ, Austin PC, Tonelli M, Laupacis A. Selection bias explains apparent differential mortality between dialysis modalities. J Am Soc Nephrol 22: 1534-1542, 2011.

Methods

- **Definitions:**

Hospitalization: any causes of hospitalization recorded in the database

- **Outcomes:**

Cost: healthcare cost including outpatient cost, hospital cost, and pharmacy cost; per patient per month represented by NHI points obtained from the database

Hospitalization: expressed as per 1,000 patient-days

Total incident patients	Before matching			After matching		
	All-HD	Planned-HD	PD	Planned-HD	PD	P-value[a]
HD(n=90399)/PD(n=10596)	90399	45130	10596	6816	6816	
Age years(mean±SD)	68.0±13.5	66.1±12.9	56.8±15.5	59.5±13.3	59.5±13.2	0.98
Gender, female (%)	44.3	41	46.3	44.5	44.5	0.93
Socioeconomic status(%)						0.71
< 35,000 NTD	80.5	80.3	72.8	78.0	78.3	
≥ 35,000 NTD	19.5	19.7	27.2	22.0	21.7	
Urbanization(%)						0.28
Rural	82.4	81.9	86.5	89.8	90.3	
Urban	17.6	18.1	13.5	10.2	9.7	
Major comorbidity(%)						
Diabetes	50.1	50.4	35	37.8	38.2	0.66
Hypertension	95	95.2	93.7	95.7	95.6	0.74
Hyperlipidemia	51.5	53.1	49.3	50.4	49.8	0.52
Cardiovascular Disease	36.7	33.8	21	19.2	18.8	0.5
AMI	7.2	5.8	3.3	3.4	4.4	0.6
Ischemic stroke	11.4	9.8	5.8	3.7	3.7	0.89
Heart failure	31.1	26.1	17.1	15.2	14.8	0.58
Gout	14.1	15.5	16.6	11.3	10.9	0.46
PAD	67	64	62.8	66.5	67.0	0.52
Charlson Comorbidities Index						
Median (IQR)	5.9(2.3)	5.7(2.3)	4.5(2.3)	4.6(2.3)	4.5(2.3)	0.014

Results(cost)

	Patient number(n)	Outpatient cost mean SD(points)	Hospital cost mean SD(points)	Pharmacy cost mean SD(points)	All cost mean SD(points)
All HD	90,399	655,680	266,530	7,483	877,135
Planned HD	45,130	660,769	202,544	7,238	824,687
PD	10,596	550,900	194,262	4,315	712,056
PD after PS matching	6,816	550,361	192,437	4,250	708,685
Planned-HD after PS matching	6,816	657,026	170,699	6,116	784,594

Before matching: Planned HD VS PD=> 824,687 points VS 712,056 points (P<0.001)

After matching: Planned HD VS PD=> 784,594 points VS 708,685 points (P<0.001)

Points to NTD: HD≈0.9 PD≈1 during 2013~2021

Planned HD VS PD=> 706,135 NTD VS 708,685 NTD

Results(hospitalization)

	Patient number(n)	Hospitalization frequency mean SD (per 1000 patient-days)
All HD	90,399	2.3
Planned HD	45,130	1.8
PD	10,596	1.7
PD after PS matching	6,816	1.7
Planned-HD after PS matching	6,816	1.5

Before matching: Planned HD VS PD=> 1.8 VS 1.7 (per 1000 patients-days)

After matching: Planned HD VS PD=> 1.5 VS 1.7 (per 1000 patients-days)

Discussion

staffing, space, and moving distance may contribute to the cost gap!

Country	Main cost drivers	Key insight
Hong Kong	HD = hospital staff + space PD = home supply + logistics	PD-first works **because PD uses home capacity and centralized supply**
Thailand/South Africa	HD = labor & travel heavy	Low labor and travel heavy → PD sustainability
U.S.	HD = nurse time + facility overhead	**Labor-driven** system cost gap
UK	HD = unit estate & staff; PD = utility reimbursement to patients	Policy covers **home utilities** → better PD uptake

Choy AS, Li PK. Sustainability of the Peritoneal Dialysis-First Policy in Hong Kong. Blood Purif. 2015;40(4):320-5. doi: 10.1159/000441580.
Karopadi AN, Mason G, Rettore E, Ronco C. Cost of peritoneal dialysis and haemodialysis across the world. Nephrol Dial Transplant. 2013 Oct;28(10):2553-69. doi: 10.1093
Liu FX, Gao X, Inglese G, Chuengsaman P, Pecoits-Filho R, Yu A. A Global Overview of the Impact of Peritoneal Dialysis First or Favored Policies: An Opinion. *Peritoneal Dialysis International: Journal of the International Society for Peritoneal Dialysis*. 2015;35(4):406-420.

Discussion

Cost gap contributory conditions in Taiwan

- ***Space*:** HD facilities are **widespread and easily accessible**.
- ***Staffing***: Well-trained workforce with **lower labor cost compared with many Western countries.**
- ***Distance***: High population density results in shorter travel distances for patients

=> These conditions differ from PD favoring countries and narrow the HD–PD cost gap in Taiwan.

Discussion

Planned HD further decrease cost and hospitalization:

- **Less acute impatient**(Sepsis, access failure, ICU stay)
- **More smooth outpatient dialysis**
- **Fewer catheter changes/complications**

=> Decrease selection bias(not address in earlier studies)

=> Apparent advantages of PD in cost and hospitalization may be driven by the inclusion of sicker, unplanned HD patients rather than the dialysis modality itself.

Te-Hui Kuo, Ya-Hui Chang, Li-Jung Elizabeth Ku, Wei-Hung Lin, Jo-Yen Chao, An-Bang Wu, Chia-Chun Lee, Ming-Cheng Wang, Chung-Yi Li, Late creation of vascular access increased post-hemodialysis mortality, hospitalization, and health-care expenditure: A population-based cohort study in Taiwan,Journal of the Formosan Medical Association,Volume 123, Issue 8,2024,Pages 882-890,ISSN 0929-6646
Brown PA, Akbari A, Molnar AO, Taran S, Bissonnette J, Sood M, Hiremath S. Factors Associated with Unplanned Dialysis Starts in Patients followed by Nephrologists: A Retropective Cohort Study. PLoS One. 2015 Jun 5;10(6):e0130080. doi: 10.1371
Bello AK, Okpechi IG, Osman MA, Cho Y, Htay H, Jha V, Wainstein M, Johnson DW. Epidemiology of haemodialysis outcomes. Nat Rev Nephrol. 2022 Jun;18(6):378-395. doi: 10.1038/s41581-022-00542-7.

Conclusions

- In this nationwide study from Taiwan**, planned HD was associated with lower hospitalization rates compared with PD**.

- Although PD was slightly less costly, **its financial advantage diminished after adjusting for reimbursement rates.**

- The mechanisms underlying the survival and hospitalization benefits observed in planned HD **remain unclear and warrant further investigation.**

- Our findings urge a re-evaluation of current PD-favoring policies in Taiwan.

Thank you for your attention!