Trends and Practices in Early versus Late Initiation of Renal Replacement Therapy in South Korea and Taiwan

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When to start RRT (Renal replacement therapy)

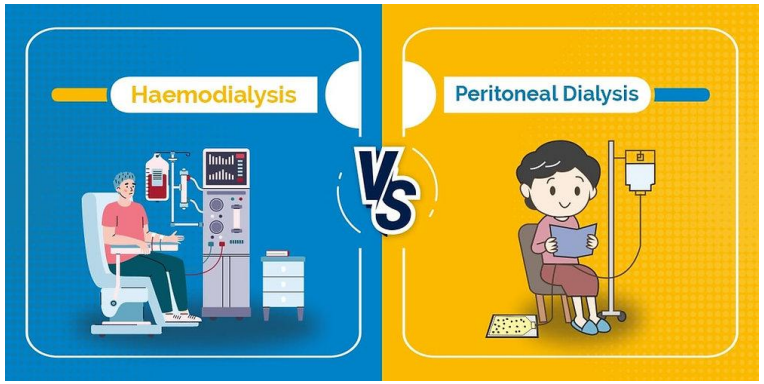
<KDIGO 2024 Guideline>

5.4 Timing the initiation of dialysis

Practice Point 5.4.1: Initiate dialysis based on a composite assessment of a person's symptoms, signs, QoL, preferences, level of GFR, and laboratory abnormalities.

Practice Point 5.4.2: Initiate dialysis if the presence of one or more of the following situations is evident (Table 41). This often but not invariably occurs in the GFR range between 5 and 10 ml/min per 1.73 m^2.

Practice Point 5.4.3: Consider planning for preemptive kidney transplantation and/or dialysis access in adults when the GFR is <15–20 ml/min per 1.73 m^2 or risk of KRT is >40% over 2 years.



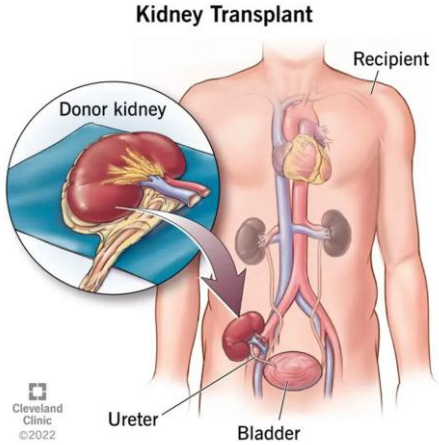
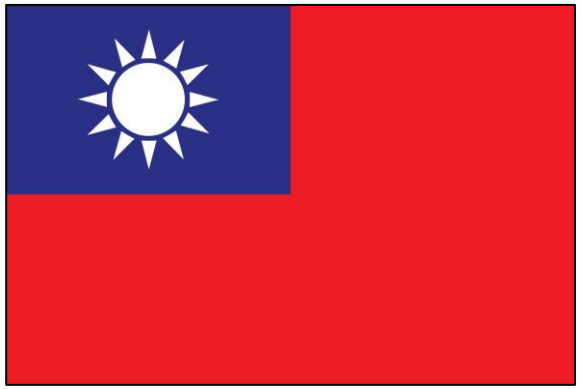


Table 41 | Indications for the initiation of dialysis

Symptoms or signs attributable to kidney failure (e.g., neurological signs and symptoms attributable to uremia, pericarditis, anorexia, medically resistant acid-based or electrolyte abnormalities, intractable pruritus, serositis, and acid-base or electrolyte abnormalities)
Inability to control volume status or blood pressure
Progressive deterioration in nutritional status refractory to dietary intervention, or cognitive impairment

Different regulations RRT initiation

Each nephrologist is independently allowed to initiate RRT at their clinical discretion, when eGFR falls <15 mL/min/1.73 m²



National insurance system generally restricts initiation to cases, where eGFR falls < 10 mL/min/1.73 m²

Goal

1) Compares RRT initiation practices of South Korea and Taiwan, focusing on changes in the eGFR

2) Whether the difference in RRT initiation timing is associated with the mortality difference

Cohort Population

- **South Korea**
  - Two tertiary referral centers (SNUH, BRMH)
  - 2001~2021

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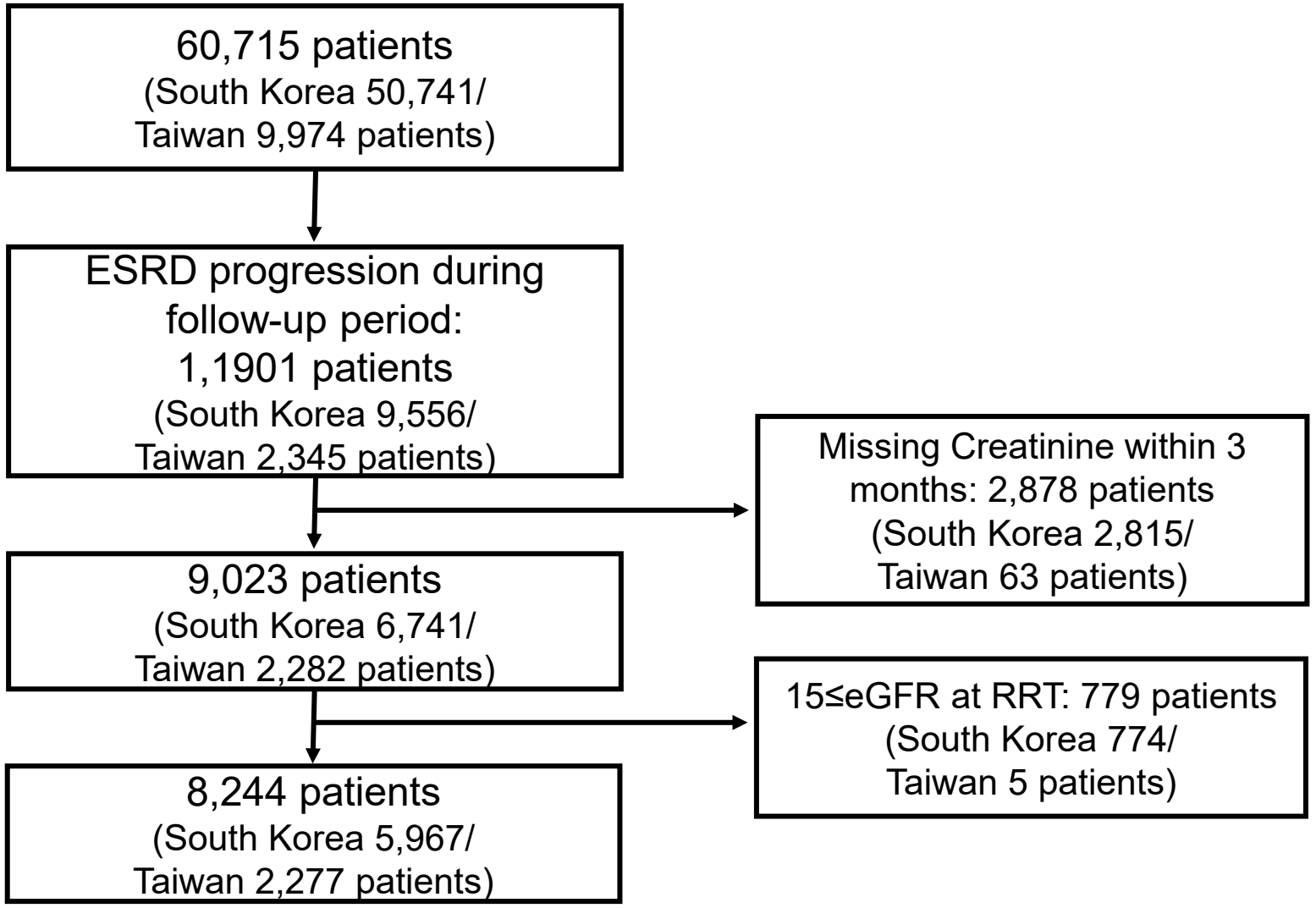
- **Taiwan**
  - One tertiary referral center (Taiwan Kidney Outcome (TAKO) cohort from Kaohsiung Medical University Hospital [KNUH] care system
  - 2005 ~2021

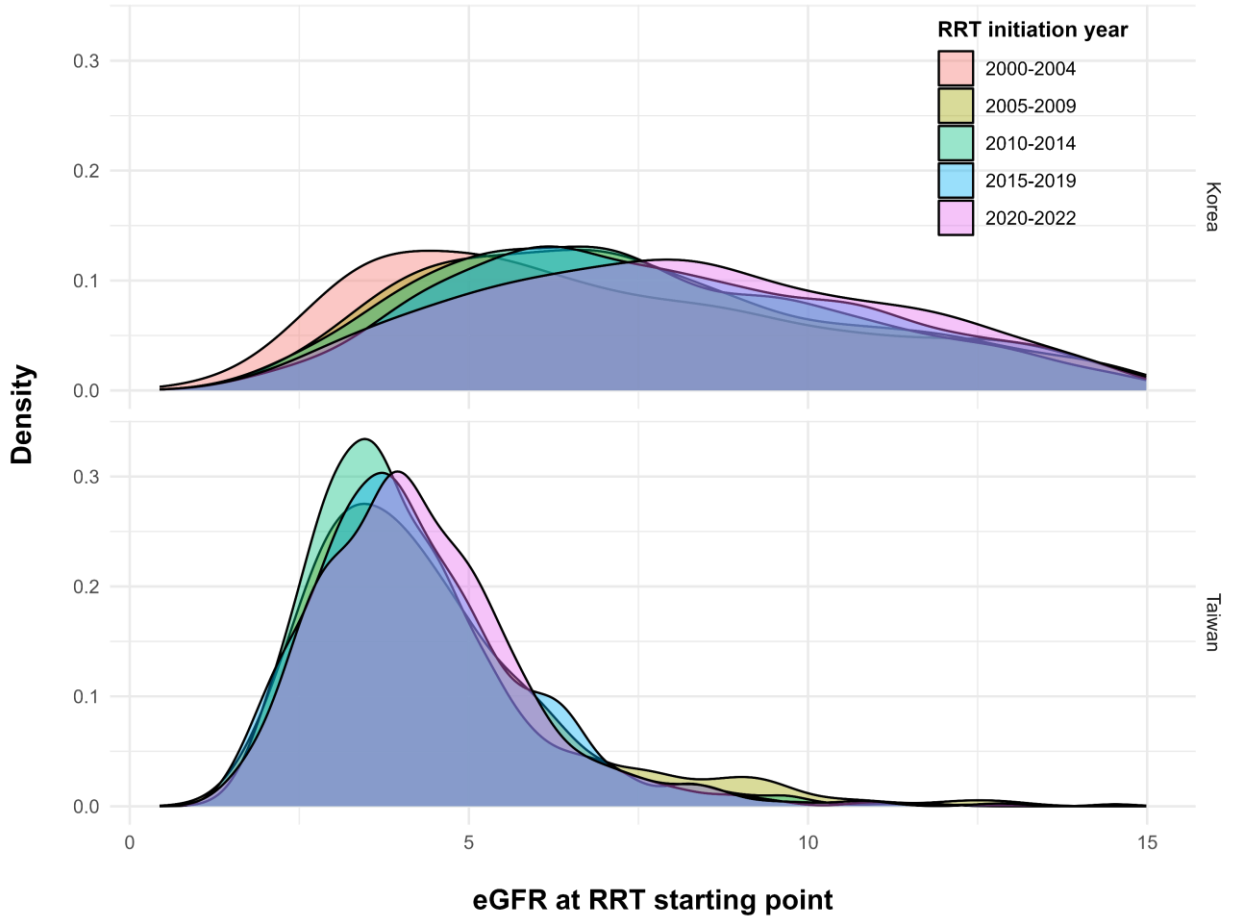


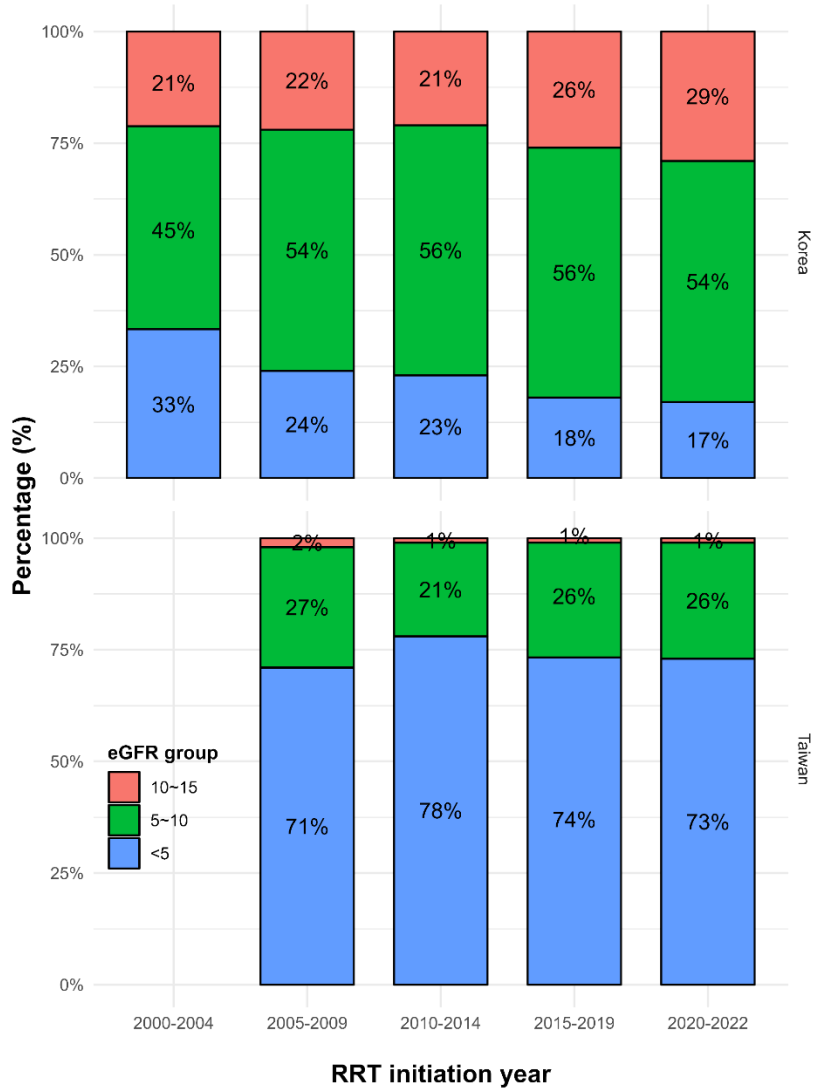
Comparison of baseline characteristics of two countries

Patients (N)	South Korea 5,967	Taiwan 2,277	Total 8,244	
Age (year)	60.0 [48.0;70.0]	65.0 [56.0;74.0]	61.0 [50.0;71.0]	<0.001
Body mass index	22.6 [20.4;25.1]	24.3 [21.7;27.2]	23.0 [20.7;25.7]	<0.001
Sex (male, %)	3508 (58.8%)	1239 (54.4%)	4747 (57.6%)	<0.001
Comorbidities (N, %)				
Diabetes mellitus	2781 (46.6%)	1546 (67.9%)	4327 (52.5%)	<0.001
Hypertension	3674 (61.6%)	2178 (95.7%)	5852 (71.0%)	<0.001
Dyslipidemia	887 (14.9%)	1097 (48.2%)	1984 (24.1%)	<0.001
Coronary artery disease	463 (7.8%)	412 (18.1%)	875 (10.6%)	<0.001
Heart failure	398 (6.7%)	634 (27.8%)	1032 (12.5%)	<0.001
Laboratory findings				
Blood urea nitrogen, mg/dL	68.0 [51.0;90.0]	102.3 [77.4;130.2]	75.0 [55.0;103.0]	<0.001
eGFR, ml/min/1.73m^2	7.1 [5.2; 9.7]	3.9 [3.1; 5.0]	6.0 [4.2; 8.7]	<0.001
Albumin, g/L	3.6 [3.2; 4.0]	3.6 [3.2; 4.0]	3.6 [3.2; 4.0]	0.467
Hemoglobin, g/dL	9.7 [8.6;10.8]	9.0 [8.1;10.0]	9.5 [8.5;10.6]	<0.001
Potassium, mmol/L	4.8 [4.2; 5.4]	4.2 [3.8; 4.8]	4.6 [4.1; 5.2]	<0.001
Total CO_2, mmol/L	20.0 [17.0;23.1]	19.4 [16.0;23.1]	20.0 [16.6;23.1]	<0.001
Glucose, mg/dL	107.0 [91.0;140.5]	104.0 [93.0;127.0]	106.0 [92.0;137.0]	0.002
Hemoglobin A1c, %	6.3 [5.7; 7.2]	6.0 [5.4; 6.8]	6.2 [5.6; 7.1]	<0.001
Phosphate, mg/dL	4.9 [4.1; 5.9]	5.7 [4.7; 7.0]	5.1 [4.2; 6.2]	<0.001
Total cholesterol, mg/dL	150.0 [125.0;180.0]	161.0 [133.0;193.0]	152.0 [126.9;183.0]	<0.001
UPCR, g/g	3.3 [1.7; 6.4]	3.6 [1.7; 6.7]	3.4 [1.7; 6.4]	0.129
Intact PTH	120.0 [52.0;246.0]	272.2 [150.4;443.4]	200.8 [98.3;378.0]	<0.001

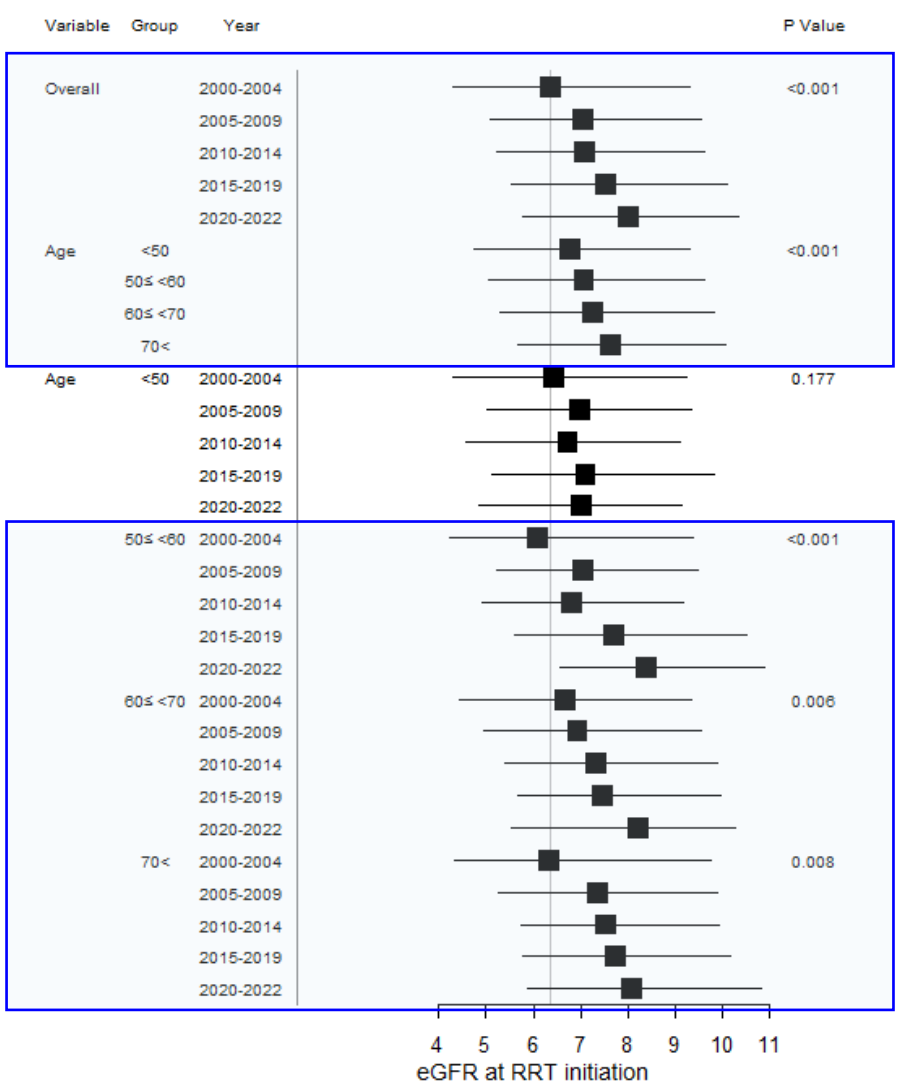
Patients (N)	South Korea 5,967	Taiwan 2,277	Total 8,244	
Medication usage				
Anti-diabetic medications	1310 (22.0%)	1412 (62.0%)	2722 (33.0%)	<0.001
Metformin	95 (1.6%)	41 (1.8%)	136 (1.6%)	0.57
Sulfonylurea	573 (9.6%)	809 (35.5%)	1382 (16.8%)	<0.001
DPP4-inhibitor	487 (8.2%)	745 (32.7%)	1232 (14.9%)	<0.001
TZD	98 (1.6%)	96 (4.2%)	194 (2.4%)	<0.001
Insulin	568 (9.5%)	1077 (47.3%)	1645 (20.0%)	<0.001
Anti-hypertensive medications	3473 (58.2%)	2154 (94.6%)	5627 (68.3%)	<0.001
RAS Blocker	2702 (45.3%)	1426 (62.6%)	4128 (50.1%)	<0.001
Diuretics	1664 (27.9%)	1796 (78.9%)	3460 (42.0%)	<0.001
Statin	1983 (33.2%)	1137 (49.9%)	3120 (37.8%)	<0.001

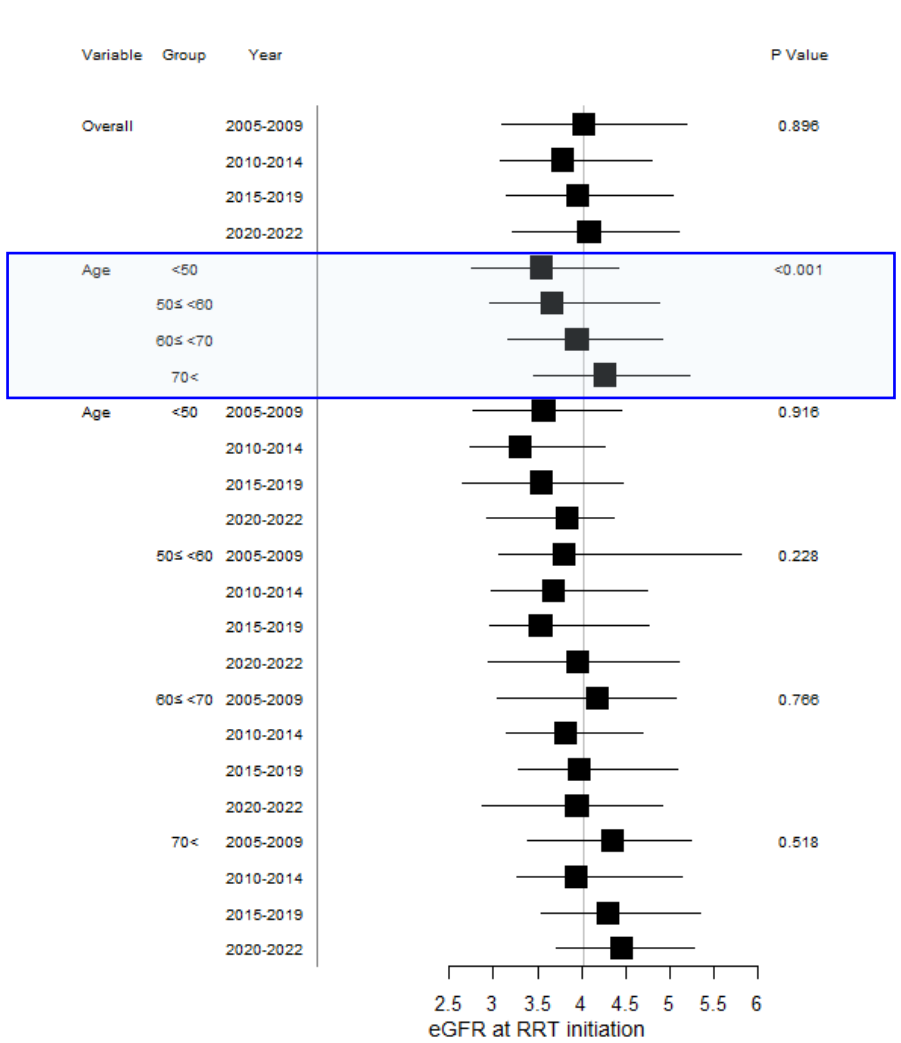
Differences in eGFR Trends Between South Korea and Taiwan





Subgroup analysis (1) Age





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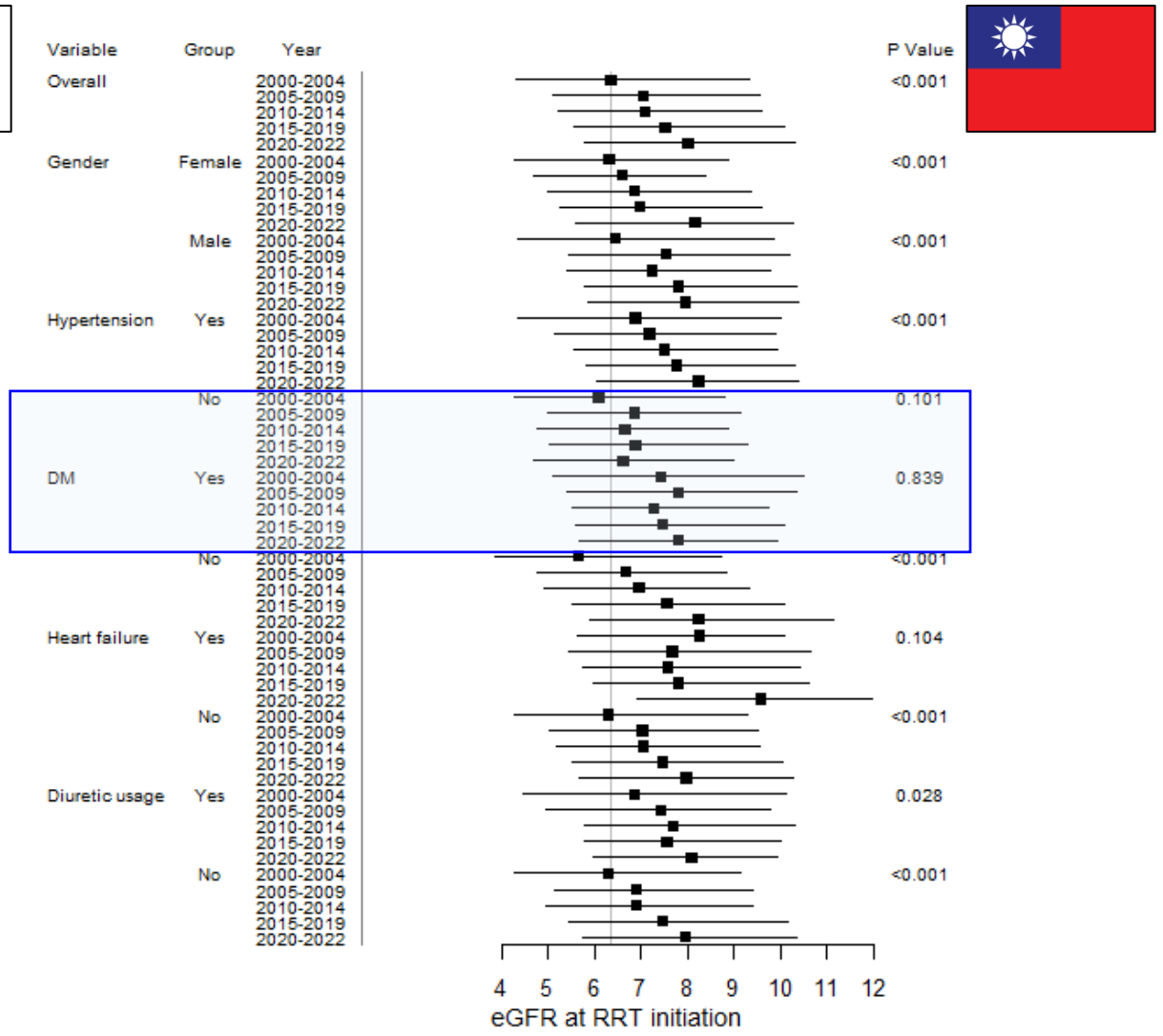
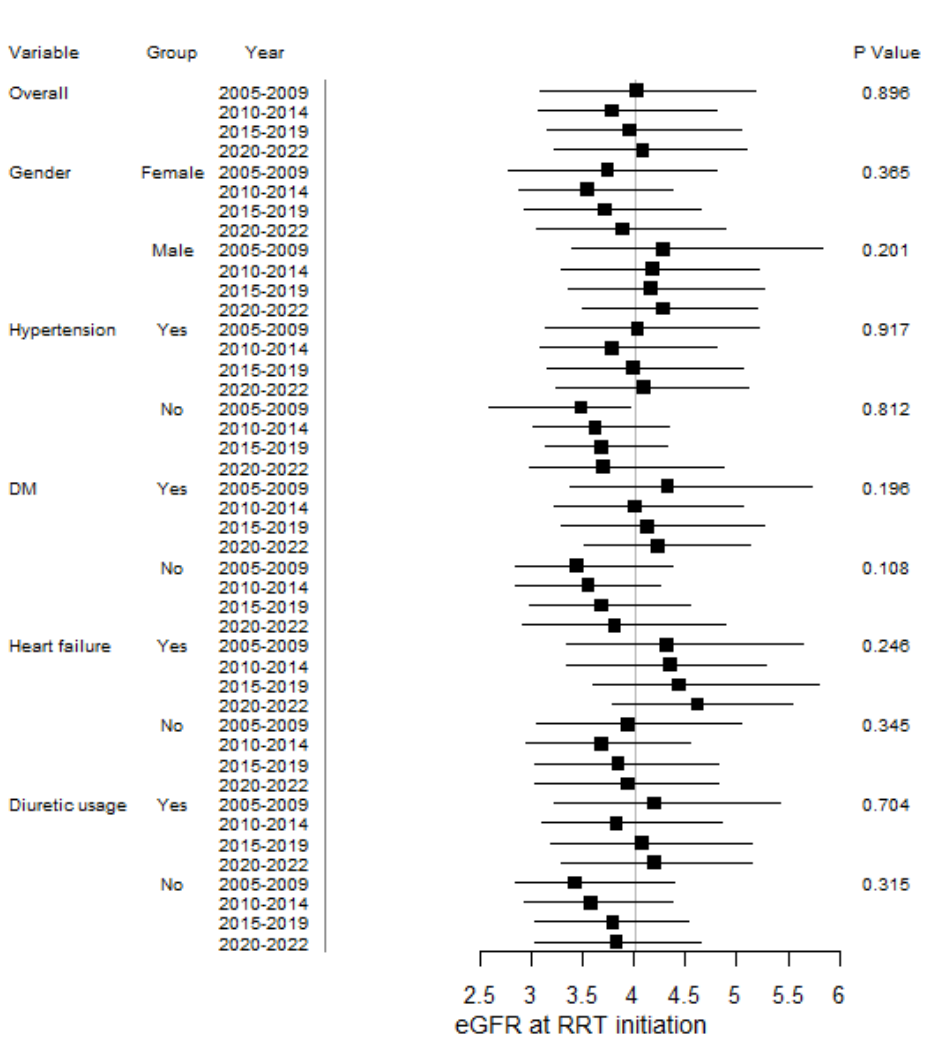
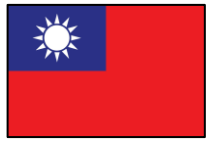
Subgroup analysis (2) Other comorbidities



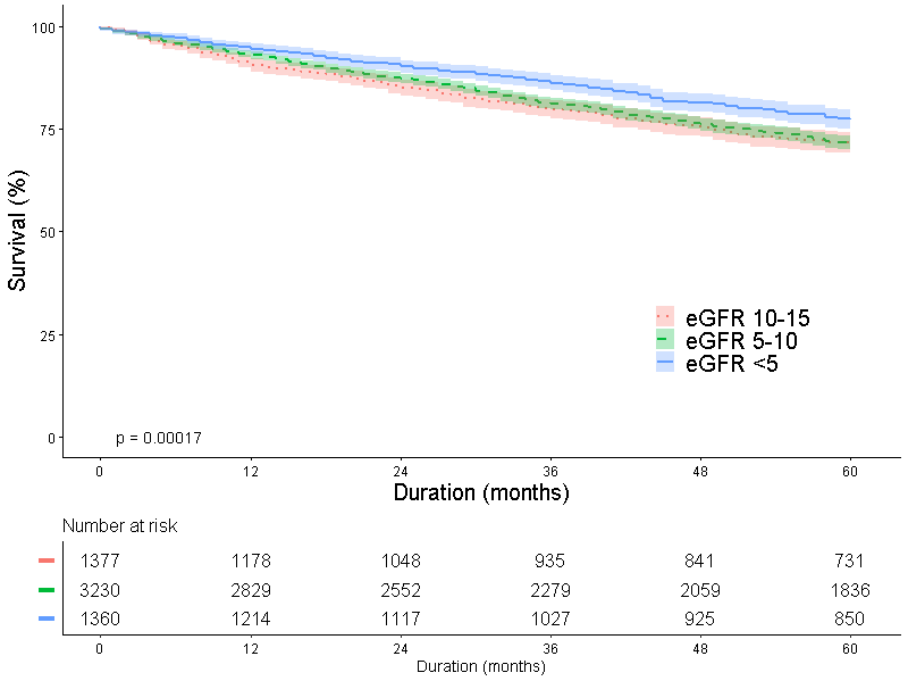


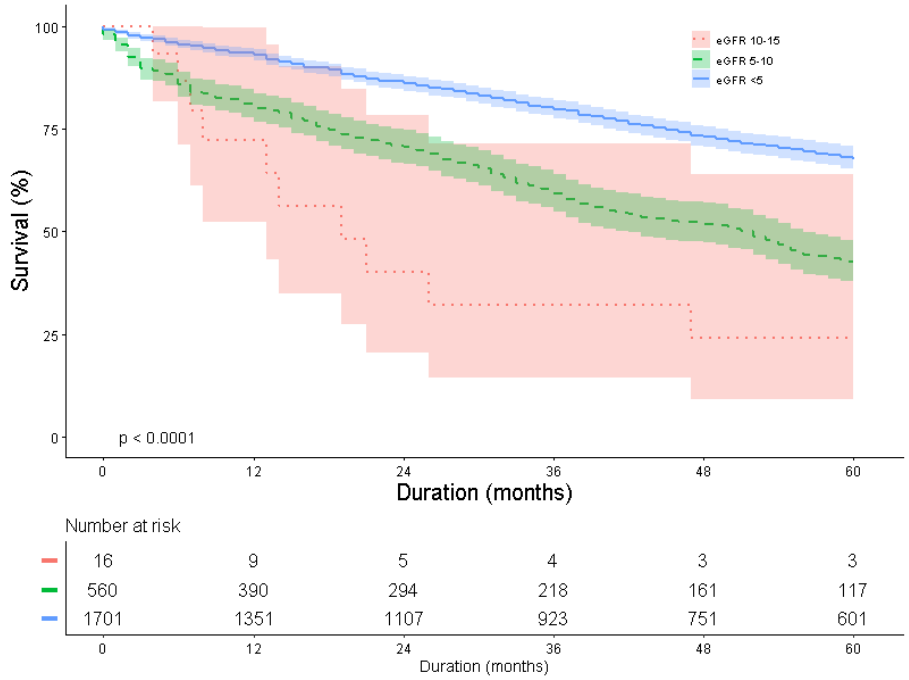
5 Year Mortality – Kaplan Meier

1457/5967= 24.4%



658/2777= 28.9%





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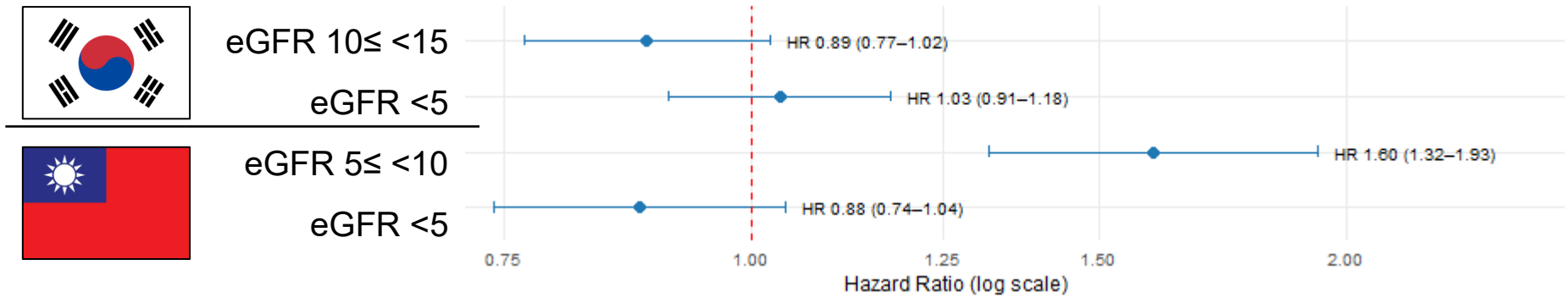
5 Year Mortality – Cox analysis

		eGFR 10≤ <15			eGFR 5≤ <10			eGFR<5		
		HR	95% CI	p-value	HR	95% CI	p-value	HR	95% CI	p-value
Korea	Univariate	1.024	0.9037-1.1602	0.71	1	Ref		0.765	0.6673-0.8757	<0.001
	Model 1	0.978	0.8629-1.1092	0.7325				0.927	0.8082-1.0641	0.2827
	Model 2	1.018	0.8943-1.582	0.7894				0.904	0.7828-1.0443	0.1704
	Model 3	1.014	0.8912-1.1542	0.8306				0.921	0.7968-1.0639	0.2626
Taiwan	Univariate	Data were excluded due to lack of representativeness			1	Ref		0.440	0.3749-0.5157	<0.001
	Model 1							0.555	0.4702-0.6541	<0.001
	Model 2							0.528	0.4253-0.6555	<0.001
	Model 3							0.533	0.4293-0.6626	<0.001

Model 1 : Gender, Age, Hospital, Year, DM, HTN, DL
Model 2 : Model 1 + Laboratory (BUN, Albumin, Hb, Phosphate, Total cholesterol)
Model 3 : Model 2 + + Medication (DM med, HTN med, Diuretics, Statin)

Reference: Korea, eGFR 5≤ <10, Cox Model 3



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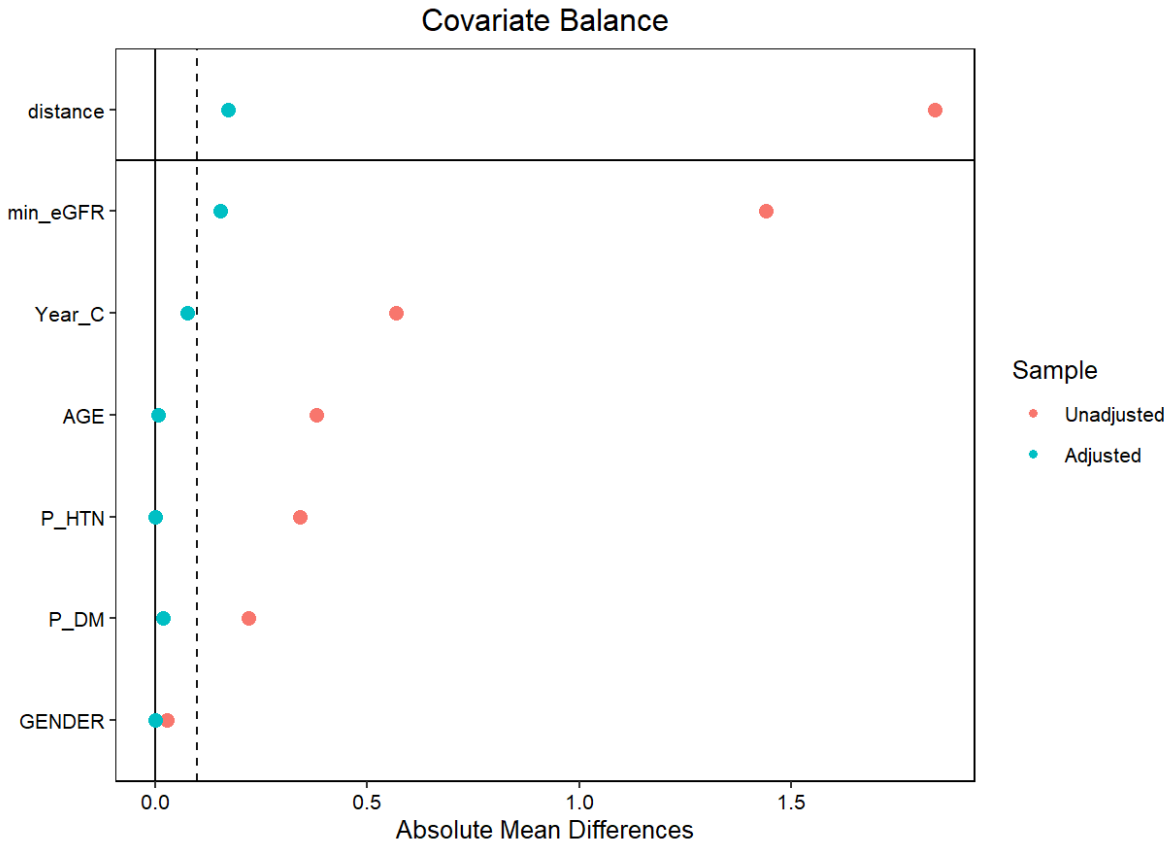
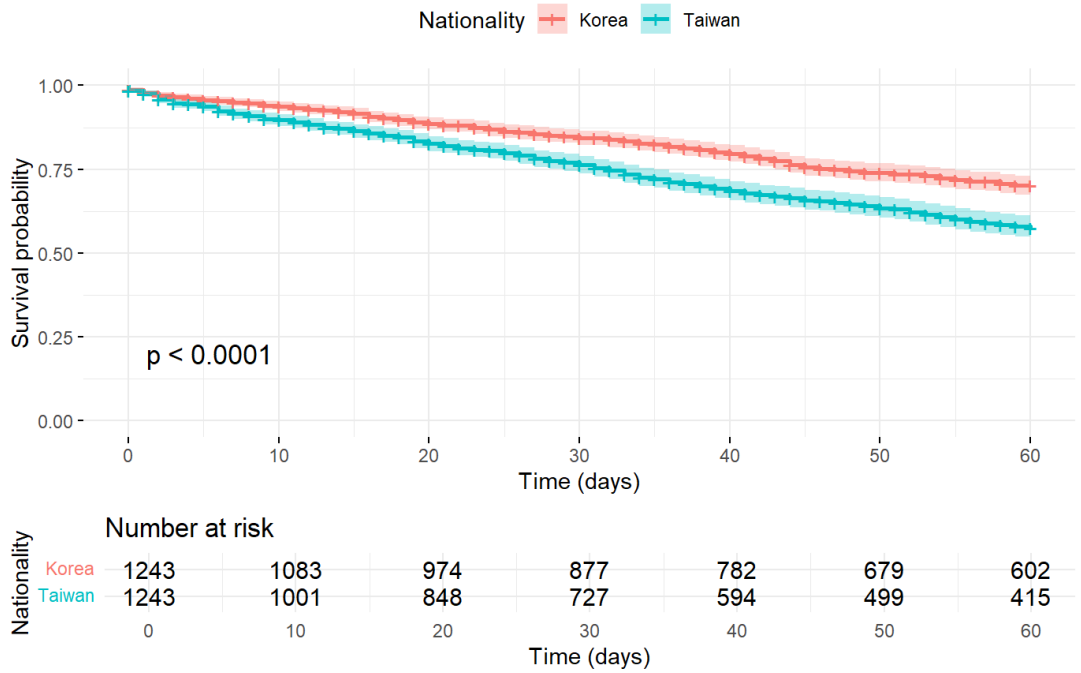
5 Year Mortality – Propensity score matching with Cox





▶ Conclusion

- RRT was initiated earlier in Korea compared to Taiwan
- Taiwan has maintained a stable eGFR threshold for dialysis initiation due to government regulations, whereas Korea has shown a trend toward earlier initiation in recent years
- Even after adjustment using Cox regression and PSM, Korean patients with eGFR 5–10 at dialysis initiation show better survival.

▶ This suggests that, for patients with eGFR 10–15, earlier dialysis initiation based on clinical judgment may potentially improve survival.

Limitations

- This retrospective observational study has limitations
  - Three-center design limits generalizability to national level
  - Lack of data on uremic symptoms (a key factor for dialysis initiation)
  - Inability to assess differences by RRT modality comparison
  - Unable to confirm whether pre-RRT preparation for modality was performed
  - Possible residual bias beyond RRT start timing that may explain higher survival in Korean patients

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