

CKD to ESRD in Taiwan: Early detection or underdiagnosis?

Introduction

- Early detection and proactive care of pre-dialysis patients not only improves outcomes and quality of care, but also reduces costs.
- Taiwan has the world's highest incidence and second-highest prevalence of end-stage renal disease (ESRD).
- The potential source of this high incidence is very likely the chronic kidney disease (CKD) population's transition to ESRD.
- Few studies, however, can provide evidence of how well ESRD patients were identified during their pre-ESRD stages.
- The present study retrospectively examined primary diagnoses of incident ESRD patients to determine how well they had been identified as CKD patients before initiating dialysis.
- We also examined the associations of pre-ESRD diagnosis and referral to a nephrologist with total medical costs and mortality.

Methods

- The design is a retrospective cohort study based on the claim datasets from the Bureau of National Health Insurance (NHI) in Taiwan.
- The study population was derived from the 1% random sample of the entire NHI population.

- Incident ESRD patients who initiated their dialysis treatments during 2000 to 2003 were pooled and analyzed; the longest follow-up time was 36 months before dialysis initiation.
- The primary and secondary diagnoses of interest include CKD, diabetes mellitus, hypertension, and cardiovascular disease, identified by disease coding methods of the US Renal Data System.
- At least two outpatient claims or one inpatient claim was required for identification as a CKD patient.
- Descriptive analyses were used to present the diagnosis progression from CKD to ESRD.
- Linear regression analysis and logistic regression were applied to examine the effects of early diagnosis on the use of medical resources and mortality, respectively.

Results

- The pooled sample size was 236 patients, with a mean age of 61.3 years (SD=14.0); distribution of males and females was equivalent; prevalence was highest for hypertension.
- More than 80% of incident ESRD patients had a primary diagnosis of CKD before initiating dialysis. Adding secondary diagnoses, about 97% of dialysis patients had a prior diagnosis of CKD. More than 40% of incident ESRD patients, however, were not identified as CKD patients until 6 months before dialysis initiation.

- Approximately one third of incident ESRD patients had hypertension (34.3%) and diabetes (33.7%); less than 10% had the primary diagnosis of cardiovascular disease.
- At 7-12 months before starting dialysis 55% of the patients had not seen a nephrologist and only 49% reported a diagnosis of chronic kidney disease.
- Pre-ESRD care provided by nephrologists was associated with lower annual total medical costs ($P < 0.05$) and a lower probability of mortality (OR=0.48; 95% CI, 0.25-0.90).

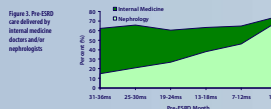
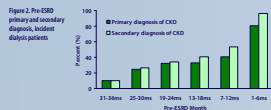
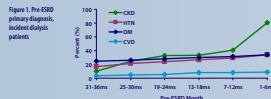


Table 1. Patient characteristics, incident ESRD patients (N=236)

	2000	2001	2002	2003	Total
N	57	54	56	59	226
Mean age (SD)	59.3(14.7)	58.2(13.8)	60.5(13.3)	61.4(14.8)	61.3(14.0)
Age-group (%)					
0-19	0	1.85	0	0	0
20-44	21.05	11.31	14.55	15.25	18.0
45-64	31.09	41.85	43.64	32.29	33.78
65-74	31.58	27.78	25.45	23.73	28.89
75+	12.28	17.41	16.36	23.75	19.33
Gender (%)					
Male	47.37	48.15	48.0	47.46	47.11
Female	52.63	51.85	52.0	52.54	52.89
Pre-ESRD Diagnosis (%)					
CKD	26.32	22.22	26.79	23.03	24.34
Hypertension	68.42	72.22	66.07	78.0	71.24
Diabetes	49.25	43.86	38.89	49.15	45.64
Cardiovascular	13.79	10.53	20.37	11.86	14.60

Table 2. Linear regression estimates of medical costs of incident ESRD patients

	Univariate Analysis			Multivariate Analysis		
	Coefficient	SE	P	Coefficient	SE	P
Constant				632,238		
Age						
45-64	154,889	0.12	0.07	113,962	0.12	0.32
65-74	85,945	0.03	0.14	83,974	0.03	0.41
75+	152,100	0.04	0.00	142,368	0.04	0.06
Female	12,745	0.01	0.84			
Specialist						
General Med	-29,146	-0.03	0.68			
Internal Med	71,941	0.06	0.27			
Nephrology	-51,155	-0.06	0.02	-71,790	-0.08	0.02
Chinese Med	-13,797	-0.01	0.87			
Pre-ESRD Diagnosis						
Without CKD (Ref)						
With CKD	83,648	0.00	0.12	89,109	0.02	0.21
CKD-DM	166,492	0.10	0.00	188,454	0.09	0.00
CKD-DM+CV	200,454	0.01	0.00	202,316	0.01	0.00
Level of Care						
Medical center (Ref)						
Regional Hosp	-142,005	-0.15	0.11	-163,551	-0.17	0.07
Disputed Hosp	-157,334	-0.14	0.11	-192,016	-0.17	0.06
Primary care	-181,372	-0.17	0.04	-190,805	-0.17	0.03
Hospital Ownership						
Public Hosp (Ref)						
Private Hosp	-97,558	-0.11	0.30			
NPP Hosp	-11,753	-0.01	0.90			
Residence area						
Metropolitan (Ref)						
Sub-metro	-124,995	-0.06	0.38			
Non-metro	2,305	0.00	0.97			
Previous Service Use						
Outpatient costs	-1	-0.02	0.74			
Inpatient costs	0	0.02	0.75			
Annual costs	0	0.01	0.90			
Adjusted R ²	0.4					

NOTE: SE, Standardized regression coefficient; NPP, Non-for-profit. Covariates adjusted for multivariate analysis.

Table 3. Logistic regression estimates of mortality of incident ESRD patients

	Univariate Analysis		Multivariate Analysis	
	Exp (B)	95% CI	Exp (B)	95% CI
Age				
20-44 (Ref)				
45-64	0.82	0.20 3.38		
65-74	0.90	0.22 3.77		
75+	2.83	0.71 11.3		
Gender				
Male				
Female	1.02	0.55 1.87		
Specialist				
General Med	1.21	0.63 2.36		
Internal Med	1.49	0.81 2.74		
Nephrology	0.48	0.23 0.99	0.48	0.23 0.94
Chinese Med	0.69	0.29 1.61		
Pre-ESRD Diagnosis				
Without CKD (Ref)				
With CKD	1.21	0.48 3.03		
CKD-DM	2.94	1.60 6.20	2.21	0.92 5.40
CKD-DM+CV	2.97	0.45 19.64		
Level of Care				
Medical center (Ref)				
Regional Hosp	0.97	0.42 2.21		
Disputed Hosp	1.32	0.54 3.24		
Primary care	0.67	0.26 1.72		
Hospital Ownership				
Public Hosp (Ref)				
Private Hosp	0.58	0.25 1.34		
NPP Hosp	0.42	0.17 1.02		
Residence area				
Metropolitan (Ref)				
Sub-metro	1.40	0.73 2.70		
Non-metro	0.61	0.12 3.05		

Note: Covariates were adjusted for multivariate analysis.

Conclusions

- The CKD population appears to be underdiagnosed in Taiwan. More than 20% of ESRD patients did not have a primary diagnosis of CKD before dialysis initiation and 55% between 7-12 months before dialysis. This underdiagnosis may deny patients adequate preparation for and timely initiation of renal replacement therapy.
- The current findings support early identification of persons at risk for kidney disease, thus providing an opportunity to prevent or delay disease progression, and to decrease mortality and health costs.
- An integrated care plan, including an early detection program for kidney disease, would be an appropriate approach to manage CKD in the contexts of individuals, providers, and health systems.