

CHAPTER 12

CARDIOVASCULAR MORTALITY OF PATIENTS WHO COMMENCE DIALYSIS WITHOUT CLINICAL EVIDENCE OF CARDIOVASCULAR DISEASE

**Matthew Roberts
Kevan Polkinghorne
Stephen McDonald
Francesco Ierino**



INTRODUCTION

Patients on dialysis experience a heavier burden of cardiovascular disease (CVD) and a markedly increased risk of death compared to the general population. The aim of this analysis was to quantify the cardiovascular mortality rate of patients receiving dialysis *who have no clinical evidence of CVD*, and compare this to the general population. Secondary aims were to examine the influence of baseline characteristics on this cardiovascular mortality, and to compare changes in mortality rates over time between the general population and patients receiving dialysis.

METHODS

Adult patients who commenced dialysis between 1992 and 2002 were followed to the end of 2003. Patients with no known CVD when they commenced dialysis were defined as having *no known or suspected* coronary artery disease, peripheral vascular disease or cerebrovascular disease. The outcome of interest was cardiovascular death defined according to ANZDATA Codes (Figures 12.1 and 12.2) and the broadest corresponding International Classification of Diseases codes in the general population data, so as to obtain the most conservative match (Figure 12.1). The 9th Revision (ICD-9) was used until 1996 (1999 for patients in New Zealand) and the 10th Revision (ICD-10) thereafter. General population data was obtained from the Australian Bureau of Statistics, Statistics New Zealand and the New Zealand Health Information Service.

Patients entered the analysis on the date of their first dialysis and were analysed until the date of cardiovascular death with censoring at (1) death from a non cardiovascular cause, (2) first renal transplant, (3) return of native kidney function, or (4) loss to follow up. Age-specific mortality rates were calculated and standardised mortality ratios (SMR) derived using the data from the general population.

Figure 12.1			
Cardiovascular Death Defined by the ANZDATA ICD-9 and ICD-10 Codes			
Outcomes	ANZDATA	ICD-9	ICD-10
Cardiovascular	10-12, 14-17, 22	402, 404, 410-414	I11, I13, I20-25, I30-
Death	26, 28	420-429, 430-438, 441, 557	I52, I60-I69, I71, K55

Figure 12.2			
Specific Causes of the Cardiovascular Deaths in the ANZDATA Cohort			
Deaths in patients who receive a kidney transplant are not included			
Code	Cause of death	Australia	New Zealand
10, 11	Myocardial infarction	1627 (46%)	471 (54%)
16	Cardiac arrest	1044 (29%)	245 (28%)
22	Cerebrovascular accident	442 (12%)	93 (11%)
12, 15, 17	Heart failure	273 (8%)	47 (5%)
28	Bowel infarction	117 (3%)	12 (1%)
26	Aortic aneurysm - rupture	36 (1%)	7 (<1%)
14	Haemorrhagic pericarditis	7 (<1%)	0
Total		3546	875

RESULTS

During the study period, 18,113 patients were eligible for inclusion with 54,342 person years of follow up. There were 8,572 deaths from any cause during the study period. At their last survey, 14,902 were residing in Australia and 3,211 in New Zealand. Almost half of the patients had known or suspected CVD at the time of commencing dialysis (Figure 12.3). The prevalence of baseline CVD was greater in the 45-54 year age group in New Zealand compared to Australia (Figure 12.4).

There were substantial differences between Australian and New Zealand patients with respect to ethnicity, prevalence of diabetes and initial mode of dialysis (Figure 12.5). Because of these differences, separate analyses were performed for each country.

Figure 12.3

**Proportion of Patients with Coronary Artery Disease
Peripheral Vascular Disease, Cerebrovascular Disease
or any One of These**

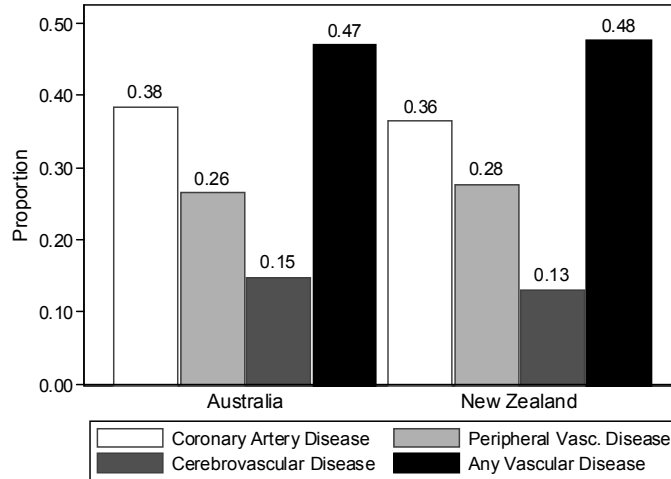
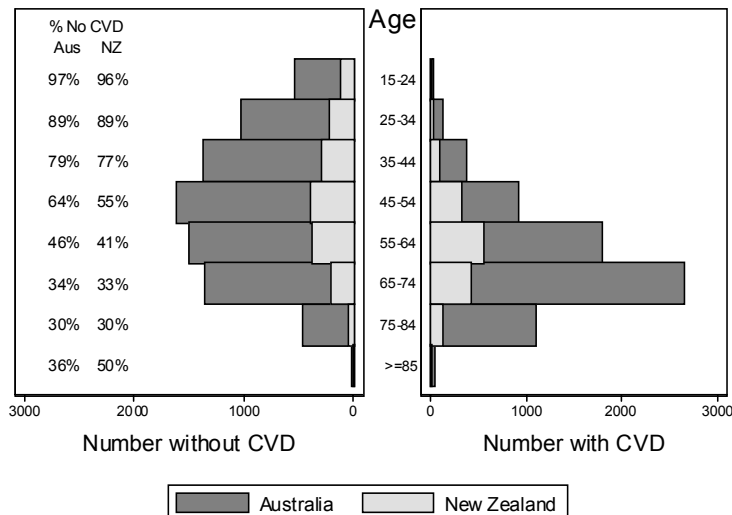


Figure 12.4

**Age Distribution of Patients Receiving Dialysis
According to Baseline CVD Status**





AUSTRALIA

Cardiovascular disease was responsible for 51% of deaths (Figure 12.2). The age-specific cardiovascular mortality rate for patients without CVD at baseline was 2.3 (95% confidence interval: 1.9-2.8) per 100 person years in those aged 35 to 44 years and increased to 11.9 (10.5-13.5) per 100 person years in those aged 75 to 84 (Figure 12.6 A). Respectively, these patients were 121 (98-149) and 5.7 (5.0-6.4) times more likely to die a cardiovascular death than people of similar age in the general population (Figure 12.6 B). Even in patients with no CVD and no diabetes, the cardiovascular mortality rate was almost 100 times that of the general population in younger patients (Figure 12.7). The age-specific mortality rates were similar for men and women but women had substantially greater age-specific SMRs (Figure 12.8). Results were similar for the individual causes of death with the exception of death due to cardiac arrest. Younger patients without known CVD commencing dialysis had a thousand-fold, not hundred-fold, increased risk of death due to cardiac arrest than younger people in the general population (Figure 12.9).

There has been a steady decline in the CVD mortality rates, particularly in people aged over 65 years, in the general population. There was no evidence that patients on dialysis experienced a comparable decline in cardiovascular mortality (Figure 12.10). In fact, CVD mortality rates may even be rising in the 45-54 year age group.

NEW ZEALAND

Cardiovascular disease was responsible for 55% of deaths (Figure 12.2). The findings in New Zealand patients were similar to the Australian patients overall and with respect to the main outcome of cardiovascular death (Figure 12.11). The cardiovascular mortality rates were slightly higher in both dialysis and general populations. The age-specific cardiovascular mortality rate for patients without CVD as baseline was 3.4 (2.4-4.9) per 100 person years in those aged 35 to 44 years and increased to 12.9 (8.1-19.2) per 100 person years in those aged 75 to 84. Respectively, these patients were 131 (92-186) and 5.3 (3.6-7.9) times more likely to die a cardiovascular death than people of similar age in the general population. Other specific comparisons were also similar to the Australian data but confidence intervals were wider.

DISCUSSION

Almost half of all patients commencing dialysis over a twelve-year period had some form of cardiac or vascular disease, indicating the substantial development of CVD prior to the need for dialysis. Patients without known cardiac or vascular disease experienced a cardiovascular mortality rate 5 to 100 times that of people in the general population, depending on their age, and over 1000 times higher for death from cardiac arrest in younger patients. These high cardiovascular mortality rates reinforce the need for intensive management of CVD risk factors in the pre-dialysis phase and to develop strategies for the identification and treatment of clinically silent CVD in patients starting dialysis.

Figure 12.5

Characteristics at First Dialysis in Australian and New Zealand Patients Divided According to the Presence or Absence of Cardiovascular Disease (CVD)

	Australia			New Zealand		
	No CVD (n=7,909)	CVD (n=6,993)	P	No CVD (n=1,683)	CVD (n=1,528)	P
Age	51.3 (38.3 - 64.1)	66.0 (57.0 - 72.4)	<0.001	50.1 (37.7 - 60.6)	61.1 (53.0 - 68.3)	<0.001
Male	4335 (55%)	4211 (60%)	<0.001	928 (55%)	946 (62%)	<0.001
Diabetes	1364 (17%)	3070 (44%)	<0.001	466 (28%)	912 (60%)	<0.001
Haemodialysis	5943 (75%)	4948 (71%)	<0.001	963 (57%)	836 (55%)	0.153
Race			<0.001			<0.001
Caucasoid	6316 (80%)	5807 (83%)		861 (51%)	688 (45%)	
ATSI	693 (9%)	597 (9%)		-	-	
Maori	44 (<1%)	21 (<1%)		484 (29%)	576 (38%)	
Pacific	111 (1%)	91 (1%)		226 (13%)	188 (12%)	

ATSI = Aboriginal or Torres Strait Islander

In the following (Figures 12.6-12.9 and 12.11), panel A shows the age-specific cardiovascular mortality rates and panel B the age-specific standardised mortality ratio for cardiovascular death.

Figure 12.6

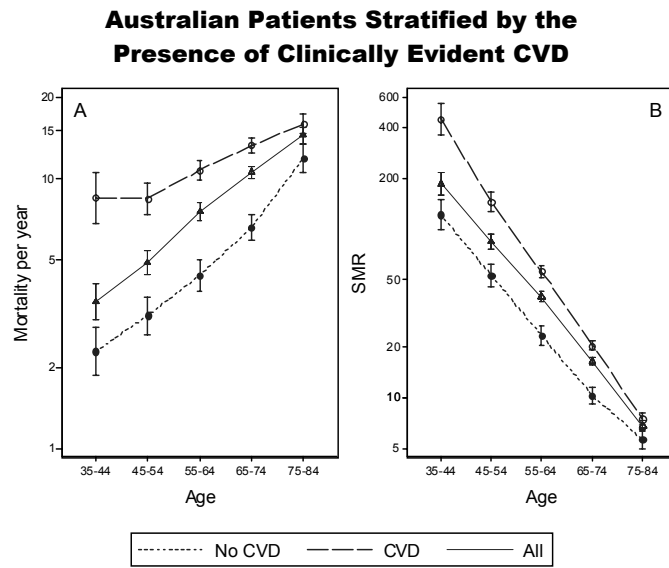


Figure 12.7

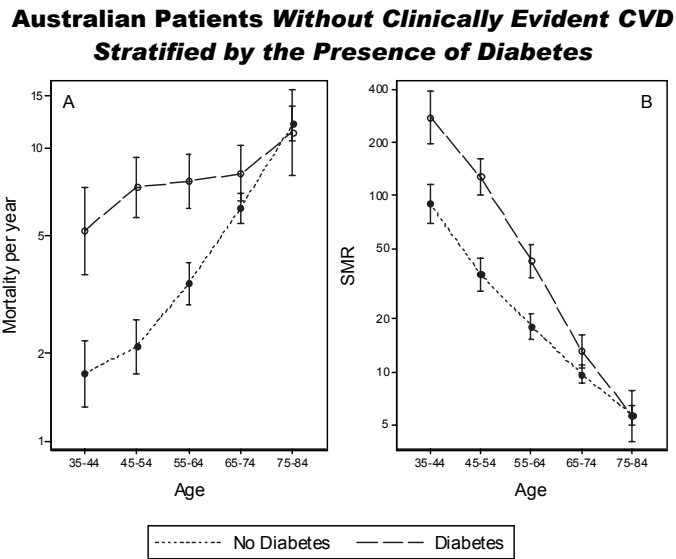


Figure 12.8

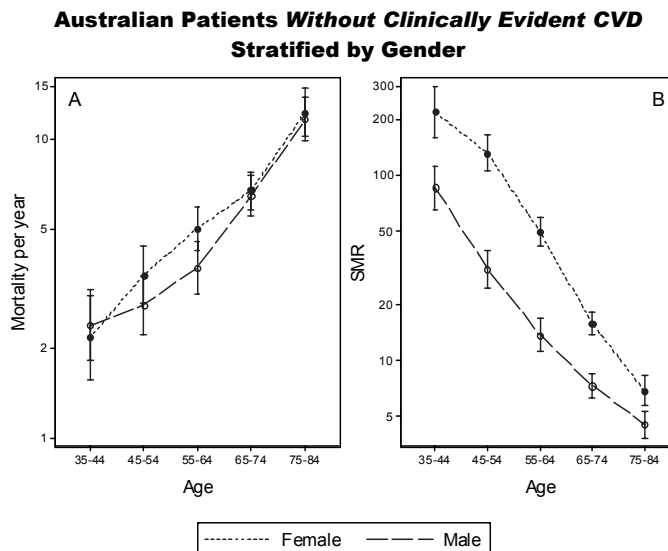




Figure 12.9

Sudden Cardiac Deaths in Australian Patients Stratified by the Presence of Clinically Evident CVD

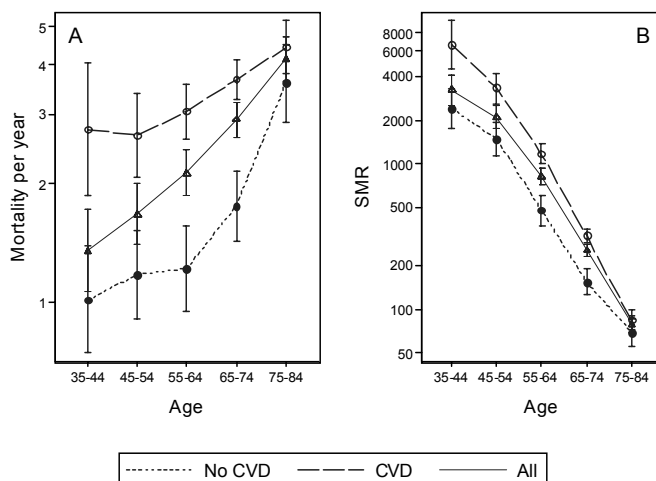
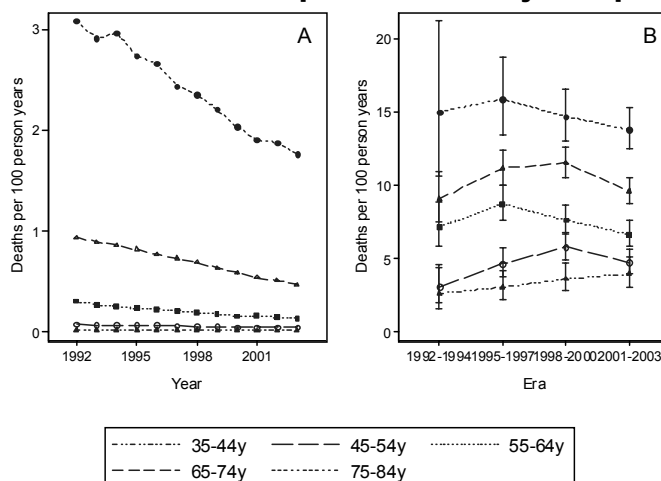


Figure 12.10

Cardiovascular Mortality Rates from 1992 - 2003 in the General Australian Population and Dialysis Population



- (A) The General Australian Population
- (B) Australian patients commencing dialysis between 1992 and 2002

Figure 12.11

New Zealand Patients Stratified by the Presence of Clinically Evident CVD

