

Cancer-specific death rates & EPO use among prevalent hemodialysis patients from 1991 to 2005

Introduction

- The USRDS Annual Data Report (ADR) shows that the one-year death rate of prevalent hemodialysis (HD) patients was generally stable from 1991 to 2005.
- Trends of cause-specific death rates in these patients, however, have not been reported.
- Erythropoietin (EPO) was introduced in 1989; its use can be attributed to increased patient hemoglobin levels between 1991 and 2005.
- Recently, concerns have risen that EPO use in patients with cancer may be associated with adverse outcomes.
- We analyzed cancer-specific one-year death rates in prevalent HD cohorts from 1991 to 2005 to determine whether these rates showed the stability of all-cause death rates or actually increased with the increased use of EPO during the period.

Methods

- Study population
 - Point-prevalent hemodialysis patients on January 1 of each year from 1991 to 2005, age 20 and older, and with Medicare Parts A and B coverage.

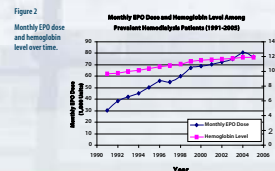
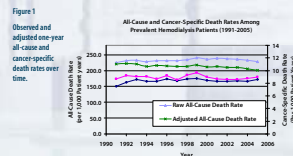
- Data sources
 - ESRD Medical Evidence form
 - Death Notification form
 - Medicare enrollment database
 - UNOS transplant data
 - Medicare ESRD claims
- Patients in each cohort year were followed from January 1 of the year to the first of death, modality change (change to PD), transplant, change of Medicare coverage, loss to follow-up, recovery of renal function, or the end of the year.
- The Kaplan-Meier method was used to calculate the observed (unadjusted) one-year death rate.
- A Cox proportional hazard regression model was used to calculate the adjusted one-year death rate, while adjusting for patient age, race, gender, primary cause of ESRD, and dialysis vintage. The 2005 hemodialysis population was used as the reference.
- The mean hemoglobin level and mean monthly EPO dose were also calculated for each year.
- Hospitalization time was excluded in the calculation of monthly EPO dose.

Results

- The number of patients in each cohort year grew from 86,146 in 1991 to 207,388 in 2005.
- Patient characteristics changed slightly over time (Table 1):
 - Mean age increased from 60.54 to 62.22.
 - The percentage of males increased from 51.25 to 53.93.
 - The percentage of whites remained stable, the percentage of blacks decreased from 41.98 to 39.93, and the percentage of individuals of other races increased from 3.93 to 6.06.
 - Primary causes of ESRD:
 - The percentage with diabetes rose from 24.87 to 42.85.
 - The percentage with hypertension rose from 25.96 to 28.86.
 - Mean ESRD vintage increased from 4.02 to 4.37 years.
- The all-cause one-year death rate varied over time between 226 and 241 per 1,000 patient years, showing a slight increase before 1999 followed by a slight decrease; the adjusted death rate decreased slightly. (Figure 1. Data from USRDS 2007 ADR. Reference for adj. rates: 1996 all ESRD.)
- The observed one-year cancer-specific death rate varied between 7.53 and 8.76 per 1,000 patient years, and between 8.11 and 8.76 if the year 1991 cohort was excluded (Figure 1).

Table 1

Age	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Patient characteristics over time	mean	60.54	60.81	60.91	61.19	61.41	61.58	61.70	61.88	62.07	62.22
	Standard Deviation	15.36	15.30	15.28	15.28	15.27	15.27	15.24	15.18	15.15	15.09
	median	63.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00	64.00
Gender	20-44	17.66	17.06	16.81	16.39	16.04	15.67	15.28	14.78	14.32	13.98
	45-64	34.87	34.93	35.36	35.14	35.13	35.49	35.91	36.35	36.65	37.18
	65-74	28.67	28.54	27.85	27.64	27.23	26.58	26.13	25.86	25.53	25.12
	>=75	18.81	19.46	19.99	20.83	21.59	22.26	22.68	23.01	23.51	23.71
Race	Male	51.25	51.37	51.56	51.94	51.99	52.32	52.62	53.04	53.39	53.62
	Female	48.75	48.63	48.44	48.06	48.01	47.68	47.38	46.96	46.61	46.38
ESRD Cause	White	54.09	53.85	53.49	53.45	53.20	53.21	53.48	53.96	54.01	53.90
	Black	41.98	41.88	41.84	41.66	41.72	41.52	41.43	40.55	40.33	40.27
	Other	3.93	4.28	4.67	4.89	5.07	5.27	5.39	5.49	5.66	5.82
	Diabetes	24.87	27.34	30.74	33.71	35.89	37.49	39.01	40.35	41.30	42.11
Vintage	GN	11.19	11.03	11.12	11.19	11.16	11.17	10.93	10.75	10.48	10.19
	Hypertension	25.96	26.11	26.56	27.18	27.57	27.86	28.05	28.21	28.43	28.73
	Other	37.98	35.62	31.58	27.93	25.38	23.47	22.01	20.69	19.79	18.98
	mean	4.02	4.04	4.07	4.08	4.13	4.17	4.22	4.24	4.27	4.32
Standard Deviation	3.99	4.01	4.05	4.08	4.13	4.17	4.22	4.25	4.29	4.35	
median	2.72	2.73	2.78	2.81	2.87	2.90	2.93	2.95	2.97	3.01	
<1 Year	18.62	17.76	18.22	18.60	18.50	18.18	17.90	17.71	17.44	17.24	
1-5 Year	55.28	56.23	55.53	54.79	54.14	54.01	54.09	54.24	54.38	54.03	
>=5 Year	26.10	26.02	26.25	26.61	27.36	27.81	28.01	28.05	28.18	28.74	



Results (Cont.)

- The adjusted one-year cancer-specific death rate was similar to the observed rate, and ranged between 8.55 and 9.69 per thousand.
- The mean hemoglobin level increased from 9.67 g/dl in 1991 to 11.93 in 2005.
- The mean monthly EPO dose increased from 30,439 units in 1991 to 80,766 in 2004, followed by a decrease to 77,072 units in 2005.

Conclusions

- Patient characteristics varied little over time; mean age increased, and there were fewer blacks, more diabetics, and more patients with longer vintage.
- Cancer-specific one-year death rates among prevalent HD patients were stable between 1991 and 2005.
- Both patient Hgb levels and monthly EPO doses increased substantially through 2004; the fall in monthly EPO dose observed in 2005 may be due to higher DPO use or incompleteness of claims at the end of the year.
- Studying outcome trends for HD patients with cancer could provide additional insights into the potential impact of EPO use on cancer mortality.