

Associations of weight and weight change with mortality in hemodialysis patients

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Introduction

- A number of studies have shown associations between lower weight and increased risk of death in hemodialysis (HD) patients.
- In 2005, CMS began requiring height and weight on each dialysis claim, as part of the reimbursement calculation.
- Using these data, we examined associations of weight and weight change with risk of mortality.

Methods

- Inclusion criteria:**
 - Prevalent hemodialysis patients from January-June 2006;
 - Medicare as primary payer;
 - Valid weight data on monthly dialysis claim.
- For each patient, a regression line was fit to their 6 monthly weights to obtain a slope (weight change).

Methods (cont)

- Comorbidity for each patient was characterized during this same 6-month period using a method previously developed and validated for identifying diabetes from claims which required:
 - at least one inpatient, skilled nursing facility, or home health claim, or,
 - at least two physician/supplier or outpatient claims with the diagnosis code of interest.
- Beginning follow-up on July 1, 2006 a Cox model was used to assess the effect of weight and weight change (both categorized by quartiles) on risk of mortality through August 31, 2007 and adjusting for patient demographics, cause of renal failure, hospital days in the entry period, and comorbidity.

Results

- Lower weight was associated with older age, white and other race, higher proportions with all comorbidities except diabetes, and more hospital days in the entry period.

Results

- Weight loss was associated with higher levels of all comorbidities and more hospital days in the entry period.
- Although not as large in magnitude, weight gain was also associated with increased comorbidity and hospital days.
- Patients in the lowest 3 weight quartiles of had higher risks of death compared to patients in the highest weight group.
- Patients in the lowest slope group (weight decreasing the most) had higher risks of death than patients in the other categories of weight change.
- There was some evidence of a reverse J shape relationship of weight change with risk of death, with patients experiencing little change during the 6 months having the lowest risk of death.
- There was little evidence of a differential relationship between weight change and risk of death based on absolute weight.

Table 1
Patient Characteristics

	N		Percent		N		Percent		N		Percent	
	All	100,000	100-0%	0-100%	Weight < median	Weight > median	Weight < median	Weight > median	Weight < median	Weight > median	Weight < median	Weight > median
Age												
< 40	13,507	8.3%	7,123	8.8%	6,384	7.8%						
40 - 54	35,299	21.8%	15,236	18.7%	20,063	24.9%						
55 - 64	35,802	21.9%	14,731	18.1%	21,071	25.7%						
65 - 74	40,288	24.7%	19,318	23.7%	20,970	25.6%						
75 - 84	30,766	18.8%	13,099	15.9%	17,667	14.2%						
85+	7,664	4.7%	3,845	4.7%	3,819	4.7%						
Gender												
Female	75,919	46.5%	44,662	54.9%	31,257	38.5%						
Male	24,327	15.1%	16,690	45.1%	20,717	61.9%						
Race												
White	85,000	51.7%	44,025	54.1%	41,975	51.2%						
Black	67,591	41.4%	30,781	37.8%	36,808	44.9%						
Other	9,785	6.0%	6,554	8.1%	3,181	3.9%						
Primary Cause of Renal Failure												
Diabetes	70,322	43.1%	29,511	36.3%	40,811	49.8%						
Hypertension	48,576	29.7%	26,495	32.6%	22,081	26.9%						
GN	18,588	11.4%	9,901	12.2%	8,687	10.6%						
Other	25,840	15.8%	15,445	19.0%	10,395	12.7%						
Comorbidities												
ASHD	61,615	37.7%	31,520	38.7%	30,095	36.7%						
CHF	50,020	30.3%	31,815	39.1%	17,205	33.2%						
CVA	20,439	12.5%	11,913	14.6%	8,526	10.4%						
PVD	48,795	29.9%	25,293	31.1%	23,502	28.7%						
Other Cardiac	40,508	24.8%	22,795	28.0%	17,709	21.6%						
COPD	26,314	16.1%	14,166	17.4%	12,148	14.8%						
GI	11,639	7.1%	6,835	8.4%	4,804	5.9%						
Liver disease	12,199	7.7%	6,577	8.1%	6,028	7.3%						
Dysrhythmia	39,279	24.0%	20,819	25.6%	18,460	22.5%						
Cancer	30,272	18.8%	15,521	19.2%	14,751	18.1%						
Diabetes	50,189	30.3%	42,088	51.7%	52,901	64.5%						

* All p-values comparing characteristics with weight < 62 kg

Figure 1
Survival curves by weight

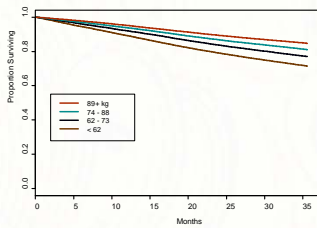


Figure 2
Adjusted hazard ratios for weight gain

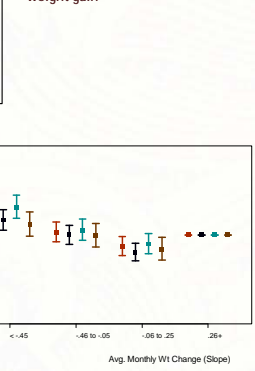


Figure 3
Adjusted hazard ratios for weight gain, by weight

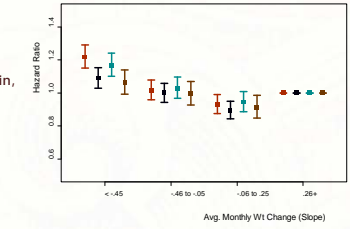


Table 2
Cox Model Results

Variable	Hazard Ratio	95% Confidence Limits		P-value
		Lower	Upper	
Weight < 62 kg	1.74	1.67	1.80	<.0001
62 - 73 kg	1.52	1.28	1.57	<.0001
74 - 88 kg	1.10	1.07	1.14	<.0001
89+ kg	1.00			
Slope < -.45	1.14	1.11	1.18	<.0001
-.46 to -.05	1.01	0.98	1.04	0.009
-.06 to .25	0.92	0.89	0.95	<.0001
.26+	1.00			
Height	0.96	0.94	0.98	0.0004
Height*2	1.00	1.00	1.00	<.0001
Hospital days	1.02	1.02	1.03	<.0001
Hospital days*2	1.00	1.00	1.00	<.0001
Cause of RF - DM	1.12	1.08	1.16	<.0001
Cause of RF - GN	0.87	0.83	0.91	<.0001
Cause of RF - HTN	0.98	0.95	1.02	0.328
Cause of RF - Other	1.00			
Age	1.01	1.01	1.02	0.0003
Age*2	1.00	1.00	1.00	<.0001
female	0.91	0.88	0.93	<.0001
Black race	0.81	0.79	0.83	<.0001
Other race	0.73	0.70	0.77	<.0001
White race	1.00	0.70	0.77	<.0001
ashd	1.05	1.03	1.08	<.0001
chf	1.35	1.32	1.39	<.0001
cva	1.16	1.13	1.20	<.0001
pvd	1.19	1.17	1.22	<.0001
othcardiac	1.10	1.07	1.13	<.0001
gnpd	1.21	1.18	1.24	<.0001
gi	1.12	1.09	1.16	<.0001
liverdis	1.05	1.02	1.09	0.006
dysrhyth	1.25	1.22	1.28	<.0001
cancer	1.32	1.27	1.37	<.0001
em	1.19	1.15	1.22	<.0001

Conclusions

- The association between higher weight and decreased risk of death has been shown in numerous studies.
- Although a number of studies have assessed interdialytic weight change and risk of poor outcomes, change in weight assessed over a 6 month period is more a measure of longer term trajectory of weight.
- Our results show that:
 - weight gain, low absolute weight, and weight loss are associated with increased risk of mortality.
- Weight gain may reflect changes in evolving comorbidity and intercurrent events that may increase risk of death.
- Limitations:
 - Weight obtained from billing data.
 - Although proportional hazards models were used to control for confounding, there is a possibility of residual confounding due to unmeasured variables.