Body mass index and survival in incident dialysis patients: the answer depends on the question

Dear Sir:

In a recent issue of the journal, Johansen et al (1) examined an important question—What is the association of body size with survival adjusted for muscle mass in incident dialysis patients? However, there are really 3 questions: 1) What is the independent association between muscle mass and mortality, 2) What is the independent association between BMI and mortality, and 3) How does mortality vary across different levels of BMI and muscle mass combined. Based on the answer to the question posed by Johansen et al, inferences on whether body composition influences the survival of incident dialysis patients with a high BMI could not be drawn.

We reexamined the data from our earlier study (2), which the authors graciously discussed. Details on study population, inclusion criteria, data collection, and statistical methods were described earlier (2). In 70,028 incident hemodialysis patients in the United States, from 1 January 1995 to 31 December 1999, the associations of BMI categories described by Johansen et al with survival were examined combined. Based on the answer to the question posed by Johansen et al, inferences on whether body composition influences the survival of incident dialysis patients with a high BMI could not be drawn.

To further examine the influence of body composition on survival in high-BMI patients, each of the BMI groups was divided into subgroups on the basis of muscle mass: low (urinary creatinine <0.55 g/d), normal, or high (urinary creatinine >0.55 g/d) percentile, ie, <25th percentile, ≤0.55 g/d, normal, or high (urinary creatinine >0.55 g/d) subgroups. The hazard ratios from the multivariable parameteric proportional hazards survival model, adjusted for urinary creatinine, demographics, comorbid conditions, serum albumin, and functional status, were examined.

Figure 1 and 2 appear contradictory, but, in reality, they are not. Adjustment for urinary creatinine in the multivariable parameteric proportional hazards survival model, adjusted for all of the above factors except urinary creatinine, are presented in Figure 1. In the high-BMI group, each of the BMI groups was divided into subgroups on the basis of muscle mass: low (urinary creatinine <0.55 g/d), normal, or high (urinary creatinine >0.55 g/d) percentile, ie, <25th percentile, ≤0.55 g/d, normal, or high (urinary creatinine >0.55 g/d) subgroups. The hazard ratios from the multivariable parameteric proportional hazards survival model, adjusted for all of the above factors except urinary creatinine, are presented in Figure 2.

At first glance, Figures 1 and 2 appear contradictory, but, in reality, they are not. Adjustment for urinary creatinine in the multivariable model (Figure 1) does not mean that the hazard of death is constant across the spectrum of urinary creatinine values in any

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given BMI group (Figure 2). Whether the association of BMI with survival is confounded by muscle mass is examined in Figure 1. Whether those with a large body size but low muscle mass have a survival advantage over “healthy” patients with a normal BMI and a normal or high muscle mass is examined in Figure 2.

In our study we summarized the findings in Figure 2 as “the survival advantage conferred by high BMI in dialysis patients is limited to patients with normal or high muscle mass.” We understand the concerns of Johansen et al that this could be construed as independence. We rephrase our conclusions as follows. Patients with a
high BMI and low muscle mass have a higher mortality than do “healthy” incident dialysis patients with a normal BMI and normal or high muscle mass. On the other hand, patients with a high BMI and normal or high muscle mass have a lower mortality than do “healthy” incident dialysis patients with a normal BMI and normal or high muscle mass. Thus, compared with “healthy” incident dialysis patients with a normal BMI and normal or high muscle mass, those with a high BMI have a lower mortality only if their muscle mass is normal or high.

In conclusion, the questions addressed in the 2 studies were related but had different emphases. We absolutely agree with Johansen et al that body size is an important determinant of survival in incident dialysis patients. However, we stand by our earlier conclusion that, in incident dialysis patients, body size and body composition influence survival. In incident dialysis patients, adiposity confers a survival advantage over undernutrition, but higher muscle mass is better than higher body fat. We agree that, given the current data, incident dialysis patients should not be encouraged to lose weight but should be encouraged to increase muscle mass rather than fat mass.

None of the authors had a conflict of interest.

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Reply to S Beddu et al
Dear Sir:

We appreciate the comments of Beddu et al regarding our recent publication that examined the relation between body size and outcomes among incident hemodialysis patients (1). In particular, we agree with the idea that body composition, and perhaps muscle mass in particular, is important to consider for patients receiving dialysis. However, it is important that, in our discussion of the “best” way to adjust for muscle mass in these patients, we not lose sight of the larger issues at hand. First, although analyses using large data sets are often constrained to the use of body mass index or similar weight-for-height indexes as the primary indicator of body size, they are fundamentally not the best measures of body composition. The best way to address the contribution of muscle mass to survival among incident hemodialysis patients would be to measure muscle mass itself. Although this is not possible in large cohorts that can be established with the use of data from the US Renal Data System, body composition can be measured directly in smaller cohorts and the results used to determine which components are most important to patient survival.

Second, survival is only part of the story when it comes to associations between body composition and outcomes in patients receiving hemodialysis. Body fat mass and muscle mass could each be related in important ways to quality of life in these patients. For example, a larger muscle area is related to greater strength and improved physical performance (2). Conversely, it is possible that greater fat mass is associated with greater difficulty with physical activity and activities of daily living. These associations need further study before anyone can assign muscle or fat as “more important” in this patient population.

Neither of the authors had a conflict of interest.

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Diet and risk of ischemic heart disease in India
Dear Sir:

We would like to point out some problems with the interesting article by Rastogi et al (1) that was recently published in the Journal. In this study, only 12% of the subjects were women; the remaining 88% were men. Generally speaking, in India, men are not involved in cooking. Hence, the men in this study may not have been able to correctly specify the amount of cooking oil that would be used.

In Table 4, there are some factors that were not significant in the univariate analysis but that were significant in the multivariate analysis because of an interaction among the variables. A better way of presenting these data would have been to present data for only those variables that were significant in the univariate analysis and then subjected to multivariate analysis to determine the variation in relative risk. Another problem with the study was that type of personality and stress were not taken into consideration, which may have confounded the results.

None of the authors had a conflict of interest.

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