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Acute organ failure is not associated with hospital readmission among severe sepsis survivors

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To the Editor

We appreciate the interest that Drs. Shen and Li (1) demonstrated in our recent manuscript: Frequency, Cost, and Risk Factors of Readmissions among Severe Sepsis Survivors (2). The manuscript identified that 30-day hospital readmission after severe sepsis survival is both common (26%) and costly (approximately $25,500/readmission) and resulted in additional mortality in the survivor cohort. Additionally, characteristics at the levels of patient, hospital, and hospitalization were associated with increased odds of hospital readmission. Specifically, patient comorbidities such as malignancy, collagen vascular disease, and chronic kidney disease among others demonstrated associations with 30-day readmission in a multivariate logistic regression model. During model construction, we examined whether the development of organ failure during the index admission with severe sepsis was also associated with an increased risk of readmission and discovered only weak associations that were non-significant in the presence of comorbidities. Drs. Shen and Li raise the question of

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whether this lack of association between acute organ failure and subsequent hospital readmission is related to inappropriate analyses.

We chose our statistical approach carefully with the goal of identifying unique characteristics (specific payors, specific comorbidities, specific organ failures etc.) that were associated with readmission in order to help clinicians and administrators better understand the patient population at the highest risk of readmission. As such, during model construction we simultaneously included dichotomous dummy variables for failure of each of seven organ systems using previously validated coding methodology (3) in the manner that Drs. Shen and Li have suggested. Using this approach, we discovered that none of the individual organ failures were associated with hospital readmission.

Drs. Shen and Li also voice concerns about how hospital sepsis case volume and hospital sepsis mortality rates were handled in the multivariate model. They can be reassured that both of these variables were handled as ordinal and not continuous variables in the multivariate model as is described in both the methods and results sections.

Finally, Drs. Shen and Li raise the question of whether index event bias may contribute to the lack of association between organ failure during index admission and subsequent readmission. Index event bias may occur in recurrence risk research when independent risk factors which are associated with the outcome of interest appear to be dependent upon each other inside of a population that has experienced the outcome of interest (4). As a result, the presence of some risk factors may seem to “protect” against having others and, therefore, these risk factors appear to be “paradoxically” not associated with recurrence of the outcome of interest. Although we cannot completely rule out the possibility of undetected index event bias in our data, we do not agree with Drs. Shen and Li’s assertion that this is contributing to the lack of association between acute organ failure and hospital readmissions for two reasons: 1) acute organ failure is not always a risk factor for severe sepsis, in fact, it is more commonly a sequelae of severe sepsis and 2) it is highly unlikely that patients who experience acute organ failure during severe sepsis will be “protected” from other identified risk factors such as the comorbidities associated with readmission in our study.

We feel that a much more likely explanation of our findings lies in the inherent characteristics of our study cohort. As we chose to examine only patients who survived their initial admission for sepsis, we were, by definition, selecting a group who did not incur sufficient organ failure to result in death. Thus, we were deliberately examining a cohort with less severe organ failure which may not have been sufficient to increase the risk of readmission. Alternatively, it is possible that sepsis survivors who experience a larger burden of acute organ failure have higher rates of discharge to chronic or intermediate care facilities and by controlling for discharge destination, we were subsequently unable to detect associations with organ failure. Finally, it is also possible that acute organ failure is just not associated with the risk of readmission. While there is ample evidence to suggest that organ failure is associated with mortality in severe sepsis (3), similar data linking organ failure to readmissions is not available.

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