

# Correspondence

## The use of a frailty index to predict adverse postoperative outcomes of older surgical patients

In a prospective cohort study by Lin et al<sup>1</sup> assessing the feasibility and performance of using a frailty index (FI) to predict the adverse postoperative outcomes of older surgical patients, the logistic regression analysis showed that every 0.1 increase in the FI was associated with 36% greater odds of death at 12 months (odds ratio, OR 1.36 [95% confidence intervals, CI, 1.04 to 1.79],  $P=0.026$ ), 53% greater odds of unplanned hospital re-admission at 12 months (OR 1.53 [95% CI 1.24 to 1.90],  $P<0.001$ ) and 68% greater odds of combined adverse outcomes (OR 1.68 [95% CI 1.34 to 2.10],  $P<0.001$ ). The authors determined the associations between the preoperative FI and adverse postoperative outcomes, but did not assess the predictive performance of the preoperative FI for adverse postoperative outcomes. The authors should further construct the receiver operating characteristic curve (ROC) to obtain the sensitivity, specificity, positive, and negative predictive values of the preoperative FI for adverse postoperative outcomes in the validation and development sets. By providing the predicted probabilities and observed frequencies for adverse postoperative outcomes based on the levels of preoperative FI, the readers can estimate whether there is a good overall agreement between predicted probabilities and observed frequencies in the development and the validation sets<sup>2</sup>. Moreover, the area under the ROC can also indicate predictive ability of the preoperative FI for adverse postoperative outcomes. For example, an area under the ROC of 0.90 to 1.0 indicates excellent, 0.75–0.89 good, 0.60–0.74 fair, and 0.50–0.59 no, predictive value<sup>3</sup>.

In fact, the FI used in this study only includes the preoperative factors associated with adverse postoperative outcomes, such as medical comorbidities, physical and cognitive impairments, psychosocial risk factors, common geriatric syndromes, etc. Because the surgical burden and major complications are the important determinants for postoperative mortality, the preoperative risk factors commonly used for predictive models may not completely explain postoperative outcomes. The available evidence shows that the early-term postoperative mortality is most likely related to the surgery and perioperative management, and occurs within a month. However, the long-term mortality primarily represents the natural process of ageing or potential diseases<sup>4</sup>. Thus, not taking perioperative risk factors into the account may be a main reason for their finding that there are no significant associations between levels of frailty and rates of adverse early postoperative outcomes. It has been shown that compared to the sole use of preoperative

variables, combined use of preoperative and intraoperative risk factors in the model can improve the predictive ability for adverse early postoperative outcomes<sup>5</sup>.

Finally, a limitation of this study design is the lack of comparison of the predictive ability of the preoperative FI for adverse postoperative outcomes with those of other established preoperative risk scores or models, such as modified frailty index, American Society of Anesthesiologists physical status classification, Charlson Comorbidity Index, Portsmouth-modified Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity, etc. Accordingly, an important issue that cannot be answered by this study is whether the predictive ability of the preoperative FI for adverse postoperative outcomes in older surgical patients equals or surpasses these established preoperative risk scores or models. This deserves further study.

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## References

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## In reply to Liu

Thank you for your comments on our paper titled *Perioperative assessment of older surgical patients using a frailty index—feasibility and association with adverse postoperative outcomes*<sup>1</sup>. This was a pragmatic study evaluating the feasibility of the frailty index—comprehensive geriatric assessment (FI-CGA) tool on assessing frailty in older surgical patients. While we were able to demonstrate an association of frailty with several adverse outcomes, our study was not designed or powered to determine the predictive validity of the FI-CGA tool. Our data was not adequate for constructing a receiver operating characteristic curve to evaluate the FI cut-off points that would give the best predictive power and our study methodology did not include comparison of FI-CGA with the existing perioperative risk assessment tools. These are important questions that our group would like to address in a future study with a larger sample size.

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