Ventilatory and Heart Rate Responses to Exercise: Better Predictors of Heart Failure Mortality Than Peak Exercise Oxygen Consumption

To the Editor:

We read with great interest the article by Robbins et al.\(^1\) describing how exercise-related ventilatory and heart rate responses better predict heart failure mortality than peak exercise oxygen consumption.\(^2\)

Although Robbins et al.\(^1\) correctly state that other investigators have shown that exercise-related ventilatory abnormalities can be useful in predicting mortality,\(^3\) they fail to acknowledge the fact that our group\(^4\) previously published similar findings, which demonstrated that ventilatory abnormalities were related to outcome in congestive heart failure. Importantly, we demonstrated that by combining ventilatory abnormalities and peak exercise oxygen consumption, patients at a particularly high risk for death could be identified. These findings are similar to the data presented in Figures 1, 5, and 7 of the article by Robbins et al.\(^1\) In patients with minute ventilation/carbon dioxide production ($\dot{V}E/\dot{V}CO_2$) $>50$ and a peak exercise oxygen consumption $<15$ mL·kg$^{-1}$·min$^{-1}$, we described a mortality rate of 82% (median follow-up time, 552±329 days) compared with a mortality of 22% in patients with $\dot{V}E/\dot{V}CO_2$ $<50$ and a peak exercise oxygen consumption $<15$ mL·kg$^{-1}$·min$^{-1}$. In addition, Robbins et al.\(^1\) state that the value of $\dot{V}E/\dot{V}CO_2$ at the anaerobic threshold was almost as strong a predictor of mortality as $\dot{V}E/\dot{V}CO_2$ at peak exercise. We also used $\dot{V}E/\dot{V}CO_2$ at the anaerobic threshold\(^4\) because it predicted outcome better than $\dot{V}E/\dot{V}CO_2$ at peak exercise. Robbins et al.\(^1\) further state that there was a threshold phenomenon regarding $\dot{V}E/\dot{V}CO_2$ values, with mortality increasing markedly as values exceeded 40 to 45. Similarly, our data clearly show a marked increase in mortality with values $>50$. The study by Robbins et al.\(^2\) had a follow-up period similar to ours; however, they deserve credit for studying a larger patient population and for analyzing data regarding chronotropic responses to exercise.

On the basis of these published data,\(^4\) we have used exercise-related ventilatory responses in conjunction with peak exercise oxygen consumption to evaluate candidates for transplantation for the past 3 years at the University of Pittsburgh Medical Center. We believe that a proper scientific evaluation of the hypothesis that exercise-related ventilatory responses provide additional prognostic information in heart failure beyond that provided by peak exercise oxygen consumption requires a full recognition of all pertinent, previously published studies. Clearly, this is an important area of clinical research that may have a substantial impact on the management of patients with congestive heart failure.

Response

We thank Drs MacGowan and Murali for their letter. We agree that their study,\(^1\) along with ours and those of others,\(^2\) strongly support the view that ventilatory responses to exercise must be carefully considered when risk-stratifying patients with severe heart failure. We are also now routinely incorporating the ventilatory response to exercise in our metabolic stress test reports and in our considerations regarding candidacy for cardiac transplantation.

Michael S. Lauer, MD
Mark Robbins, MD
Fredric Pashkow, MD
Kathy Hoercher, RN
Claire E. Snader, MA
James B. Young, MD
Gary Francis, MD
Department of Cardiology
Cleveland Clinic Foundation
Cleveland, Ohio
lauerm@cesmtp.ccf.org


Guy A. MacGowan, MD, FACC
Srinivas Murali, MD, FACC
Section of Heart Failure and Transplantation Cardiology
Cardiovascular Institute of the University of Pittsburgh Medical Center
200 Lothrop Street
Pittsburgh, PA 15213

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Circulation. 2000;102:e182
doi: 10.1161/01.CIR.102.24.e182

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