

though we have our suspicions, there are no published scientific data that tell us exactly *what* impedes appropriate use of prone positioning, assuming that we now know which patients constitute that group who should benefit from it. The Lung-Safe survey results are certainly germane to the writer's questions of interest but quite tangential to ours.

In short, we understand and agree with Dr Chertoff's frustration with today's reluctance to adopt useful practices, but his lament seems misdirected. These controversy debates are never meant to settle the question or to reach tight consensus, simply to air the relevant issues.

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### STOP-BANG Questionnaire to Screen Sleep-Disordered Breathing for Football Players: Methodological Validity

*To the Editor:*

I read with great interest the article by Dobrosielski et al<sup>1</sup> on their risk assessment for sleep-disordered breathing (SDB) in 51 collegiate football players by using the STOP-BANG questionnaire and finger pulse oximetry device. The STOP-BANG questionnaire consists of the following 8 dichotomous (yes/no) items: snoring, tiredness, observed apnea, high blood pressure, body mass index, age, neck circumference, and male sex. Summing the score, ranging from 0 to 8, was used to specify high-risk and low-risk groups for SDB. The authors defined SDB as an apnea-hypopnea index (AHI) of  $\geq 5$ , and about half of the players were categorized in the high-risk group for SDB by the STOP-BANG questionnaire. There was no significant difference in the prevalence of SDB between the 2 groups, and I surmise that there is no advantage of using the STOP-BANG questionnaire to specify SDB patients in athletes. I have some concerns regarding their study.

First, I think that football players have a tendency toward a large neck circumference and high body mass index, which would not be related to obesity. The STOP-BANG questionnaire was prepared for the general population, and there is difficulty applying the STOP-BANG questionnaire to athletes with muscularity. Taken together, the screening ability of the STOP-BANG questionnaire for football players should be approached with caution.

Second, I question the definition of SDB as AHI of  $\geq 5$ . Chung et al<sup>2,3</sup> overviewed the STOP-BANG questionnaire to screen for obstructive sleep apnea. The authors found that the sensitivity of a STOP-BANG score of  $\geq 3$  to detect moderate to severe obstructive sleep apnea (AHI >15) and severe obstructive sleep apnea (AHI >30) was 93 and 100%, respectively. In addition, corresponding negative predictive values were 90 and 100%. The same authors also presented predictive performance using sensitivity, specificity, positive predictive value, and negative predictive value by citing another reference by the authors.<sup>2,4</sup> These reports showed that specificity and positive predictive value were not satisfactory when a STOP-BANG score of  $\geq 3$  was adopted as a cut-off point, but there is no information in

these references that AHI of  $\geq 5$  was selected for diagnosing or ruling out SDB. Because the prevalence of SDB among collegiate football players was about 8% by using the mild SDB criteria of an AHI of  $\geq 5$ , it seems that the SDB risk is relatively small as compared with the general population.

In summary, predictive performance differs by setting different cut-off points of STOP-BANG score and selecting different values of AHI as an accepted standard. There is a recent report on combination of the STOP-BANG questionnaire and a simple physiological apparatus for detecting obstructive sleep apnea,<sup>5</sup> and it should be considered for further study.

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### STOP-BANG Questionnaire to Screen Sleep-Disordered Breathing for Football Players: Methodological Validity—Reply

*In reply:*

On behalf of my co-authors, I thank Dr Kawada for comments on our recent pa-

per.<sup>1</sup> We do not dispute his principle points, which are that (1) the STOP-BANG questionnaire was prepared for the general population and therefore would not be appropriate to screen athletes with muscularity, and (2) predictive performance of the STOP-BANG differs by selecting different values of apnea-hypopnea index as the accepted standard.

The anatomy of collegiate football players is not normal and therefore would not fit into the models for standardized measures. Indeed, few characteristics of these individuals are normal because of their sleep habits (eg, early morning wake up times for practice), physical training, emotional/mental burden to succeed in their sport and academics, and nutritional requirements to maintain training and body habitus. Related to Dr Kawada's second concern, we point out that the positive cases of sleep-disordered breathing in our study were identified

using a single-channel device. Without comparison with an accepted standard (ie, polysomnogram) in the sample, it may not be the case that the "positives" are true positives. Thus, it is not entirely appropriate to assess the effectiveness of the STOP-BANG when the true and false positives are not known, regardless of what threshold we use to define sleep-disordered breathing.

We emphasize that our a priori decision to use the STOP-BANG as a screening tool was based on the likelihood that it might be incorporated into a sports medicine setting due to its ease of use and simple scoring system *despite* the limitations. Accordingly, we hope our study results and the concerns raised by Dr Kawada help to inform sports medicine decisions as they relate to assessing sleep in athletes. It remains to be seen what is the most suitable screening tool for sleep-disordered breathing in this cohort. In the meantime, a longitudinal assessment of

how these players feel after sleeping and if they are well rested may be the most effective way to identify those at high risk for any sleep disorder.

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