

Letter

Does the asthma visual analog scale relate to the Asthma Control Questionnaire?

Control-based asthma management, comprising a continuous cycle of assessment, adjustment, and review of treatment response, is recommended by the Global Initiative for Asthma (GINA) guidelines.¹ Objective measurement and documentation of asthma control in UK clinical practice are often poor. In the National Review of Asthma Deaths (United Kingdom), of the 69% of patients who had an asthma review before their death, only 27% had any formal assessment of asthma control.² Therefore, having a simple but effective tool to detect changing severity of asthma is important.

The Asthma Control Questionnaire 6 (ACQ-6) is a widely used and well-validated nonbinary metric that strongly predicts future exacerbations.³ It demarcates controlled, partially controlled, and uncontrolled based on cut point scores of less than 0.75, 0.75 to less than 1.5, and 1.5 or greater, respectively.⁴ The asthma visual analog scale (VAS) is a 10-cm continuum that indicates the overall symptom burden⁵ and can be patient or physician administered. It has been demonstrated, in a large Japanese population, to discriminate among GINA-defined categories of controlled, partially controlled, and uncontrolled as less than 1.5 cm, 1.5 cm to less than 7.19 cm, and 7.19 cm or greater, respectively.⁵ The VAS is also effective in adolescents at detecting changes in asthma symptoms, reflecting more detailed multi-item asthma diaries.⁶ We have evaluated for the first time, to our knowledge, whether VAS correlates to ACQ-6 and if the predefined GINA cut points relate to ACQ-6-defined levels of control.

We retrospectively analyzed 84 patients who volunteered for asthma screening in clinical trials at the Scottish Centre for Respiratory Research. All patients gave written informed consent for their anonymized screening data to be used. Patients had to have a physician-based asthma diagnosis for at least 3 months before attending screening and be free of an asthma exacerbation that required steroids for 3 months before screening. Patients underwent basic spirometry (Micromedical, Chatham, United Kingdom), exhaled nitric oxide (FeNO) measurement (NIOX MINO, Circassia Ltd, United Kingdom), and recording of medical history and concomitant medications and completed the ACQ-6 (Qoltech Ltd) and VAS questionnaires. As per Ohta et al,⁵ for the VAS, patients were asked to “put a mark on the line below to indicate how much your symptoms bother you?” with a 0- to 10-cm line presented to the patient, with 0 cm indicating “not at all bothersome” and 10 cm indicating “extremely bothersome.” The mean age of patients was 52

years, and 90% of patients were receiving inhaled corticosteroids (ICS), with a mean beclomethasone dipropionate equivalent dose of 675 µg/d. Of those taking ICS, 80% received a long-acting β_2 -agonist as a combination inhaler, 42% of those receiving ICS also received a concomitant leukotriene receptor antagonist, mean FeNO was 45 ppb, and mean forced expiratory volume in 1 second (FEV₁) was 89% predicted; 63% of patients had a positive skin prick test result, with the mean number of positive skin prick test results being 2.

The VAS correlated with the ACQ-6 (overall Spearman correlation 0.62, $P < .001$). Mean VAS scores for ACQ were 2.2 cm (95% CI, 1.35–3.06 cm) in the controlled (<0.75) group, 2.56 cm (95% CI, 2.61–4.50 cm) in the partially controlled (0.75 to <1.5) group, and 5.27 cm (95% CI, 4.46–6.08 cm) in the uncontrolled group (≥ 1.5) (Fig 1). The VAS did not correlate ($r_s = 0.08$) with FeNO or FEV₁ percentage predicted ($r = -0.18$).

Between-group differences for mean values comparing GINA-defined VAS categories of controlled ($n = 22$) vs partially controlled or uncontrolled ($n = 62$) showed a significant difference for ACQ-6 (0.57 vs 1.73; $P < .001$) but not FEV₁ (89% vs 89%) or FeNO (32 vs 30 ppb).

Between-group differences for mean values comparing ACQ-6-defined categories of controlled ($n = 27$) vs partially controlled or uncontrolled ($n = 57$) showed no significant difference for FEV₁ (91% vs 88%) or FeNO (29 vs 36 ppb). The ACQ-6 score also did not correlate with FeNO ($r = -0.06$).

Receiver operating characteristic curve (ROC) analysis, using ACQ-6 to compare controlled vs partially controlled or uncontrolled, revealed an optimal cut point for VAS of 1.95 cm (area under the curve, 0.8; sensitivity, 88%; specificity, 68%), and comparing controlled vs uncontrolled revealed a VAS cut point of 3.5 cm (area under the curve, 0.7; sensitivity, 66%; specificity, 61%). Furthermore, the GINA-defined cut point of 7.19 cm or greater was associated with a sensitivity of 26% and specificity of 91%.

Our data indicate that the VAS correlated with the overall ACQ-6 score; however, the VAS cut points used to determine GINA-defined control were not tailored to the ACQ-6. The mean VAS of 5.27 (95% CI, 4.46–6.08) for patients with an ACQ-6 score of 1.5 or higher was lower than the 7.19-cm GINA cut point, and the ROC suggested that a much lower VAS score (≥ 3.5 cm) would optimally identify such patients. The corollary is that patients with a VAS score of 3.5 cm or greater should warrant further inquiry about their asthma control (eg, using the ACQ-6) and that the VAS may only be considered a quick screening tool in a busy clinic. Furthermore, the VAS is sensitive to bronchodilation⁷ and can be repeated daily.⁶ The benefit of a daily symptom score, such as the VAS, is that it may obviate recollection errors from retrospective questionnaires⁸;

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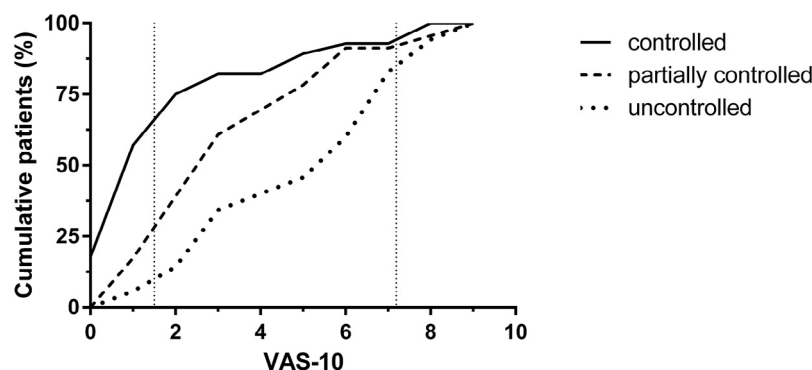


Figure 1. Distribution of Asthma Control Questionnaire 6 control categories relative to visual analog scale 10 (VAS-10) levels. Vertical lines represent Global Initiative for Asthma-defined cut points of controlled (1.5 cm) and uncontrolled (7.19 cm) asthma.

furthermore, in adolescents, the asthma VAS has been evidenced as predictive of future asthma control at 6 months.⁶

The failure of the VAS to correlate with FEV₁ percentage predicted corresponds with data from primary care, where the VAS did not correlate with peak expiratory flow,⁹ suggesting that a proportion of individuals with asthma do not reliably detect changes in their lung function. This finding has been evidenced previously in the context of acute bronchoconstriction.¹⁰

We acknowledge our study has limitations. First, the sample is small and from a single site; therefore, it may not represent the general asthma population. Second, this was a retrospective analysis, which found that VAS cut points correlating to GINA-defined asthma control were not the most suitable for ACQ-6-defined asthma control. The VAS cut points assessed in our study were from a large cross-sectional Japanese population. However, it cannot be assumed that these cut points are generalizable to other regions. A prospective study with a larger sample size, using the lower cut points derived from our ROC analysis, would further clarify how sensitive VAS is at detecting levels of ACQ-6 asthma control of controlled, partially controlled, and uncontrolled asthma. Finally, the VAS is a snapshot of current control, whereas the ACQ-6 is reflective of the previous week.

We conclude that the GINA-defined VAS cutoff (≥ 7.19 cm) is a poor predictor of control in relation to an ACQ-6 score of 1.5 or greater. Hence, further evaluation is required to define the VAS threshold in relation to control defined by the ACQ-6 rather than GINA and whether a decrease in VAS score correlates with a decrease in the ACQ-6 score because change in control is arguably more important than current level.

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