Does the asthma visual analogue scale relate to the asthma control questionnaire?

Jabbal, Sunny; Lipworth, Brian

Published in:
Annals of Allergy, Asthma and Immunology

DOI:
10.1016/j.anai.2017.12.026

Publication date:
2018

Elsevier Editorial System(tm) for Annals of Allergy, Asthma & Immunology

Manuscript Draft

Manuscript Number: 17-11-0589R2

Title: Does the asthma visual analogue scale relate to the asthma control questionnaire?

Article Type: Letters

Keywords: Asthma; VAS; Visual Analogue Scale; ACQ; Asthma Control Questionnaire

Corresponding Author: Professor Brian Lipworth, MD

Corresponding Author's Institution: University of Dundee

First Author: Sunny Jabbal, Mb ChB

Order of Authors: Sunny Jabbal, Mb ChB; Brian J Lipworth, MD

Suggested Reviewers:

Opposed Reviewers:

Response to Reviewers: We thank you for the final review of our manuscript. We have duly acknowledged the last suggestion and changed the manuscript accordingly.

*Title Page

Does the asthma visual analogue scale relate to the asthma control questionnaire?

[1]*Sunny Jabbal Mb ChB,* [1]*Brian J. Lipworth MD.*

[1]*Scottish Centre for Respiratory Research, Ninewells Hospital and Medical School, Dundee, Scotland, DD1 9SY, UK*

Correspondence to: Dr BJ Lipworth, Scottish Centre for Respiratory Research, Ninewells Hospital & Medical School, University of Dundee, Dundee, DD1 9SY. Tel: +44 1382 383188 b.j.lipworth@dundee.ac.uk

Declaration of funding: Existing departmental funds

Word count: *1066*

Both authors have made substantial contributions to the acquisition, analysis and interpretation of data, drafting the article, and give final approval of the version to be submitted.

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 is often poor. In the National Review of Asthma Deaths (UK), 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 (ACQ-6), is a widely used and well validated non-binary metric which strongly predicts future exacerbations(3) . It demarcates between controlled (C), partially controlled (P), and uncontrolled (U), based on cut point scores of <0.75, $\geq 0.75 < 1.5$, and ≥ 1.5 respectively (4). The asthma visual analogue scale (VAS) is a 10cm continuum indicating the overall symptom burden (5), and can be patient or physician administered. It has been demonstrated, in a large Japanese population to discriminate between GINA defined categories of C, P and U as <1.5cm, $\geq 1.5 < 7.19$cm, and ≥ 7.19cm respectively (5). VAS has also been shown to be effective in adolescents at detecting changes in asthma symptoms reflecting more detailed multi-item asthma diaries (6). We have evaluated for the first time whether VAS correlates to ACQ-6, and if the predefined GINA cut points relates to ACQ-6 defined levels of control.

We retrospectively analysed n=84 patients who volunteered for asthma screening into clinical trials at the Scottish Centre for Respiratory Research. All patients gave written informed consent for their anonymised screening data to be used. Patients had to have a physician based asthma diagnosis for at least three months before attending screening, and be free from an asthma exacerbation requiring steroids for 3 months prior to screening. Patients completed basic spirometry (Micromedical, Chatham, U.K.), exhaled nitric oxide (FeNO, NIOX MINO, Circassia Ltd, UK) had their medical history and concomitant medications recorded, and

completed both ACQ-6 (Qoltech Ltd), and VAS questionnaires. As per Ohta et al. patients were asked to perform the VAS, and ~~As per Ohta et al. patients were asked to~~ "p~~P~~ut a mark on the line below to indicate how much your symptoms bother you?", with a 0-10cm line presented to the patient, 0cm= "not at all bothersome", and 10cm= "extremely bothersome" (5).

The average age of patients was 52 years, and 90% of patients were receiving inhaled corticosteroids (ICS) with a mean beclometasone dipropionate (BDP) equivalent dose of 675µg/day. Of those on ICS 80% received a long acting beta-2 agonist (LABA) as a combination inhaler (ICS/LABA), 42% of those receiving ICS also received concomitant leukotriene receptor antagonist (LTRA), mean FeNO was 45ppb, mean forced expiratory volume in 1 second (FEV1) was 89% predicted; 63% of patients had a positive skin prick test, with the mean number of positive skin prick tests being 2.

VAS correlated with ACQ-6, overall Spearman's correlation was 0.62, P<0.001. Mean VAS levels for ACQ were: C (<0.75): 2.2cm (95% CI 1.35-3.06), P (≥0.75<1.5): 2.56cm (95% CI 2.61-4.50), U (≥1.5): 5.27cm (95% CI 4.46-6.08) (Figure 1). VAS did not correlate (r_s= 0.08, p=NS) with FeNO, or FEV_1 % predicted (r=-0.18, p=NS).

Between group differences for mean values comparing GINA defined VAS categories of C (n=22) vs P/U (n=62) showed a significant difference for ACQ: 0.57 vs 1.73 (p<0.0005), but not FEV1: 89% vs 89%, or FeNO: 32ppb vs 30ppb.

Between group differences for mean values comparing ACQ defined categories of C (n=27) vs P/U (n=57) showed no significant difference for: FEV1: 91% vs 88% or FeNO 29ppb vs 36ppb. ACQ score also did not correlate to FeNO (r= -0.06, p=NS).

Receiver operator curve analysis, using ACQ to compare C vs U/P revealed an optimal cut point for VAS of 1.95cm (AUC 0.8, sensitivity 88%, specificity 68%), comparing C vs U

revealed a VAS cut point of 3.5cm (AUC 0.7, sensitivity 66%, specificity 61%). Furthermore the GINA defined cut point of ≥7.19cm was associated with a sensitivity of 26% and specificity of 91%.

Our data showed that VAS correlated with the overall ACQ-6 score, however the VAS cut points used to determine GINA defined control were not tailored to ACQ. The mean VAS of 5.27 (95% CI 4.46-6.08) for patients with an ACQ≥1.5 was not only lower than the 7.19cm GINA cut point, but also the ROC suggested that a much lower VAS value (≥3.5cm) would optimally identify such patients. The corollary is that patients with a VAS≥3.5cm, should warrant further enquiry into their asthma control (e.g. using ACQ), and that VAS may only be considered a quick screening tool in a busy clinic. Furthermore VAS is sensitive to bronchodilation (7) and can be repeated daily (6). The benefit of a daily symptom score such as VAS is that it may obviate recollection errors from retrospective questionnaires (8), furthermore, in adolescents, asthma VAS has been evidenced as predictive of future asthma control at 6 months (6).

The failure of VAS to correlate with FEV_1 % predicted corresponds with data from primary care, where VAS did not correlate to peak expiratory flow (9), suggesting that a proportion of asthmatics do not reliably detect changes in their lung function. This has been evidenced previously in the context of acute bronchoconstriction (10).

We acknowledge our study has limitations. Firstly, the sample size is small, and from a single site, therefore it may not represent the general asthma population. Secondly this was a retrospective analysis, which found that VAS cut points correlating to GINA defined asthma control were not the most suitable for ACQ 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

74 study with a larger sample size, using the lower cut points derived from our ROC analysis
75 would further clarify how sensitive VAS is at detecting levels of ACQ asthma control of C, P,
76 U. Finally, the VAS is a snapshot of current control, whereas the ACQ is reflective of the
77 previous week.

78 We conclude that the GINA defined VAS cut off (≥7.19cm) is a poor predictor of control in
79 relation to an ACQ≥1.5. Hence, further evaluation is required to define the VAS threshold in
80 relation to control defined by ACQ rather than GINA, and also whether a decline in VAS
81 correlates to a decline in ACQ, as change in control is arguably more important as current
82 level.

83

84

***References**

References:

1. 2017 GINA Report: Global Strategy for Asthma Management and Prevention. [cited; Available from: http://ginasthma.org/2017-gina-report-global-strategy-for-asthma-management-and-prevention/
2. Levy ML. The national review of asthma deaths: what did we learn and what needs to change? Breathe (Sheffield, England); 2015. p. 14-24.
3. Meltzer EO, Busse WW, Wenzel SE, et al. Use of the Asthma Control Questionnaire to predict future risk of asthma exacerbation. The Journal of allergy and clinical immunology. 2011 Jan;127(1):167-72.
4. Juniper EF, Bousquet J, Abetz L, Bateman ED. Identifying 'well-controlled' and 'not well-controlled' asthma using the Asthma Control Questionnaire. Respiratory medicine. 2006 Apr;100(4):616-21.
5. Ohta K, Jean Bousquet P, Akiyama K, et al. Visual analog scale as a predictor of GINA-defined asthma control. The SACRA study in Japan. J Asthma. 2013 Jun;50(5):514-21.
6. Rhee H, Belyea M, Mammen J. Visual analogue scale (VAS) as a monitoring tool for daily changes in asthma symptoms in adolescents: a prospective study. Allergy Asthma Clin Immunol. 2017;13.
7. Noseda A, Schmerber J, Prigogine T, Yernault JC. Perceived effect on shortness of breath of an acute inhalation of saline or terbutaline: variability and sensitivity of a visual analogue scale in patients with asthma or COPD. The European respiratory journal. 1992 Oct;5(9):1043-53.
8. Reznik M, Sharif I, Ozuah PO. Classifying asthma severity: prospective symptom diary or retrospective symptom recall? The Journal of adolescent health : official publication of the Society for Adolescent Medicine. 2005 Jun;36(6):537-8.
9. Kendrick AH, Higgs CM, Whitfield MJ, Laszlo G. Accuracy of perception of severity of asthma: patients treated in general practice. BMJ (Clinical research ed). 1993 Aug 14;307(6901):422-4.
10. Rubinfeld AR, Pain MC. Perception of asthma. Lancet (London, England). 1976 Apr 24;1(7965):882-4.

Figure Legend

Figure 1.

Distribution of ACQ control categories relative to VAS levels. Vertical lines represent GINA defined cut points of control (1.5cm) and uncontrolled (7.19cm) asthma.

Figure 1

Click here to download high resolution image