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Patient-reported outcome measures (PROMs) using the MASK-air® app in severe asthma

To the Editor,

Patient-reported outcome measures (PROMs) are increasingly used. They improve shared decision making, symptom management, patient satisfaction and quality of life.[1] PROMs must be carefully defined and accurately measured to capture relevant patient information and to allow them to be compared with other measurements. PROMs may concern signs, symptoms, physical functioning (e.g. sleep), social functioning (e.g. work performance) and others.[2]

The MASK-air® (Mobile Airways Sentinel networK for airway diseases) app is a DG Santé Good Practice for digitally-enabled, patient-centred care in rhinitis and asthma multimorbidity.[3] PROMs in MASK-air® include visual analogue scales (VASs) assessing daily global allergy symptoms, nose, eye and asthma symptoms, dyspnoea, and impact of allergy on work and sleep. These VASs have not been tested in severe asthma. When the study was initiated, severe asthma was defined as a condition requiring the Global Initiative for Asthma (GINA) 4 or 5 level of medications to be controlled or which remains uncontrolled despite that treatment.[4] As an add-on therapy to inhaled corticosteroids and long-acting β-agonists, GINA recommends tiotropium (long-acting anti-muscarinic agent: LAMA) for patients at Steps 4–5 and biologics for those at Step 5.[5]

In this study, we aimed to assess the correlation between VAS asthma and other MASK-air® daily reported PROMs in severe asthmatic patients with nasal symptoms. Considering the definition of severe asthma when this study was initiated, we included daily monitoring data from MASK-air® users aged 16–90 years self-reporting at least 1 day of ICS-LABA+LAMA and/or omalizumab use. We analysed data from 21 May, 2015 to 6 December, 2020 (Appendix S1; Tables S1 and S2).[3]

Among the 17,780 MASK-air® users, 86 met the inclusion criteria and were enrolled (age range: 18–80 years). Twenty-six reported at least 1 day of omalizumab use (with or without LAMAs). A total of 2473 days were reported for patients using omalizumab at least once compared with 2349 days for the remaining participants (averages: 95.1 and 39.2 days per patient) (Table S2).

The correlations between PROMs are shown in Table 1, Figure 1 and Figure S1. Strong correlations were found between VAS asthma and other VASs. The Spearman correlation coefficient between VAS asthma and VAS dyspnoea was 0.898. In addition, to account for the existence of different observations by the same users, repeated measures correlation coefficients were calculated.[6] The repeated measures correlation coefficients were strongest for the associations between VAS asthma and dyspnoea ($\rho = 0.713$), combined symptom-medication score ($\rho = 0.747$) and work ($\rho = 0.658$).

As in any real-world data app study, several common limitations should be considered.[3] Moreover, in this study, there were no diagnoses of asthma reported by physicians or by pulmonary function test. However, patients treated with omalizumab and LAMAs are likely to be asthmatic patients at GINA Steps 4–5, even though we may not exclude other diseases (e.g. LAMA for chronic obstructive pulmonary disease). Another limitation corresponds to the relatively small number of included participants (particularly compared with the number of MASK-air® users), resulting in a lower precision of our estimates.

VAS asthma appears to be an interesting PROM in severe asthma. It is strongly correlated with VAS dyspnoea. The latter may therefore not necessarily be useful for inclusion in MASK-air®, even in this severe form of asthma. VAS asthma was more strongly correlated with

TABLE 1 Correlation coefficients between different PROMs in severe asthma

	N observations	Spearman correlation coefficient (95% CI)	Repeated measures correlation coefficient (95% CI)[5]
VAS asthma *vs* VAS dyspnoea	1862	0.898 (0.879;0.915)	0.713 (0.690;0.735)
VAS asthma *vs* VAS global	4822	0.767 (0.750;0.784)	0.544 (0.524;0.564)
VAS asthma *vs* VAS nose	4822	0.755 (0.738;0.771)	0.465 (0.443;0.487)
VAS asthma *vs* VAS eyes	4822	0.640 (0.620;0.661)	0.378 (0.354;0.402)
VAS asthma *vs* VAS work	1840	0.768 (0.739;0.793)	0.658 (0.631;0.683)
VAS asthma *vs* VAS sleep	4168	0.637 (0.613;0.658)	0.339 (0.312;0.366)
VAS asthma *vs* CSMS	4822	0.875 (0.865;0.884)	0.747 (0.734;0.759)

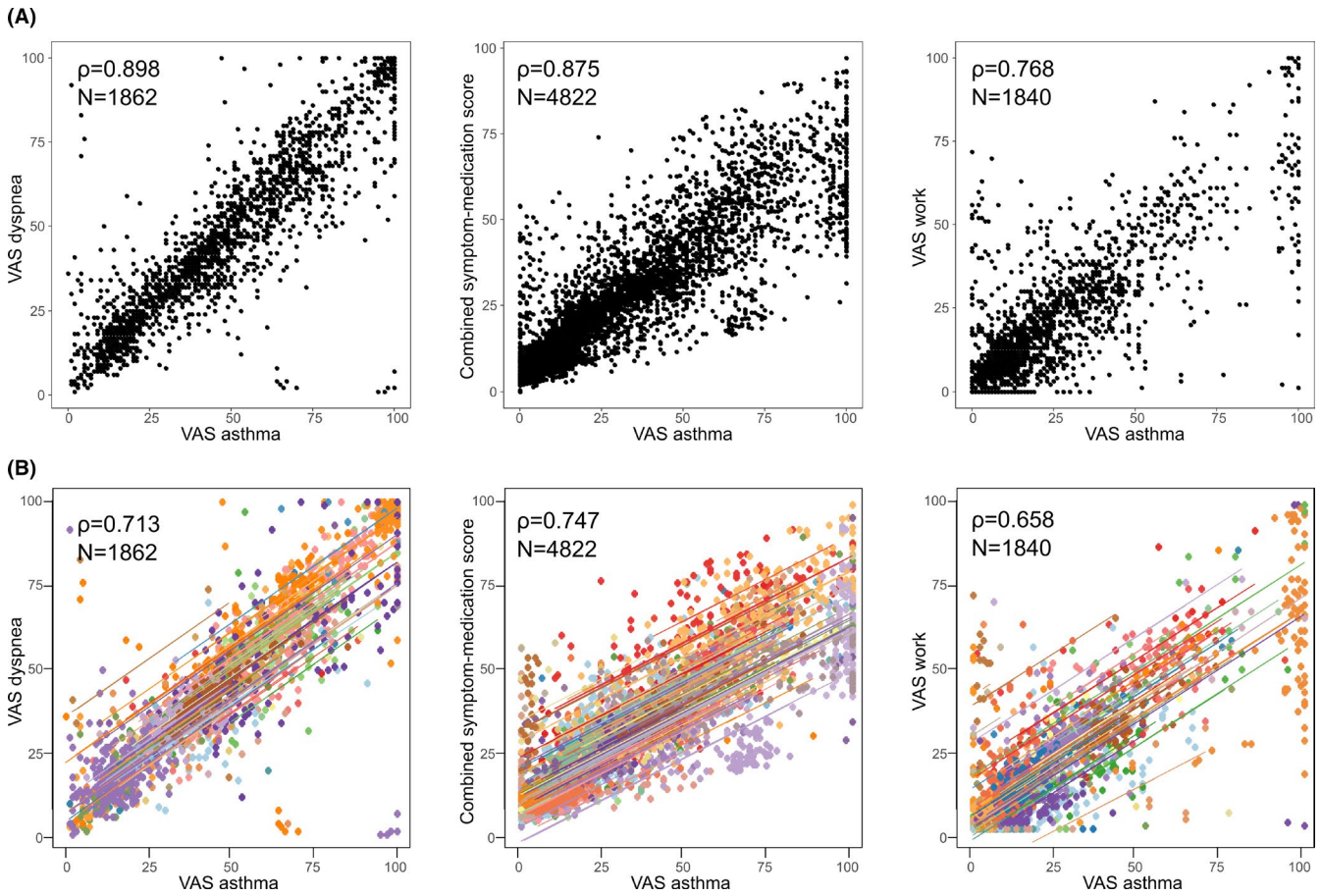

FIGURE 1 Correlations between the visual analogue scale (VAS) assessing the severity of asthma symptoms ('VAS asthma') and (i) VAS dyspnoea, (ii) the combined symptom-medication score and (iii) VAS work. A—Spearman rank correlation coefficients; B—Repeated measures correlation coefficients

other PROMs related to lower airways or to functional domains (e.g. VAS work) than with PROMs related to rhinitis. This indicates good convergent and divergent validity. While results of this study point to a high validity of VAS asthma in severe asthma, future studies with larger samples are needed to assess other properties—including reliability and responsiveness—of this PROM.

CONFLICTS OF INTEREST

JB reports personal fees from Chiesi, Cipla, Hikma, Menarini, Mundipharma, Mylan, Novartis, Sanofi-Aventis, Takeda, Teva, Uriach, other from KYomed-Innov, personal fees from Purina, other from MASK-air, outside the submitted work.

Bernardo Sousa-Pinto[1,2]
Joao A. Fonseca[1,2]
Bilun Gemicioglu[3]
Frederico S. Regateiro[4]
Nicola Scichilone[5]
Maria Teresa Ventura[6]
Jean Bousquet[7]

[1]*Department of Community Medicine, Information and Health Decision Sciences, Faculty of Medicine, University of Porto, Porto, Portugal*
[2]*Center for Health Technology and Services Research, University of Porto, Porto, Portugal*
[3]*Department of Pulmonary Diseases, Cerrahpasa Faculty of Medicine, Istanbul University-Cerrahpasa, Istanbul, Turkey*
[4]*Allergy and Clinical Immunology Unit, Centro Hospitalar e Universitário de Coimbra, and Institute of Immunology, Faculty of Medicine, University of Coimbra, and ICBR - Coimbra Institute for Clinical and Biomedical Research, (iCBR), Facutly of Medicine, University of Combra, Coimbra, Portugal*
[5]*PROMISE Department, University of Palermo, Palermo, Italy*
[6]*Unit of Geriatric Immunoallergology, University of Bari, Bari, Italy*
[7]*Institute of Allergology, Charité – Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin and Fraunhofer Institute for Translational Medicine and Pharmacology ITMP, Allergology and Immunology, Berlin, Germany, Germany*

Correspondence
Jean Bousquet, Institute of Allergology, Charité – Universitätsmedizin Berlin, Corporate Member of Freie Universität Berlin and Humboldt-Universität zu Berlin, Berlin, Germany.
Email: jean.bousquet@orange.fr

ORCID

Bernardo Sousa-Pinto https://orcid.org/0000-0002-1277-3401
Jean Bousquet https://orcid.org/0000-0002-4061-4766

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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Research impact analysis of international funding agencies in the realm of allergy and immunology

To the Editor,

A longitudinal approach should be employed for research and development (R&D) on allergic and immunological diseases across all life stages. To strategically use limited public funds in promoting such R&D, their characteristics of long-term research support and societal implementation should be considered.[1] However, outcomes of the funding research evaluation have focused on conventional, shortsighted indicators. To determine the kind of indicators needed for the funding strategy, we compared the research impact of funding agencies (FAs) in the UK, US, and Japan, utilizing indices related to research substantiality[2] and analyzing index words/abstracts connected with the national strategy for allergy and immunology.[3]

We used AMEDfind—an open database of top-down R&D projects funded by AMED—and selected 53 awards for a Practical Research Project for Allergic Diseases and Immunology (AMED-PPAI) (Figure S1). 1053 papers with verified PubMed IDs were included. As the controls, we selected the Hypersensitivity, Autoimmune, and Immune-mediated Diseases Study Section (NIH-HAI), an immunology-focused project in the Americas, and Human Immunology Unit (MRC-HIU), that in Europe, extracting 373 US papers and 118 UK papers, published in 2015–2019, respectively (see Appendix S1 for all methods).

The Field-Weighted Citation Impact (FWCI)—evaluating research paper quality—was highest for MRC-HIU following NIH-HAI and AMED-PPAI (Table 1, Figure 1A). Although the international co-authorship rate was lowest in the AMED-PPAI, the annual trend showed a gradual increase (Figure 1B, Table 1). The number of top 10% most cited papers[2]/value, evaluating funding efficiency, was highest for MRC-HIU (Table 1).

To characterize these outputs, we performed natural language analyses of the top 50 FWCI papers from three FAs and top 100 papers on this topic during 2015–2019 (Figure 1C–E).[4] Although all FAs produced mainly basic allergy/immunology study papers (e.g., clusters 0, 1, 2, and 9 in Figure 1D), AMED-PPAI produced relatively

Abbreviations: AMED-PPAI, Practical Research Project for Allergic Diseases and Immunology of the Japan Agency for Medical Research and Development; EU, European Union; FA, Funding agency; FWCI, Field-Weighted Citation Impact; MeSH, Medical Subject Headings; METI, Ministry of Economy, Trade and Industry of Japan; MEXT, Ministry of Education, Culture, Sports, Science and Technology of Japan; MHLW, Ministry of Health, Labour and Welfare of Japan; MRC-HIU, Human Immunology Unit of the Medical Research Council; NIH-HAI, Hypersensitivity, Autoimmune, and Immune-mediated Diseases Study Section of the National Institutes of Health; R&D, Research and development; UK, United Kingdom; UMAP, Uniform Manifold Approximation and Projection; US, United States of America.