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BRIEF COMMUNICATION

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The Allergic Rhinitis and its Impact on Asthma (ARIA) score of allergic rhinitis using mobile technology correlates with quality of life: The MASK study

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Abbreviations: AHA, Active and Healthy Ageing; AR, allergic rhinitis; ARIA, Allergic Rhinitis and its Impact on Asthma; EIP on AHA, European Innovation Partnership on Active and Healthy Ageing (DG CONNECT, DG Santé); EQ-5D, EuroQuol; ICT, information and communications technology; MACVIA, Contre les MAladies Chroniques pour un VIellissement Actif; MAFEIP, Monitoring and assessment framework for the EIP on AHA; MASK, MACVIA-ARIA Sentinel NetworK; Q9, Question 9 of WPAI-AS; QOL, Quality of life; SF-36, Short Form 36 questions; VAS, visual analogue scale; WPAI-AS, Work Productivity and Activity Impairment in allergy.

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Abstract

Mobile technology has been used to appraise allergic rhinitis control, but more data are needed. To better assess the importance of mobile technologies in rhinitis control, the ARIA (Allergic Rhinitis and its Impact on Asthma) score ranging from 0 to 4 of the *Allergy Diary* was compared with EQ-5D (EuroQuol) and WPAI-AS (Work Productivity and Activity Impairment in allergy) in 1288 users in 18 countries. This study showed that quality-of-life data (EQ-5D visual analogue scale and WPA-IS Question 9) are similar in users without rhinitis and in those with mild rhinitis (scores 0-2). Users with a score of 3 or 4 had a significant impairment in quality-of-life questionnaires.

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KEYWORDS
Allergic Rhinitis and its Impact on Asthma, EuroQuol, MACVIA-ARIA Sentinel NetworK, rhinitis, Work Productivity and Activity Impairment in allergy

1 | INTRODUCTION

Measures of allergic rhinitis (AR) control include symptom scores, patients' self-administered visual analogue scales (VAS), objective measures of nasal obstruction, a recent modification of the ARIA severity classification, or patients' reported outcomes such as QOL and scores with several items.[1,2] Mobile technology has been used to appraise AR control.[3,4] More information is, however, needed to fully understand the importance of these novel approaches.

MASK-rhinitis (MACVIA-ARIA Sentinel NetworK for allergic rhinitis), an ICT system centred around the patient,[5] is one of the implementation tools of the B3 Action Plan of the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA).[6] A mobile phone app (*Allergy Diary*) central to MASK-rhinitis belongs to the Fondation Partenariale FMC VIA-LR (Ministry of Education and Research, France). App users are asked to complete a short demographic questionnaire, EQ-5D[7-10] and WPAI-AS,[11,12] thus providing baseline characteristics of their disease. The *Allergy Diary* has been launched in 21 countries.[3,4] It was found to be an easy and effective method of assessing symptoms of AR and work productivity. The ARIA score is also available in the Allergy Diary, adding the four components of the impact of AR (sleep, work and school performance, daily activities and bothersome symptoms).

The ARIA score of the *Allergy Diary* was compared with QOL scores of EQ-5D[7-10] and WPAI-AS.[11,12]

2 | METHODS

2.1 | Design of the study

A cross-sectional study on a self-selected population was carried out from 1 June 2016 to 1 June 2017. EQ-5D[7-10] and/or WPAI-AS[11,12] questionnaires are only available in some countries, and not all of the *Allergy Diary* users filled in these questionnaires as they are optional. All users filled in the ARIA score. The ARIA score was compared with the EQ-5D VAS and Question 9 (degree allergy affected regular activities) of the WPAI-AS.

The study is reported according to STROBE.

2.2 | Setting and users

All consecutive users from 1 June 2016 to 1 June 2017 who answered the questions of the EQ-5D[7-10] and/or WPAI-AS[11,12] were included in the study in 18 countries. Some demographic characteristics (age, sex, country and language) were recorded. The App was used by people who found it on Internet, Apple App store, Google Play store or in any other way. A few users were clinic patients that were asked by their physicians to use the app. However, due to anonymization of data, no specific information was gathered.

2.3 | Allergy diary

The app collects information on AR symptoms experienced (nasal and ocular), disease type (intermittent/persistent), how symptoms impact users' lives, and type(s) of AR treatment used (Table S1). The system has been deployed in 21 countries and in 16 languages (translated and back-translated, culturally adapted and legally compliant).

2.4 | Ethics

The Allergy Diary is CE1 registered but not considered by the Ethical Committee of the Cologne hospital of the MHRA (Medicines and Healthcare products Regulatory Agency—GOV.UK) as a medical device as it does not provide recommendations concerning treatment or diagnosis. The terms of use, translated into all languages and customized according to each country's legislation, allow the use of the results for research purposes. The data are anonymized except for geolocalized data that are never totally anonymous. An Independent Review Board approval was not needed.

2.5 | Outcomes

The ARIA score was calculated using the four Q4 questions of the *Allergy Diary* which include impact on daily activities, work and sleep as well as troublesome symptoms (Table S1). Each of the four items was ascribed a score of 1 ("Yes") or 0 ("No"). The total ARIA score ranged from 0 (no impairment) to 4 (severe impairment).

The electronic form of the EQ-5D-5L questionnaire (https://euroqol.org) was applied in the 10 available languages (Danish, Dutch, English, Finnish, French, German, Italian, Polish, Portuguese, Spanish) (Data S1). We assessed the global VAS level and mobility impairment as this was an absent domain in the assessment of AR impairment.

The electronic form of the WPAI-AS questionnaire was applied in the 10 available languages (same as above for EQ-5D)[11,12] according to the package obtained from Reilly and associates (www.reillyassociates.net/WPAI_General.html). The percentage of impairment due to allergy for daily activities (Q9) was the outcome used. (Data S2).

2.6 | Classification of users

Users with any positive answer to Q4 (Table S1) were classified as "rhinitis" (score 0-4). Those with a score of zero were classified as "no rhinitis" if they had no symptom (Q3, Table S1). Those with a positive answer were classified as "rhinitis" (score 0).

2.7 | Statistical methods and analyses

Some users filled in EQ-5D or WPAI-AS more than once for a single day, in which case the first data were used. A non-Gaussian distribution was found for some of the data (Shapiro-Wilk test). However, EQ-5D data are usually reported in means and SD. Since the number of observations was large, we used parametric analyses.

3 | RESULTS

3.1 | Users

Of the 12 179 registered users, 1287 filled in the EQ-5D questionnaire and 1028 the WPAI-AS questionnaire (Table S2). Among the 843 users who filled in both questionnaires, there were 507 women (60%) and 336 men (40%), with a mean (±SD) age of 35 ± 14 years.

3.2 | Main results

Similar levels of EQ-5D VAS and WPAI-AS Q9 were found for users with no rhinitis and for those with an ARIA score of 0-2. There was a significant reduction in EQ-5D VAS levels and a significant increase in WPAI-AS Q9 levels in users with an ARIA score of 3 or 4 (Table 1).

TABLE 1 Mean levels of EuroQuol (EQ-5D) and Work Productivity and Activity Impairment in allergy (WPAI-AS) depending on the Allergic Rhinitis and its Impact on Asthma (ARIA) score

		EQ-5D VAS		WPAI-AS Q9	
		N	m ± SD	N	m ± SD
No rhinitis		48	80.0 ± 19.0	49	27.5 ± 25.5
ARIA score	0	83	77.0 ± 21.3[a]	71	29.9 ± 27.3[d]
	1	403	79.5 ± 19.1	308	20.4 ± 22.1
	2	368	76.2 ± 20.2	268	30.1 ± 23.9
	3	199	72.6 ± 18.7[b]	164	41.4 ± 27.3
	4	186	67.7 ± 23.0[c]	168	45.8 ± 27.7[e]

$P_{a/b} < .0001$, $P_{a/c} < .0001$, $P_{d/e} < .0001$, Student's *t* test.

The repartition of users for both EQ-5D and WPAI-AS (Figure 1) shows that impairment occurred significantly more commonly for ARIA scores of 3 and 4 than for ARIA scores of 0-3. There were from 12% to 16% of users with an EQ-5D VAS level ≥60 in ARIA scores 0-2 whereas the level increased to 26% and 27% in users with an ARIA score of 3 or 4. There were from 19% to 31% of users with a Q9 ≥50 in ARIA scores of 0-2 whereas the level increased to 51% and 53% in users with a score of 3 or 4.

4 | DISCUSSION

This pilot study using mobile technology showed that QOL data (EQ-5D VAS and WPAI-AS Q9) are similar in users without rhinitis as in those with mild rhinitis (scores 0-2). Users with a score of 3 or 4 had a significant impairment in QOL.

4.1 | Strengths and limitations

The strengths and limitations of this study are those of mobile technology lengthily discussed previously.[3,4] In particular, there is a lack of patient characterization that is impossible using an App. However, every observational study we have performed using the *Allergy Diary* has confirmed its interest and was able to identify users with a severe disease. It is likely that mobile technology will become a very important tool for the understanding and management of AR.

One specific problem of the study is that there are more countries with EQ-5D or WPAI-AS reporting than translations in the App. It is not known which translations were employed by users.

In this study, we did not perform subanalyses assessing the importance of symptoms or other factors. We did not investigate the treatments received. As this is a pilot study, these analyses will be carried out once the number of users will have increased.

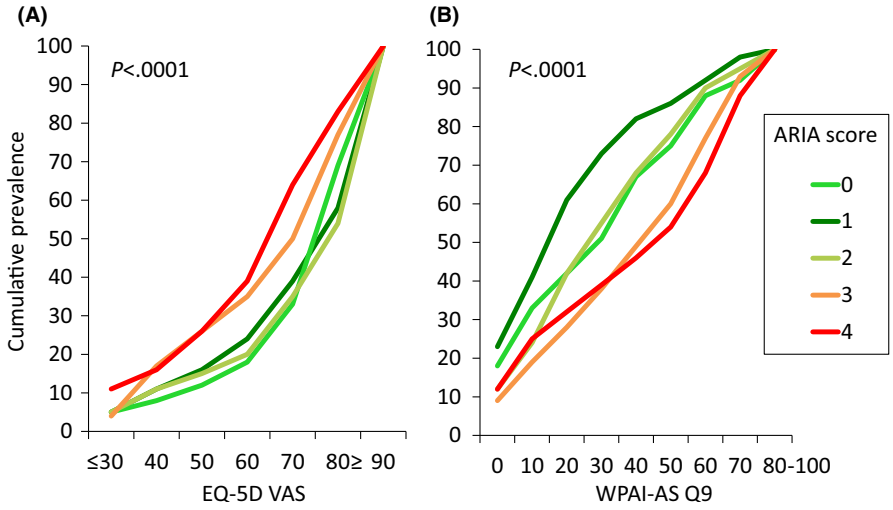

FIGURE 1 Repartition of users depending on EuroQuol (EQ-5D) visual analogue scale (A) and Work Productivity and Activity Impairment in allergy (WPAI-AS) Q9 (B)

4.2 | Generalizability

The EQ-5D scores observed in the study accord with those of previous studies.[8,10] Users with an ARIA score of 3 to 4 have a level similar to that of asthmatic patients with uncontrolled asthma.[13,14] Because of the equal weighing score of ARIA, it is difficult to know whether these differences may be due to specific symptoms (eg, sleep). EQ-5D is a MAFEIP (Monitoring and assessment framework for the EIP on AHA) tool,[15] and the present study is in line with the EIP on AHA. This is another important finding as the Transfer of Innovation of the Allergy Diary is an EIP on AHA scaling up project.[16]

One of the major findings of the study is the very similar results with both tools. This supports use of the ARIA score to assess AR control using mobile technology. The WPAI-AS scores observed in the study are lower than those reported in patients selected by physicians.[11,17-19] This is because many users have mild rhinitis whereas in clinical trials or in patients selected by physicians, AR is usually more severe.

This study also suggests that, in real life, there is a phenotype of severe AR that needs to be considered in terms of public health and cost savings, as the severe form causes disability. This phenotype is in focus with the Finnish Allergy Program.[20]

CONFLICTS OF INTEREST

Dr. BOUSQUET reports personal fees and other from Chiesi, Cipla, Hikma, Menarini, Mundipharma, Mylan, Novartis, Sanofi-Aventis, Takeda, Teva, Uriach, other from Kyomed, from null, outside the submitted work Dr. Devillier reports personal fees from AstraZeneca, GlaxoSmithKline, Meda Pharma, personal fees and non-financial support from Stallergenes, ALK-Abello, Menarini, Chiesi, outside the submitted work Dr. Kuna reports personal fees from Berlin Chemie Menarini, FAES, HAL, ALK, Allergopharma, Adamed, Polpharma, outside the submitted work Dr. Mösges reports personal fees from Allergy Therapeutics, ALK, Allergopharma, Bayer, FAES, Friulchem, GSK, Hexal, Johnson & Johnson, Klosterfrau, MSD, Meda, Servier, Stada, UCB, Nuvo; grants from ASIT biotech, Optima, Leti, BitopAG, Hulka, Ursapharm; grants and personal fees from Bencard, Stallergenes; grants, personal fees and non-financial support from Lofarma, Novartis; non-financial support from Roxall, Bionorica, Atmos; non-financial support from Otonomy, Ferrero, outside the submitted work. Dr. Price reports other from Meda, during the conduct of the study; other from Aerocrine, Almirall, Amgen, AstraZeneca, Boehringer Ingelheim, Chiesi, Cipla, Kyorin, Mylan, Mundipharma, Napp, Novartis, Teva Pharmaceuticals, GlaxoSmithKline, Pfizer, Theravance, Merck, Skyepharma, Zentiva; grants from Aerocrine, AKL Research and Development Ltd, AstraZeneca, Boehringer Ingelheim, British Lung Foundation, Chiesi, Mylan, Mundipharma, Napp, Novartis, Pfizer, Respiratory Effectiveness Group, Teva Pharmaceuticals, Theravance, UK National Health Service, Zentiva; non-financial support from Efficacy and Mechanism Evaluation programme Health Technology Assessment, outside the submitted work; stock options from AKL Research and Development Ltd which produces phytopharmaceuticals; owns 74% of the social enterprise Optimum Patient Care Ltd (Australia, Singapore, and UK) and 74% of Observational and Pragmatic Research Institute Pte Ltd (Singapore). Dr. Siroux reports personal fees from TEVA, AstraZeneca, Novartis, outside the submitted wor Dr. Todo-Bom reports grants and personal fees from Novartis; grants and personal fees from Boehringer Ingelheim, Mundipharma, GSK personal fees from Teva Pharma, AstraZeneca, outside the submitted work.

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REFERENCES

1. Schatz M, Meltzer EO, Nathan R, et al. Psychometric validation of the rhinitis control assessment test: a brief patient-completed instrument for evaluating rhinitis symptom control. *Ann Allergy Asthma Immunol*. 2010;104:118-124.
2. Bousquet J, Schunemann HJ, Hellings PW, et al. MACVIA clinical decision algorithm in adolescents and adults with allergic rhinitis. *J Allergy Clin Immunol*. 2016;138:367-374.
3. Bousquet J, Bewick M, Arnavielhe S, et al. Work productivity in rhinitis using cell phones: the MASK pilot study. *Allergy*. 2017;72:1475-1484.
4. Bousquet J, Caimmi DP, Bedbrook A, et al. Pilot study of mobile phone technology in allergic rhinitis in European countries: the MASK-rhinitis study. *Allergy*. 2017;72:857-865.
5. Bousquet J, Hellings PW, Agache I, et al. ARIA 2016: care pathways implementing emerging technologies for predictive medicine in rhinitis and asthma across the life cycle. *Clin Transl Allergy*. 2016;6:47.
6. Bousquet J, Addis A, Adcock I, et al. Integrated care pathways for airway diseases (AIRWAYS-ICPs). *Eur Respir J*. 2014;44:304-323.
7. Hoehle LP, Speth MM, Phillips KM, et al. Association between symptoms of allergic rhinitis with decreased general health-related quality of life. *Am J Rhinol Allergy*. 2017;31:235-239.
8. Ock M, Jo MW, Gong YH, Lee HJ, Lee J, Sim CS. Estimating the severity distribution of disease in South Korea using EQ-5D-3L: a cross-sectional study. *BMC Public Health*. 2016;16:234.
9. Petersen KD, Kronborg C, Larsen JN, Dahl R, Gyrd-Hansen D. Patient related outcomes in a real life prospective follow up study: allergen immunotherapy increase quality of life and reduce sick days. *World Allergy Organ J*. 2013;6:15.
10. Chen H, Cisternas MG, Katz PP, et al. Evaluating quality of life in patients with asthma and rhinitis: english adaptation of the rhinasthma questionnaire. *Ann Allergy Asthma Immunol*. 2011;106:110-118.
11. Bousquet J, Neukirch F, Bousquet PJ, et al. Severity and impairment of allergic rhinitis in patients consulting in primary care. *J Allergy Clin Immunol*. 2006;117:158-162.
12. Virchow JC, Kay S, Demoly P, Mullol J, Canonica W, Higgins V. Impact of ocular symptoms on quality of life (QoL), work productivity and resource utilisation in allergic rhinitis patients–an observational, cross sectional study in four countries in Europe. *J Med Econ*. 2011;14:305-314.
13. Sullivan PW, Ghushchyan VH, Campbell JD, Globe G, Bender B, Magid DJ. Measurement of utility in asthma: evidence indicating that generic instruments may miss clinically important changes. *Qual Life Res*. 2016;25:3017-3026.

14. Terzano C, Cremonesi G, Girbino G, et al. 1-year prospective real life monitoring of asthma control and quality of life in Italy. *Respir Res*. 2012;13:112.
15. Boehler CE, de Graaf G, Steuten L, Yang Y, Abadie F. Development of a web-based tool for the assessment of health and economic outcomes of the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA). *BMC Med Inform Decis Mak*. 2015;15 (Suppl 3):S4.
16. Bousquet J, Agache I, Aliberti MR, et al. Transfer of innovation on allergic rhinitis and asthma multimorbidity in the elderly (MACVIA-ARIA) - Reference Site Twinning (EIP on AHA). *Allergy*. 2018;73:77-92.
17. Stull DE, Roberts L, Frank L, Heithoff K. Relationship of nasal congestion with sleep, mood, and productivity. *Curr Med Res Opin*. 2007;23:811-819.
18. Meltzer EO, Munafo DA, Chung W, Gopalan G, Varghese ST. Intranasal mometasone furoate therapy for allergic rhinitis symptoms and rhinitis-disturbed sleep. *Ann Allergy Asthma Immunol*. 2010;105:65-74.
19. Colas C, Brosa M, Anton E, et al. Estimate of the total costs of allergic rhinitis in specialized care based on real-world data: the FERIN Study. *Allergy*. 2017;72:959-966.
20. Haahtela T, Valovirta E, Bousquet J, Makela M, Allergy Programme Steering Group. The finnish allergy programme 2008-2018 works. *Eur Respir J*. 2017;49: pii: 1700470.

SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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