THE ROLE OF MASK-AIR/CRUSE IN MANAGING ALLERGIC RHINITIS/ASTHMA AND DIGITALLY-ENABLED, PERSON-CENTERED CARE FOR UKRAINIAN CITIZENS AND REFUGEES

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Abstract. MASK-air is a fully validated mHealth app (Medical Device Class 2a) for the management of rhinitis and asthma. It is operational in 27 countries and 19 languages (over 59,000 users worldwide). It has been highly effective in the screening and management of patients in all countries where it has been tested. The app was acknowledged as a Best Practice of OECD in March 2023 enhancing equity and person-centered care. CRUSE is available, globally, in English, and in 14 countries with national language versions, and used by CSU patients in 31 countries. MASK-air and CRUSE include daily monitoring questionnaires with six Patient-Reported Outcome Measures. A scrollable list of rhinitis and asthma medications is available in each country. Additional validated questionnaires, such as the EQ-ED-5L (EuroQOL) for utility assessment and CARAT (Control of Allergic Rhinitis and Asthma Test) are included. The apps can be easily used up to 75 years.

Key words: bronchial asthma, allergic rhinitis, digital application, MASK-air.

Introduction

In recent years, the rise of mobile health (mHealth) applications has revolutionized the way chronic diseases are managed. Among the most promising digital tools in respiratory medicine is MASK-air (Mobile Airways Sentinel Network), an app designed to support individuals suffering from allergic rhinitis (AR) and asthma. These two chronic respiratory conditions often coexist, creating compounded health challenges that affect millions of people globally. Their overlap, known as the united airways disease model, suggests that upper and lower airway inflammation are interconnected, warranting integrated treatment strategies. Allergic rhinitis and asthma are responsible for significant morbidity, reduced quality of life, and substantial economic burden. The prevalence of AR is estimated at 10–40% globally, while asthma affects over 300 million individuals worldwide. These diseases often result in frequent doctor visits, absenteeism from work or school, and the need for long-term pharmacological treatment. Despite established clinical guidelines such as ARIA (Allergic Rhinitis and its Impact on Asthma) and GINA (Global Initiative for Asthma), many patients experience sub-optimal control due to poor treatment adherence, insufficient education, or inadequate symptom tracking. The MASK-air app was developed in collaboration with the ARIA group to address these gaps. It enables patients to record daily symptoms, medication use, environmental triggers, and overall disease control through standardized tools such as the Visual Analogue Scale (VAS). The app is available in multiple languages and is adapted to various healthcare systems, facilitating its use across Europe and beyond. Its implementation supports patient empowerment, real-world data collection, and clinical decision-making. This literature review synthesizes the findings of ten recent studies (2020–2024) that examine different aspects of MASK-air's development, application, and impact. The review is organized into thematic sections focusing on integrated care, personalized support, outcome measurement, environmental monitoring, implementation challenges, and clinical outcomes. By analyzing these dimensions, this review aims to assess the clinical value and future potential of MASK-air in the management of

AR and asthma. Ukrainian patients complete their questionnaires and daily symptom-medication scores for asthma and rhinitis documentation in MASK-air and CRUSE in the Ukrainian language. In accordance with the General Data Protection Regulation (GDPR), patients can grant their physician access to the app by scanning a QR code displayed on the physician's (or healthcare provider's) computer. This will enable the physician to read the app contents in their own language. The entire process takes less than a minute to display patient data in the physician's web browser.

MASK-air as a Tool for Integrated Care in Chronic Respiratory Diseases

One of the most significant contributions of MASK-air is its role in supporting integrated care models. Integrated care refers to coordinated services that are designed around patient needs, often combining primary, secondary, and community care. For chronic respiratory diseases such as allergic rhinitis (AR) and asthma, integration is crucial, as it ensures continuity of care, reduces duplication, and improves health outcomes. The MASK-air app plays a central role in this context by functioning as a digital bridge between patients and healthcare professionals (HCPs). Patients record daily data on nasal and ocular symptoms, breathing issues, medication adherence, and environmental exposures. This information is visualized through intuitive graphs and summary scores, which clinicians can use to evaluate treatment effectiveness over time. Rather than relying solely on episodic, subjective consultations, providers gain access to longitudinal, real-world data that enhances the clinical encounter.

Moreover, MASK-air aligns with broader public health initiatives. According to Bédard et al. (2021), the app supports the World Health Organization's concept of Integrated Care for Older People (ICOPE), suggesting its relevance not only for young allergy patients but also for multimorbid elderly populations. As many older adults suffer from multiple chronic conditions, the app's capacity to monitor comorbid asthma and rhinitis, along with adherence to treatment regimens, is especially valuable. Another strength of MASK-air lies in its capacity to harmonize care delivery across countries with diverse healthcare infrastructures. Through standardized measures and multilingual interfaces, the app allows for cross-border comparison of treatment effectiveness, symptom burden, and medication usage patterns. The data generated by MASK-air contributes to the creation of reference profiles or "dig-ital phenotypes" that inform public health policy, resource allocation, and population-level disease modeling [1, 8].

Furthermore, studies such as those by De Vries et al. (2022) have demonstrated the app's potential in fostering shared decision-making. Patients who engage regularly with the app report feeling more informed and involved in their care plans. The act of tracking symptoms and visualizing changes over time empowers individuals to understand the impact of triggers, identify when medications are effective, and recognize the need for medical re-evaluation. By improving communication, supporting remote monitoring, and fostering data-driven consultations, MASK-air aligns with the paradigm of person-centered, value-based care. It reduces the reliance on memory recall during visits, enables timely therapeutic adjustments, and encourages patients to take an active role in disease management. This multidimensional functionality positions MASK-air® as a cornerstone of integrated respiratory care in the digital age.

Digitally-enabled, person-centered care to support Ukrainian citizens and refugees

In 2014, the AIRWAYS ICPs (Integrated Care Schemes for Respiratory Diseases) project was launched under the auspices of the European Innovation Partnership on Active Living, Ageing and Health (EIP on AHA, DG CONNECT and DG Santé). The aim of the project was to initiate collaboration to create multi-level integrated care schemes (ICPs) for chronic respiratory diseases for the population of the European Region and beyond, as a project demonstrating the agility of the Global Alliance for Respiratory Disease Control (GARD). MASK-air (Mobile Airways Sentinel Network for airway diseases) is an initiative of ARIA (Allergic Rhinitis and its Impact on Asthma) and aims to create a mobile health strategy for the AIRWAYS ICPs [2-4, 5-7].

The UCARE programme is an initiative of GA²LEN, the Global European Allergy and Asthma Network, established to implement an interactive network of Urticaria Centres of Excellence (UCAREs, REF). Urticaria is a common and often severe, difficult-to-treat condition that can be challenging for both patients and clinicians, especially when it becomes chronic. Since its inception in 2016, the UCARE network has grown to over 130 member centres in over 40 countries. Today, it is one of the largest and most active urticaria consortia and centres with the largest global

reach of patients suffering from urticaria and its associated complications. The global UCARE network aims to collaborate with research projects (REFs), improve patient care and provide education to clinicians and patients through the UCARE LevelUp and UCARE 4U programmes respectively. In 2022, thanks to the results of its CURICT (REF) project, UCARE launched the MASK-air twin mHealth mobile application, CRUSE°, for the treatment of chronic spontaneous urticaria (CSU) [8].

Today, refugees pose many challenges for the healthcare systems of the countries that host them. They include a heterogeneous group of patients with specific needs for medical care. The first link to create this care is the doctors, who must be perfectly trained in providing care, but at the same time they are vulnerable and often have an incorrectly formed understanding of the condition of the allergic patient. Language support plays a particular role here, given the peculiarity of taking anamnesis, doctor-patient communication and other related issues. In turn, a high level of technical language proficiency must be ensured, which is necessary for communication using specific medical terminology [8-10].

The UN Refugee Agency (UNHCR) assessed the situation (January 24, 2023) and concluded that there are slightly less than 8 million Ukrainian refugees living in Europe (https://data.unhcr.org/en/situations/ukraine). Despite the conditions and other difficulties of staying abroad, associations and communities of refugees and doctors are currently almost the only effective means of communication and demonstrate the principles of solidarity and humanism that are characteristic of Europe. About 5 million Ukrainian refugees have registered for temporary protection or other similar national European protection mechanisms. According to estimates, 15-20 % of refugees suffer from allergic diseases, asthma and/or urticaria, and more than 100,000 of them may have a severe course of the disease. However, their number may be higher, which in turn is due to the stressful conditions of stay [11-13].

Some governments offer a wide range of medical services to Ukrainian refugees. However, providing effective medical care will require a special, well-founded medical approach. In addition, continuous improvement of the care system is key and aims to create comfortable interaction with the refugees themselves in order to clarify the problems they face. That is why the provision of personalized medical care is important here. To this end, many different approaches have been proposed to help Ukrainian refugees. But modern conditions require new solutions. Tools such as Google Translate can help, but do not provide detailed collection of the patient's medical history. In addition, the protection of personal data, continuity of patient care regardless of borders is also important. All this can be ensured by implementing certain digital tools, such as the proposed EU Digital COVID, where patients decide personally what sensitive medical information they can provide in each specific case. Also innovative can be a Health Information System that uses data from social networks, mobile medical applications to maintain data confidentiality [14-16].

There is an urgent need for a low-cost, digital, structured, patient-centered healthcare system that will facilitate shared decision-making between Ukrainian allergy patients and European physicians. These changes apply to all levels of healthcare (hospitals, specialists, family doctors, nurses, pharmacists) (Table 1).

Table 1: Conceptualization of the benefits and drawbacks of MASK-air and CRUSE

Added value for the access to primary health and specialized care for the continuity of care.
Improvement of the monitoring of patients.
Help for the integration between social and health care.
The use of the Apps without access to health care professionals is likely to be of little help.

The purpose and action plan of the MASK-air/CRUSE project

On the initiative of Professor Bolesław Samolinski from the Medical University of Warsaw, who directly established contacts with colleagues from Ukraine – Wladyslaw Tsaryk, Andriy Kurchenko and Igor Kaydashev – leading to the creation of a joint working coalition., which offered the MASK-air application to ARIA members as an innovative medical digital device. Initially, a similar concept was developed for the treatment and control of urticaria by M Maurer and became the impetus for the creation of UCRAID (Support for Ukrainian Citizens and Refugees in Allergy, Immunology and Dermatology).

The main goal of UCRAID is to improve the care of Ukrainians with allergies and skin diseases in Ukraine and abroad. The MASK-air/CRUSE action plan is the first stage in the implementation of UCRAID [15].

Major allergic diseases, which include bronchial asthma, allergic rhinitis and chronic urticaria, are the most common chronic diseases in children and adoles-

cents, which prevail among a significant number of refugees. The vast majority of Ukrainian refugees are women, children and adolescents. At this stage of care, language interaction in the health care system is especially important, given the delicacy of collecting patient complaints and the related issues of subsequent correct treatment. According to many data, interaction between refugees themselves is key, avoiding the language barrier, which local doctors often face. That is why ARIA proposed a digital, patient-centered care system using MASK-air, which has been adapted and has a Ukrainian version, to help healthcare workers and Ukrainian refugees establish interaction. In our opinion, MASK-air is the best suited for this. Another important tool that expands the scope of this project is skin diseases and the establishment of interaction between patients and dermatologists, for which a separate CRUSE application was created. The next step is to develop an application for patients with COPD [9]. According to the concept of the developed application, the patient is invited to fill out questionnaires daily for further symptom assessment and correction of drug treatment of asthma, allergic rhinitis (MASK-air®) and urticaria (CRUSE®). In accordance with the requirements of the GDPR, the patient provides his doctor with access to the content of the application. This is done by scanning a QR code, which is then displayed on the doctor's computer screen (MASK-air) and the possibility of further sending this information by e-mail (CRUSE) or in PDF format (MASK-air and CRUSE). Thanks to

this, the doctor will be able to receive application data in his native language. The entire process takes less than one minute to provide patient data to the physician either in the physician's web browser or to send results via email (Table 2).

Considering culturally tailored strategies to meet complex health and social needs may include liaising with local and national support organizations for Ukrainians and refugees. 10Wheals and angioedema, the hallmark clinical features of CSU, are transient and often not present when patients see their physician. Describing their skin lesions to physicians, in a foreign language, is difficult for patients [16].

Essential stepThe CRUSE photodoc feature enables patients to document their skin lesions and share these images, together with the documentation of disease status, with their physician.

The MASK-air/CRUSE Action Plan will follow Kotter's Change Management strategy, previously used in respiratory allergic diseases. The study will be regularly monitored for effectiveness and user acceptance. Data from the MASK-air and CRUSE apps provide valuable insights for healthcare providers and national payers about the unmet needs of this population [8].

MASK-air

MASK-air® is a fully validated app for the management of rhinitis and asthma. It is operational in 27 countries and 19 languages (59,000 users) (Figure 1).

Table 2. How to provide the patients data. Problems and it's solutions

Problems	Solutions
Physicians are often on the front lines, providing care to vulnerable and often misunderstood refugees who are often left without support [8]	It is crucial to offer a straightforward solution that fulfills all the necessary requirements for improved communication and collaborative decision-making
The role of language assistance is particularly important in health care, given the sensitivity of the issues and the high level of technical language competence required to convey medical terminology [9]	This solution should be tailored to medical terminology and aim to bridge the gap between refugees and healthcare professionals
Many different approaches have been proposed to help Ukrainian refugees, but the crisis requires new solutions [14]	An innovative and cost-effective approach involves utilizing a smartphone, operational in 27 countries (both middle and high-income nations)
It is important to engage with the refugees themselves to understand the barriers they face. Culturally tailored strategies to address complex health and social needs may include collaboration with local and national Ukrainian and refugee support organizations (https://www.who.int/europe/news/item/17-01-2023-understanding-the-obstacles-faced-by-ukrainian-refugees-in-romania)	To implement person-centered care
Considering culturally tailored strategies to meet complex health and social needs may include liaising with local and national support organizations for Ukrainians and refugees [10]	This is a vital step

Figure 1: Countries where MASK-air is available in the national language(s).

The number of countries can be easily increased to get the full coverage of Europe.

MASK-air is a Medical Device Class 2A under the European MDR (Medical Device Regulation). It includes a simple daily monitoring questionnaire with six Patient-Reported Outcome Measures (visual analogue scales (VASs) for global allergy symptoms, nose, eyes, asthma, work (and school) and EQ-5D. Moreover, a scroll list of all medications for rhinitis and asthma is available. Additional questionnaires on EQ-ED-5L are included, allowing the assessment of utilities and CARAT (Control of Allergic Rhinitis and Asthma Test). The maturity level of MASK-air® in rhinitis ranges from Technology Readiness Levels (TRLs) 8 to 9. MASK-air is combined with the prediction of the allergen season and air quality (pollution) using COPERNICUS data (Finnish Meteorological Institute). MASK-air includes daily electronic symptom-medication scores for rhinitis and asthma, allowing a daily follow up (Table 1 in Annex 3). MASK-air® has been accorded eight EU grants and projects, It will be a Best Practice of OECD-DG Santé (March 2023) on equity-enhancing, digitally-enabled, person-centred care. MASK-air will soon be available for COPD [18-26].
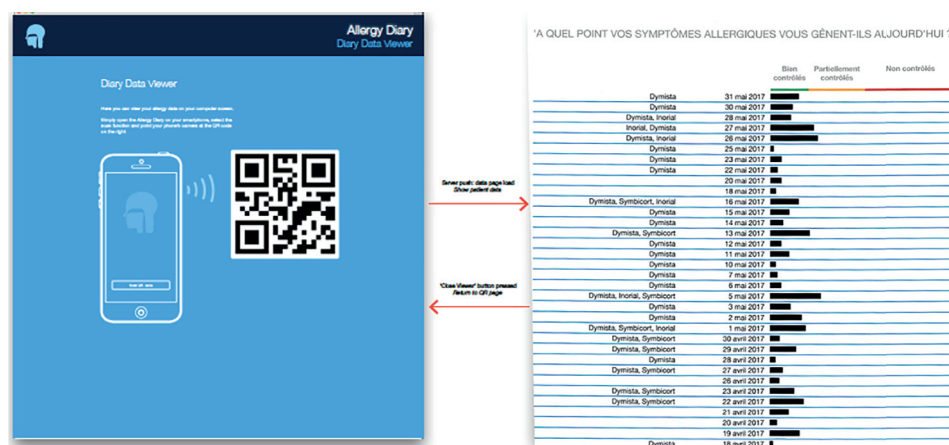

Figure 2: Transfer of patient's data to healthcare professional's computer.

Figure 3: Example of transfer of VAS global.

The MASK-air app has been translated in Ukrainian and is currently ready to be deployed (Figure 4).

Magnitude of the problem

After nearly a year of war, understanding the healthcare access and communication challenges faced by Ukrainian refugees is crucial. An ARIA/UCARE-based assessment was conducted with several organizations. A simple questionnaire (Annex 1) was sent to European, Georgian, and Turkish ARIA and UCARE members to determine if Ukrainian refugees consult specialists and identify unmet needs in Russian-speaking countries and others. We received 223 responses, with 144 (64.6 %) from respondents who had seen at least one Ukrainian refugee in clinical

Figure 4: MASK-air app in Ukrainian.

practice due to allergic diseases or urticaria. Among the 114 respondents, most had seen refugees with asthma (82.6 %) or rhinitis (82.6 %), and fewer for urticaria (45.8 %). Seventeen refugees (11.8 %) had been seen in the Emergency Department. When refugees came alone, 61.0 % of respondents reported communication difficulties. Using electronic translating tools reduced these difficulties. This study supports the MASK-air/CRUSE action plan, ARUCare, and the UCRAID project initiative.

Conclusion

MASK-air represents a pioneering advancement in digital respiratory medicine, offering real-time, personalized, and ecologically valid insights into the management of allergic rhinitis and asthma. By combining symptom tracking, standardized outcome measures, environmental data integration, and health system interoperability, the app empowers patients and enhances clinician decision-making. The ten studies reviewed herein underscore the app's value across clinical, research, and public health domains. MASK-air supports integrated care pathways, enables personalized treatment strategies, and contributes to a deeper understanding of environmental influences on respiratory health. Its robust data infrastructure offers both individual-level benefits and epidemiological insights, establishing a blueprint for future mHealth innovations.

Looking forward, several directions can further enhance the impact of MASK-air:

Artificial intelligence integration could improve predictive analytics for exacerbation risk.

Passive data capture from smart inhalers and wearables may reduce user burden and enrich symptom-context mapping.

Global deployment, especially in low- and middle-income countries, could extend the benefits of digital allergy care to underserved populations.

Policy advocacy using MASK-air data can drive resource allocation, environmental regulation, and allergy awareness campaigns.

Ultimately, MASK-air exemplifies the transformative potential of digital tools in chronic disease management. Its success illustrates how technology, when thoughtfully implemented, can bring medicine closer to the patient – enhancing outcomes, improving quality of life, and supporting a truly connected model of care.

This project can serve as a model for improving chronic disease management amidst language and cultural barriers. The MASK-air and CRUSE solutions can be expanded to enhance care for refugees of other nationalities and can act as a role model for other mHealth tools for Ukrainian refugees with chronic diseases like COPD and cardiovascular diseases.

РОЛЬ MASK-AIR/CRUSE У ЛІКУВАННІ АЛЕРГІЧНОГО РИНІТУ/АСТМИ ТА ЦИФРОВІЙ ПЕРСОНІФІКОВАНІЙ ДОПОМОЗІ ДЛЯ ПІДТРИМКИ ГРОМАДЯН УКРАЇНИ ТА БІЖЕНЦІВ

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Резюме. The aim oMASK-air — це повністю валідований мобільний додаток для мобільного здоров'я (медичний пристрій класу 2а) для лікування риніту та астми. Він працює у 27 країнах та доступний 19 мовами (59 000 користувачів). Він продемонстрував високу ефективність у скринінгу та веденні пацієнтів у всіх країнах, де його було протестовано. У березні 2023 року додаток було визнано найкращою практикою OECP, що сприяє підвищенню орієнтованості на людину. CRUSE доступний у всьому світі англійською мовою та у 14 країнах з версіями національними мовами, і використовується пацієнтами з хронічною кропив'янкою у 31 країні. MASK-air та CRUSE включають анкети для щоденного моніторингу з шістьма показниками результатів, про які повідомляють пацієнти. Окремий список ліків від риніту та астми доступний у версіях для кожної країни. Також є додаткові анкети, такі як EQ-ED-5L (EuroQOL), що дозволяють оцінити корисність, та CARAT (тест на контроль алергічного риніту та астми). Додатки можна легко використовувати пацієнтам віком до 75 років.

Ключові слова: бронхіальна астма, алергічний риніт, мобільний цифровий додаток, MASC-air.

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