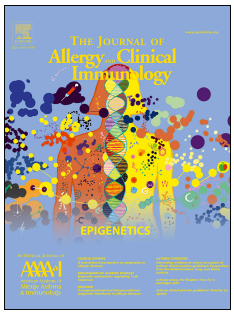
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Abstract

Allergic Rhinitis and its Impact on Asthma (ARIA) has evolved from a guideline using the best approach to integrated care pathways (ICPs) using mobile technology in AR and asthma multimorbidity. The proposed next phase of ARIA is Change Management (CM) with the aim of providing an active and healthy life to rhinitis sufferers and to those with asthma multimorbidity across the life cycle whatever their gender or socio-economic status in order to reduce health and social inequities incurred by the disease. ARIA has followed the 8-step model of Kotter to assess and implement the impact of rhinitis on asthma multimorbidity and to propose multimorbid guidelines. A second change management strategy is proposed by ARIA Phase 4 to increase self-medication and shared decision making in rhinitis and asthma multimorbidity. An innovation of ARIA has been the development and validation of IT evidence-based tools (MASK: Mobile Airways Sentinel Network) that can inform patient decisions on the basis of a self-care plan proposed by the health care professional.

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Abbreviations

AHA: Active and Healthy Ageing

AIRWAYS ICPs: Integrated care pathways for airway diseases

AIT: Allergen immunotherapy

AR: Allergic rhinitis

ARIA: Allergic Rhinitis and its Impact on Asthma

BAMSE: Barn Allergi Milj. Stockholm Epidemiologi Projektet

CDSS: Clinical decision support system

CM: Change management

CM2: Second phase of change management

DG CONNECT: Directorate General for Communications Networks, Content & Technology

DG Santé: Directorate General for Health and Food Safety

DG: Directorate General

EAACI: European Academy of Allergy and Clinical Immunology

EFA: European Federation of Allergy and Airways Diseases Patients' Associations

EGEA: Epidemiological study on the Genetics and Environment of Asthma, bronchial hyperresponsiveness and atopy

EIP on AHA: European Innovation Partnership on Active and Healthy Ageing

EIP: European Innovation Partnership

ELF: European Lung Foundation

EQ-5D: Euroquol

ERS: European Respiratory Society

EUFOREA: European Forum for Research and Education in Allergy

GARD: WHO Global Alliance against Chronic Respiratory Diseases

HCP: Health care professional

ICP: Integrated care pathway

ICT: Information and communication technology

IT: Information technology

JA-CHRODIS: Joint Action on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle

MACVIA-LR: contre les MAladies Chroniques pour un VIeillissement Actif (Fighting chronic diseases for AHA)

MASK: Mobile Airways Sentinel network

MAS: German Multicenter Allergy Study

MeDALL: Mechanisms of the Development of Allergy

mHealth: mobile health

OTC: Over the counter

POLLAR: Impact of air POLLution on Asthma and Rhinitis

QOL: Quality of life

SCUAD: Severe chronic upper airway disease

SDM: Shared decision making

TRL: Technology Readiness level

VAS: Visual analogue scale

WHO: World Health Organization

WPAI-AS: Work Productivity and Activity questionnaire

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Introduction

Allergic Rhinitis and its Impact on Asthma (ARIA) has evolved from a guideline using the best approach [1,5] to integrated care pathways (ICPs) using mobile technology in AR and asthma multimorbidity [6]. The term co-morbidity is commonly used for allergic diseases, but multimorbidity might be more appropriate. Comorbidity is the presence of one or more additional diseases co-occurring with a primary disease or the effect of such additional disorders or diseases. Multimorbidity is a term which means co-occurring diseases in the same patient [7, 8].

ARIA provides an evidence-based approach for managing the patient's needs but real-life data have shown that few patients use guidelines and that they often self-medicate (Menditto, in preparation). Moreover, patients largely use OTC medications dispensed in pharmacies [9,11]. Self-care and shared decision making (SDM) centered around the patient should be used more frequently.

Change is inevitable in health care. ARIA has followed a change management (CM) strategy in the past, but a new revised plan should be considered in order to fill the gaps of knowledge translation into practice and to increase the benefits of self-care in care pathways (ICPs) using the currently-available ICT tools [12]. These changes should prepare and support individuals, teams and organizations in making organizational change centered around the patient for more efficient care.

1- Background

1-1- The four ARIA phases

ARIA was initiated during a World Health Organization (WHO) workshop in 1999 [2] and has evolved in four phases:

Phase 1: Development of an evidence-based document to provide a guide for the diagnosis and management of AR and asthma multimorbidity [1, 2]. In 2008, ARIA was updated using the same recommendation system [1, 13]. ARIA has been disseminated and is implemented in over 70 countries around the world [14].

Phase 2: In its 2010 Revision, ARIA was the first chronic respiratory disease guideline to adopt the GRADE (Grading of Recommendation, Assessment, Development and Evaluation) approach, an advanced evidence evaluation and recommendation methodology for guidelines [3,5]. When guidelines are made using the same methodology, the recommendations are similar [5, 15].

Phase 3: ARIA focused on the implementation of emerging technologies for individualized and predictive medicine to develop ICPs for the management of AR and asthma by a multi-disciplinary group centered around the patients [16,19,20,23] (MASK: Mobile Airways Sentinel Network).

The proposed ARIA phase 4 is CM to provide an active and healthy life to rhinitis and asthma sufferers across the life cycle whatever their gender or socio-economic status with the aim to reduce health and social inequities globally.

1-2- Shared decision making and patient empowerment

In SDM, both the patient and the physician contribute to the medical decision-making process, placing the patient at the centre of the decision-making paradigm [24]. Physicians explain treatments and alternatives to patients who then choose the treatment option that best aligns with their beliefs, lifestyles and goals along with the benefits and risks [25]. In contrast to SDM, the traditional medical care system places physicians in a position of authority, with patients playing a passive role in care. Patients want greater involvement in SDM [26]. An innovation of SDM in ARIA is the use of IT evidence-based tools that can inform patient decisions on the basis of a guided self-management plan proposed by their health care professionals [27]. In asthma, the effectiveness of four SDM studies shows improvement of control and some other parameters but more studies are needed to confirm the data [28].

1-3- Change management

Change is inevitable in health care. However, many change projects fail due to varied belief and cultural circumstances, poor planning, unmotivated staff, deficient communication, or excessively frequent changes [29].

CM aims to prepare and support individuals, teams and organizations in making organizational change. It proposes methods redirecting or redefining resources, business processes, budget allocation and/or modes of operation. When properly applied, CM significantly changes healthcare and its organization. However, health systems differ largely between countries or even regions and a combination of CM with ICPs may be more relevant allowing each organization to use the CM principles according to their needs and regulations. CM deals with different disciplines from healthcare, behavioral and social sciences to IT and business solutions.

Although theories may seem abstract and impractical for healthcare practice, they can help in planning solutions to common healthcare problems [29]. The Lewin's 3-Step model is widely used [30,31]: unfreezing, moving, and refreezing [31]. Lippitt [32] and Kotter [12] have added intermediate steps (Table 1) [29].

Several models of organizational and personal change have been reviewed for respiratory diseases [33]. Kotter's theory has been applied to different fields of medicine [34,36] and pharmacies [37].

2- ARIA Phases 1 and 2 followed the Kotter's 8-step change model

2-1- Goals

Guidelines such as GINA (Global INitiative for Asthma) [38,39], GOLD (Global initiative for Lung Diseases) [40,41], EPOS [42] and ARIA [2, 3, 13] developed a CM strategy that was very effective and produced many updates and revisions while having a positive impact on clinical care and influencing research priorities.

Most guidelines are condition specific but ARIA was unique as it included for the first time the multimorbid component of the airway diseases. Although it followed the patient's perspectives, epidemiologic evidence [43] and some supporting mechanistic studies [44], this concept was not accepted by the leadership of GINA who considered neither the asthma-rhinitis multimorbidity concept nor the benefit for the patients.

2-2- The 8-step model

2-2-1- Establish a sense of urgency

The sense of urgency should identify and highlight the potential threats and the repercussions that might arise in the future by examining the opportunities which can be tapped through effective interventions. In AR and asthma, in the 1990s, the sense of urgency was to provide guidelines that could reduce both the burden of the diseases and the deaths (in asthma). Although there were papers indicating the links between the upper and lower airways [45, 46], the impact of rhinitis on asthma was not fully recognized and ARIA was initiated to better reconize the inter-relationships between the two diseases and to propose multimorbid guidelines.

2-2-2- Create a guiding coalition

The ARIA working group was initiated during a WHO meeting (December 1999) and evolved as a powerful group with 400 members in 70 countries [14]. Members have been working together for years and include all stakeholders needed for CM [1,6]. The patients' organization EFA (European Federation of Allergy and Airways Diseases Patients' Associations) has always been an active member of ARIA.

2-2-3- Develop a vision and strategy

The ARIA vision has always been to provide a guide for the diagnosis and management of AR and asthma multimorbidity, including developing countries,[1, 2] using the best available evidence [3,5]. ARIA has established two major targets: the recognition and implementation of the asthma-rhinitis multimorbidity as well as a new classification (intermittent-persistent and mild-moderate severe AR) to meet patients' expectations. Moreover, ARIA priorities have always included primary care physicians, pharmacists and patients' organizations.

2-2-4- Communicate the change vision

One of the ARIA strengths has been to communicate its vision effectively worldwide. Over 1,000 papers have been posted on Pubmed from over 50 countries using the ARIA recommendations [14]. The number of training sessions in over 70 countries cannot be counted. ARIA has been endorsed by many governments and international organizations: ARIA recommendations have been used for the labeling of allergen immunotherapy by the European Medicine Agency.

2-2-5- Empower others to act on the vision

Organizational processes and structures are in place and are aligned with the overall organizational vision. However, a continuous check is needed for barriers and for people who are resisting change. We have implemented proactive actions to remove the obstacles involved in the process of change.

ARIA has been recognized as the major rhinitis and asthma multimorbidity guideline for years in most countries except for the US and Japan. However, the recent US guidelines are using the evidence-based approach of ARIA (GRADE: Grading of Recommendations, Assessment, Development and Evaluation), and the recommendations are similar [15, 47, 48] to those of ARIA [5]. The recent Japanese guidelines for AR are also making bridges with ARIA [49].

2-2-6- Generate short-term wins

As proposed by Kotter [12], creating short-term wins early in the change process, instead of having one long-term goal, can give a feeling of victory in the early stages of change, which will reinforce support to the strategy.

The concept of asthma and rhinitis multimorbidity is now globally accepted in developed and developing countries [50]. It is now recognized that multimorbidity is independent of IgE-mediated allergy [8, 51] and new phenotypes of severe airway disease have been identified. The implementation of the multimorbid concept in clinical practice has a direct benefit for the patient whose nasal symptoms are often more bothersome than asthma.

2-2-7- Consolidate gains and produce more change

The goals of step 7 [12] are to achieve continuous improvement by analysing the success stories individually and improving from those individual experiences. These goals are exactly those that have been followed by ARIA for the past 18 years.

2-2-8- Anchor new approaches in the culture and institutionalize the changes

The goals of step 8 [12] are met by the ARIA strategy:

1. Discuss widely the successful stories related to change initiatives.
2. Ensure that the change becomes an integral part of the practice and is highly visible.
3. Ensure that the support of the existing as well as the new leaders continues to extend towards the change.

2-3- Results, drawbacks and solutions

ARIA has fully achieved its goals following the 8-step Kotter's model of (Figure 1). The outcome assessment can be measured (i) by the numbers of citations of ARIA. ARIA 2001 has been cited 1750 times, ARIA 2008 over 2300 times (only paper in asthma cited >200 times a year) and ARIA 2010 710 times. This initiative is far better cited than GINA. (ii) By the countries that have endorsed ARIA in their national allergy program: Finland, Malaysia, Philippines, Portugal, Singapore. (iii) By the approval of treatments by agencies: The European Medicines Agency used the ARIA classification in the approval of Acarizax® (mite sublingual immunotherapy).

Some drawbacks have been pointed out in Kotter's change model [12]. In particular, the model is essentially top-down and may discourage any scope for participation or co-creation. In ARIA, we considered that the first CM model was a great success but that it's life cycle had come to an end. It was then decided within the coalition to propose a new CM model based on patients' needs and emerging technologies (CM2 model).

Since the Kotter model cannot be redesigned, we proposed a new maturity CM model based on the same Kotter's 8-step change model [12]. We used ARIA Phase 3 (care pathways for rhinitis and asthma multimorbidity using mobile technology) [6] to better plan the second CM model (CM2 model) and make new assumptions with a patient's centered approach.

3- The *Allergy Diary* strengthens change management

3-1- MASK

In 2012, the European Commission launched the European Innovation Partnership on Active and Healthy Ageing (DG Santé and DG CONNECT) (52). The B3 Action Plan, devoted to innovative integrated care models for chronic diseases, selected integrated care pathways for airway diseases (AIRWAYS ICPs) [53, 54] with a life cycle approach [55] as the model of chronic diseases. An AIRWAYS ICPs Action Plan was devised [53], implemented [54] and scaled up [56, 57]. AIRWAYS ICPs is a GARD (WHO Global Alliance for Chronic Respiratory Diseases) [58] research demonstration project (Figure 2).

MASK, the ARIA Phase 3, is an AIRWAYS ICPs tool [6, 59]. It represents a Good Practice focusing on the implementation of multi-sectoral care pathways using emerging technologies with real life data in rhinitis and asthma multi-morbidity. MASK follows the JA-CHRODIS (Joint Action on Chronic Diseases and Promoting Healthy Ageing across the Life Cycle, 2nd EU Health Programme 2008-2013 [60]) recommendations for good practices [18].

MASK was initiated to reduce the global burden of rhinitis and asthma, by giving the patient a simple tool to better prevent and manage respiratory allergic diseases. More specifically, MASK should help to (i) understand the disease mechanisms and the effects of air pollution in allergic diseases (ii) better appraise the burden incurred by medical needs but also indirect costs, (iii) propose novel multidisciplinary care pathways integrating pollution and patients' literacy, (iv) improve work productivity, (v) propose the basis for a sentinel network at the EU level for pollution and allergy and (vi) assess the societal implications of the project to reduce health and social inequalities globally.

3-2- The *Allergy Diary*

The mobile technology of MASK is the *Allergy Diary*, an App (Android and iOS) freely available for AR and asthma sufferers in 23 countries (16 EU countries, Argentina, Australia, Brazil, Canada, Mexico, Switzerland and Turkey) and 16 languages (translated and back-translated, culturally adapted and legally compliant) [6] (Figure 3). Anonymized users fill in a simple questionnaire on asthma and rhinitis upon registration and daily assess the impact of the disease using a visual analogue scale (VAS) [61] for global allergy symptoms, rhinitis, conjunctivitis, asthma and work. Moreover, a questionnaire is applied every week to assess disease impact on patients' QOL (EQ-5D) [21].

Data of pilot studies in up to 17,000 users and over 95,000 days are available. The *Allergy Diary* has been validated [19] and has shown that (i) totally anonymized geolocation can be used in 23 countries (in preparation), (ii) data can be analyzed in 23 countries and 17 languages, (iii) sleep, work productivity and daily activities are impaired in AR [16, 17], (iv) daily work productivity is associated with AR severity [16], (v) the everyday use of medications can be monitored proposing a novel assessment of

treatment patterns [20], (vi) novel patterns of multimorbidity have been identified [22] and confirmed in epidemiological studies [8, 62] and (vii) over 70% of AR patients self-medicate and are non-adherent to medications (Menditto, in preparation).

The *Allergy Diary* (TRL 9, Technology Readiness level 9) represents a validated mHealth tool for the management of AR. Asthma has also been monitored but data have not yet been analyzed. Economic impact can be monitored using work productivity. The results of the Allergy Diary have made innovative approaches of AR possible and are directly strengthening CM strategies in ARIA.

3-3- Transfer of Innovation of MASK

A Transfer of Innovation (Twinning) project has been funded by the European Innovation Partnership on Active and Healthy Ageing (EIP on AHA) using MASK in 25 Reference Sites or regions across Europe, Argentina, Australia, Brazil, Columbia and Mexico [63]. The number of countries is increasing and MASK should be rapidly operative in the US, China, India (in English only) and Japan. This will improve the understanding, assessment of burden, diagnosis and management of rhinitis in old age by comparison with an adult population. The Twinning has been tested in Germany (Region Kohln-Bonn) in a pilot study that has now been extended to the other German cities and countries of the Twinning project.

3-4- Clinical decision support system

Clinical decision support systems (CDSS) are software algorithms that advise health care providers on the diagnosis and management of patients based on the interaction of patient data and medical information. They should be based on the best evidence to aid patients and health care professionals to jointly determine treatment (SDM). In allergic rhinitis, the MASK CDSS is incorporated into a tablet interoperable with the *Allergy Diary* [64] for health care professionals (*ARIA Allergy Diary Companion*) [6, 59]. This is based on an algorithm to aid clinicians to select pharmacotherapy for AR patients and to stratify their disease severity [65]. This approach will be adapted for the patient's guided self-care in a context of SDM.

3-5- POLLAR

Interactions between air pollution, sleep and allergic diseases are clear but insufficiently understood. POLLAR (Impact of Air POLLution in Asthma and Rhinitis) is a new Horizon 2020 project of the EIT Health (European Institute of Innovation and Technology for Health) that will embed environmental data into the *Allergy Diary*. POLLAR aims at combining emerging technologies (including the *Allergy Diary*, Technology Readiness level TRL9 meaning that the system is proven in operational environment) with machine learning to (i) understand the effects of air pollution in AR and

its impact on sleep, work and asthma, (ii) assess societal consequences, shared with citizens, and professionals (iii) propose preventive strategies including a sentinel network and (iv) develop participative policies.

4- ARIA Phases 3 and 4 deploy a novel Kotter's 8-step change model

4-1- Goals

Although the first CM model developed by the ARIA Initiative was a great success, there are still unmet needs in the treatment of asthma and rhinitis multimorbidity. In ARIA Phase 4, we encourage the participation of all the stakeholders.

4-2- The 8-step model

4-2-1- Establish a sense of urgency

ICPs will include multi-disciplinary structured care plans detailing the key steps of patient care including self-care as proposed by AIRWAYS ICPs [53] (Integrated care pathways for airway diseases). GRADE-based guidelines for physicians are available for AR and their recommendations are similar [3, 5, 15]. However, they are based on the assumption that patients regularly use their treatment and are not tested with real-life data. Unfortunately, adherence to treatment is very low and real-life studies do not necessarily accord with all recommendations [20]. New-generation guidelines embedding real life data are being developed.

4-2-2- Create a guiding coalition

The ARIA working group initiated in 1999 includes over 500 members in 70 countries [14]. A successful coalition working on CM2 has been identified within the group.

The AIRWAYS ICPs coalition was established in 2014 and is part of the European Innovation Partnership on Active and Healthy Ageing (DG Santé and DG CNECT) [53]. Moreover, many national and European scientific societies (European Academy of Allergy and Clinical Immunology (EAACI), European Respiratory Society (ERS) and International Primary Care Respiratory Group (IPCRG)), and other patients' organization (European Lung Foundation (ELF), Asthma UK) have joined the coalition. It is a WHO GARD (WHO Global Alliance against Chronic Respiratory Diseases) demonstration project. Finally, the transfer of innovation of ARIA has been carried out to the Reference Sites of the European Innovation Partnership on Active and Healthy Ageing [63].

This CM2 guiding coalition is already in place in EUFOREA (European Forum for Research and Education in Allergy and Airways Diseases, http://www.euforea.eu) [66].

4-2-3- Develop a vision and strategy

The vision of ARIA phase 4 is to provide CM2 for AR and asthma multimorbidity in order to develop SDM with the ultimate goal of improving AR and asthma control while maintaining quality-of-life and reducing costs, using mobile technology and real-time data management to inform decisions.

The strategy for realizing the changes is based on the patient-centered implementation of ICPs [53] using IT solutions such as the *Allergy Diary* [6].

4-2-4- Communicate the change vision

The updated vision (CM2) will use the experience of the first CM strategy. It has already been discussed among the ARIA CM coalition members and the present paper is the first to be published. However, it takes time to address the concerns of all stakeholders, and papers published recently on the Allergy Diary may help to convince many. ARIA is involving a maximum number of people to deploy the CM vision.

The integration of new paths of understanding health and change is a requirement for the strategy**.** The CM2-model clearly expands and strengthens the potential for actual change to occur and take hold in all kinds of organizations and institutions. Supplementary to the ambition of change in existing practices and institutions, it is also important to consider the integration of other modes of communication and dissemination on the basis of healthy behaviour. A central example is the general need to raise the level of health literacy in society. The general public should clearly not be perceived simply as "patients waiting for something to happen". They should have the ability to navigate and understand health messages, an essential tool for self-managing wellbeing, even before any actual condition or major challenge actually occurs. But to do so, one must consider how to improve this health literacy by integrating it much better into the educational system and cultural settings to which it applies. This is a very long-term investment in self-care and prevention. A later target audience with a higher level of health literacy will naturally also ensure an easier adoption of subsequent health messages, possibly using ICT [67]. The basis for understanding is simply enhanced compared to the previous scenario. In a similar line of thinking, one could also consider a wider community-oriented approach to dissemination. This could also cover social media and self-help groups, as some of the later patients would benefit not only from both personal previous experience and knowledge about these ailments, but also from a supportive environment, that would be better able to support and help these citizens/friends/family members – regardless of age – in their attempt to adapt to new modes of

behavior. This is a wider application of the CM2-model and should also be considered in our work to help patients and citizens.

4-2-5- Empower others to act on the vision

Organizational processes and structures are in place and are aligned with the overall organizational vision. However, we need to continuously check for barriers and for those who are resistant to change and focus on the education of both physicians and patients on how to achieve the best outcomes of treatment. We are acting proactively to remove the obstacles involved in the process of change.

4-2-6- Generate short-term wins

We propose to create new short-term (e.g. 12 months) and medium-term (e.g. 24 months) targets. In 2018, a high-level meeting organized by POLLAR will approach the *improvement in care pathway* design to enhance patient participation, health literacy and self-care through technology-assisted 'patient activation'. In this meeting, rhinitis and asthma multimorbidity will be used as a model of non-communicable disease (Figure 4). Three major aspects of ICPs will be considered: self-care, pharmacy care and next-generation guidelines in which the recommendations of the GRADE-guidelines on AR [5, 15] will be tested in real life using MASK.

4-2-7- Consolidate gains and produce more change

Most of the goals of Kotter's change model step-7 [12] have been met by the ARIA CM and will be further developed in CM2.

Conclusions

For the past 18 years, ARIA has had the major goal of providing a guide for the diagnosis and management of AR and asthma multimorbidity applicable to developing countries [1, 2] using the best evidence [3-5]. ARIA Phases 1 and 2 were developed in accordance to Kotter's 8 step change model and can be used as a model of CM in chronic diseases. However, there are still unmet needs for the management of rhinitis and asthma in real life.

A second CM model has been proposed by ARIA Phases 3 and 4. It was initiated by the development in 23 countries of an App that showed partly unexpected results. Patients with AR (and possibly with asthma) do not follow physicians' advice: they self-medicate. There is an urgent need to harness this information and to update our concept of treatment as well as treatment adherence using mobile technology and care pathways. This is the goal of ARIA Phase 4 and the second wave of CM.

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1467 **Table 1: Examples of planned change management models.** Adapted from (31)

1468

Lewin (68)	Kotter (12)	Lippitt (32)
Unfreezing	*Step 1*: Establish a sense of urgency *Step 2*: Create a guiding coalition *Step 3*: Develop a vision and strategy	*Phase 1:* Diagnose the problem *Phase 2:* Assess motivation and capacity for change *Phase 3:* Assess change agent's motivation and resources
Moving	*Step 4*: Communicate the change vision *Step 5*: Empower others to act on the vision *Step 6:* Generate short-term wins *Step 7*: Consolidate gains and produce more change	*Phase 4:* Select a progressive change objective *Phase 5:* Choose appropriate role of the change agent
Refreezing	*Step 8*: Anchor new approaches in the culture and institutionalize the changes	*Phase 6:* Terminate the helping relationship

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Figure 1: Change management strategy of ARIA Phases 1 and 2

ARIA: Allergic Rhinitis and its Impact on Asthma, BAMSE: Barn Allergi Milj. Stockholm Epidemiologi Projektet , EGEA: Epidemiological study on the Genetics and Environment of Asthma, bronchial hyperresponsiveness and atopy, GRADE, MAS: German Multicenter Allergy Study, MASK: Mobile Airways Sentinel network, MeDALL: Mechanisms of the Development of Allergy, SDM: Share decision making, T2: Type 2 immunity

Figure 2: Links between ARIA and MASK for change management

AIRWAYS-ICPs: Integrated Care Pathways for airway diseases (European Innovation Partnership on Active and Healthy Ageing), WHO CC: World Health Organisation Collaborating Center, DigitalHealthEurope: Digital Transformation of Health in Europe (H2020), Euriphi: Better Health and care, economic growth and sustainable health systems (H2020), GA²LEN: Global Allergy and Asthma European network (FP6), GARD: Global Alliance against Chronic Respiratory Diseases, Good Practice of DG Santé: Good Practice on digitally-enabled, integrated, person-centred care of the Directorate-General for Health and Food Safety (European Commission), ICP: Integrated care pathway, MACVIA-LR: Contre les Maladies Chroniques pour un Vieillisement Actif (European Innovation Partnership on Active and Healthy Ageing), MeDALL: Mechanisms of the Development of ALLergy (FP7), POLLAR: Impact of air POLLution in Asthma and Rhinitis (EIT Health), SPAL: EU Development and Structural Funds, Sunfrail, Twinning: Vigour: (Evidence-Based Guidance to Scale-up Integrated Care in Europe, 3rd Health Programme).

Figure 3: The Allergy Diary

GPDR: General Data Protection Regulation (https://www.eugdpr.org)

Figure 4: Change management based on next-generation ICPs

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F1

Current knowledge (2000)

- Clinical practice: allergic multi-morbidity is common and represents a patient's need
- ECRHS: epidemiologic evidence for allergic multi-morbidity
- Nasal and bronchial biopsies confirm commonalities in rhinitis and asthma

2000

ARIA

Mechanistic, epidemiological and clinical studies reinforcing the ARIA multi-morbidity concept

2010

MeDALL

EGEA

MASK

2017

Multi-morbidity not occurring by chance, independent of IgE

T2 origin of multi-morbidity

Multi-morbid polysensitized phenotype

Novel multi-morbid patterns

ARIA-GRADE guideline

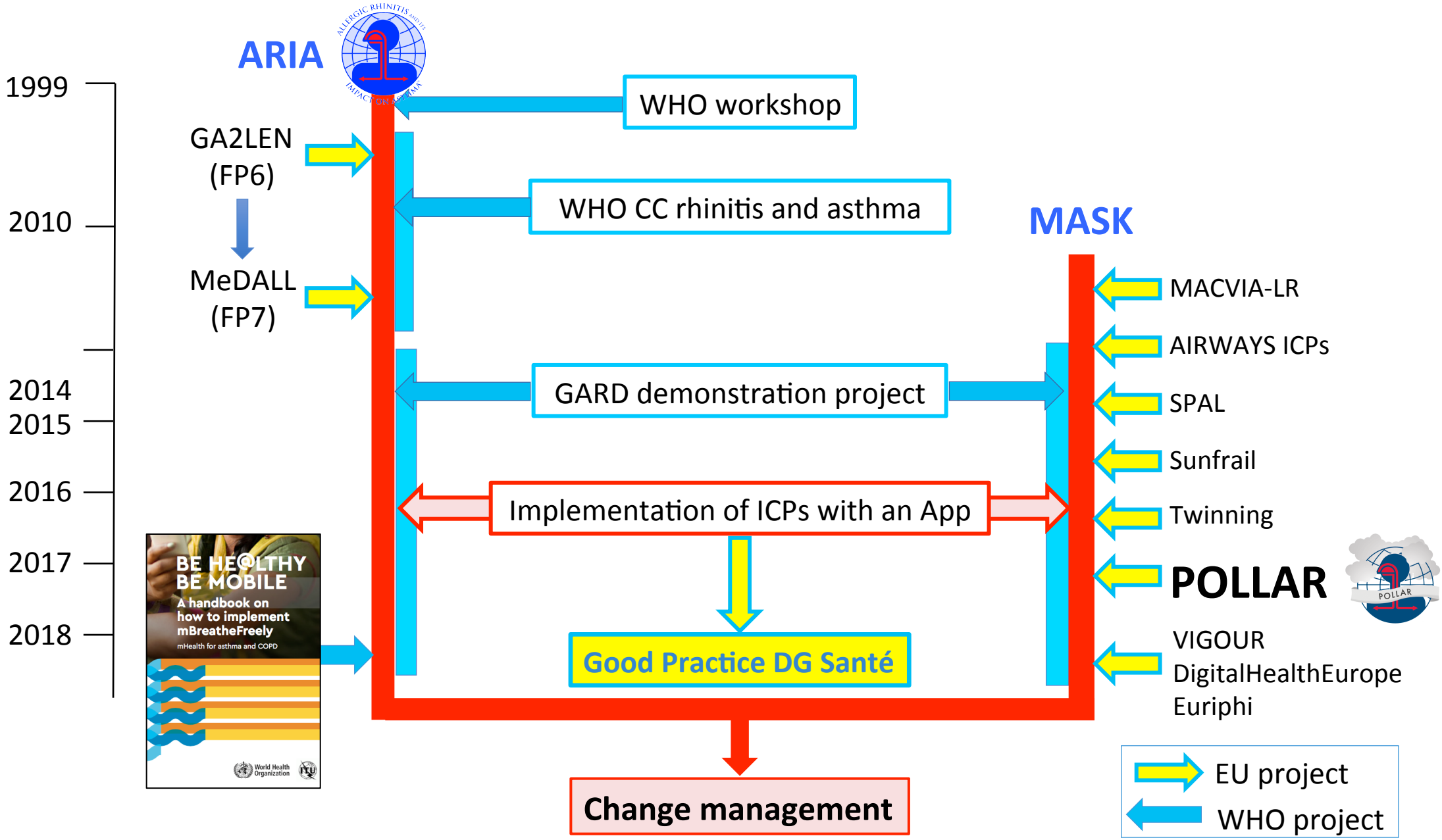
Clinical practice

Birth cohorts (BAMSE, MAS….)

SDM

Change management: allergic multi-morbidity is adopted in clinical practice worldwide

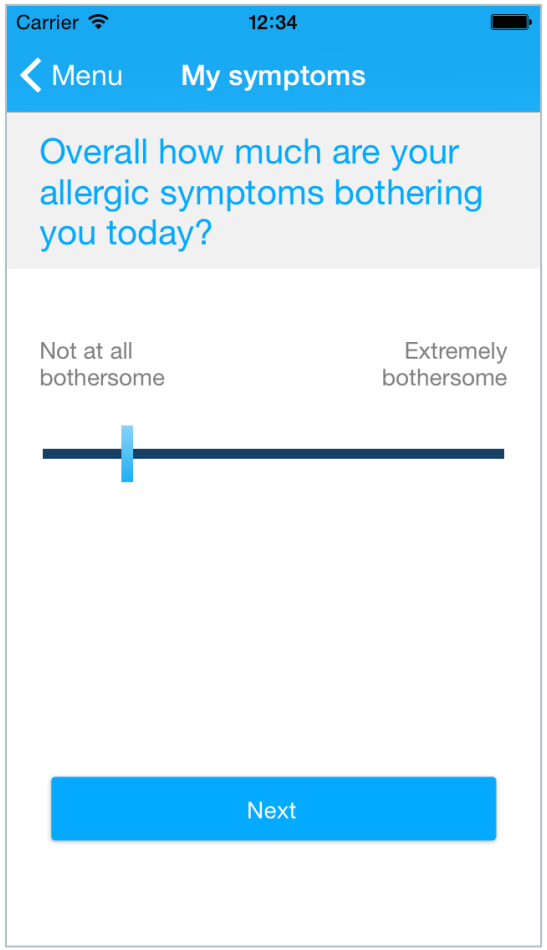
F2


ARIA
1999
2010
2014
2015
2016
2017
2018
GA2LEN
(FP6)
MeDALL
(FP7)
WHO workshop
WHO CC rhinitis and asthma
GARD demonstration project
Implementation of ICPs with an App
Good Practice DG Santé
Change management
MASK
MACVIA-LR
AIRWAYS ICPs
SPAL
Sunfrail
Twinning
POLLAR
VIGOUR
DigitalHealthEurope
Euriphi
BE HEALTHY
BE MOBILE
A handbook on
how to implement
mBreatheFreely
mHealth for asthma and COPD
World Health Organization
EU project
WHO project

F3

The *Allergy Diary*: MASK-air





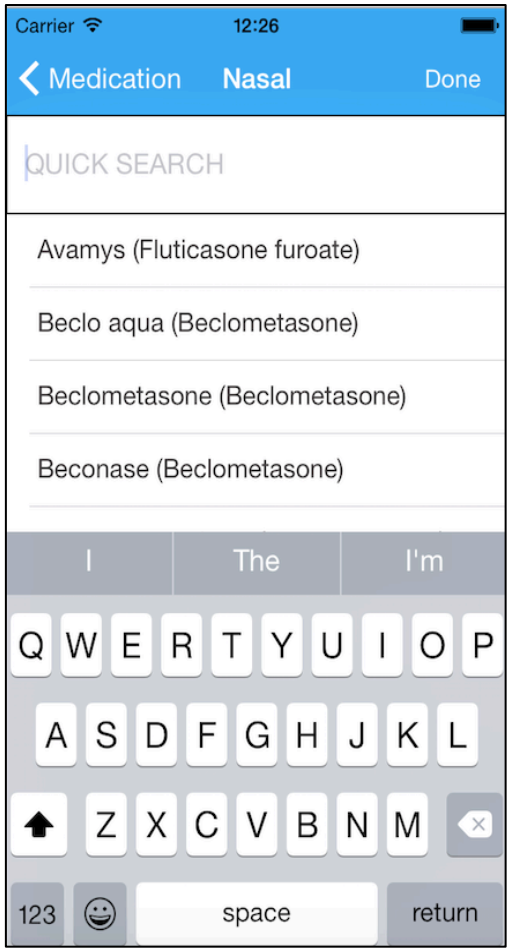
How much are your nose symptoms bothering you today?

How much are your eye symptoms bothering you today?

How much are your asthma symptoms bothering you today?

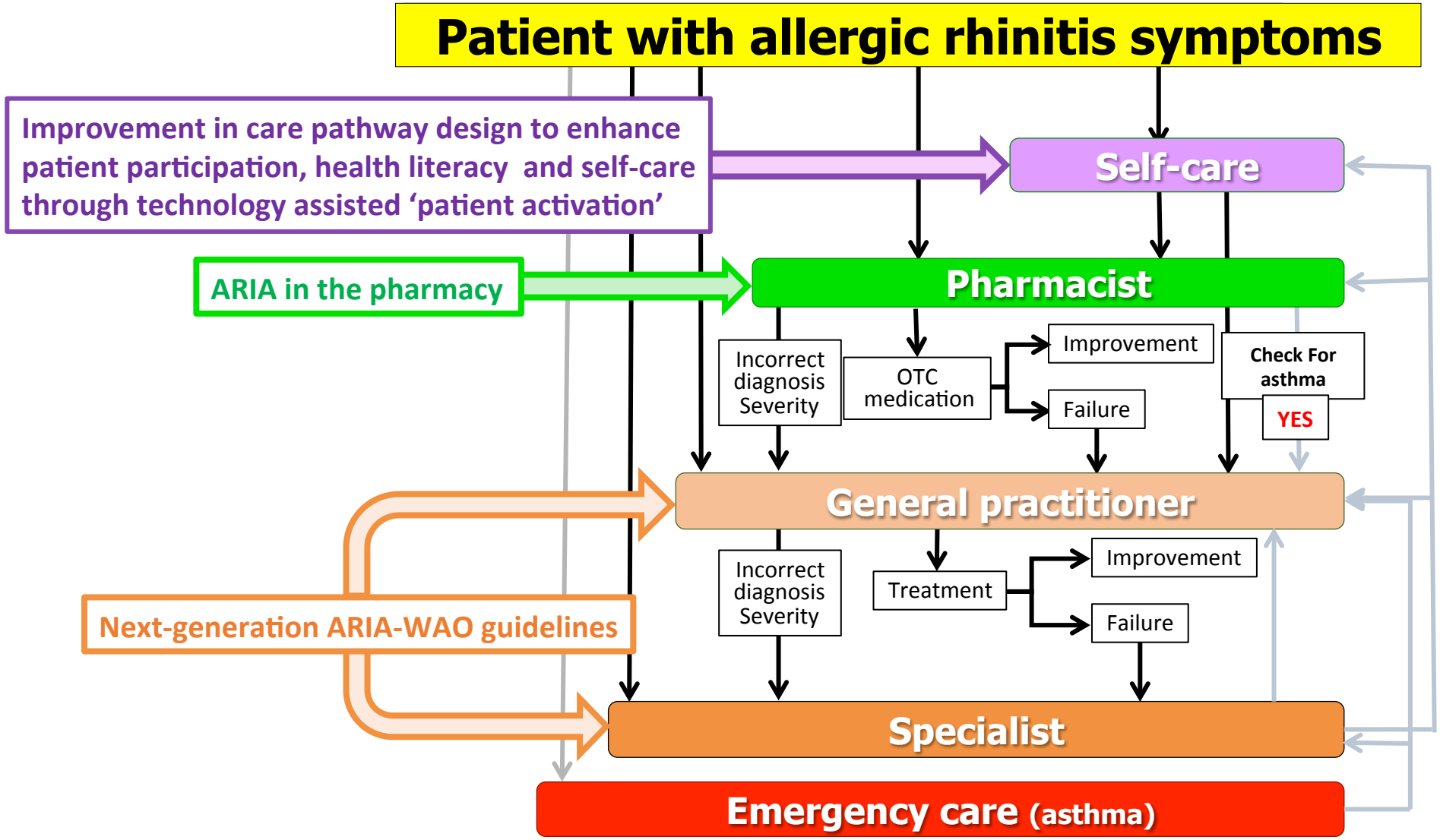
23 countries (+3)
17 languages
25,000 users
180,000 VAS days

GPDR



Free on Android and IOS

F4


Patient with allergic rhinitis symptoms
Improvement in care pathway design to enhance patient participation, health literacy and self-care through technology assisted 'patient activation'
Self-care
ARIA in the pharmacy
Pharmacist
Incorrect diagnosis Severity
OTC medication
Improvement
Failure
Check For asthma
YES
General practitioner
Incorrect diagnosis Severity
Treatment
Improvement
Failure
Next-generation ARIA-WAO guidelines
Specialist
Emergency care (asthma)