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A multi-disciplinary approach to the diagnosis and management of allergic diseases: An EAACI Task Force

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Abstract

Background: Guidelines for management of patients with allergic conditions are available, but the added value of nurses, allied health care professionals (AHPs) and general practitioners (GPs), in the management of allergic disease has not been fully clarified. The European Academy of Allergy and Clinical Immunology (EAACI) appointed a task force to explore this issue.

Aim: To investigate the added value of nurses, AHPs and GPs in management of allergic diseases, in an integrated model of care.

Methods: A search was made of peer-reviewed literature published between 2010 and December 2020 (Cochrane Library, PubMed, and CINAHL) on the involvement of the various specific health care providers (HCPs) in the management of allergic diseases.

Results: Facilitative models of care for patients with allergies can be achieved if HCP collaborate in the diagnosis and management. Working in multidisciplinary teams (MDT) can increase patients' understanding of the disease, adherence to treatment, self-care capabilities, and ultimately improve quality of life. The MDT competencies and procedures can be improved and enhanced in a climate of mutual respect and shared values, and with inclusion of patients in the planning of care. Patient-centered communication among HCPs and emphasis on the added value of each profession can create an effective integrated model of care for patients with allergic diseases.

Conclusion: Nurses, AHPs, and GPs, both individually and in collaboration, can contribute to the improvement of the management of patients with allergic disease. The interaction between the HCPs and the patients themselves can ensure maximum support for people with allergies.

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Introduction

Allergic disorders are currently estimated to afflict between 25- 40% of the population in the developed world [1]. A holistic approach needs to be adopted for the optimal care of people with allergy, with allergists sharing the burden of care with other health professionals [2]. This approach encompass the collaboration of multi-disciplinary teams (MDTs), the composition of which may vary according to the country, the care setting (community, primary, secondary or tertiary), and the severity of the allergies. The MDTs would include nurses, general practitioners (GPs) and allied health professionals (AHPs) (i.e., dietitians, psychologists, physiotherapists, and pharmacists) [3]. These health care providers (HCPs) are known to be actively involved in the clinical management of patients with allergic disease, but the added value of their services has not been fully clarified.

If we accept as a general principle that patient care must be holistic, with the wellbeing and quality of life (HRQL) of patients and their involvement in decisions about their own care playing a central role [4], then, as depicted in Figure 1, TEAMWORK (Team, Enthusiasm, Accessibility, Motivation, Workplace, Objectives, Role, Kinship) becomes the ideal framework for optimal care [5]. A key responsibility of all HCPs is to support the self-management of patients with allergies, with the aim of enhancing their coping abilities and their health related QoL (HRQL) [6,7]. The patients' attitudes, and those of their families and social environment, and the policies of the healthcare system, may all exert an impact on the potential for self-care and self-management. The knowledge and understanding of the distinct role of each HCP is a necessary condition for effective teamwork. The competencies of the team members and the procedures can be improved and enhanced through appropriate delineation of responsibilities, in a climate of mutual respect and shared values, with the common aim of optimal benefit for the patients [8].

Although guidelines for the diagnosis and management of patients with allergic conditions are available, the roles of GPs, nurses and AHPs are not mentioned, and the concept of MDT healthcare for the allergic population is not highlighted. Consequently, obstacles may arise in the effort to achieve optimum patient care. Thus, a task force, the "*Developing a multi-disciplinary approach to the diagnosis and management of allergic disease task force"* was developed under the auspices of the European Academy of Allergy and Clinical Immunology (EAACI). The aim of this task force was to identify the unresolved issues in the diagnosis and management of allergic

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disease, to clearly define the responsibilities of GPs, nurses and AHPs, and to translate the theoretical description into a practical application of a multi-disciplinary approach. A model will be proposed to depict the interaction between the health care sectors and the specific HCPs aimed at the improvement of care for patients with allergic diseases.

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Methods: search strategy

We conducted a search for relevant published original studies, meta-analyses/randomised controlled trails, and systematic reviews pertinent to *"Developing a multi-disciplinary approach to the diagnosis and management of allergic disease – the added value of allied health professionals"* in the databases of peer-reviewed published literature (i.e., Cochrane Library, EMBASE and CINAHL, and MEDLINE) up to December 2020. The keywords used were nurses, allied health care professionals and general practitioners, in combination with, allergy, food allergy, asthma, urticaria, atopic dermatitis.

The search profile and number of papers is presented in table 1. Based on the literature search each author formulated the different health care professionals' role in the management of patient with allergic diseases. Special emphasis was placed on the added value of the collaboration and multidisciplinary teamwork. Thereafter, the first and last author edited and analysed the texts and inserted additional references based on the literature search.

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Results

In an optimum integrated care system for patient with allergy, he/she will: achieve normal growth and development in the young, suffer the least possible disease complications, and the patient/carer will adhere better with medical instructions, gain increased self-management skills, attend the hospital less frequently, and in addition, will have access to patient organizations and will experience good HRQL, overall. The literature review indicated significant unresolved issues in the management of allergic disease according to the above aims, despite the relevant guidelines. It also provided information on the roles of GPs, nurses and AHPs, and the ways in which they can improve the level of care, either independently or through collaboration. The literature findings are reviewed here according to the type of allergy.

Allergic rhinitis and rhinoconjunctivitis

"Obviously, nobody dies from it. But it does cause a tremendous amount of sickness and suffering." (https://www.webmd.com/a-to-z-guides/features/allergies-allergic-rhinitis)

Allergic rhinitis (AR) is characterized by nasal mucosal inflammation, and it affects approximately 40% of the population [9], with a significant impact on HRQL[2]. Pharmacological treatment is usually easily accessible to the patient over the counter (OTC). In most European countries, the first-line management is usually with OTC medications, often suggested by either the GP or the community pharmacist [1]. Guidelines for AR management are currently available for specialist allergists, and also for non-specialist primary care HCPs. Such guidelines have been issued by Allergic Rhinitis and its Impact on Asthma (ARIA), which resolve discrepancies between actual and recommended treatment patterns [4]. The appropriate pharmacotherapy for patients with allergic rhinitis can control the disease, but non-adherence and misinterpretation of treatment instructions by patients are common problems [4]. Patient education and continuing support in self-care should be priority for each certified HCP who prescribes medication [3]. One way of informing and supporting patients is by using e-Health tools, an example of which is the freely available app developed by the Mobile Airways Sentinel network (MASK), as part of the Phase 3 ARIA initiative. This is an information and communication technology system centered on the patients (adolescents and adults). MASK can guide patient decisions, based on a self-care plan proposed by the HCP.

HCPs in the primary health care services can be of great help to many patients with AR, but those with severe forms that persist despite the administration of appropriate initial treatment may need

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investigation, treatment and support from a specialist allergist. Allergen immunotherapy (AIT) is a safe, effective treatment for respiratory and insect venom allergies [4,5], but it should be prescribed by specialists, and administered in an allergy clinic. It can be administered by specialist nurses, who can provide prompt recognition and management of adverse reactions[10].

A common dietary issue for people with AR involves the Pollen Food Syndrome (Oral Allergy Syndrome), a food allergy which is a common comorbidity with AR, due to cross-reactions between pollen allergens and plant food proteins[11]. Pollen Food Syndrome is the most frequent manifestation of new-onset food allergy in adults. It is usually a mild condition with highly characteristic symptoms, which can be diagnosed by GPs and managed by community dietitians [12]. The allergist can further confirm the diagnosis, rule out other severe food allergy and indicate proper food restrictions [13]

It is well recognized that AR impairs HRQL, and may lead to lower performance at work and school [14]. To measure the disease burden of allergies, validated instruments are useful, and that most frequently used in AR is the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) [15]. Such instruments can be administered by all HCPs to assess impairment and to identify those individuals for whom appropriate intervention is needed, including psychological support.

Asthma

"It can feel like I'm breathing through a squished straw." (https://www.self.com/story/people-describe-asthma-attack)

Asthma is a common chronic inflammatory disease of the lower airways, characterized by variable airflow obstruction. Most patients with asthma, both children and adults, can be monitored and managed successfully and cost-effectively in the primary care setting. A GP and a nurse with competence in asthma management, working together with the patient as a team, have been shown to improve the care of individuals with asthma [16]. However, for patients with a more severe disease access to a specialist setting for endo-phenotyping of the disease and appropriate management is essential[17].

In 2019, a fundamental change in asthma management was proposed by GINA. Treatment of asthma with short-acting bronchodilators alone should no longer be recommended for adults and

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adolescents with asthma [18]. Thereafter, a recently published Cochrane review concluded that treatment with a combination with fixed-dose beta agonist and steroid inhaler was s required for adults or children with mild asthma [19]. For patients with severe asthma the use of biologicals may be an alternative. Pharmacological treatment with biologicals have been reported to improve asthma-related outcomes (reducing exacerbations but limited effect on improving asthma control, quality of life or lung function) [20]. To support all patients with asthma, a personalised asthma action plan (written action plan) is recommended [21]. The action plan can be used by all HCP in the dialog with the patient as well as within the MDT.

The long-term goal of asthma treatment is to achieve control of symptoms and maintain normal activity levels [22]. A high proportion of children [23], adolescents [24] and adults, however, have uncontrolled asthma. Having uncontrolled asthma, is associated with both morbidity and also mortality, despite the availability of effective treatments [25]. A nationwide cohort study in Denmark reported an incidence rate of 0.32 per 100,000 person-years among young adults with uncontrolled asthma. [26]

To achieve as good as possible asthma control, regular monitoring of disease control and response to treatment, and exploration of risk factors by an appropriate HCP is important [27]. Through an active partnership with their health care professionals, most patients can achieve good control of their asthma with symptom monitoring, optimal pharmacotherapy, and control of confounding factors.[28]

Patient training in inhalation techniques, self-adjustment of treatment and trigger-avoidance are key components of asthma management. Although educational support can be delivered by all HCPs, it is usually provided by nurses, in both specialist clinics and the primary health care setting, and by pharmacists dispensing asthma medication to the patient. One important part of asthma management is to support the patient to physical activity. A recent systematic review evaluating the effects of physical activity on asthma outcomes suggest that physical activity improves quality of life, as well as asthma control, lung function parameters, and inflammatory serologies among patients with asthma [29]. Advice on the importance of physical activity can be provided by all HCP and should be a natural part of the meeting patients with asthma. The ongoing management and support should be based on shared decision making [30].

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All children and adolescents spend many hours on weekdays at school. However, childhood asthma is associated with high rates of school absenteeism, particularly in children of low socioeconomic status. School nurses, empowered with asthma action plans (AAPs) and relevant health information, can improve care and reduce the risk of asthma exacerbations.

The transition from paediatric to adult health care presents a specific challenge for patients with asthma. Recently published data show that, in general, few asthma-related healthcare consultations take place for adolescents and young adults, and even fewer after their transition to adult health care [31]. These challenges, illustrate a gap between the optimal management described in asthma guidelines and the actual process. Support from appropriate HCPs is required to facilitate the adolescent with asthma in the transfer from paediatric care to adult care, with increasing responsibility for self-management [32]. Good transition needs to begin early in the developmental pathway, and a personalized transition plan needs to be formulated. Multidisciplinary input, with the possible inclusion of dieticians and psychologists, is the key to maturation of the child with asthma into the adult who can utilize the various skills of the MDT in the management of his/her asthma. The role of the dietitian in the care of patients with asthma is usually in the area of weight control, as weight loss in individuals with asthma who have co-morbid obesity may improve their asthma outcome [33]. In addition, individualized dietary advice is needed for patients with asthma and concomitant food allergy (FA). In this situation good control of the asthma reduces the risk of a severe reaction on ingestion of the culprit allergen.[34].

For patients with severe or difficult to control asthma, a psychologist working as part of a clinical MDT can help in anxiety reduction and enhancement of the ability of patients to manage their condition and achieve better self-efficacy, partly by the institution of specific coping practices [35]. Several psychometric instruments, including the Asthma Quality of Life Questionnaire (AQLQ) [36] and the mini-AQLQ [36], are available. They are easy to use by all HCPs to gather subjective information on patients' perceptions of the status of their disease, their overall well-being, behavior, and feelings. It is important to include such instruments in routine clinical practice to monitor the impact of the disease on HRQL, and to indicate the possible need for supportive intervention.

Food allergy

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"I think we do a great disservice to people with EpiPen videos that show people going into respiratory distress and having red flushed hive-covered faces and dropping to the ground; … it doesn't always appear that way." [37].

FA is a common condition, affecting both children and adults, with a considerable worldwide prevalence [38]. There is, however, a wide gap between reported and confirmed FA in both childhood and adulthood, and it is vital for the correct diagnosis to be made [39,40]. Although numerous evidence-based guidelines for the diagnosis and management of FA have been published in the last 10 years, among both patients and HCPs, the knowledge of, and adherence to, such guidelines is variable [41-44].

Unfortunately, accurate diagnosis of FA, even with the use of skin testing and laboratory tests, is not always easy. The gold standard of double-blind, placebo-controlled food challenge is often not possible, because of a lack of specialized allergy clinics with dietitians and specialized nurses. Improving the education of GPs, nurses and dietitians working in primary care could ensure accurate, timely diagnosis and appropriate dietary management of patients with mild symptoms. This is in particular important to avoid unwarranted elimination diets, that may post a nutritional risk and ensure that normal growth and developmental milestones are reached in children [45]. Patients with severe or complex symptoms of FA need access to an allergy clinic or an allergy specialist. An allergy consultation is mandatory for those presenting with anaphylaxis, which is often under-recognized, leading to inadequate or untimely prescription of epinephrine (adrenaline), and/or insufficient patient training on when and how to use it. Educational efforts can reduce this gap in knowledge and improve the safety of patients [46,47].

On top of that, proper diagnosis, and prognosis of the possibility of allergy resolution are key components for management and reassurance of minimum food avoidance [48]. When resolution is not anticipated, allergen specific immunotherapy appears as the only promising future treatment [49].

Constant vigilance and fear of severe or anaphylactic reactions can increase anxiety in patients with FA and result in a tendency to overly restrict their diet [50]. This may lead to poor or erratic eating habits and impairment of the nutritional status, but also curtailment of their social life and an increase in psychological distress for patients, and often their care givers [51,52].

In such a situation, guidance from experienced dietitians and support from psychologists and other HCPs is essential for effective management. Also, in the occasion of food dependent exercise

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induced anaphylaxis the dietitian should provide individualised dietary advice on avoidance of specific food allergens 4-6 h prior to exercise and 1 h after. In line parents, teachers and sports coaches might need to receive special counselling on how to recognise initial symptoms and signs to discontinue exercise immediately [53]. In ideal circumstances, preventive services for patients with FA could be provided by an MDT.

Several questionnaires are available for detecting the impact of FA on the HRQL of patients and their families, including the Food Allergy Quality of Life Questionnaire (FAQLQ) [54], and the Food Allergy Self-Efficacy Scale for Parents [55]. These instruments are easy to administer by HCDs and should be an integral part of the diagnostic work up of FA, providing a basis for the therapeutic approach and monitoring.

Atopic dermatitis

*"My skin would get so dry that it would hurt or even bleed when I turned my body or moved my arms or neck too quickly." (*https://www.self.com/story/what-its-really-like-to-have-eczema*)*

Atopic Dermatitis (AD) or eczema [56] is a chronic disease, that can be driven by both allergic and non-allergic mechanisms, with symptoms ranging from mild to very severe [57].
The goals of treatment of AD are to increase disease control and to extend asymptomatic periods as much as possible, and ultimately to improve HRQL [58]. The first-line treatment of the disease is to repair the skin barrier with emollients and to treat the inflammation with topical glucocorticoids [59,60]. Many patients with AD are undertreated, however, and especially adolescents [61]. When treatment is prescribed and a management plan is put in place, it is important that the patient and/or care giver, receives instructions on how and why to follow the process, but this is not always routine practice [62].
Mild-to-moderate AD can be managed well in the primary care setting by the GP, with nurses providing invaluable advice and practical tips on the use of topical treatments and emollients, and community pharmacists giving information when dispensing the prescribed medications [63,64].
Referral to an allergy/dermatology specialist is advisable for those with moderate/severe, or uncontrolled symptoms, including frequent skin infections or excessive scratching leading to loss of sleep [63].

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The EAACI Global Atlas of Skin Allergy advises that a dietitian should be involved when relevant dietary discussions are undertaken with AD patients and/or their caregivers, as patients with AD may otherwise be subjected to unnecessary dietary restrictions [65]. As approximately one third of children with AD suffer from severe eczema and have a co-existing FA, the dietitian plays an important role in the MDT [66,67].

Living with AD can have a negative impact on HRQL. Some patients with AD report a relationship between emotional distress, pruritus, and scratching [68], suggesting that psychotherapeutic intervention may be efficacious [60,69]. A plethora of HRQL measures have been developed to measure the impact of AD on the HRQL of the patient, including the Dermatology Life Quality Index (DLQI), and specifically for children, the Infants' Dermatitis Quality of Life Index (IDQLI) and the Children's Dermatology Life Quality Index (CDLQI), and for the family, the Parents Index of HRQL in Atopic Dermatitis (PIQoL-AD), [70]. Using these instruments in routine clinical practice, HCPs can assess to what degree the patient and his/her family are affected by the disease, provide personalized therapeutic strategies accordingly, and monitor the response to therapeutic intervention.

Since allergic comorbidity are common among individuals with AD, and AD may be the first step of the atopic march a clinical investigation to rule out or confirm allergic comorbidity by the GP or allergy specialist is an important action [71].

Urticaria

Acute urticaria (AU) or hives, is defined as a spontaneous appearance of wheals, occasionally accompanied with angioedema, for a duration of no more than 6 weeks. It is quite common, but the presentation may be alarming, especially in young children and infants [72]. FA, infections, and drug reactions are often thought to cause AU, leading many clinicians to initiate a series of investigations which may be fruitless, misleading, expensive, and of no benefit to the patient [73,74]. Treatment for AU requires non-sedating antihistamines, and nothing else [75]

Chronic spontaneous urticaria (CSU), often called a "Cinderella" dermatological disease, is urticaria which lasts more than six weeks. Patients with persistent urticaria that cannot be controlled with up to four times the standard dose of non-sedating antihistamines need referral to a specialist.

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The disease burden for patients and their families is seriously underestimated [76], and unpredictable flare ups result in impairment of the physical, psychological and emotional aspects of HRQL [77].

With expert assessment and management, most patients with CSU may achieve control of their disease. Underestimation of the impact of urticaria and prescription of inadequate treatment, in either dosage or duration, can affect the HRQL of the patient. Misinterpretation of the symptoms and signs of AU may lead to misdiagnosis of a systemic allergic reaction and administration of unnecessary medication, such as cortisone or epinephrine. A recent metanalysis has demonstrated an increase in the prevalence of CSU[78]. Nurses have an important role in providing advice on non-pharmacological measures for alleviating CSU and monitoring response to treatment [79].
Dietary interventions have been proposed for urticaria, including a low histamine diet, or the pseudo-allergen diet [80], but none of these, often very restrictive diets, have been particularly successful. A role for the dietitian in the context of expert assessment and management of CSU could be to review the diet of the patients and advise on unnecessary avoidance of foods, and on general nutritional issues.
As the features of urticaria vary between sufferers, appropriate individualized therapy should be decided with the active involvement of the patient. For optimum management of this challenging disease, early referral to a specialist is indicated for patients whose symptoms are unresponsive to antihistamines [81].

Support from patient organizations and support groups

For patients with an allergic disease, participation in evidence-based support groups with medical advisory boards may be useful. Patients with allergies often face obstacles that are indirectly related to the disease complications, but which are generated by financial, family, and social circumstances, and which often interfere with their decision making.
Programs for patients can be organized by nurses, dietitians and/or psychologists, sometimes working in an MDT, who have received training in this area, and who can provide an integrated patient-centered approach on how to live with, and manage, FA as well as allergic diseases [82].
Educational programs for HCPs, patients, teachers, food manufacturers and suppliers, and local communities can also improve food and environmental safety, through the acquisition of knowledge in non-clinical settings [83]

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New advances in healthcare of allergy- Telehealth

In recent years, various forms of telehealth have been developed, using different combinations of teleconsultations, e-health, apps etc. During the Covid-19 pandemic, when healthcare was forced to switch to digital meetings instead of physical visits, this has developed further. A recently published paper demonstrates an important role of telemedicine in management of childhood and adolescent asthma [84]. One other paper investigating the role of teleconsultation during COVID-19 for AD patients present promising results [85]. Moreover, positive results of digital meetings with home spirometry and video consultation for children with chronic respiratory conditions have been presented. In the coming years, HCP will have the opportunity to further develop and evaluate different forms of telehealth.

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Discussion

During the past decade, much research in the field of allergy has been directed towards deciphering allergic disease and improving the capabilities for diagnosis and treatment [86,87]. However, despite the provision of relevant guidelines, many unresolved issues concerning management of patients with allergic disease, particularly in the more complex, moderate, or severe cases, remain. Based on evidence from this careful literature review facilitative models of care for patients with allergies can be achieved if HCP collaborate in the management. Working in multidisciplinary teams (MDT) can increase patients' understanding of the disease, adherence to treatment, self-care capabilities, and ultimately improve quality of life. Patient-centered communication among HCPs and emphasis on the added value of each profession can create an effective integrated model of care for patients with allergic diseases. Since for most allergic disease there is no absolute cure, patients must be provided with maximum support for self-management, with the goal of having the minimum of symptoms and restriction that impact their everyday life.

Emphasis on the value of multidisciplinary collaboration, with patient-centered communication among HCPs [88] is highly significant to improving care. Defining the role of each HCP is critical for collaboration when aiming for optimized integrated care. The current literature review, focused on identifying the crucial role of each member of the MDT, and their level of interaction for optimum allergy management. The scope of such interaction is reduction of the uncertainty caused by the unresolved issues in the diagnosis and care of patients suffering by an allergic disease [3].

Apart from the specialist allergists, GPs, nurses and the various other AHPs can enhance the capability of patients in proactive self-care [89]. They play a significant role in ensuring that patients with allergy are receiving and understanding all the information they need about their disease and its management. They are often more accessible than the allergist, as they meet the patients on an outpatient hospital basis or in the primary health care setting.

It is important to make sure that appropriate and continuous information exchange can take place between the various members of the MTD and the patient, in order to avoid misunderstandings and delays. With the primary principle of recognition of and response to patients' uncertainties

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and emotions, AHPs can fill in their gaps in knowledge about the disease, and its management, but also incorporate structured psychosocial management of their emotional distress, and anxiety [90]. A nurse or another AHP may be the first person to suspect or diagnose an allergy. A school nurse may witness an allergic reaction in a child with no previous history of allergy, or be called on to deal with an asthma exacerbation of asthma at school [91]. A pharmacist may be the first HCP contacted by a patient with allergic symptoms, while patients whose medication is reviewed by a pharmacist are less likely to have inadequate documentation of drug allergies [92]. A dietitian may suspect food intolerance or FA while completing a dietary history on a patient [93]

Another important contribution of nurses and AHPs is to prevent complications in patients with allergy during transitions in care [94]. A recent qualitative study documented young adults with asthma expressed a feeling of being "lost in the transition process" from paediatric care to adult follow-up [95]. EAACI, recognizing the significance of a harmonized transition process, compiled guidelines in which it is proposed that the transition process must commence in early adolescence [32]. A need to facilitate adolescents through this process has been identified, in order to reduce the risk of inappropriate changes in treatment and resultant exacerbations. With the involvement of nurses, GPs and AHPs in MDTs, allergy care can be transformed into a well-organized, accessible, and responsive place for meeting the varied needs of patients.

Effective interaction among the AHPs in the MDT can empower patient self-management and improve health outcomes for patients with allergies, through several pathways, including adherence to treatment, monitoring of symptoms and identification and alleviation of psychosocial distress [96]. The enhancement of self-care is crucial, for both the patients with allergy and the health systems. The "Pyramid of Care in Allergic Disease", as shown in Figure 1, depicts the interrelationship of the level of autonomy, symptom severity and cost, with self-care, and the societal and health care contribution to treatment.

-INSERT FIGURE 1 ABOUT HERE-

Of major importance is the outcome of several recently published systematic reviews, which demonstrate conclusively that nurses and AHPs can establish more facilitative models of care, both working independently and in collaboration with other HCPs to enhance the adherence of patients to their treatment schedule and to improve their self-care capabilities [43,97,98]. Individually, but also as part of MDTs, they can also provide coordination between the various sectors

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implicated in allergy prevention and care, such as the health care system itself, patient organizations, health education, food production and others, with a view to increasing knowledge and understanding of allergy and improving the care paradigms of patients with allergy [99-101].

Conclusions

GPs, nurses and AHPs play an important role in the delivery of integrated care, whereby the health care system and the social environment join forces to improve the quality of facilities, and ultimately the lives of people with allergic disease (Figure 2). Although not all nurses and AHPs can be specialized in allergy care, is highly recommended that these professionals should have basic knowledge about allergic disease, enabling their recognition of allergies, their delivery of supportive allergy management at the primary care level and onward referral of patients to specialist allergy services when indicated, including patients' education. Evidence based patient organisations in countries across Europe including the EAACI Patient Organisation Committee plays an important role in supporting patients with allergy.

-INSERT FIGURE 2 ABOUT HERE-

Proposed model to enhance the individual role and collaboration capabilities of nurses and AHPs in the care of patients with allergy. They can:

1. By defining the role of each HCP involved in the care an optimized integrated care can be achieved.
2. Work actively to support patients with allergic disease with skills for self-care, knowledge of the disease and improved adherence to treatment.
3. Create pathways of collaboration within the health care system, between primary, secondary, tertiary care as well as community care.
4. Provide coordination between the various sectors implicated in allergy prevention and care, such as the health care system itself, patient organizations, health education.
5. Improve competencies among heath care professional in allergy prevention and care.
6. Develop educational material for health care professionals and make the material accessible.

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7. Work towards the spread of knowledge about allergic diseases in the community. A more informed society would ensure that patients feel more included, regardless of the severity of their disease.
8. Fluent communication among health care providers and with the patients' and informal community care

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Table 1. Search history, pertinent to *"Developing a multi-disciplinary approach to the diagnosis and management of allergic disease – the added value of allied health professionals,* final edit on *2021-03-21.*

	Nurses	**Allied health care professionals**	**General practitioners**
	Number of papers	*Number of papers*	*Number of papers*
Systematic reviews			
Allergy	33	6	16
Asthma	31	8	17
Atopic dermatitis	3	1	2
Food allergy	3	0	2
Urticaria	1	0	1
Meta-analyses/Randomised controlled trials			
Allergy	231	10	86
Asthma	188	11	79
Atopic dermatitis	18	1	3
Food allergy	1	0	2
Urticaria	2	0	0
Original articles last 10 years			
Allergy	1277	56	529
Asthma	834	47	392
Atopic dermatitis	86	2	48
Food allergy	99	5	46
Urticaria	42	0	30

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Figure 1

The PYRAMID of Care in Allergic Disease

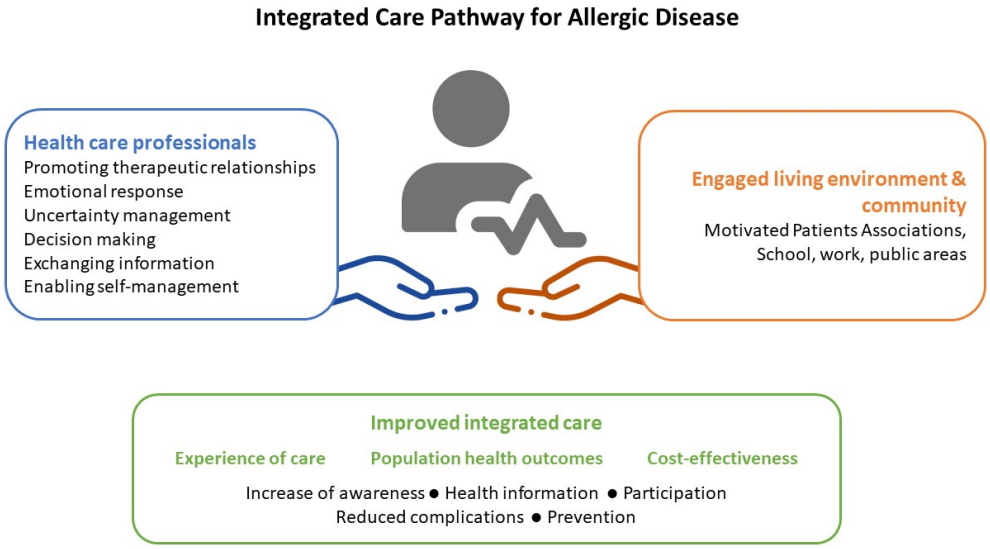
Figure 2

Proposed integrated care pathway model of care aiming for a targeted and productive interaction for the benefit of the patient with allergies.

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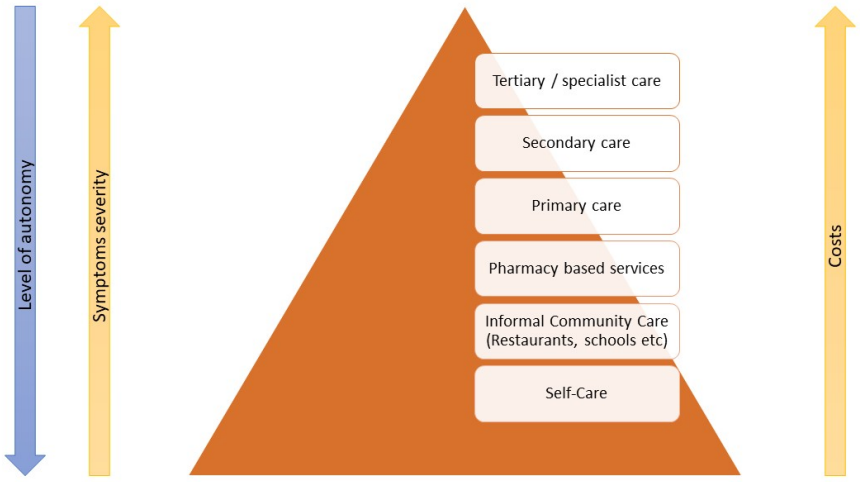
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