

# Limited Reimbursement and Underuse of Digital Healthcare Concepts Are Major Barriers to Clinical Allergological Care in Germany

Anna Katharina Schober<sup>a</sup> Moritz Maximilian Hollstein<sup>b</sup> Regina Treudler<sup>c</sup>  
Sven Becker<sup>d</sup> Jelena Epping<sup>e</sup> Eckard Hamelmann<sup>f</sup> Christian Taube<sup>g</sup>  
Martin Wagenmann<sup>h</sup> Bettina Wedi<sup>i</sup> Margitta Worm<sup>j</sup> Alexander Zink<sup>a</sup>  
Timo Buhl<sup>b</sup> Thomas Werfel<sup>k</sup> Stephan Traidl<sup>k</sup>

<sup>a</sup>Department of Dermatology and Allergology, Technical University of Munich, School of Medicine, Munich, Germany; <sup>b</sup>Department of Dermatology, Venereology and Allergology, University Medical Center Göttingen, Göttingen, Germany; <sup>c</sup>Department of Dermatology, Venereology and Allergology, UMC Leipzig, Leipzig, Germany; <sup>d</sup>Department of Otorhinolaryngology, Head and Neck Surgery, University of Tübingen, Tübingen, Germany; <sup>e</sup>Department of Medical Sociology, Hannover Medical School, Hannover, Germany; <sup>f</sup>Children's Center Bethel, Evangelical Hospital Bethel, University of Bielefeld, Bielefeld, Germany; <sup>g</sup>Department of Pulmonary Medicine, Ruhrlandklinik, University Hospital Essen, Essen, Germany; <sup>h</sup>Department of Otorhinolaryngology, HNO-Klinik, Universitätsklinikum Düsseldorf, Düsseldorf, Germany; <sup>i</sup>Department of Dermatology and Allergy, Comprehensive Allergy Center, Hannover Medical School, Hannover, Germany; <sup>j</sup>Division of Allergy and Immunology, Department of Dermatology, Venereology and Allergy, Charité Universitätsmedizin Berlin, Berlin, Germany; <sup>k</sup>Division of Immunodermatology and Allergy Research, Department of Dermatology and Allergy Hannover Medical School, Hannover, Germany

## Keywords

Allergy · Allergy care · Barrier · Healthcare · Telemedicine

## Abstract

**Introduction:** Allergic diseases represent a broad spectrum of high-prevalence, chronic conditions that remain underdiagnosed and undertreated. The aims of this interdisciplinary, questionnaire-based, non-interventional study were to identify and analyze potential barriers to clinical allergological care in Germany. **Methods:** All hospitals listed in the German hospital register involved in the treatment of allergological patients ( $n = 899$ ) were invited to participate. The study yielded a response rate of 52.1% ( $n = 468$ ). **Results:** Overall, 88.5% of clinics

agreed that allergological care in Germany needs improvement, especially in terms of reimbursement for diagnostics and therapy. More than 80% of participating clinics reported that the decreased availability of test substances and the time-intensity of allergological testing represent relevant barriers. For dermatology and pulmonology, the former is the strongest barrier, while for pediatric and ENT clinics, time-intensity is regarded as the strongest barrier. The availability of good therapy and appropriate guidelines present no barriers to allergological care. Regarding the use of digital healthcare concepts, a very large majority of clinics ( $n = 352$ ;

Trial registration: The study was registered with the DRKS before study initiation (DRKS00026677).

91.4%) do not offer video consultations or the use of health applications in patient care. **Conclusion:** In conclusion, we have identified several structural barriers to allergological care in Germany. Reimbursement and the use of digital healthcare concepts in German clinics providing allergological care need improvement. Based on the results of this study, there is an urgent need for researchers and policymakers to further investigate and support allergology departments in their clinical work and in their implementation of digital healthcare concepts.

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## Introduction

Allergic diseases represent a broad spectrum of high-prevalence and chronic conditions such as allergic rhinitis, allergic asthma, drug allergies, and contact allergies. In Germany, allergic diseases have a lifetime prevalence of about 30% [1]. In Europe, allergic rhinitis alone affects 17–29% of the population [2]. Allergic diseases can be effectively treated with therapies such as allergen-specific immunotherapy (AIT), corticosteroids, and H1-antihistamines [3–6]. Therefore, effective and accessible allergological care benefits the general population and is necessary to meet the increasing medical demands of patients.

In Germany, allergological care is provided by interdisciplinary specialties such as dermatology and pneumology. Consequently, allergology training is structured as a subspecialty that requires a relatively short training duration after completion of another full specialty. However, it is a full specialty in many neighboring European countries [7]. A recent study showed that Germany has the highest number of allergologists per 100,000 inhabitants compared to its neighbors [7]. In Germany, allergological testing and treatment – such as drug provocation tests and induction of AIT with *Hymenoptera* – commonly take place in inpatient settings. This is a further unique facet of allergological care in Germany.

Currently, allergological patients in Germany and Europe remain partly underdiagnosed or inadequately treated [8, 9]. Not only do untreated allergic diseases have a significant impact on quality of life in terms of, for example, participation and sleep [10, 11], but they also cause high socioeconomic strain, inflicting direct healthcare costs as well as resulting in significant loss of productivity [8, 12–15].

To analyze and identify the reasons for this continuing undertreatment, data on the structure of and barriers to allergological care are needed. However, the only comprehensive data on allergological care in Germany are based on a survey of representatives of national allergology societies [7]. There are currently no available care data collected at the level of care providers themselves. Therefore, data on the complex interdisciplinary structure, distribution of responsibilities, and relevant barriers affecting the quality of allergological care in Germany at present are required.

Accordingly, the *Qualitate-GER survey* was initiated by the *German Society for Allergy and Clinical Immunology* (DGAKI). In the first instance, it aimed to capture an accurate picture of clinical allergological care in Germany. It included all hospitals involved in the treatment of allergic diseases and aimed to consider the full spectrum of allergology diagnostics and treatment in Germany.

Based on the data collected in this survey, the aims of the present study were to identify and analyze potential barriers to clinical allergological care in Germany. Furthermore, our findings may provide impetus for a European effort to remove such barriers and improve the care of allergological patients.

## Methods

This questionnaire-based, non-interventional study was conducted between January and February 2022 as separately described [16]. In short, it included all hospitals listed in the German hospital register (*Deutsches Krankenhaus Register*) and involved in the treatment of allergological patients. The chief physicians of hospitals with ten or more beds and a specialization in dermatology ( $n = 114$ ), ENT ( $n = 214$ ), gastroenterology ( $n = 194$ ), pediatrics ( $n = 290$ ), or pulmonology ( $n = 82$ ) were invited to participate in the study by answering either a paper-based or an online version of the study questionnaire. Departments with less than ten beds were excluded.

The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. It was approved by the Ethics Committees of Hannover Medical School (nr. 10036\_BO\_K\_2021) as well as the University Medical Center Göttingen (nr. 25/11/21 Ü) and registered with the DRKS before study initiation (DRKS00026677).

Research Electronic Data Capture (RedCAP, Vanderbilt University, Nashville, USA) was used to digitalize the questionnaires returned via post. Each answer was entered twice; discrepancies were identified and corrected.

IBM SPSS Statistics (28.0.0.0) was used for all analyses; alpha error was set at 0.05. The survey questionnaire and statistical analysis are described in detail in online supplement S1 (for all online suppl. material, see [www.karger.com/doi/10.1159/000529708](http://www.karger.com/doi/10.1159/000529708)).

## Results

As previously described, 468 of 899 departments participated in this study, yielding a return rate of 52.1%. From the 468 participating departments, 150 were specialized in pediatrics, 99 in dermatology, 131 in ENT, 56 in pulmonology, and 24 responses came from other departments. For more details and a cohort description, see the study by Hollstein et al. [16].

### Barriers

Barriers to providing allergology care were reported by all participating clinics (Fig. 1). Most frequently reported as relevant were the decreasing availability of test substances and the time-intensity of allergological diagnostics (81.9% and 80.2%, respectively), with 38.4% and 44.6% of participating departments rating them as strong barriers to allergological care. More than 50% of participants saw relevant barriers in the cost-intensity of allergological diagnostics (77.0%), official regulations making testing more difficult (72.7%), risks accompanying allergological tests (61%), and the existence of higher priorities in clinical care (56.8%).

Potential barriers related to allergological therapy itself were considered least relevant by the participating departments. Among those, the potential barriers were (i) insufficient availability of good therapy and (ii) lack of appropriate guidelines. However, they were only cited by 22.8% and 18.6% of clinics, respectively.

### By Specialty

Grouping responses by department specialization revealed that the disciplines perceived differences in the relevance of barriers they faced. For both dermatology (67.0%) and pulmonology (45.2%) clinics, decreased test substance availability was the overall strongest barrier. Conversely, pediatric (41.7%) and ENT (39.6%) clinics cited the time-intensity of allergological diagnostics most often as a barrier.

In general, dermatological clinics cited barriers regarding test substance availability, time- and cost-intensity of diagnostics, and restrictions by official regulations more frequently than other specialties. Unique to pulmonological clinics was that they cited barriers particularly associated with priorities other than allergic diseases and barriers related to an unclear distribution of responsibilities (Fig. 2).

### Factors Associated with Reporting Barriers

Next, we performed a multiple logistic regression analysis to determine for the most relevant barriers and

potential influencing factors (Fig. 1b). Citing the decrease in test substance availability as a strong barrier was found to coincide with the performance of allergological training (OR 3.30; 95% CI 2.02–5.39) and the city size of the clinic (OR 1.70; 95% CI 1.04–2.77). Performing allergen immunotherapy (OR 0.47; 95% CI 0.24–0.93) and being located in a bigger city (OR 0.27; 95% CI 0.08–0.86) were negatively associated with perceiving an unclear distribution of responsibilities as a strong barrier. Clinics with a high proportion of allergological outpatients in relation to total outpatients and clinics performing AIT were less likely to agree with the statement that other diseases have a higher clinical priority (OR 0.52 and 0.47, respectively).

### Opinions

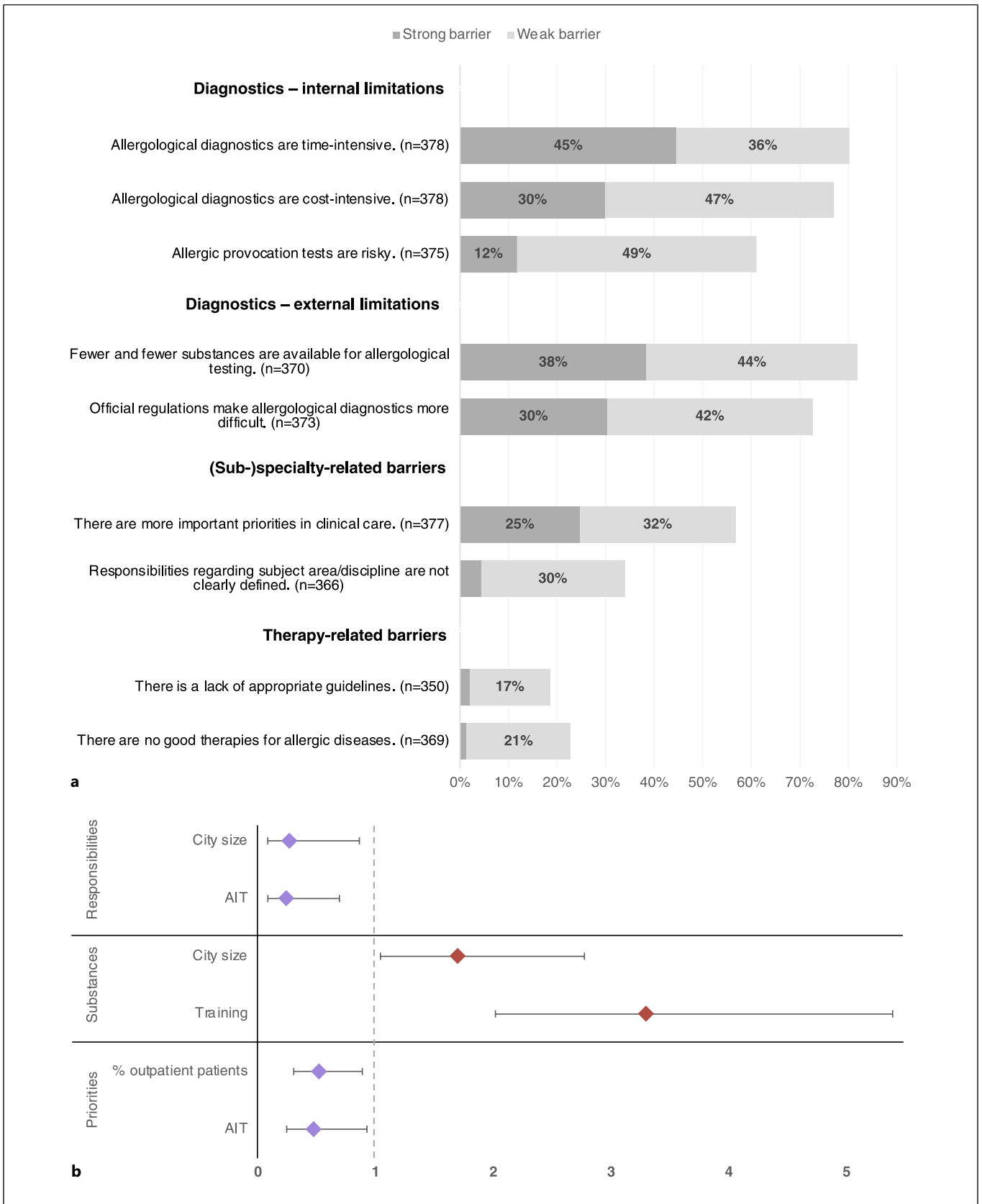
Subsequently, we asked participants for their opinion on the entire field of allergology in Germany. A total of 88.5% of participants agreed with the statement that allergological care in Germany needs improvement in general; 85.2% saw a need for improvement in private practice, 80.5% in hospitals, and 67.9% in their own clinic. Although 68.4% of the participants reported that allergology has a high priority in their field, almost 59.9% perceived a decrease in the importance of the subject in the inpatient setting.

Agreement among the participants was strongest regarding statements related to improving reimbursement structures for diagnostics and therapy, with 91.6% and 87.6% agreeing, respectively (Fig. 3). The controversial question of whether allergology should become a full specialty in Germany was answered heterogeneously by the participating clinics; only 38.6% agreed that allergology should become a full specialty instead of a subspecialty, whereas 47.7% disagreed.

### By Specialty

When comparing specialties, dermatological clinics agreed most frequently that there is a need for improvement of reimbursement structures and allergological care in general (Fig. 3). Pulmonological clinics agreed most strongly with the statement that allergology training needs improvement. Clinics with a pediatric specialization agreed least with the statement that allergological care is losing importance in the inpatient setting.

As mentioned above, a long-debated question is whether allergology should be considered a full specialty. Grouping by specialty showed that this idea was most frequently supported by dermatological (33.3%) and



(For legend see next page.)

pediatric (26.3%) clinics, and less frequently by ENT (19.4%) and pulmonological (14.3%) clinics.

#### Digital Healthcare

In the face of rapidly evolving digitalization, we next assessed the use of digital healthcare concepts. We found that a very large majority of clinics ( $n = 352$ ; 91.4%) do not offer video consultations. More than one in five of the clinics (21.2%;  $n = 82$ ) reported that they employ apps in patient care (Fig. 4), but only 4.4% reported using them frequently or most of the time. The most frequently given reasons for not providing digital healthcare concepts were lack of availability ( $n = 100$ , 34.7%), lack of patient demand ( $n = 95$ , 33.0%), and difficulties in its implementation ( $n = 94$ , 32.6%).

#### Not Offering Allergological Care

A further very important question was why some departments do not perform any allergologic diagnostics or therapy, even though they belong to one of the specializations usually providing allergological care. In total, 56 respondents stated that they do not offer allergological care in their clinics. Of those, 30 (53.6%) reported that this was due to a lack of accreditation by the *Statutory Health Insurance Association (Kassenärztliche Vereinigung)*. Other reasons were a lack of personnel ( $n = 22$ ; 39.3%), lack of profitability ( $n = 20$ ; 35.7%), and a lack of expertise ( $n = 19$ ; 33.9%) (Fig. 5).

## Discussion

There is a high and continually increasing demand for allergological care in Germany. The survey used in the present study collected data on allergological care in German hospitals with the goal of detecting potential barriers to its delivery and analyzing its future perspectives. Strong barriers regarding the resources available for allergological care that require political attention were identified. Additionally, we found that digital healthcare concepts were implemented by a very low proportion of clinics, without any detailed evaluation to explain these disappointing findings.

The strongest barriers (“decline in substance availability,” “time-intensity of testing,” “cost-intensity of testing,” and “restrictions by official regulations”) were all associated with allergy diagnostics and suggest generally

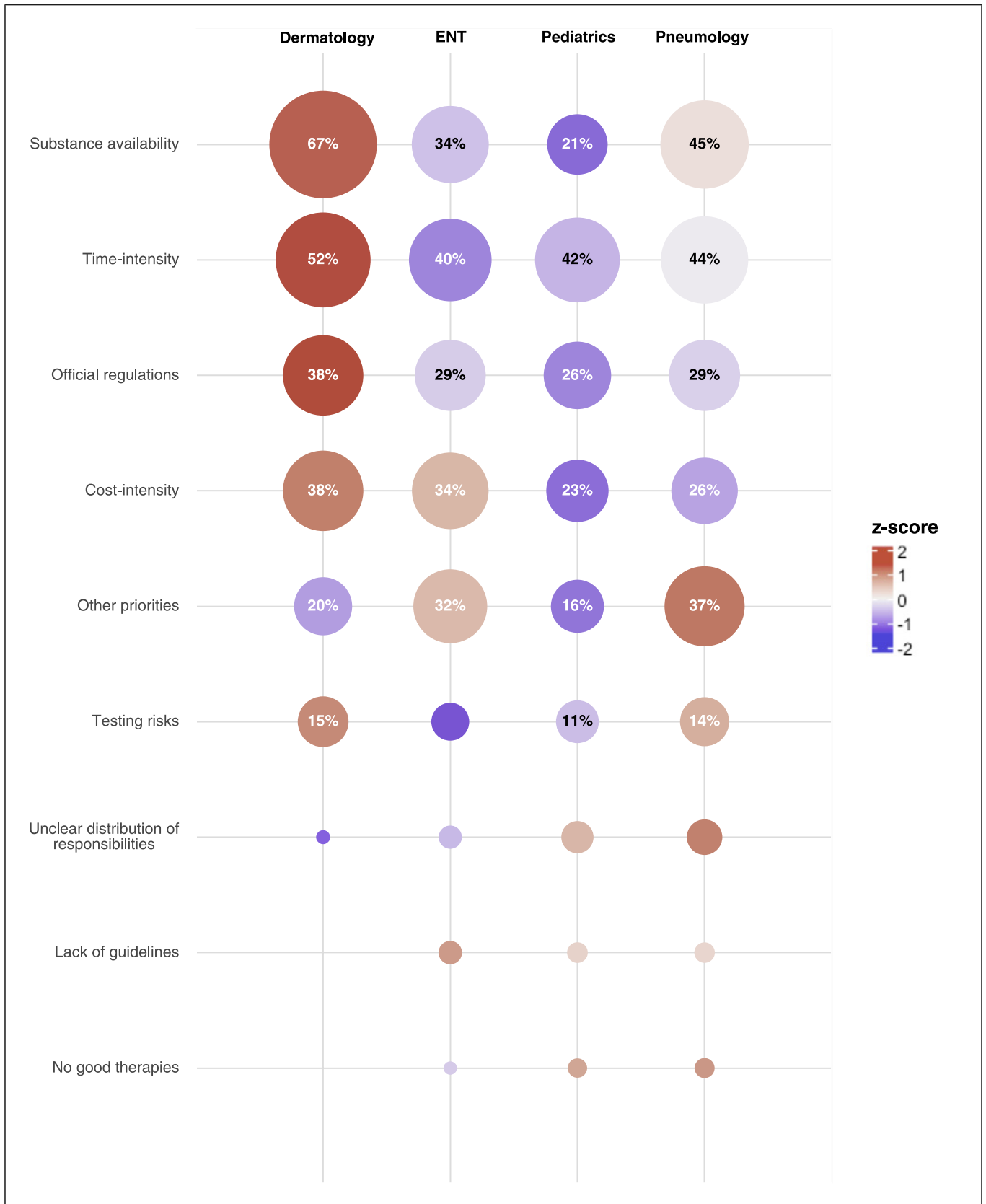
insufficient resources and a need for greater attention to allergological care. Interestingly, the strong and increasingly tightened regulatory demands for testing compounds do not match with the low reimbursement for compounds and testing, resulting in lower availabilities for test substances and a lack of developments in the pharmaceutical industry. This lack of funds is further emphasized by the fact that barriers related to the interdisciplinary structure of allergology in Germany and therapy-related factors such as lack of guidelines and adequate therapy are perceived as far less relevant. These findings may explain the translational gap in allergological care where sufficient evidence and guidelines are available but do not translate into better healthcare outcomes [17].

Two studies on the main barriers to patch testing conducted in Australia and New Zealand found the time and cost-intensity of allergic testing as well as insufficient staff to be the most important factors [18, 19]. Interestingly, both studies found the availability of patch test allergens to be only a minor obstacle. Regulatory problems were not even mentioned, suggesting that this problem might be more specific to Germany or Europe. The problem of strict regulatory demands in Europe is well known. It leads to high costs and a decrease in the availability of allergens for diagnostic procedures. Because of its importance, this issue has already been addressed by the EAACI and is now considered a serious threat to allergological care in Europe [20, 21]. Our findings indicate that this also affects Germany on a large scale.

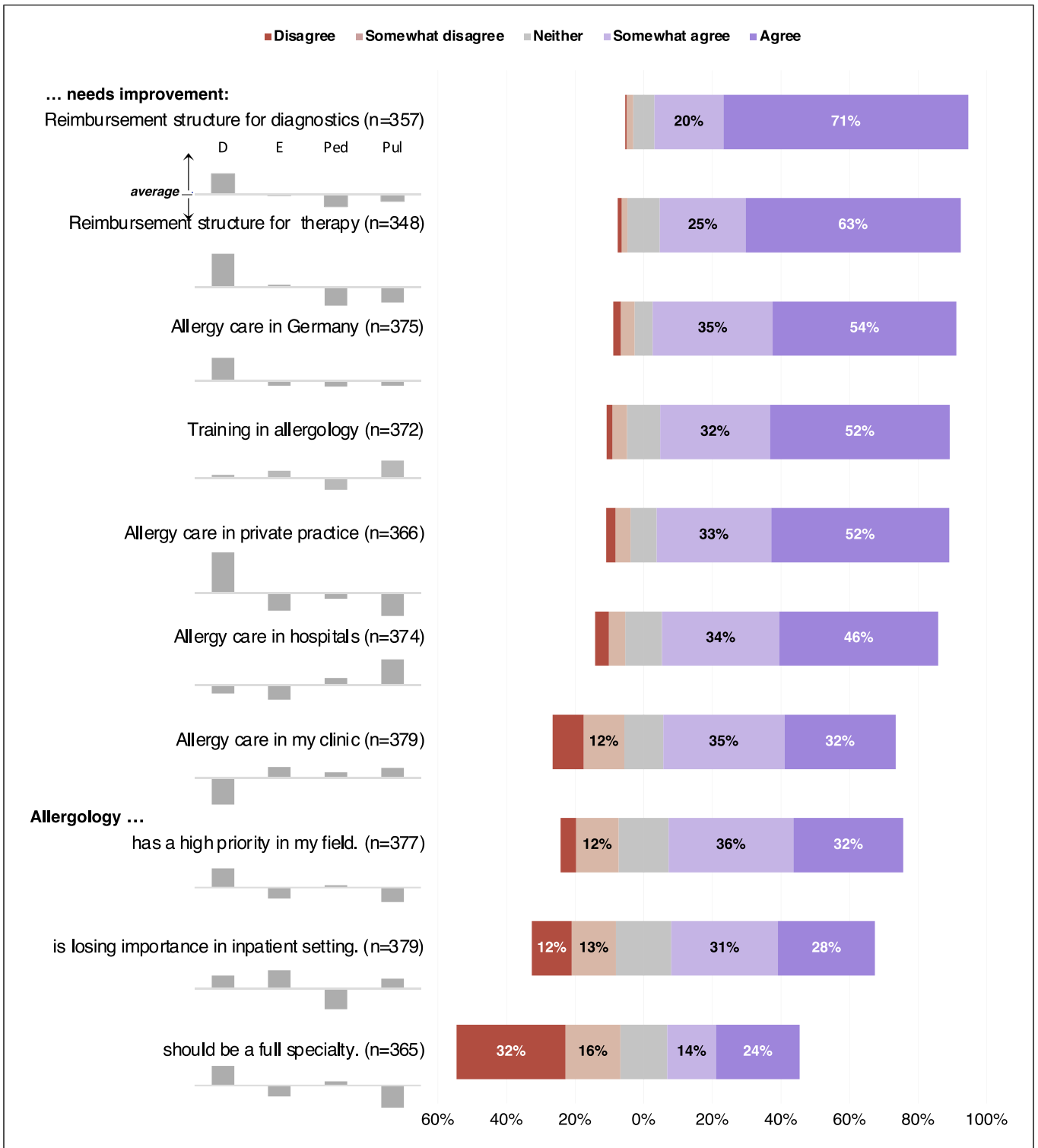
Our results imply that the core barriers to allergological care in Germany are not directly medical but influenced by policy and economics. These aspects require corresponding political measures aimed at securing test substance availability, simplifying regulations, and providing adequate funding [20].

We found that some of the barriers to performing allergological diagnostics, especially the decreasing availability of test substances, were most frequently reported by dermatological clinics. This can, to some extent, be explained by our separately published finding that dermatological clinics perform significantly more diagnostic workups for drug allergies and contact allergies than those of other specialties [16]. For these conditions, substance-based tests such as provocation tests and patch tests are very important in diagnostic pathways [22, 23]. Indeed, dermatological clinics also perform more patch

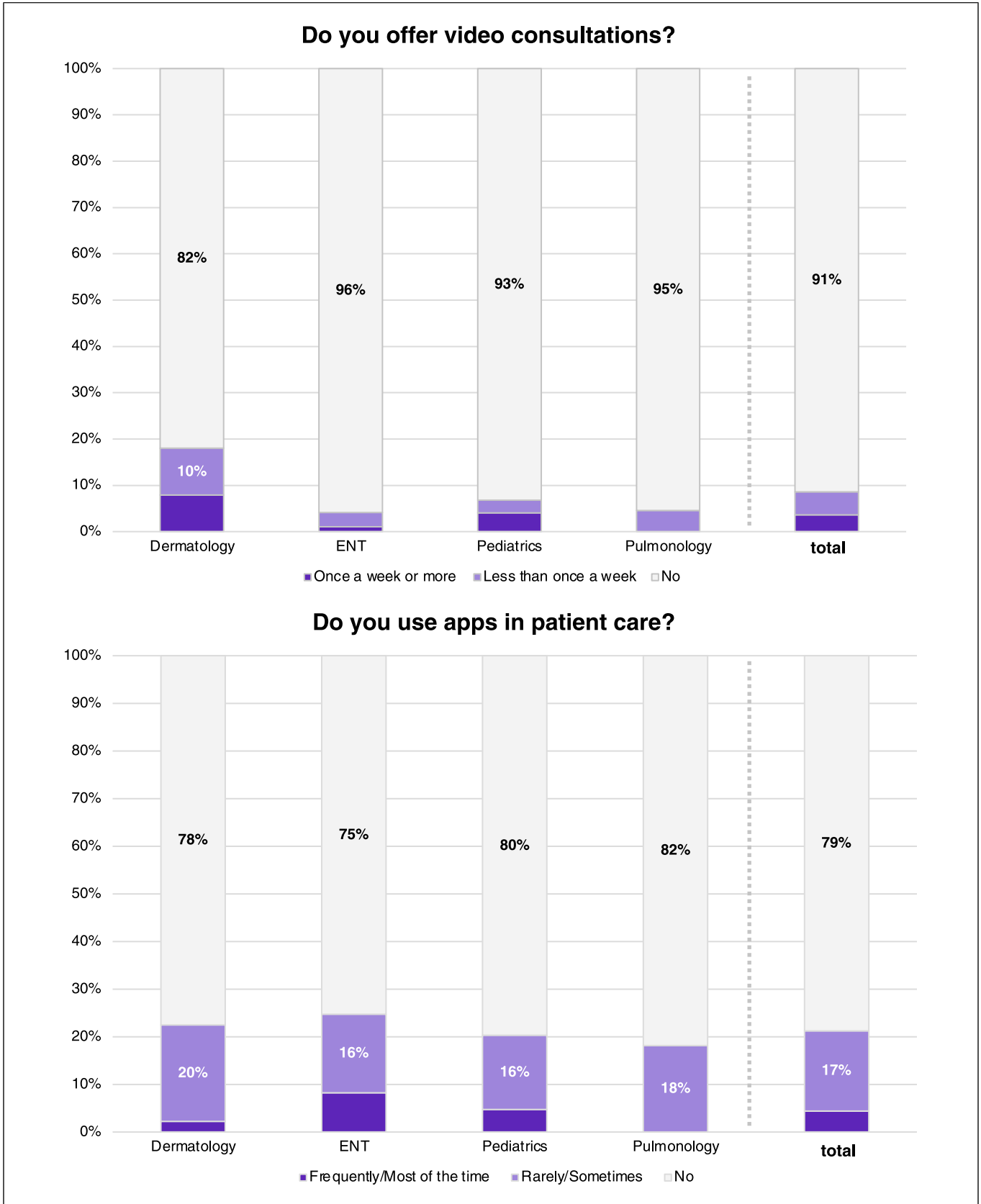
**Fig. 1.** Barriers and predictive factors. **a** Strong (dark gray) and weak (light gray) barriers in allergological care subdivided into the four categories internal and external limitations of diagnostics, (sub-)specialty, and therapy-related barriers. **b** Predictive factors for perceiving barriers.



**Fig. 2.** Barriers distinguished by specialty. z-scores were calculated for each barrier.



**Fig. 3.** Opinions on allergology care. The five-point Likert scale was used to gauge opinion on allergology care in different settings. Furthermore, the differences between dermatology, ENT, pediatrics, and pulmonology are depicted.



**Fig. 4.** Implementation of digital healthcare concepts differentiated by specialty. The use of video consultation and apps is depicted.



testing and provocation tests and have reported a higher variety of allergens for the latter [16]. This variety was especially notable compared to pediatric clinics, potentially explaining the latter's less frequent perception of such barriers.

Pulmonological clinics view other clinical priorities as a stronger barrier compared to the other specialties. We reason that this has several causes. First, many diseases treated by pulmonologists may not be related to allergic reactions, especially in an inpatient setting. Examples include chronic obstructive pulmonary disease and lung cancer, while asthma and allergic airway diseases are mainly treated by pulmonologists in private practices. Second, for some diseases that are caused or exacerbated by allergies, the correct treatment may not necessitate a full allergological assessment. However, since asthma is a very serious disease [24] that can be triggered by allergens in some patients [25], barriers should still be reduced. Other possible barriers, such as the lower profitability of allergological treatment and better financial reimbursement for other diseases, should be considered.

Insufficient funding and reimbursement strategies have been previously reported as barriers in the context of AIT and the prescription of biologicals [26, 27], and they have also been identified as challenges to allergology in Europe [7]. This is strongly reflected in our findings, with almost all clinics agreeing that there is a need for improvement in reimbursement structures for both diagnostics and therapy.

The perceived decrease of the importance of allergology in the inpatient setting might reflect a desired shift to the outpatient or even primary care setting [28]. This is a favorable development, as outpatient settings are more flexible and more cost-effective than inpatient settings. However, it is also a cause for concern because not all diagnostics and treatments can be performed in an outpatient setting. It will thus be necessary to secure inpatient treatment opportunities that are still required.

An interesting finding is the overall disagreement regarding the question of whether allergology should be a full specialty, which contrasts the aim of the EAACI's position paper promoting allergology as a full specialty [7]. Although the majority of respondents reported that allergological care in Germany needs improvement, the current system seems to be preferential in this survey.

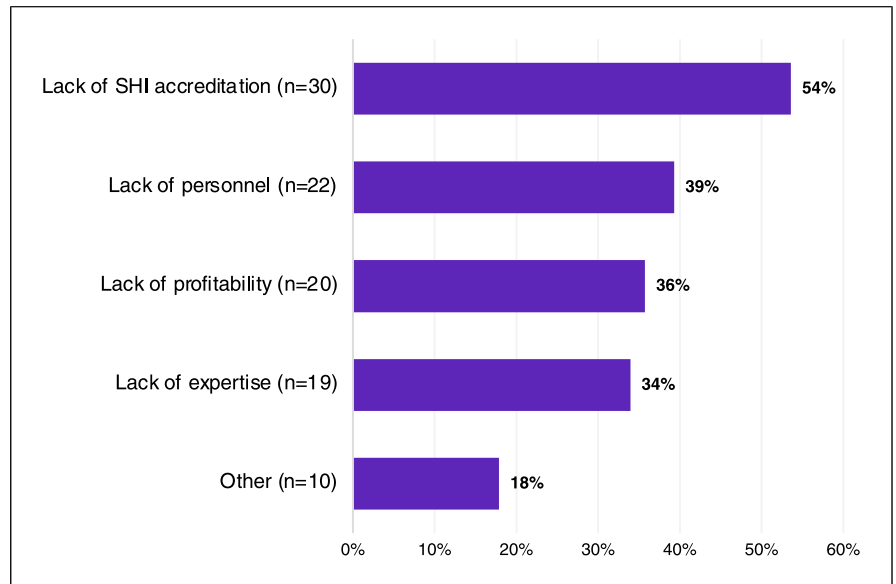
Another striking finding of this survey is the very low percentage of clinics offering video consultations and implementing apps in their care strategy. The numbers we found are only slightly higher than those from a 2016 American study where 6.1% of allergologists offered video consultations [29], and they are lower than those from a recent German survey on telemedicine in allergology, in

which 15.6% of participants reported offering video consultations [30]. However, the latter study had several limitations, as it was sent out in a newsletter and potentially attracted a higher number of respondents interested in telemedicine. Our findings suggest that the increased acceptance and popularity of telemedical services in healthcare, especially in light of the COVID-19 pandemic [31, 32], seem not to have translated into a notable increase in its use in clinical allergological care in Germany. Many studies have demonstrated their advantages, including in the treatment of allergic diseases, such as better accessibility and economic benefits while being as effective as in-person meetings [33–35]. Concepts like the MASK-air app may give rise to the development of further novel, practical tools for clinical routines [36]. When employed optimally, they offer benefits to patients by encouraging self-management [37] and offering a reliable source of information. Additionally, they can represent valuable data sources for patient-centered research [38].

Nevertheless, there is further need for a thorough evaluation of eHealth interventions and their indications in order to identify allergic diseases and patient subgroups where these tools can be employed effectively and complement current treatment pathways [39]. An investigation into attitudes toward eHealth among German allergology healthcare providers may be of value in order to encourage the adoption of beneficial eHealth strategies.

The structural barriers we identified in allergological care in Germany were also reflected in clinics' reasons not to offer allergological care, the main reasons being no official authorization and lacking personnel and profitability. Notably, the financial aspect may cause more unmet medical needs in allergological care in comparison with those in financially more attractive fields of medicine. Financial barriers have been identified as being present in all aspects of care, from the general availability of allergological care, to diagnostics or the prescription of efficient medicine [27, 40]. Although Germany currently has a relatively high number of allergologists, the number of specialists is continually decreasing [7]. In our opinion, this highlights the importance of sufficient financial motivation for providing sufficient allergological care and meeting increasing medical demands.

Several aspects should be addressed as limitation when considering the generalizability of the results. As participation in the survey was voluntary, the results and the subsequent conclusions may be biased in regard to a non-response bias. However, due to a high response rate and the fact that all clinics were contacted, it may be argued that this survey is representative.



**Fig. 5.** Reasons for not providing allergological care by percentage. SHI, Statutory Health Insurance.

Notably, questionnaires were only sent out to clinics, whereas a broad spectrum of allergological diagnostics and treatments in Germany are carried out in private practices. While most allergological diagnostics in the clinical setting are performed by dermatologists and pediatricians, allergological workup for patients with, for example, allergic rhinitis, is mainly performed in private ENT practices. Barriers in the private sector could be different from those identified in the current study. Thus, further studies on the barriers of office-based allergological care are warranted.

### Conclusion

We conclude that the barriers to allergological care in Germany affect all involved specializations but to different extents. Digital healthcare concepts need improvement in German clinics that provide allergological care. Overall, we believe that there is a pressing need for researchers and policymakers to find ways to help allergology departments perform their work and develop digital healthcare concepts.

### Statement of Ethics

The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines. It was approved by the Ethics Committees of Hannover Medical School (nr. 10036\_BO\_K\_2021) as well as the University Medical Center

Göttingen (nr. 25/11/21 Ü) and registered with the DRKS before study initiation (DRKS00026677). Informed (online) consent was applied; participants provided their declaration of consent by checking the corresponding box before the start of the survey.

### Conflict of Interest Statement

The study was conducted by the task force “Allergological Care” of the German Society for Allergy and Clinical Immunology. The authors declare that there are no conflicts of interest.

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### Author Contributions

Conceptualization and project administration: S.T., M.M.H., T.W., R.T., B.W., M.W.O., T.B., S.B., and M.W.A.; data collection and data preparation and analysis: S.T., A.S., M.M.H., and J.E.; writing original draft: A.S., S.T., M.M.H., T.B., and T.W.; supervision, review, and editing: R.T., S.B., J.E., E.H., C.T., M.W.A., B.W., M.W.O., A.Z., T.B., and T.W. All authors read and approved the manuscript.

### Data Availability Statement

Data are not publicly available due to ethical reasons. Further inquiries can be directed to the corresponding author.

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