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Original Article

Perceptions on Home-Administration of Biologics in the Context of Severe Asthma: An International Qualitative Study

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What is already known about this topic? Patient and health care provider perceptions about home-administered biologics have been reported in other diseases, but are limited in severe asthma (eg, single country, single type of biologic).

What does this article add to our knowledge? International insight into the perceptions and experiences of patients and health care providers regarding home administration of biologics in the treatment of severe asthma, including all types of (home)-administered biologics that are currently available.

How does this study impact current management guidelines? To reduce the patient journey from severe asthma onset to biologics prescription, awareness of biologics should increase. Guided practice, accessible contact, and monitoring social support should be central in the transition from hospital to home administration.

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Abbreviations used
ACQ- Asthma Control Questionnaire
BMQ- Beliefs about Medicines Questionnaire
COVID-19- Coronavirus disease 2019
HCP- Health care provider

BACKGROUND: Biologics are an effective therapy for severe asthma. Home administration of biologics by patients is likely to facilitate their accessibility. Yet little is known about patients' and health care providers' (HCPs) perceptions regarding home administration of biologics.

OBJECTIVE: The aim of this study is to create more insight into the perceptions and experiences of patients and HCPs regarding home administration of biologics in the context of the treatment of severe asthma.

METHODS: A qualitative international study was performed in the Netherlands, United States, Australia, and United Kingdom. In each country, 2 focus groups were held with potential/recent and long-term users of biologics at home. Prior to the focus groups, patients were prompted with themes on online forums. For triangulation purposes, interviews were held with HCPs to discuss salient findings from forums and focus groups. Data were analyzed with qualitative content analysis.

RESULTS: In total, 75 patients participated in the forums, of which 40 participated in the focus groups. Furthermore, 12 HCPs were interviewed. The following overarching themes were identified: living with severe asthma; practical aspects of using biologics; the role of HCPs regarding biologics; social support from family, friends, and others; effectiveness of biologics and other treatments; side effects of biologics.

CONCLUSIONS: This study showed that, for those using biologics for severe asthma, the benefits of home administration of biologics usually outweigh inconvenience and side effects. Guided practice, accessible support contact, and monitoring including social support should be central in the transition from hospital to home administration of asthma biologics. **(J Allergy Clin Immunol Pract 2022;10:2312-23)**

Key words: *Severe asthma; Biologics; Biologicals; Self-administration; Home administration; Hospital administration; Qualitative study*

INTRODUCTION

Severe asthma refers to asthma that remains ineffectively controlled despite adherence to optimized standard treatments with inhaled corticosteroids and inhaled bronchodilators.[1] Severe asthma affects approximately 3% to 10% of all asthma patients[2] and is associated with increased risks of hospitalization, development of comorbidities, higher disease burden, and mortality.[3-5]

The improved understanding of inflammatory mediators in the pathogenesis of asthma in the last decades paved the way for new therapies for severe asthma. With the advent of biologics in recent years, treatment of severe uncontrolled asthma has markedly improved.[6] However, unlike the standard pharmacotherapy for airways disease (inhaled or oral), the predominant mode of administration of biologics is systemic (subcutaneous or intravenous) by health care providers (HCPs). Consequently, hospital- or office-based administration was potentially a barrier to biologics for eligible patients.[7]

More recently, self-injection pens and prefilled syringes have become available to enable patients to administer biologics at home.[7] Currently, 5 biologics are approved for severe asthma: benralizumab, dupilumab, mepolizumab, omalizumab and reslizumab. All except reslizumab can be administered subcutaneously at home through an injection pen or prefilled disposable syringe. These biologics are administered on established schedules at 2-week to 8-week intervals.[6]

The option of home administration is promising to decentralize health care, promote self-care, and improve access for severe asthma patients, as has been reported for patients with urticaria and rheumatoid arthritis.[8,9] However, only a limited number of studies have explored patients' and physicians' perceptions of biologics use in both home and clinical settings for severe asthma.[10,11] Therefore, the aim of this study is to examine the perceptions and experiences of patients and HCPs regarding home administration of biologics in the context of the treatment of severe asthma.

METHODS

Study design

A qualitative study was conducted in the Netherlands, United States, Australia, and Northern Ireland between November 2020 and September 2021. The study was reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ) criteria.[12]

Participants

Adults with severe asthma were eligible if they were potential or current users of biologics at home. Exclusion criteria were limited life expectancy, presence of psychiatric disorders, intellectual disability or neurodegenerative disease, inability to understand the local language, or being enrolled in a clinical trial on biologics. Patients were recruited through local severe asthma specialists of the University Medical Center Groningen, University of Michigan, University of Melbourne (Royal Melbourne Hospital), and the Queens University Belfast. In the Netherlands, patients were also recruited through the Dutch patient organization for severe asthma (Vereniging Nederland Davos).

In each country, 2 focus groups were organized: 1 group with potential and recent users ($\leq$1 y) of biologics at home and 1 group with long-term users (>1 y). Purposive sampling was used to obtain variation in the patients' demographic and clinical characteristics (eg, age, gender, educational level, type and duration of biologic use). The HCPs were eligible for an interview if they had treated severe asthma patients in the past 3 months. In each country, 2 clinicians and 1 nurse were interviewed.

The study was approved by medical ethical committees in the participating countries (the Netherlands, Medical Ethical Review Committee Assen [20.123/IH]; United States, Medical School Institutional Review Board [HUM00193918]; Australia, Melbourne Health Human Research Ethics Committee [HREC/73661/MH-2021]; and Northern Ireland, South-Central Oxford Research Ethics Committee [21/SC/0067]). Patients received an e-gift voucher to thank them for their participation.

TABLE I. Descriptive characteristics of patients (self-reported)*

Patient characteristics	The Netherlands n = 34	United States n = 13	Australia (n = 16)	Northern Ireland n = 12	Total n = 75
Male, n (%)	5 (15)	0	3 (19)	3 (25)	11 (15)
Age, y (SD)	46.3 (13.9)	51.9 (9.3)	53.0 (14.7)	56.7 (5.3)	50.4 (12.8)
Living with spouse/partner, n (%)	19 (56)	9 (69)	14 (93)	10 (83)	52 (70)
Data available, n			15		74
Educational level,† n (%)					
Low	6 (18)	3 (23)	3 (19)	9 (75)	21 (28)
Intermediate	9 (26)	7 (54)	6 (38)	1 (8)	23 (31)
High	19 (56)	3 (23)	7 (44)	2 (17)	31 (41)
Employment status, n (%)					
Employed	NA	5 (38)	10 (63)	3 (25)	18 (44)
Unemployed	NA	1 (8)	1 (6)	0	2 (5)
Unable to work owing to disability	NA	6 (46)	0	5 (42)	11 (27)
Retired	NA	1 (8)	4 (25)	4 (33)	9 (22)
Student	NA	0	1 (6)	0	1 (2)
Data available, n					41
Type of biologics, n (%)					
Benralizumab	7 (21)	6 (46)	2 (13)	1 (8)	16 (21)
Dupilumab	5 (15)	5 (38)	4 (25)	0	14 (19)
Mepolizumab	7 (21)	2 (15)	3 (19)	11 (92)	23 (31)
Omalizumab	10 (29)	0	7 (44)	0	17 (23)
Reslizumab	5 (15)	0	0	0	5 (7)
Duration of biologics use, n (%)					
0–12 mo	7 (21)	4 (31)	5 (31)	2 (17)	18 (24)
>12 mo	27 (79)	9 (69)	11 (69)	10 (83)	57 (76)
Administration mode of biologics, n (%)					
At the hospital through IV or injection	15 (44)	3 (23)	7 (47)	1 (8)	26 (35)
At home with autoinjector or prefilled syringe	19 (56)	10 (77)	8 (53)	11 (92)	48 (65)
Data available, n			15		74
Self-reported asthma exacerbations parameters in the past 12 mo					
Three or more d of oral corticosteroids, n (%)					
0	12 (36)	5 (42)	8 (50)	8 (67)	33 (45)
1–3	14 (42)	3 (25)	6 (38)	3 (25)	26 (36)
>3	7 (21)	4 (33)	2 (13)	1 (8)	14 (19)
Data available, n	33	12			73
Visits to emergency department, n (%)					
0	17 (50)	7 (54)	13 (81)	10 (83)	47 (63)
1–3	14 (41)	1 (8)	3 (19)	2 (17)	20 (27)
>3	3 (9)	5 (38)	0	0	8 (11)
Hospital admission, n (%)					
0	20 (61)	7 (54)	12 (75)	12 (100)	51 (69)
1–3	12 (36)	3 (23)	3 (19)	0	18 (24)
>3	1 (3)	3 (23)	1 (6)	0	5 (7)
Data available, n	33				74
Age at onset asthma (y), n (%)					
<18	17 (50)	2 (15)	9 (56)	6 (50)	34 (45)
19–30	7 (21)	5 (38)	1 (6)	1 (8)	14 (19)
>30	10 (29)	6 (46)	6 (38)	5 (42)	27 (36)
Asthma medication, n (%)					
SABA	21 (62)	10 (83)	14 (88)	9 (75)	54 (73)
LABA	8 (24)	2 (17)	0	0	10 (14)
ICS	21 (62)	4 (33)	4 (25)	0	29 (39)
ICS/LABA combination	25 (74)	9 (75)	14 (88)	12 (100)	60 (81)

(continued)

TABLE I. *(Continued)*

Patient characteristics	The Netherlands n = 34	United States n = 13	Australia (n = 16)	Northern Ireland n = 12	Total n = 75
SAMA	10 (29)	0	0	0	10 (14)
LAMA	15 (44)	1 (8)	0	1 (8)	17 (23)
Triple therapy (ICS/LABA/LAMA)	1 (3)	0	0	0	1 (1)
Leukotriene antagonists	10 (29)	0	0	1 (8)	11 (15)
OCS	6 (18)	0	0	1 (8)	7 (9)
SABA/SAMA combination	9 (26)	0	0	0	9 (12)
LABA/LAMA combination	1 (3)	0	0	0	1 (1)
Other medication	11 (32)	0	0	0	11 (15)
Data available, n		n=12			n=74
Smoking status, n (%)					
Current smoker	0	0	0	0	0
Nonsmoker	26 (76)	11 (85)	12 (75)	5 (42)	54 (72)
Quit smoking	8 (24)	2 (15)	4 (25)	7 (58)	21 (28)
Pack-years, mean (SD)	19.6 (13.2)	2.0 (2.8)	5.2 (4.5)	20.3 (25.4)	15.2 (17.8)
Data available, n	7				20
ACQ, mean (SD)	2.3 (1.1)	1.8 (1.4)	1.4 (1.1)	1.7 (1.1)	1.9 (1.2)
Well-controlled (≤0.75), n (%)	3 (9)	4 (31)	5 (33)	3 (25)	15 (20)
Unlikely well-controlled (>0.75 and <1.5), n (%)	6 (18)	2 (15)	2 (13)	2 (17)	12 (16)
Uncontrolled (≥1.5), n (%)	25 (74)	7 (54)	8 (53)	7 (58)	47 (64)
Data available, n			15		74
BMQ, mean (SD)					
Necessity‡	22.0 (2.8)	23.1 (2.5)	23.1 (2.7)	23.6 (1.4)	22.7 (2.6)
Data available	32	12	15		71
Concerns‡	12.1 (4.6)	15.2 (3.9)	14.4 (2.9)	14.0 (4.2)	13.5 (4.2)
Data available	29	11		10	66

ICS, Inhaled corticosteroids; *IV,* intravenous; *LABA,* long-acting beta-2 agonist; *LAMA,* long-acting muscarinic-antagonist; *NA,* not available; *OCS,* oral corticosteroids; *SABA,* short-acting beta-2 agonist; *SAMA,* short-acting muscarinic-antagonist.

*Calculations are based on total numbers indicated at the top of the columns, unless otherwise indicated in the rows labeled Data available.

†Low = primary school or high school; Intermediate = secondary education or college/university without certificate; High = Bachelor's degree, Master's degree, PhD.

‡Higher scores indicate stronger beliefs (score range 5−25). BMQ question 11 was not included in the analysis.

Study procedures

Owing to the coronavirus disease 2019 (COVID-19) pandemic, the entire study was performed online.

Descriptive data collection and forums. Eligible patients who were willing to participate in the study gave their consent to their local clinician for researchers to contact them. Thereafter, the researcher emailed the patient information about the study and patients were invited to register for Within3 with a link in the email. Within3 is a secured online platform that was used to host the descriptive data collection and the forums. Once registered to Within3, participants first needed to open the patient information and complete the informed consent questions. The answers to the descriptive questions (Table I) were private and only visible to the researchers and the individual participants themselves. To maintain anonymity, all participants were automatically assigned a nickname upon registration for Within3.

The Asthma Control Questionnaire (ACQ) consists of 6 questions with a 7-point Likert scale.[13] Patients with a total ACQ score of 0.75 or lower are considered to have well-controlled asthma, between 0.75 and 1.5 are unlikely to have well-controlled asthma, and 1.5 or higher to have uncontrolled asthma.[14] The Beliefs about Medicines Questionnaire (BMQ) assesses patients' beliefs about the necessity of prescribed medication and their concerns. Patients indicated their degree of agreement with each statement on a 5-point Likert scale. Higher scores indicate stronger beliefs.[15]

Approximately 1 week after the launch of the Within3 platform, a total of 6 themes with related statements regarding biologics were posted every other day (Table II and Table E1; available in this article's Online Repository at www.jaci-inpractice.org). These themes were developed in collaboration with severe asthma specialists (J.D., L.G.H., M.H., and N.L.). Answers to the themes were visible to all participants, and participants discussed their opinions and experiences with other participants. The rationale for this forum was to stimulate participants to think about the themes before joining the focus group. Moreover, emerging issues were discussed in the focus groups. Patients were reminded by email when a new theme was posted online.

Focus groups with patients. A focus group guide was developed based on the themes discussed on the forums and was amended for each participating country if deemed necessary (iterative data collection). The focus groups were held in Zoom and led by a professional moderator (J.J.A.L., Dutch focus groups; and A.M., English-speaking focus groups) and at least 1 researcher (F.P., C.A., B.F.d.B.) for technical support. The focus groups were recorded and lasted a maximum of 2 hours.

Semistructured interviews with clinicians. The HCPs were interviewed for the purpose of triangulation (ie, understanding and interpreting patients' perspectives from a clinical point of view). These semistructured interviews were based on the themes discussed

TABLE II. Themes online forum*

n	Theme
1	Place and mode of administration
2	Expectations of HCPs
3	Expectations of relatives/friends/peers
4	Effectiveness
5	Side and adverse effects of biologic therapy
6	Nonadherence

*Complete overview of questions corresponding to each theme can be found in Table E1.

in the forums and in the focus groups. For each theme, HCPs were asked to reflect on salient quotes. The interview guide was amended for each participating country if deemed necessary (iterative data collection). The 12 individual interviews were performed by 3 researchers (F.P., C.A., B.F.d.B.) using Zoom. The interviews were recorded and lasted a maximum of 1 hour.

Data analysis

The forum discussions were extracted as transcripts from the Within3 Web site. All Zoom recordings were transcribed verbatim by an independent company (Uitgetypt.nl). All transcripts were independently coded by two researchers (B.d.M., B.M.) using Dedoose (version 9.0.17, SocioCultural Research Consultants, Los Angeles, Calif). The results of the coding were discussed to obtain consensus, and when deemed necessary, a third researcher (B.F.d.B.) was consulted to obtain consensus. An overview of all themes and codes that were identified is shown in Figure 1. For the descriptive analysis, STATA Statistical Software (release 17, StataCorp) was used.

RESULTS

Participant characteristics

In total, 116 patients with severe asthma were invited to participate. Of the 87 patients who registered for Within3, 75 patients completed the questionnaires and responded to the forums. Of these patients, 40 participated in the focus groups (Figure 2 and Table III).

A diverse group of participants was included regarding the self-reported demographic and clinical characteristics (Table I). All types of biologics were included. Only the characteristics gender, duration of biologics, and smoking status showed less diversity (ie, more women, more long-term users, and no current smokers). Despite prolonged use of biologics, nearly two-thirds (64%) reported ACQ scores greater than 1.50, indicating uncontrolled asthma. The BMQ scores indicated that patients had stronger beliefs about the necessity of their prescribed medication than concerns about taking it. The ACQ and BMQ scores were comparable for starters and experienced users of biologics, except that starters had slightly stronger concerns (16.0 vs 12.7; Table E2; available in this article's Online Repository at www.jaci-inpractice.org). In total, 12 HCPs were interviewed (pulmonologists n = 8 and nurses n = 4). The number of patients on biologics seen by these HCPs (women n = 9) ranged from daily to 2 to 4 per month and the total number of patients on biologics in their clinics ranged from 50 to 400.

Living with severe asthma

Patients mentioned that their identity was shaped by asthma and that asthma had restricted their life course to a large extent (eg, study choice or ability to work). However, there were also patients who consciously did not want to identify themselves with asthma (Table IV, quote 1). The invisibility of asthma was often mentioned, which was often accompanied with invisible sorrow (Table IV, quote 2). Also, HCPs were aware of the invisibility of asthma (Table IV, quote 3).

Practical aspects of using biologics

Expectations. Several patients described positive expectations regarding biologics. They expected improvement in their lives and reduction of other medications, specifically oral corticosteroids (Table IV, quote 4). The HCPs stressed the importance of discussing patient expectations before starting with biologics to create realistic expectations (Table IV, quote 5).

Prescription. Several patients described a long journey before being prescribed biologics. Sometimes patients described having to qualify for a prescription (Table IV, quote 6), which they found troublesome, and patients wondered whether the threshold for being prescribed biologics could be lowered. Patients described having seen many different HCPs and some of them not confirming the severity of the disease resulting in delayed referral (Table IV, quote 7). Others reported that their former HCPs did not know about biologics or did not know how to prescribe them (Table IV, quote 8). This long journey was also acknowledged by the HCPs (Table IV, quotes 9 and 10).

Administration at home or in the hospital. Several patients had experiences with the administration of biologics in the hospital and at home. An often-mentioned advantage of home administration was not having to go to the hospital, which saves (travel) time and organization (eg, time off work), and it was appreciated even more during the COVID-19 pandemic (Table IV, quote 11). In addition, home administration offered more flexibility to patients (eg, to go on a holiday for a longer period; Table IV, quote 12). Conversely, an often-mentioned disadvantage of home administration was the lack of contact with clinical staff, including missing personal contact or the safe environment, and concerns about severe adverse reactions at home (Table IV, quote 13).

The administration of biologics in the hospital was sometimes a conscious choice of the patient (eg, when a patient feels uncomfortable about self-injecting), but could also be obligated (eg, owing to the type of biologic or because only hospital administration was covered by the patient's insurance). Sometimes home administration was performed by a nurse, yet several patients indicated a preference for a clinical setting over home administration by a nurse. In Australia, several patients got their injections at their general practitioner's office (Table IV, quote 14).

In general, HCPs favored home administration when possible (Table IV, quote 15). For some patients, HCPs favored hospital administration (eg, owing to needle phobia, unstructured lifestyles [Table IV, quote 16], or when home administration was not covered by the patient's insurance). For those on home administration, HCPs mentioned the importance of patient monitoring (eg, scheduled half-yearly appointments, monitoring through medical dossiers, and accessible contact options for patients). Several HCPs indicated that home administration gained momentum during the COVID-19 pandemic and that many

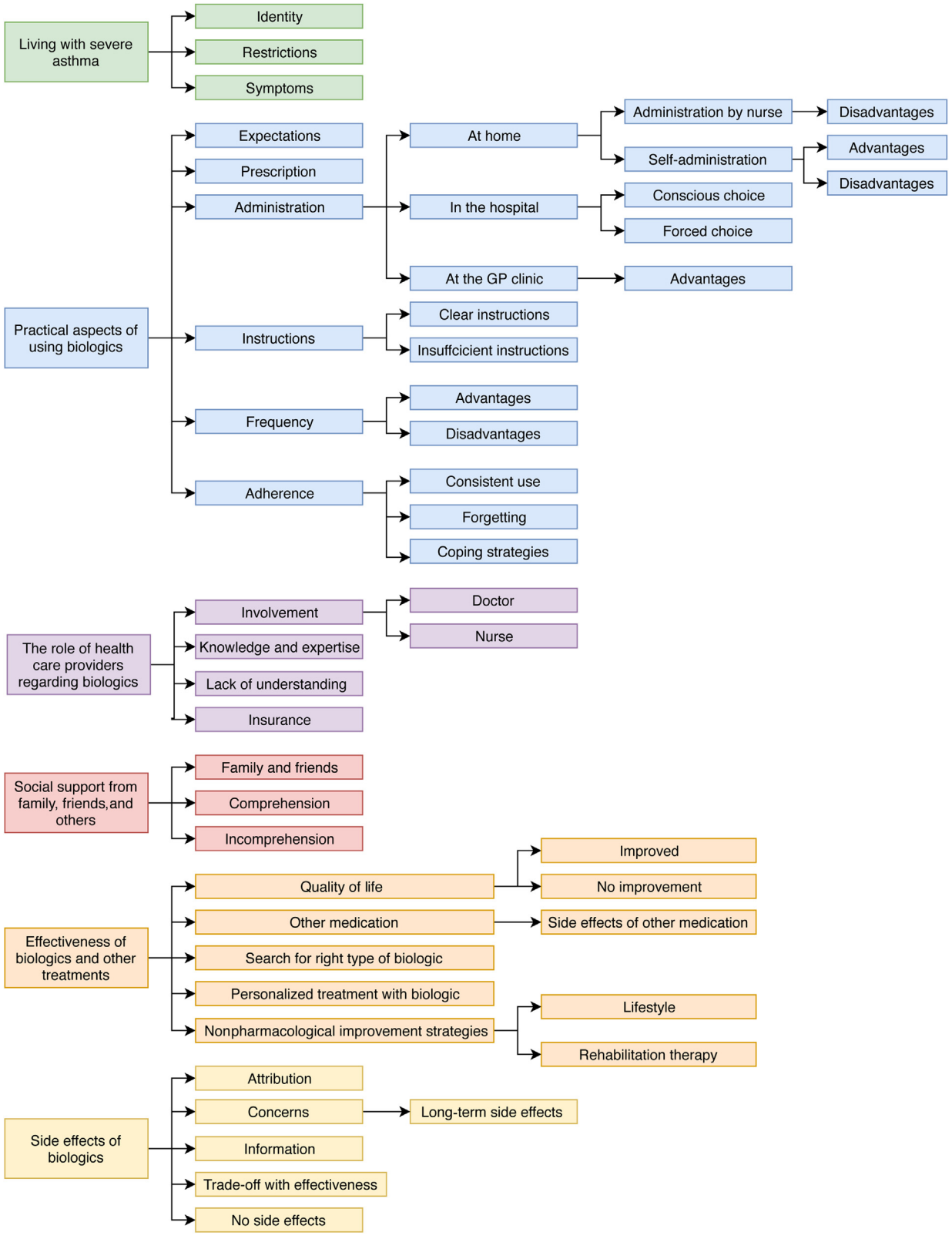

FIGURE 1. Coding tree. *GP*, General practice.

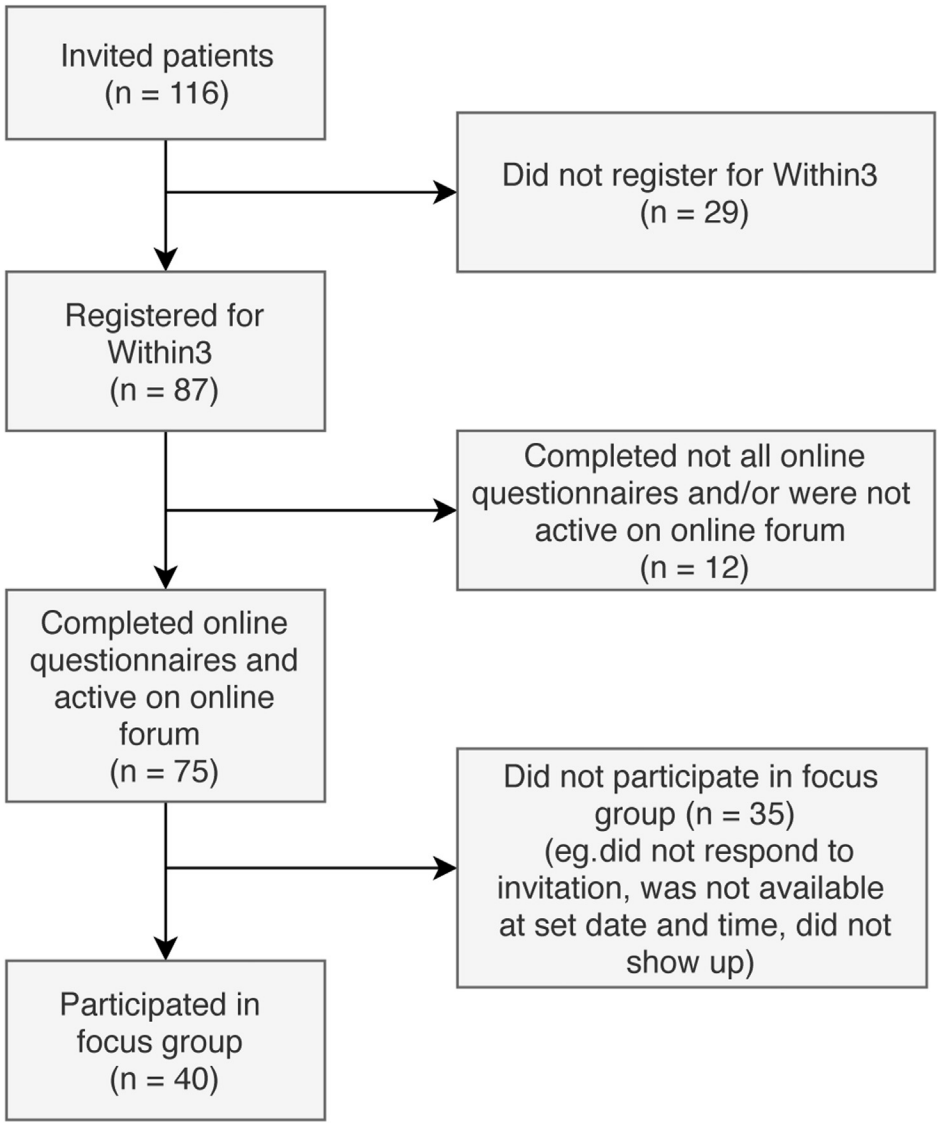

FIGURE 2. Flow diagram.

patients made a transition to home administration much earlier than might have occurred before the pandemic.

Instructions. Often, patients described the instructions they received regarding biologics as clear. They received information from their HCP and received information booklets. Usually, patients practice the injection in the hospital, and after a few times, they felt ready to administer it themselves at home. Many patients described stress in the beginning, but the guided practice in the hospital gave them confidence (Table IV, quote 17). Sometimes, the information (eg, on how the biologics work [Table IV, quote 18] or storage temperature) was judged as insufficient.

Frequency of administration. The frequency between injections depends on the type of biologic and corresponding protocol. Patients who had experience with multiple biologics preferred the one with the longest time interval for practical reasons. Conversely, many patients described reduced effect of the biologic at the end of the time interval and the desire for receiving their next injection earlier (Table IV, quote 19). Only sometimes the HCP could accommodate this wish if the insurance company agreed or as part of clinical research.

Adherence. In general, patients reported having good adherence to biologics. Many patients reported never forgetting an injection. All kinds of reminder strategies were reported (eg, automatic reminders via their smartphone, agenda, or email). In addition, patients reported that the fading effect of the biologic itself was also a reminder for their next injection (Table IV, quote 20). When patients forgot their injection, the delay was usually a few hours to a few days, and this did not happen often. Usually, there was no specific reason for forgetting other than being preoccupied (Table IV, quote Q21). The HCPs confirmed that most of their patients had good adherence, likely owing to the severity of the disease and the effectiveness of biologics.

TABLE III. Number of participants per country and study stage*

Study stage	The Netherlands	United States	Australia	Northern Ireland	Total
Invited	43	21	20	32	116
Starters	NA	9	6	13	NA
Users	NA	12	14	19	NA
Registered for Within3	36	15	19	17	87
Starters	7	5	6	5	23
Users	29	10	13	12	64
Completed online questionnaires and active on the online forum	34	13	16	12	75
Starters	7	4	5	2	18
Users	27	9	11	10	57
Participated in focus group	17†	7	9	7	40
Starters	1	2	2‡	1	6
Users	16	5	7	6	34

NA, Not available.
*Starters: potential and recent users (<1 y) of biologics at home. Users: long-term users of biologics at home for > 1 y.
†In the Netherlands, the focus groups consisted of 8 and 9 patients, respectively.
‡One person did not complete online questionnaires and was not active on the online forum.

The role of HCPs regarding biologics

The HCPs play a very important role in the patient's journey to get to the point of biologics and beyond. In general, patients spoke well about their current HCPs and appreciated their involvement regarding medication, but also regarding their daily life (Table IV, quote 22). Moreover, knowledge and expertise of the current HCPs was praised. This was often in stark contrast to other HCPs that patients met on their journey before they started biologics (Table IV, quote 23). The HCPs often play an important role in arranging the reimbursement of biologics because, in some countries, they frequently contact the insurance companies directly to arrange the best options for their patients, but it is noteworthy that they did not always succeed because of the insurance companies' reimbursement policies (Table IV, question 24).

Social support from family, friends, and others

Several patients described receiving social support and understanding from their immediate family and friends regarding the severity of the disease and the use of biologics (Table IV, quote 25). Lack of empathy or understanding was more often seen in people of the patient's outer circle (Table IV, quote 26). However, sometimes poor understanding regarding the severity of the disease and the need for biologics was reported in close relatives, which made patients feel sad. This lack of social support was acknowledged by HCPs as a message from the study to apply in the future (Table IV, quote 27).

Effectiveness of biologics and other treatment

Many patients described that biologics changed their lives positively and improved their quality of life (Table IV, quotes 28 and 29). A major additional advantage of biologics is that patients could reduce the intake of other medications, especially oral corticosteroids (Table IV, quotes 30 and 31). As a result, patients were very pleased with the reduced side effects that came with the reduced oral corticosteroids. However, some patients had used oral corticosteroids for many years, and it caused permanent damage to their bodies. Other patients described still being on a search for the right type of biologic. The HCPs confirmed this search (Table IV, quote 32) and reported that, in a small number of patients, no biologic seemed to work well (Table IV, quote 33).

Several patients were open to the suggestion of personalized treatment regarding biologics frequency and dosage. Others were happy with the effects they achieved so far and were reluctant to change anything (Table IV, quote 34). In addition to biologics, some patients reported nonpharmacological strategies to improve their experienced effectiveness of biologics (eg, healthy lifestyle). Rehabilitation with high-altitude therapy was typically reported in the Netherlands.

Side effects of biologics

Some patients questioned whether side effects were caused by their biologics or whether they might be caused by comorbid diseases, other medications, or life stressors. Others could indicate rather precisely which side effects they attributed to biologics because of the timing of the side effects occurring after injection (eg, fatigue, headache, bruising, back pain, fever, and dry or itchy skin). Conversely, some positive side effects were also attributed to biologics (eg, reduction of eczema. Many patients were concerned about the side effects of biologics, especially the long-term side effects, as these are currently unknown (Table IV, quote 35). Often-named concerns regarded immunosuppression, cancer, and effects on fertility or on an unborn child. Concerns about immediate adverse reactions (eg, anaphylaxis) were more often reported when starting with biologics, but faded when patients became more experienced users (Table IV, quotes 36 and 37). Patients reported being informed about possible side effects by their HCP and sometimes searched for additional information online. However, several patients also reported not being worried about side effects, because they did not want to know about the possible side effects or because the effects of the biologics outweighed the possible side effects (Table IV, quotes 38–40). Fortunately, several patients also reported no side effects of their biologics.

DISCUSSION

This international qualitative study provided insight into the perceptions and experiences of patients and HCPs regarding

TABLE IV. Quotes

Number	Quote	Participant, source, county
Living with severe asthma		
1	"I am not asthma, I have asthma."	P, FG, NED
2	"But asthma is often difficult for others to understand. You can look good from the outside. While you can feel incredibly wheezy and sick. That invisible disease."	P, OF, NED
3	"Yes, so I hope (…) that this is also becoming more and more known to the environment, that asthma really is a severe chronic disease."	HCP, I, NED
Practical aspects of using biologics		
Expectations		
4	"And I expected these medications to help. But I didn't even know how much they'd help."	P, FG, AUS
5	"And sometimes you can't live up to the expectation, but that too is an answer."	HCP, I, NED
Prescription		
6	"It took me a long time to qualify as well. And because I was on such huge doses of prednisolone, my spirometry was actually really good. (…) And yeah, you do have to jump through a lot of hoops to qualify."	P, FG, AUS
7	"It took me a long time to actually make it to [my current HCP]. With my GP it was maybe going on for 5 or 6 years. I've actually been on prednisone, but even it maybe took another 2 or 3 years after that before I actually made it to the hospital. (…) I had the feeling that some of the doctors or GPs maybe didn't have a really good understanding of asthma."	P, FG, NI
8	"I think they knew about them, but I don't think they knew how to prescribe them honestly. Because I'd had other doctors telling me I need to be on the biologics, and they were actually my doctors and I'm like "Well, how do we do this?" "Well, I'm not sure." And I'm like "Why not? You're a doctor, you know, how do you not know how to get me the medicine that I need?"	P, FG, US
9	"I think with our patients when they're referred to our service, they're desperate (…) for a cure, they're just desperate to get their life back on track and to live a normal life again. And they've been to so many places before they get to us."	HCP, I, NI
10	"But I can tell you that the Asthma Clinic is a place of great sadness, you know. There are, sometimes, the patients come in. And they'll be describing, you know. I've been to the hospital. I've done this. I've done that. I've been on steroids. I've done this, and that. And I guess, there's nothing else left for me. And, and then I'll say, well. Actually, there is. You know. There are all these drugs. And I think this one might help you. And people just burst out crying."	HCP, I, US
Administration		
11	"Advantages are less risk of infection than being in hospital or clinic setting as well as no travel or specific time constraint. Privacy is also an advantage."	P, OF, US
12	"It's given me a life. I administer it myself, what is it 30 seconds of uncomfortable. That's it, in the bin, away you go."	P, FG, NI
13	"Disadvantage would be I do not have regular contact with the respiratory team and I'm reluctant to contact them otherwise."	P, OF, NI
14	"They're just a few minutes away from me. (…) They have a nurse that's always available. So, I'm quite happy with that."	P, FG, AUS
15	"It's better for the patients, I guess, to avoid coming in, because it saves them time for their own personal lives. It's better for the pandemic safety to avoid people getting in the same room. And I guess it just gives a patient a bit more of independence in terms of their own treatment about when they can administer it"	HCP, I, AUS
16	"We have some patients who would prefer to come to hospital to receive their biologic therapy. For whatever reason. It sometimes can just be a very practical reason. That they don't like needles. (…) Some patients have difficulty with medication and structuring their day. (…) So, there may be barriers there and we discuss this with the patient. Say, well, you know, we think that you might struggle a bit with this, etcetera, etcetera."	HCP, I, NI
Instructions		
17	I had self-injected at hospital a number of times and I felt comfortable doing it at home by myself for the first time. (…) There were no problems with my first injection at home because the hospital staff had prepared me so well."	P, OF, NI
18	"More timeline- and process-oriented, not too much explanation of the science behind the medication."	P, OF, AUS
Frequency		
19	"Wish that I could get my Fasenra every 6 weeks instead of 8, by the end of my 6th week I can feel the difference in my lungs."	P, OF, US
Adherence		

(continued)

TABLE IV. *(Continued)*

Number	Quote	Participant, source, county
20	"I have never forgot to use my injection as most times I am in need of this medication in the time frame when due."	P, OF, AUS
21	"I only forgot to take the injection because I have a very ill mother and my mind was preoccupied with getting her the care she needs."	P, OF, NI
The role of HCPs regarding biologics		
22	"[My current HCP] wants the best for me as a person and as patient and we have open discussions on how to handle all of my medications. She is always looking for ways to enhance my quality of life."	P, FG, US
23	"I was accused by another asthma doctor: you don't take your medication, that's the way you are. I was accused of lying. And every time I've seen the asthma nurse in another hospital: change the inhaler—every time—but the minute my asthma nurse and my GP surgery mentioned 'the miracle man,' [my current HCP], things changed: he listened, he cared, and he changed my life, but other doctors who knew, who were supposed to be respiratory doctors just didn't care as much as he does."	P, FG, NI
24	"She will appeal a denial 10 times if that's what it takes to get her patients approved. So, there are challenges in meeting the insurance criteria which seems like it's ever moving, it's like a moving target."	HCP, I, US
Social support from family, friends, and others		
25	"My family and friends are aware I am on this drug and are delighted as it has turned my health around. They […] appreciate the benefits as it has kept me out of hospital for the last number of years which means they don't worry about me as much as they used to."	P, OF, NI
26	"People are always surprised by the idea of regular injections for asthma—people generally think about asthma as nothing very serious—they tend to think it doesn't really get in the way and a couple of squirts from the puffer will sort you out."	P, OF, AUS
27	"The biggest take away I have from this is there are patients out there that don't have emotional support, and that makes me sad for them, so I think my take away would be to maybe do a little bit more investigation about what their support is, and how can we better support them."	HCP, I, US
Effectiveness of biologics and other treatments		
28	"But not being able to breathe and looking for air, is probably the worst thing that could happen in one's life. And when it is cured, from one day to the other. Well, to me, it is a miracle."	P, FG, AUS
29	"It's given me back things in my life that I thought I'd lost because at 1 stage I thought I had an illness that controlled me but now it doesn't control me anymore, if that makes sense."	P, FG, NI
30	"The injections have greatly improved my quality of life. I am able to be a lot more active when using the biologics than I was previously. I have reduced the intake of other medications over time."	P, OF, AUS
31	"Nucala worked immediately and I was able to reduce the prednisone significantly".	P, OF, AUS
32	"Some patients are super responders and others are not. Sometimes, we have to find the right biologic for you. It's not a clear picture of which one that it will be."	HCP, I, US
33	"We also have a number of people and that is very sad, who simply do not respond well to a biologic, while they are eligible for it and also have the profile. That's difficult."	HCP, I, NED
34	"I would feel a bit uneasy playing around with how often I may need a biologic injection. I don't want to experience again, how unwell I was before the biologics."	P, OF, AUS
Side effects of biologics		
35	"I am particularly worried about long-term side effects because this is a new treatment and the full effects of receiving the treatment over a sustained period may not yet be known."	P, OF, NI
36	"My only concern about self-injecting at home would be if I had an adverse reaction. I have had no reactions to the biologic that I have been on for nearly 4 years, however, given that I have just started a new biologic and I will be self-administering it at home, it does concern me a little. When due for my injection, I will administer it while family members are at home. I'm sure I will feel more at ease after I have given myself the biologic a couple of times."	P, OF, AUS
37	"And then I thought, well, I've haven't had any reaction whatsoever, up till now. So, I just sort of turned off that worry."	P, FG, AUS
38	"I don't worry about side effects *per se*. I am fortunate to be prescribed this and I read the information given at the time. Currently, I feel that the benefits outweigh any side effects."	P, OF, NI
39	"I have always said I know that my medications may cost me time at the end of my life, but my quality of life is important to me now."	P, OF, US
40	"I mean, I'm really afraid of the biologics. But I'm also afraid to take the inhalers and the other drugs too. But I feel like with just how much better I felt, you know, quality of life is worth something too over longevity, so I'm willing to do it right now. And I'm just really hopeful that they find one that works with not too many side effects."	P, FG, US

AUS, Australia; *FG,* focus group; *GP,* general practitioner; *I,* interview; *NED,* The Netherlands; *NI,* Northern Ireland; *OF,* online forum; *P,* patient; *US,* United States.

home administration of biologics in the treatment of severe asthma. Overall, patients and HCPs agreed that the benefits of home administration of biologics usually outweigh the disadvantages and side-effects.

The international nature of this study gave insight into similarities and differences between countries. Although distances in the United States and Australia between the clinic and patients' home were much larger (up to 500 miles round trip were reported) than in the Netherlands and Northern Ireland, in all countries, saving travel time was an important reported advantage of home administration. This is in concordance with an earlier study on home administration of biologics in Germany.[11] Interestingly, across all countries, patients described a fading effect of the biologic at the end of the time. This is in concordance with a recent study showing a relationship between omalizumab trough levels and patient-reported need for the next administration.[16] Finally, across all countries, HCPs reported that many patients made a transition to home administration much earlier than might have occurred before the COVID-19 pandemic. Rapid transition to home administration owing to the pandemic has also been reported in other disease areas.[17] Differences were seen regarding the descriptors of key HCP qualities (eg, U.S. patients mentioned compassion and kindness, whereas Australian patients mentioned informative and knowledgeable). In addition, U.S. patients reported more openly about the absence of social support. Furthermore, the insurance system in the United States seemed to play a more prominent role in decisions about whether biologics (and which biologic) could be prescribed compared with other countries.

Important key messages of the study were the relatively long patient clinical journey from the onset of severe asthma to the actual prescription of biologics and the lack of social support experienced by many participants. To reduce this patient journey, more awareness and education on biologics and home administration are needed, particular among primary care and respiratory medicine HCPs. This should include patient phenotype, anticipated clinical benefit, prescribing access criteria, and reimbursement for biologics. In addition, several patients described that lack of social support is probably caused by the invisibility of asthma, which is a recognized problem in literature.[18] In our study, many patients reported that they enjoyed discussing their experiences and hearing from other patients. This points to the potential benefits of organizing local or national support groups for severe asthma patients on biologics, especially for those for whom there is less emotional support from their family.

Based on patients' reported experiences with hospital and home administration of biologics, the following aspects are important in the transition from hospital to home. (1) Clear instructions regarding practical aspects of administration, the mechanism of action, and potential side effects of biologics. Preferably, this information should be provided by the HCP verbally and in written format (to be read at home). Safety concerns were frequently reported by patients when starting with biologics; these need to be addressed properly at the outset. (2) Guided administration practice in the hospital to demonstrate the process and let patients practice supervised self-administration. After a couple of times, patients were confident in administering at home. (3) Accessible contact options with HCP to make patients feel safe, particularly because some patients might otherwise be reluctant to contact the HCP. (4) Monitoring medical aspects of treatment of the patients, but also emotional well-being and social support of patients, because absence of these negatively impacts patients' overall well-being.

A strength of this study is the international nature including 4 different countries across the world, thereby enhancing the purposive sampling of a variety of patients. Furthermore, a relatively high number of patients contributed to this qualitative study, and the interviews with HCPs enriched the data collection by triangulation. Although the number of patients in the focus groups was lower than expected, this was compensated by the numbers of patients contributing to the forums. These online discussions turned out to comprise valuable information comparable with the focus groups. Although thematic saturation was achieved in our study sample, relatively more patients from the Netherlands were included and the variability of some patient characteristics was low. However, in qualitative research, the absolute numbers are less important than the variety in types of patients that are considered important for the research questions.[19] In this sense, only current smokers were lacking in our study sample. However, the prevalence of current smoking in patients with severe asthma is low.[20] In addition, some of the conclusions regarding recent versus long-term users using the dichotomous cutoff of 1 year may be limited because the experience and perception gained by patients for using biologics up to 11 months may be missed with such categorization. Furthermore, selection bias might have occurred because participants may have tended to have more Internet skills, a closer relationship with their HCP, or a higher degree of involvement in their illness compared with severe asthma patients who did not participate. Some included patients were treated by 1 of the HCP authors. However, HCPs were not involved in data gathering (online forums and focus groups), leading to a safe environment in which patients could speak freely about all aspects of home-administering biologics, including their HCP.

In conclusion, guided practice, accessible contact, and monitoring including social support should be central in the transition from hospital to home administration. Overall, this study showed that the benefits of home administration of biologics usually outweigh the disadvantages and side effects.

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ONLINE REPOSITORY

TABLE E1. Overview of questions related to the themes of the online forums

1. Place and mode of administration
Do you receive your biologics in the hospital? Or do you administrate them by yourself at home? What are the advantages and disadvantages? Has this been a deliberate choice? Did you receive instructions about receiving biologics in the hospital or about self-administration at home?
2. Expectations of HCPs
When it comes to biologics, what do you expect from your doctor or nurse in the hospital? Do you expect them to support you in coping with taking your biologics? Do you appreciate that your doctor empathizes with you or is that meddlesome to you?
3. Expectations of relatives/friends/peers
Do you have expectations from your relatives/loved ones and friends when it comes to treatment with biologics? If so, what kind of expectations are these?
4. Effectiveness
Have biologics affected your quality of life? Have you done other things to influence your quality of life? Are there other treatments available besides biologics? Have you heard of rehabilitation with high-altitude therapy? What do you think about personalizing biologic treatment? You could, for example, rate your symptoms over time to know how often you need a biologic injection? Are other issues important to know how often you would need treatment? For example, taking biologics more often may increase likelihood of side effects. Could it interfere with everyday life situations?
5. Side and adverse effects of biologic therapy
Side effects are known to occur. Do you worry about possible side effects of biologic therapy? Do you worry about long-term side effects? What are possible solutions to cope with that? Do the side effects outweigh the effectiveness? Did you receive sufficient information about possible side effects? How do you know that something that happens to you is a side effect of biologics?
6. Nonadherence
Have there been instances where you forgot to use the injection pen at home, or did you miss an appointment in the hospital? What happened? What are strategies to remember using your injection pen on time/go to the hospital on time? Were there other reasons why you did not take your biologics?

TABLE E2. ACQ and BMQ in starters* and users* of biologics at home†

ACQ and BMQ	The Netherlands (starters n = 7; users n = 27)	United States (starters n = 4; users n = 9)	Australia (starters n = 5; users n = 11)	Northern Ireland (starters n = 2; users n = 10)	Total (starters n = 18; users n = 57)
ACQ, starters, mean (SD)	2.5 (1.3)	1.3 (1.6)	2.4 (1.3)	1.0 (1.2)	2.0 (1.4)
Well-controlled (≤0.75), n (%)	1 (14)	3 (75)	0	1 (50)	5 (28)
Unlikely well-controlled (>0.75 and <1.5), n (%)	1 (14)	0	1 (20)	0	2 (11)
Uncontrolled (≥1.5), n (%)	5 (71)	1 (25)	4 (80)	1 (50)	11 (61)
Data available, n					
ACQ, users, mean (SD)	2.2 (1.1)	2.0 (1.3)	1.0 (0.7)	1.8 (1.1)	1.9 (1.1)
Well-controlled (≤0.75), n (%)	2 (7)	1 (11)	5 (50)	2 (20)	10 (18)
Unlikely well-controlled (>0.75 and <1.5), n (%)	5 (19)	2 (22)	1 (10)	2 (20)	10 (18)
Uncontrolled (≥1.5), n (%)	20 (74)	6 (67)	4 (40)	6 (60)	36 (64)
Data available, n			10		56
BMQ, starters, mean (SD)					
Necessity‡	21.2 (2.9)	23.0 (1.7)	23.2 (3.5)	23.5 (0.7)	22.4 (2.8)
Data available, n	6	3			16
Concerns‡	15.2 (3.2)	16.8 (4.3)	15.4 (3.0)	21 (.)	16 (3.4)
Data available, n	6			1	16
BMQ, users, mean (SD)					
Necessity‡	22.2 (2.8)	23.1 (2.8)	23.1 (2.4)	23.6 (1.6)	22.8 (2.5)
Data available, n	26		10		55
Concerns‡	11.3 (4.6)	14.3 (3.6)	14 (2.8)	13.2 (3.6)	12.7 (4.1)
Data available, n	23	7		9	50

*Starters: potential and recent users (≤1 y) of biologics at home. Users: long-term users of biologics at home > 1 y.
†Calculations are based on total numbers indicated at the top of the columns, unless otherwise indicated in the rows labeled Data available.
‡Higher scores indicate stronger beliefs (score range 5−25). BMQ question 11 was not included in the analysis.