Patient Preference and Adherence

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ORIGINAL RESEARCH

Preferences for Biologic Treatments: A Discrete Choice Experiment Survey of Canadians with Severe Asthma

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Purpose: The safety and efficacy of biologics for severe asthma have been demonstrated in clinical trials, and subsequent economic evaluations have established their value from a population perspective. Insight into patient preferences for attributes of biologic treatments can inform treatment-related decisions and promote adherence. However, such data are limited in Canada, and no willingness-to-pay (WTP) data exists. This study aimed to quantify the strength of preferences of those with severe asthma for attributes of biologic treatments.

Patients and Methods: Canadians with severe asthma completed a discrete choice experiment (DCE) consisting of 15 choice tasks and six biologic treatment attributes (improving daily activities, controlling other health conditions, frequency of administration, monthly out-of-pocket costs, reducing attack frequency, and reducing rescue inhaler use). Odds ratios (OR) and 95% confidence intervals (CI), and WTP (the marginal rate of substitution of attributes for money) were estimated using a conditional logistic regression.

Results: Ninety-seven eligible and unique participants completed the survey (70.1% female; mean [SD] age: 54.6 [14.4]; 48.4% ever used biologics). A dramatic (vs slight) improvement in daily activities increased the odds of a biologic being preferred by 78% (OR 1.78, 95% CI 1.48, 2.14), and a $100 increase in monthly out-of-pocket costs decreased the odds by 64% (OR 0.64, 95% CI 0.61, 0.67). On average, WTP was an extra $129 CAD in monthly out-of-pocket costs for a dramatic (vs slight) improvement in daily activities. WTP for a hypothetical biologic treatment was an extra $430 CAD in monthly out-of-pocket costs.

Conclusion: Canadians with severe asthma prefer biologic treatments that dramatically improve daily activities and have lower out-of-pocket costs. This DCE is the first to include a cost attribute and estimate WTP. These data can help inform decision-making when considering access to new biologic treatments for severe asthma and clinicians when helping patients select treatments for severe asthma.

Keywords: severe asthma, biologics, biologic treatment, patient preferences, discrete choice experiment, Canada

Introduction

Asthma is a chronic condition involving airway inflammation, characterized by wheezing, shortness of breath, and cough, that vary in severity and can fluctuate over time.[1] Severe asthma is defined by the Canadian Thoracic Society (CTS) as asthma requiring treatment with high-dose inhaled corticosteroids (ICS) and a second controller or systemic corticosteroid to achieve adequate control; or, asthma that cannot be adequately controlled despite these treatments.[2,3] Patients with severe asthma often experience treatment side effects, comorbid conditions, and persistent symptoms and exacerbations despite the use of multiple medications.[4] These factors contribute to challenges in disease management, poorer health-related quality of life (HRQoL), substantial healthcare resource utilization, and high treatment costs.[5–11]

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Biologic treatments can improve HRQoL and reduce asthma symptoms, exacerbations, and OCS use among patients with severe asthma whose symptoms are refractory to other treatments.[12–15] Many biologic treatments for asthma are currently available in Canada, including omalizumab, mepolizumab, reslizumab, benralizumab, dupilumab, and tezepelumab.[16] Costs of biologics can be high[17] and a recent qualitative study revealed that Canadians with severe asthma have difficulty accessing biologics due to prohibitive costs and struggles in obtaining insurance coverage.[18] While these treatments may be covered by publicly-funded drug plans and/or private or employer-sponsored health insurance, how these treatments align with patient preferences, and whether and how much those with asthma are willing to pay out-of-pocket for these treatments, is unclear.

Understanding patient preferences for asthma treatments is important as adherence to asthma medications, including biologics, can be poor.[1,19,20] A 2023 real-world study on biologic adherence in the US reported an average dosing delay of 58 days in the first year.[21] Adherence to biologics varied by biologic type, administration location and frequency, and health insurance coverage. Health insurance coverage was similarly associated with biologic adherence in another 2023 US-based analysis by Gleeson et al,[22] and in a 2022 survey of US physicians and their patients with severe asthma which identified costs and reimbursement as a common reason for biologic discontinuation.[23] To our knowledge, no studies have been published on adherence to biologics among Canadians with severe asthma.

A recent narrative review of chronic disease treatments, including asthma, found patients are more likely to adhere to treatments with features that align with their preferences.[24] A more nuanced understanding of how treatment features, including treatment affordability, accessibility, and alignment with patient preferences, may illuminate barriers and facilitators to adherence to treatment in severe asthma.[24]

At the same time, interest in incorporating data on patient preferences into healthcare decision-making is increasing.[25] Preference data can help explain who will take specific treatments and why, and facilitate incorporating patient treatment priorities into healthcare decision-making.[26] Several studies exploring patient preferences for biologic treatments for severe asthma have been conducted, including discrete choice experiments (DCEs). DCEs are surveys used to elicit stated preferences via a series of hypothetical scenarios (choice sets) with treatment alternatives defined by combinations of treatment attributes (eg frequency of treatment administration) and levels (eg daily vs weekly treatment).[18,27–30] The results from DCEs provide insight into the direction and relative strength of preferences for one choice alternative compared to another, and the trade-offs that respondents would be willing to make between attributes when selecting a biologic treatment. Additionally, inclusion of a cost-related attribute also allows for estimates of willingness-to-pay (WTP), which provides insight into the magnitude of out-of-pocket costs individuals are willing to pay for specific attributes of a biologic treatment.

At present, no DCE examining preferences for biologic treatments has been conducted that particularly considers the impact of out-of-pocket costs and WTP. Therefore in this study we sought to quantify and compare the strength of patients' preferences for attributes of biologic treatments for severe asthma, including costs, using a Canadian cohort with severe asthma. Ideally, these data will help decision-makers understand the challenges those with severe asthma face with respect to accessing biologic treatments.

Material and Methods

Study Design

A cross-sectional DCE survey was administered (October 2023-January 2024) to a convenience sample of participants recruited through Asthma Canada, a non-profit organization dedicated to improving the lives of Canadians living with asthma through education, research, and advocacy. An e-mail invitation was sent to all members of the Asthma Canada Member Alliance through a voluntary e-newsletter providing information related to asthma, including research studies, to Asthma Canada members.

Participants

Eligible participants were required to be adult (≥ 18 years of age) Canadian residents fluent in English or French, with severe asthma. In alignment with the CTS,[2] participants were determined to have severe asthma if they 1) reported being

diagnosed with severe asthma by a respirologist, allergist, or at an asthma or lung health clinic, 2) had used or were currently using a biologic treatment for asthma, and/or 3) were currently taking a combination of high-dose ICS and either a second controller medication or a minimum of two courses of oral corticosteroids (OCS) within the past 12 months (Supplementary Table 1). A minimum required sample size of 96 participants was calculated and targeted for recruitment.[31]

Survey and Data Collection

The online survey consisted of the DCE and questions on demographics and clinical characteristics, and was designed and conducted following best practices.[26,32] The DCE was prefaced with brief introductory text and visual aids to provide information on biologic treatments, instructions for completing the choice tasks, and descriptions of the 6 biologic treatment attributes included in this DCE (Figure 1). Treatment attributes and levels were informed by a literature review,[27–29] prior qualitative interviews of Canadians living with severe asthma,[18] and consultation with clinical experts on the research team (SW, AGK, AO, SM). An example choice task is presented in Figure 2.

The optimally D-efficient DCE design was calibrated using Ngene.[33] Each participant was randomly assigned to one of 5 blocks, each consisting of 13 choice tasks and a dominant and consistency choice task to assess internal validity.[34] The dominant choice task included one choice in which all attributes were assumed to be better than the alternate choice, with the expectation that participants would prefer the choice with 'better' attribute levels. The consistency choice task aimed to evaluate choice reliability by presenting participants with a previously completed choice task and assessing whether they selected the same response.[34] Stratified analyses were conducted among those who passed or failed the dominant and consistency choice tasks.

Data on participant characteristics, including demographics (eg, age, sex, province, rurality, race, employment) and clinical characteristics (eg, comorbidities, burden of asthma symptoms, hospitalization, impact on activities, current and previous biologic use) were collected. To assess the influence of cost sensitivity on attribute importance (ie, whether participants who are sensitive to costs would place greater importance on cost-related attributes), participants were asked to report their self-perceived sensitivity to out-of-pocket costs related to medication payment (0 = *not at all sensitive*; 2 = *very sensitive*).

Prior to dissemination, the survey was piloted with a convenience sample (n = 4) to ensure understandability, ease of completing the choice tasks, and functionality of the online survey platform.

Several safeguards were incorporated within the data collection platform to ensure the integrity of the online survey submissions,[35] including reCaptcha verification, IP address tracking, screening for duplicate Email addresses, and inserting duplicate questions at different points in the survey to check for consistency. The plausibility of submissions was reviewed, and highly suspicious submissions were removed. These included responses that 1) were submitted from the same name,

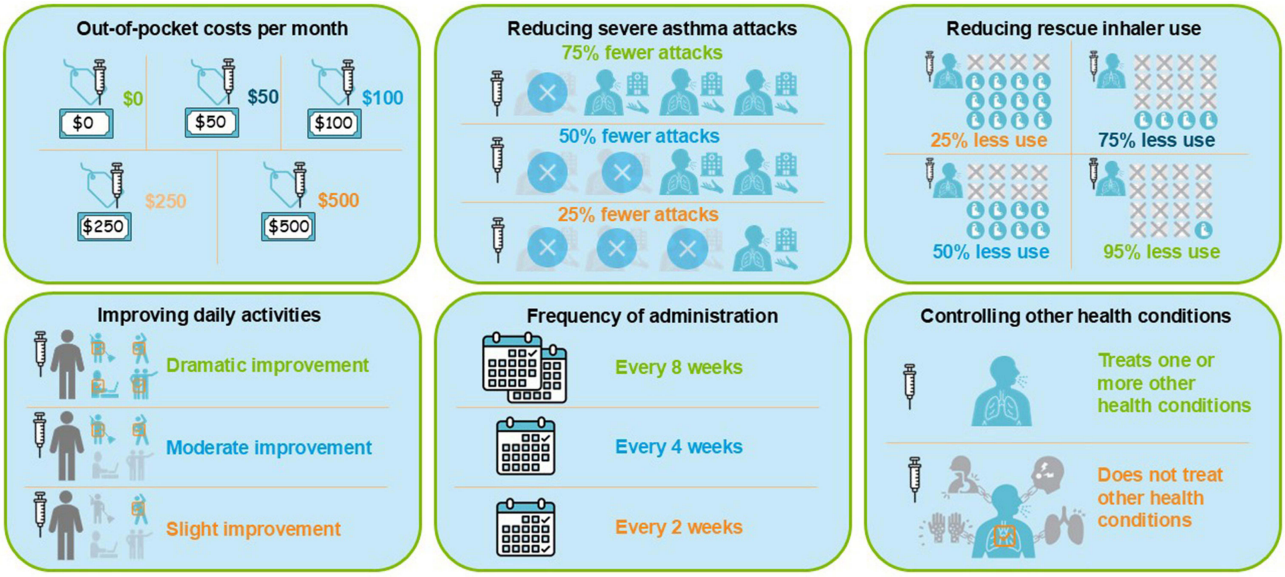

Figure 1 Discrete Choice Experiment attributes and levels.

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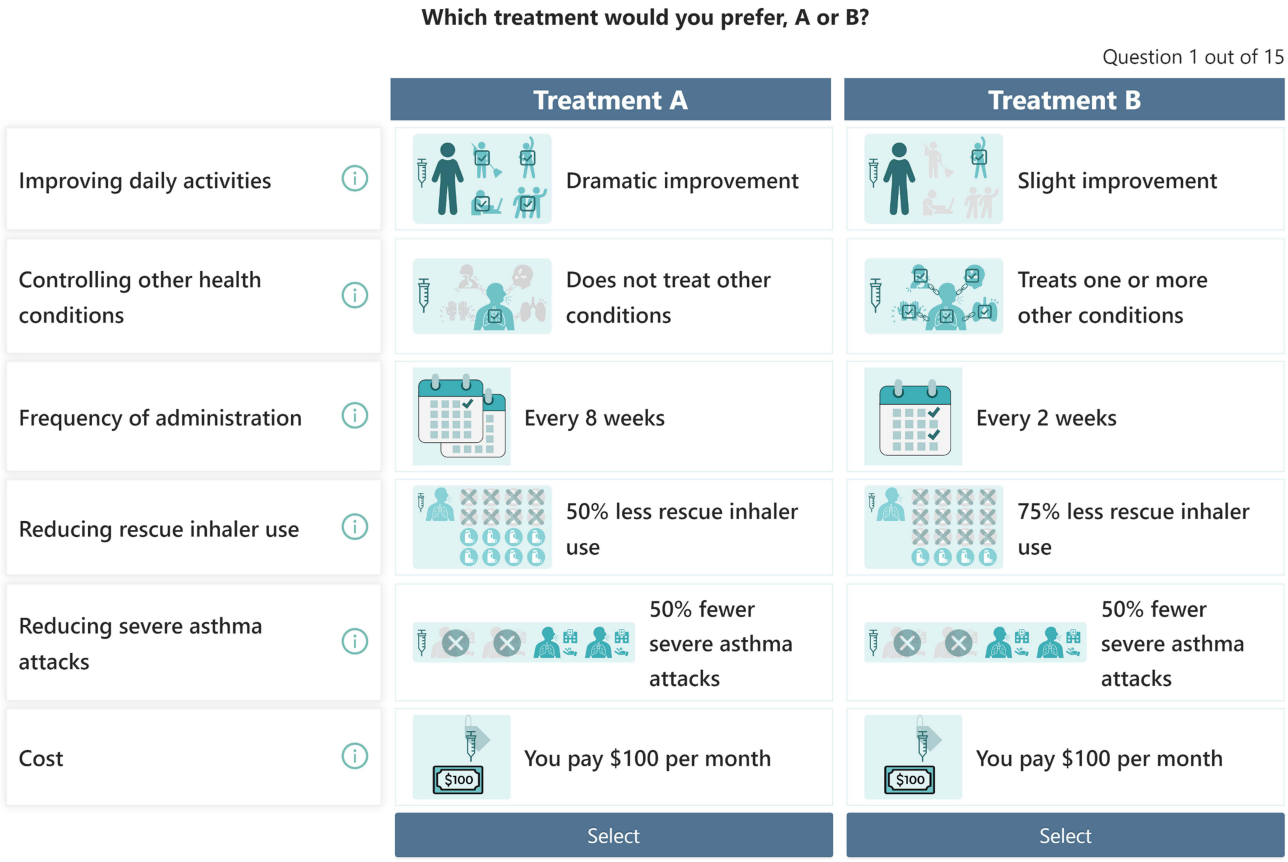

Figure 2 Example Discrete Choice Experiment choice task.

email, and/or IP address as other respondents, and 2) reported currently using >2 biologic treatments or had internally inconsistent responses when reporting which biologic treatments they were currently using when re-assessed at different points in the survey. Somewhat suspicious responses were those who had one suspicious characteristic; these responses were included in the main analysis and analyzed separately in a subgroup analysis.

Main Analysis

All analyses were conducted using R (R Core Team, 2023).[36] Demographic and clinical characteristics of study participants were summarized descriptively. Continuous variables were described as means (standard deviations [SD]) and medians (range), and categorical variables were described as frequencies and percentages. DCE data were analyzed according to best practice guidelines.[32] Conditional logistic regression analyses were conducted to evaluate patient preferences using the *mclogit* package.[37] Preferences were reported as odds ratios (ORs) and 95% confidence intervals (95% CI).

DCE Subgroup Analyses

To assess the integrity of responses, results were stratified by responses that 'passed' or 'failed' the dominant and consistency choice tasks, and by responses deemed somewhat suspicious. Cost-related characteristics were explored by stratifying results by perceived sensitivity to healthcare costs (very sensitive, somewhat sensitive, and insensitive) and by those who paid out-of-pocket for prescribed asthma medications. Additional subgroup analyses included annual household income (<$100,000, ≥$100,000, and those who did not disclose their income), any biologic use, current OCS use, and hospitalizations or ER visits in the past 12 months.

WTP

Including a cost attribute in the DCE enabled assessment of the importance (preference weights) of other attribute coefficients relative to the cost coefficient on a standardized and understandable scale.[38] The marginal rate of substitution of attributes and levels for money, or WTP,[38] was estimated for biologic treatment attributes presented in the DCE and a hypothetical combination of attributes that may reflect real-world biologic treatments. It was assumed that insignificant parameter estimates affect preferences, and these were retained in the model. The higher variability associated with their non-significance was incorporated into the variability reported for WTP. The Krinsky-Robb parametric bootstrapping method was used to estimate WTP 95% CIs.[39] Interim analyses were conducted after data from the first 45 participants were collected to ensure that no errors in programming or logic were apparent.

Consent and Ethics Approval

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki, ensuring the protection of human subjects and their rights. All participants provided informed consent electronically. The study received ethical approval from the Western Institutional Review Board-Copernicus Group (WCG IRB); IRB tracking ID 20233879. This study followed the Consensus-Based Checklist for Reporting of Survey Studies (CROSS).[40] At survey completion, participants received an IRB-approved honorarium as a token of appreciation.

Results

Of the 199 eligible respondents who consented, 185 (93.0%) submitted the survey (Figure 3). After a review of the plausibility of responses, 87 highly suspicious submissions and 1 duplicate submission were removed. Ninety-seven eligible participants without highly suspicious responses completed the survey and were included in the analysis.

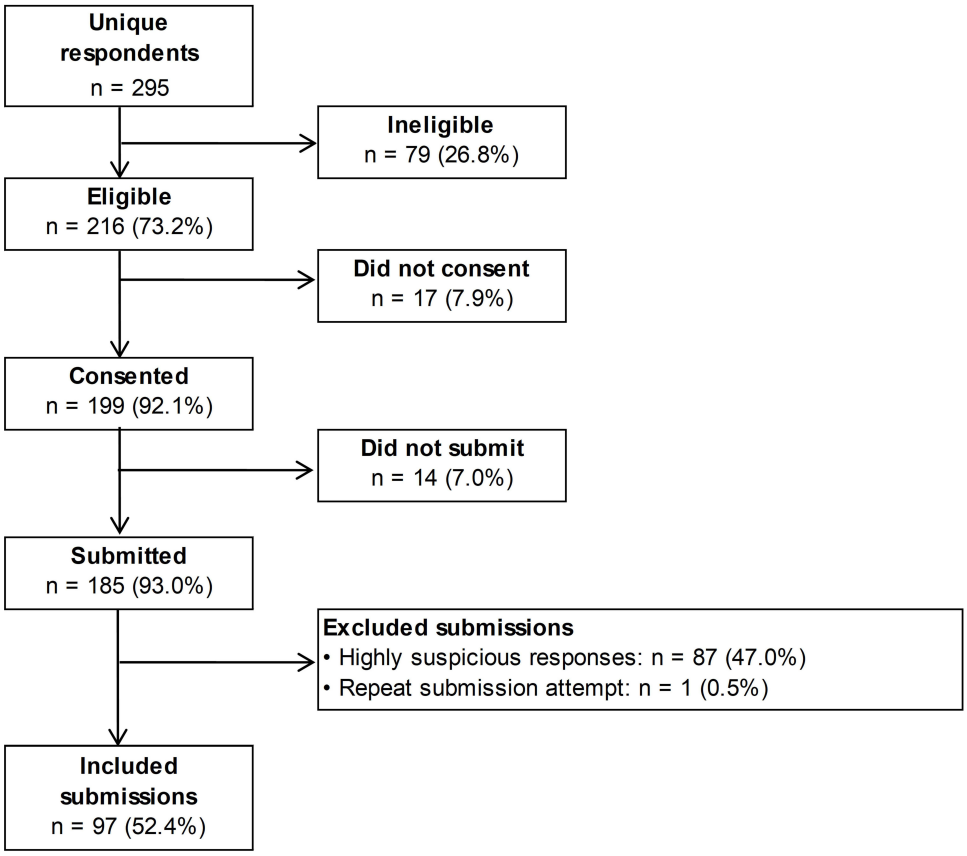

Figure 3 Study sample flowchart.

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The mean (SD) survey completion time was 18.5 (72.1) minutes. Sixty-eight (70.1%) of participants were female, and 77 (79.4%) were white. The mean (SD) age of participants was 54.6 (14.4) years. Forty-seven (48.4%) of participants had ever used biologic treatments, and over a quarter paid for medications out-of-pocket (n = 25, 25.8%; Table 1).

Table 1 Participant Characteristics

Demographic Characteristics	**n=97**
Age at time of survey (years), mean (SD)	54.6 (14.4)
Female sex, n (%)	68 (70.1)
Region, n (%)	
Atlantic region	12 (12.4)
Prairie Provinces	16 (16.5)
West Coast	22 (22.7)
Central Canada	45 (46.4)
Northern Canada	2 (2.1)
Area of residence by population size, n (%)	
Urban population centre (>100,000 individuals)	61 (62.9)
Non-urban population centre (<100,000 individuals)	35 (36.1)
Unsure	1 (1.0)
Race/ethnicity, n (%)*	
Caucasian	77 (79.4)
Non-Caucasian	19 (19.6)
Other/prefer not to answer	3 (3.1)
Employment status, n (%)*	
Retired	38 (39.2)
Employed full-time (≥ 30 hours per week)/ Employed part-time (<30 hours per week)	34 (35.1) / 9 (9.3)
Long-term/short-term disability	14 (14.4) /1 (1.0)
Unemployed	8 (8.2)
Student	3 (3.1)
Payment source for prescription medications, n (%)*	
Employer-provided health insurance (own or partner's)	52 (53.6)
Funding provided by pharmaceutical company	10 (10.3)
Government drug benefit plan or program	40 (41.2)
Out-of-pocket	25 (25.8)
Private health insurance (purchased independently)	12 (12.4)
Other/prefer not to answer	6 (6.2)

(*Continued*)

Table 1 (Continued).

Demographic Characteristics	n=97
Self-perceived sensitivity to out-of-pocket health-care related costs, n (%)	
Very sensitive	51 (52.6)
Somewhat sensitive	44 (45.4)
Insensitive	2 (2.1)
Clinical characteristics	
Ever diagnosed with severe asthma, n (%)	87 (89.7)
Age at time of severe asthma diagnosis, years, mean (SD)[†]	29.0 (20.1)
Any co-morbid health condition, n (%)	78 (80.4)
Asthma-related comorbidities, n (%)*	
Nasal polyps	26 (26.8)
Atopic dermatitis (eczema)	28 (28.9)
Urticaria (chronic hives)	4 (4.1)
Rhinosinusitis	25 (25.8)
Eosinophilic esophagitis	2 (2.1)
Ever used biologic treatments	47 (48.4)
Current/previous biologic treatments, n (%)	44 (45.4)/ 34 (35.1)
Type of biologic(s), n (%)*	
Cinqair (reslizumab)	2 (2.1)/ 2 (2.1)
Dupixent (dupilumab)	8 (8.2)/ 5 (5.2)
Fasenra (benralizumab)	8 (8.2)/ 7 (7.2)
Nucala (mepolizumab)	9 (9.3)/ 13 (13.4)
Tezspire (tezepelumab)	7 (7.2)/ 9 (9.3)
Xolair (omalizumab)	15 (15.5)/ 16 (16.5)
Completed short course of OCS in past 12 months, n (%)[§]	56 (57.7)
Number of courses, mean (SD)*	4.34 (13.2)
Currently taking maintenance OCS on on-going basis, n (%)	26 (26.8)
Symptoms worsen with NSAIDs, n (%)	28 (28.9)

Notes: *Categories are not mutually exclusive; participants could select >1 category. [†]Subset of participants who responded 'Yes'. [§]Defined as course <14 consecutive days.
Abbreviation: NSAID, non-steroidal anti-inflammatory; OCS, oral corticosteroid; SD, standard deviation.

Participants reported a high degree of symptom burden. Within the 2 weeks prior to survey completion, 84 (86.6%) experienced symptoms and 78 (80.4%) required relief or rescue medications. In the 12 months prior to survey completion, 27 participants (27.8%) were hospitalized or visited the emergency room, and most (n = 72, 74.2%) experienced a limitation in activities due to symptoms. Generally, symptom burden was greater among individuals who were not currently using biologic treatments, as a greater percentage reported experiencing symptoms (90.6% vs 81.8%) and waking from sleep due to symptoms (56.6% vs 27.3%) within the past two weeks (Table 2). The percentage

Table 2 Symptom Burden

	Overall n = 97	CURRENTLY RECEIVING BIOLOGIC TREATMENT	
		Yes n = 44	No n = 53
In the past 2 weeks…			
Experienced symptoms, n (%)	84 (86.6)	36 (81.8)	48 (90.6)
Everyday*	36 (42.9)	16 (44.4)	20 (41.7)
> 2 days per week*	28 (33.3)	10 (27.8)	18 (37.5)
< 2 days per week*	20 (23.8)	10 (27.8)	10 (20.8)
Woke from sleep due to symptoms, n (%)	42 (43.3)	12 (27.3)	30 (56.6)
Everyday*	13 (31.0)	5 (41.7)	8 (26.7)
> 2 days per week*	14 (33.3)	3 (25.0)	11 (36.7)
< 2 days per week*	15 (35.7)	4 (33.3)	11 (36.7)
Required relief or rescue medication, n (%)	78 (80.4)	35 (79.5)	43 (81.1)
Everyday*	23 (29.5)	11 (31.4)	12 (27.9)
> 2 days per week*	36 (46.2)	10 (28.6)	9 (20.9)
< 2 days per week*	19 (24.4)	14 (40.0)	22 (51.2)
In the past 12 months…			
Hospitalized or visited ER, n (%)	27 (27.8)	14 (31.8)	13 (24.5)
Ever hospitalized, n (%)	9 (33.3)	6 (13.6)	3 (5.7)
Number of admissions, mean (SD)*	2.22 (1.30)	1.83 (0.98)	3.00 (1.73)
Ever visited ER, n (%)	26 (96.3)	13 (29.5)	13 (24.5)
Number of ER visits, mean (SD)*	2.38 (1.50)	2.62 (1.45)	2.15 (1.57)
Experienced a limitation in activities due to symptoms, n (%)	72 (74.2)	30 (68.2)	42 (79.2)
Everyday*	35 (48.6)	20 (66.7)	15 (35.7)
> 2 days per week*	20 (27.8)	6 (20.0)	14 (33.3)
< 2 days per week*	17 (23.6)	4 (13.3)	13 (31.0)
Degree of limitation, n (%)*			
Completely limited	3 (4.2)	2 (6.7)	1 (2.4)
Very limited	28 (38.9)	18 (60.0)	10 (23.8)
Moderately limited	34 (47.2)	9 (30.0)	25 (59.5)
Slightly limited	7 (9.7)	1 (3.3)	6 (14.3)
Types of impacted activities, n (%)*†			
Household	45 (62.5)	16 (53.3)	29 (69.0)
Leisure	58 (80.6)	27 (90.0)	31 (73.8)
Work	14 (19.4)	8 (26.7)	6 (14.3)
Other	15 (20.8)	6 (20.0)	9 (21.4)

Notes: *Subset of participants who responded 'Yes'. †Categories are not mutually exclusive; participants could select >1 category.
Abbreviation: ER, emergency room; SD, standard deviation.

of participants who were hospitalized or visited the ER in the past 12 months was greater among those who were currently receiving biologic treatment compared to those who were not (31.8% vs 24.5%) (Table 2).

Main DCE results

Preferences for four of the six attributes considered within the DCE were statistically significant (Figure 4). Compared to a slight improvement, a dramatic improvement in daily activities increased the odds of a biologic being preferred by 78% (OR 1.78, 95% CI 1.48, 2.14). Participants were more likely to prefer biologics that offered a 10% reduction the frequency of severe asthma attacks (OR 1.14, 95% CI 1.10, 1.18) and a 10% reduction in rescue inhaler use (OR 1.07, 95% CI 1.04, 1.1). Biologic treatments that treated one or more other conditions were also more likely to preferred, but this finding was not statistically significant (OR 1.14, 95% CI 0.98, 1.33).

Participants were less likely to prefer biologic treatments associated with higher costs, as for every $100 increase in out-of-pocket costs, the odds of a biologic being preferred decreased by 36% (OR 0.64, 95% CI 0.61, 0.67). Compared to no additional treatment administrations, biologic treatments requiring two additional administrations per month were less likely to be preferred, but this result was not statistically significant (OR 0.80, 95% CI 0.62, 1.02). No difference in preferences was observed between biologics offering a moderate improvement in daily activities compared to a slight improvement (Figure 4).

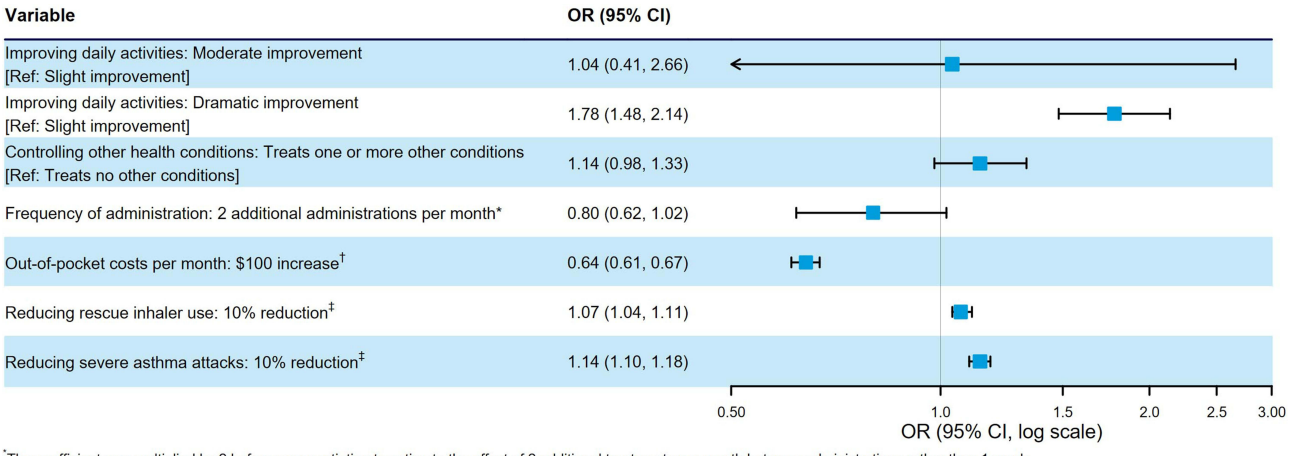
WTP

Of all the attributes, participants were willing to pay the highest amount for a dramatic improvement in daily activities compared to a slight improvement ($129), indicating that this attribute was most important to participants (Table 3). Reducing the severity of asthma attacks and rescue inhaler use were significant and the WTP analyses demonstrated that a 10% reduction in the frequency of severe asthma attacks was more important than a 10% reduction in rescue inhaler use ($29 vs $16).

On average, participants were willing to pay an additional $430 (95% CI $330-$532) in out-of-pocket costs per month for a hypothetical biologic treatment that offered a dramatic improvement in daily activities, treated one or more other health conditions, reduced inhaler use by 50% and severe asthma attacks by 75%, and required administration once every 4-weeks; compared to a biologic treatment without these features.

Subgroup Analyses

When somewhat suspicious responses (those who had one suspicious characteristic) were removed and the data was restricted to participants with no suspicious responses (n = 71), results were similar to the main analysis, except for the



*The coefficient was multiplied by 2 before exponentiating to estimate the effect of 2 additional treatments per month between administrations rather than 1-week.
†The coefficient was multiplied by 100 before exponentiating to estimate the effect of a $100 dollar increase rather than a $1 increase.
‡The coefficient was multiplied by 0.1 before exponentiating to estimate the effect of a 10% reduction rather than a 100% reduction.

Figure 4 Main Discrete Choice Experiment results.

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Table 3 Willingness-to-Pay

Attributes (in order of highest to lowest WTP)	$ CAD (95% CI)	Everything else being equal…
1. Improving daily activities: Dramatic improvement [Ref: Slight improvement]	$129.03 ($84.78, $173.37)	On average, an individual is willing to pay $129.03 out-of-pocket for a dramatic improvement in daily activities (instead of a slight improvement)
2. Frequency of administration: Two additional administrations per month	-$51.14 (-$106.01, $6.99)	On average, two additional administrations per month, decreased an individual's willingness to pay in out-of-pocket costs by $51.14; however, this result is not statistically significant
3. Controlling other health conditions: Treats one or more other conditions [Ref: Treats no other conditions]	$29.76 (-$2.01, $62.74)	On average, an individual is willing to pay $29.76 out-of-pocket to treat one or more other conditions (instead of no treatment of other conditions); however, this result is not statistically significant
4. Reducing severe asthma attacks: 10% reduction	$28.96 ($20.33, $38.67)	On average, an individual is willing to pay $28.96 out-of-pocket to reduce severe asthma attacks by 10%
5. Reducing rescue inhaler use: 10% reduction	$15.89 ($8.79, $22.95)	On average, an individual is willing to pay $15.89 out-of-pocket to reduce rescue inhaler use by 10%
6. Improving daily activities: Moderate improvement [Ref: Slight improvement]	$9.31 (-$209.66, $218.55)	On average, an individual is willing to pay $9.31 out-of-pocket for a moderate improvement in daily activities (instead of a slight improvement); however, this result is not statistically significant

Abbreviation: CAD, Canadian dollars; CI, confidence interval; WTP, willingness-to-pay.

dramatic vs slight improvement in daily activities attribute which increased in magnitude (OR 1.78 vs 1.99). Fifteen participants failed the reliability choice tasks (dominant, n = 3, 3.1%; consistency, n = 13, 13.4%; both, n = 1 1.0%). Results were similar to the main analysis when restricting to participants who did not fail the dominant or consistency choice tasks (n = 82; Supplementary Figure 1).

The importance of out-of-pocket costs did not differ substantially from the main results when stratified by perceived cost sensitivity, household income, or payment method for asthma medications. Similarly, there were no notable differences from the main analysis when stratified by biologics treatment experience, current OCS use, and those who reported a previous hospital or emergency room visit in the past 12 months (Supplementary Figure 1).

Discussion

As with the management of other chronic conditions, people with severe asthma are more likely to adhere to treatments that align with their preferences.[24] This makes insights into the preferences and WTP for biologic treatments for severe asthma valuable for clinicians seeking to improve treatment adherence through shared decision-making. In alignment with a recent qualitative study,[18] the results from this DCE highlight the desire for severe asthma treatments that substantially improve everyday life. Compared to a slight improvement, a biologic treatment offering a dramatic improvement in daily activities was 78% more likely to be preferred. Participants were willing to pay an average of $129 in additional out-of-pocket costs per month for a biologic treatment that offered a dramatic improvement, highlighting the importance of being able to engage in one's daily activities to Canadians with severe asthma. This attribute has not been examined in previous DCEs on biologics for severe asthma.[25,27]

In this DCE, a $100 increase in costs per month significantly reduced the odds of a biologic being preferred. In subgroup analyses, the importance of out-of-pocket costs remained statistically significant among all levels of sensitivity to healthcare costs and annual income, and among those who do or do not pay out-of-pocket for asthma medications. These findings align with prior qualitative studies,[18,28] and emphasize the importance of costs when choosing between

biologic treatments independent of other cost-related influences. This attribute also has not been evaluated in previous DCEs.[27,29,30]

The impact of a reduction in severe asthma attacks and rescue inhaler use were consistently statistically significant across the main results and subgroup analyses. This aligns with the results of previous US-based DCEs where participants placed high importance on treatment efficacy (including improved lung function and reduced severe asthma attacks and hospitalizations).[27,29] Previous literature on the importance of frequency of administration has been inconsistent. One DCE reported a significant preference for less frequent administration (eg, every 8 weeks vs 2 weeks),[29] however this impact of this attribute was not statistically significant in the main analysis of the present DCE, or in other DCEs.[27,30] In the present study, frequency of administration was only significant among those who pay out-of-pocket for asthma medications and those who currently or within the past 12 months used an OCS.

Other important attributes in US-based studies included a reduction in risk of treatment-related adverse events, route and setting of administration, low-risk of injection site reactions, and faster onset of improvements in symptoms.[27–30] Administration method and setting were not included as attributes in this DCE as nearly all of the biologics available in Canada are administered subcutaneously and provide the option for at-home treatment. The remainder of these attributes were not identified to be of high importance to Canadians in the prior qualitative study,[18] and therefore were not examined in the present DCE.

When presenting biologic treatment options to patients with severe asthma, clinicians can use these findings to guide discussions. The DCE results indicate that while asthma efficacy outcomes – such as reducing severe attacks and rescue inhaler use – are important, the potential impact on daily activities may carry greater weight in patient decision-making. Clinicians should emphasize the extent to which each biologic treatment may improve activities of daily living and quality of life. Additionally, patients should be informed about potential differences in out-of-pocket costs for each biologic treatment.

An unexpected finding was the greater frequency of medical encounters in the past 12 months among participants who were currently using biologics (compared to those who were not), despite fewer participants currently using biologics reporting experiencing of or being woken by symptoms in the past two weeks. A possible explanation is that some individuals could have started biologic treatment within the past 12 months (potentially after a hospitalization or ER visit), and medical encounters occurring prior to treatment initiation may have been included; however, timing of initiation was not captured in the present study.

This study has limitations. First, despite efforts to include a representative sample, study participants could vary from the general population of Canadians with severe asthma. Participants were recruited through Asthma Canada's voluntary e-newsletter and thus may be more informed about asthma care and biologic treatment. However, the characteristics of participants in the present study aligns with an observational study using data from the International Severe Asthma Registry (ISAR),[41] and are likely representative of adults with severe asthma. Second, due to the nature of online, anonymous surveys, fraudulent responses could have been included in the analysis. However, several safeguards were implemented to identify and prevent erroneous responses from fraudulent submissions. Given that the results were unchanged in subgroup analyses restricted to participants without suspicious responses and those who passed the embedded survey checks, the effect of the potential inclusion of illegitimate submissions is likely insignificant. Third, participants were required to self-report their asthma diagnosis, and some individuals may not be aware of their diagnosis. Due to the online nature of the survey, there was no way to verify their severe asthma diagnosis. To address this, eligibility was not restricted to those formally diagnosed with severe asthma, and alternate inclusion criteria based on medication use were implemented. Fourth, the generalizability of cost preferences and WTP results is limited to countries with similar drug coverage systems and population demographics. In Canada, prescription medications are paid for through a mix of both public and private coverage, and out-of-pocket cost payments vary. WTP for biologic treatments and their individual attributes may differ in regions with differing levels of public drug coverage. Lastly, the hypothetical biologic treatment attributes were selected to reflect the features of real-world biologic treatments in general, but individual treatment features may vary. As with all DCEs, it was not possible to include all attributes that may impact patient preferences; the number of attributes and levels was selected to help avoid respondent burden.

This study also has several strengths. First, the identification and inclusion of DCE attributes and levels was based on in-depth qualitative research conducted among Canadians living with severe asthma with and without experience with biologic treatments, and in consultation with clinical experts. Second, this is the first DCE on biologic treatments for severe asthma conducted among Canadian participants, and the first to include cost as an attribute, allowing for estimates of preference weights using a common unit (WTP) and comparison of attribute importance. Third, focused efforts were made to recruit a diverse sample. Participants were recruited through a national, non-profit organization for Canadians with asthma. The electronic survey promoted accessibility, and participants representing 7 of Canada's 13 provinces and territories were included. Finally, several subgroup analyses were conducted to explore the robustness of the results.

In this study, participants were willing to pay an extra $430 CAD in monthly out-of-pocket costs for a hypothetical biologic treatment. Policymakers and health technology agencies in Canada may consider this finding when making reimbursement and drug listing decisions for severe asthma treatments. However, it is important to keep in mind that stated preferences measured in DCEs are elicited by participants choosing between hypothetical treatments and these stated preferences may not necessarily align with real-world decisions that would better reflect an individual's 'revealed' preferences.[42] Revealed preferences depend on contextual factors such as health, income, criteria for approval, access, and healthcare professionals' recommendations. Such data are not presently available and further research is needed to understand which biologic treatments are selected by Canadians with severe asthma and why, how many Canadians with severe asthma pay out-of-pocket for biologic treatments, and the frequency of lack of access to biologics due to insufficient cost coverage.

Conclusion

Canadians with severe asthma prefer biologic treatments that contribute to a dramatic improvement in daily activities and have lower out-of-pocket costs. The findings from this DCE provide insight into patient preferences that can inform decision-makers when considering access to new biologic treatments and clinicians when helping patients select treatments for severe asthma.

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Disclosure

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