

# The Burden of Rhinitis and the Impact of Medication Management within the Community Pharmacy Setting



Rachel Tan, BSci(Hons)<sup>a</sup>, Biljana Cvetkovski, MPharm<sup>a</sup>, Vicky Kritikos, PhD<sup>a</sup>, David Price, FRCGP<sup>b,c</sup>, Kwok Yan, FCCP<sup>a,d</sup>, Peter Smith, FRACP<sup>e</sup>, and Sinthia Bosnic-Anticevich, PhD<sup>a,f</sup> Sydney, New South Wales and Southport, Queensland, Australia; Aberdeen, United Kingdom; and Singapore

**What is already known about this topic?** Rhinitis is a chronic, prevalent collection of disorders of the upper airways, which is often trivialized by patients despite its high burden to individuals and society.

**What does this article add to our knowledge?** Patients with rhinitis self-select their rhinitis medication, without health care provider assistance. A majority of medication selections were suboptimal and are potentially a major contributor to the high burden of rhinitis to individuals and society.

**How does this study impact current management guidelines?** Current guidelines need to articulate the role of community pharmacist in the management of rhinitis akin to a clinical pharmacy triage service and provide a pharmacist-specific clinical pathway to optimize rhinitis management in the community.

**BACKGROUND:** The burden of rhinitis is high. It is unknown to what extent this burden is related to inappropriate medication use.

**OBJECTIVE:** This study aimed to identify the way in which people with rhinitis medicate their condition and to evaluate the appropriateness of this medication management.

**METHODS:** Pharmacy customers who visited Sydney metropolitan community pharmacies and purchased medication for nasal symptoms were the sampling frame for

this study. To determine the condition for which the participants were seeking medication and the appropriateness of their medication selection, the following data were collected with a researcher-administered questionnaire: participant's demographics, symptoms, medication selected. An expert panel of clinical researcher pharmacists and specialist respiratory physician evaluated the appropriateness of medication selection based on the Allergic Rhinitis and its Impact on Asthma international guidelines.

<sup>a</sup>Quality Use of Respiratory Medicine Group, Woolcock Institute of Medical Research, University of Sydney, Sydney, New South Wales, Australia

<sup>b</sup>Academic Primary Care, University of Aberdeen, Aberdeen, United Kingdom

<sup>c</sup>Observational and Pragmatic Research Institute Pte Ltd, Singapore

<sup>d</sup>Royal Prince Alfred Hospital, Sydney, New South Wales, Australia

<sup>e</sup>Clinical Medicine, Griffith University, Southport, Queensland, Australia

<sup>f</sup>Sydney Local Health District, Sydney, New South Wales, Australia

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Pharmaceuticals, and AstraZeneca; funding for patient enrolment or completion of research from Chiesi, Teva Pharmaceuticals, Zentiva, and Novartis; stock/stock options from AKL Research and Development, which produces phytopharmaceuticals; owns 74% of the social enterprise Optimum Patient Care, UK, and 74% of Observational and Pragmatic Research Institute Pte, Singapore; and is a peer reviewer for grant committees of the Medical Research Council, Efficacy and Mechanism Evaluation programme, and Health Technology Assessment. K. Yan has received honoraria for speaking and consulting from AstraZeneca, Boehringer Ingelheim, GlaxoSmithKline, Meda, Mundipharma, and Pfizer. P. Smith is a clinical allergist with research and clinical interest in rhinology and has also been a speaker for Meda, GlaxoSmithKline, Novartis, Mundipharma, and AstraZeneca. S. Bosnic-Anticevich is a member of the Teva Pharmaceuticals Devices International Key Experts Panel; has received research support from Research in Real Life; has received lecture fees and payment for developing educational presentations from Teva and Mundipharma; and has received Honoraria from AstraZeneca, Boehringer Ingelheim, and GlaxoSmithKline for her contribution to advisory boards/key international expert forum.

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Corresponding author: Rachel Tan, BSci(Hons), Woolcock Institute of Medical Research, 431 Glebe Point Road, Glebe, Sydney, NSW 2037, Australia. E-mail: stan6464@uni.sydney.edu.au.

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*Abbreviations used*

AR- Allergic rhinitis  
 ARIA- Allergic Rhinitis and its Impact on Asthma  
 BSACI- The British Society for Allergy & Clinical Immunology  
 HCP- Health care professional  
 INCS- Intranasal corticosteroid  
 IR- Idiopathic rhinitis  
 MR- Mixed rhinitis  
 NAR- Nonallergic rhinitis  
 OTC- Over the counter  
 QOL- Quality of life

**RESULTS:** Two hundred and ninety-six participants were recruited from 8 pharmacies; 63.2% had a doctor's diagnosis for the symptoms for which they were selecting treatment. Seventy percent of participants self-selected their medications. Seventy-one percent of the participants were identified as having rhinitis. Overall, 16.5% of participants who had rhinitis selected optimal medications. Sixteen percent of participants with allergic rhinitis reported wheezing (6.3% selected optimal medications).

**CONCLUSIONS:** The majority of the participants with rhinitis selected suboptimal medications from community pharmacy highlighting the significant burden of rhinitis in community pharmacy and the contribution of medication management. Pharmacists need to take a proactive and evidence-based role in the management of rhinitis supported by clinical pathways when need to be articulated and promoted in all rhinitis guidelines. © 2018 American Academy of Allergy, Asthma & Immunology (J Allergy Clin Immunol Pract 2018;6:1717-25)

**Key words:** Clinical pathways; Community pharmacy; Medication management; Rhinitis; Self-management

Rhinitis can be broadly classified as allergic rhinitis (AR) or nonallergic rhinitis (NAR), but some types of rhinitis can have both AR and NAR components (known as mixed rhinitis [MR]).<sup>1,2</sup> This overlap in rhinitis often makes differential diagnosis difficult, with recent data suggesting that 75% of patients have AR, 60% have NAR, and 35% have MR.<sup>3</sup> In the population with AR, approximately 40% to 70% of patients have a mixed condition with idiopathic rhinitis (IR) and between 40% and 50% of patients with rhinitis have IR alone.<sup>4-6</sup> Although AR and NAR have distinct pathophysiologies and are induced by different triggers, both are risk factors for the development of asthma.<sup>7</sup>

AR is the most prevalent form of rhinitis affecting up to 30% of the world's population,<sup>8</sup> and in Australia, AR affects 19% of the population.<sup>9</sup> AR often coexists with asthma and when undertreated can worsen asthma control.<sup>10,11</sup> Up to 80% of people with asthma have coexisting AR, and at least 30% of patients with known AR also have asthma.<sup>12-14</sup>

Undertreated rhinitis can have a substantial negative impact on patients' quality of life (QOL) impairments in work productivity, school performance, social interactions, sleep and driving performance,<sup>8,14,15</sup> which contributes to the overall disease burden. The high financial costs associated with poorly managed rhinitis, including the direct treatment-related costs and indirect costs through lost wages and reduced productivity, create a substantial socioeconomic burden on individuals and society.<sup>16</sup>

Rhinitis is often regarded as a "background noise," a nuisance and a trivial disease by patients as it is not a life-threatening

condition<sup>17</sup>; however, one could question the role the validity of this latter statement in light of the recent thunderstorm asthma incidence and the relationship between AR and asthma.<sup>18</sup> It is often underrecognized by patients,<sup>19,20</sup> with 45% of patients with AR shown not to have a doctor's diagnosis of their condition.<sup>21</sup> In many instances, patients do not associate their nasal symptoms as being chronic or serious,<sup>22,23</sup> and do not seek medical advice.<sup>24</sup> Moreover, patients often self-diagnose and self-select medications from community pharmacies, without pharmacist guidance.<sup>22,25</sup> On the other hand, patients who recognize having AR may not only trivialize it because they have asthma, but may also underestimate the magnitude of its impact on their QOL<sup>19,24</sup> and frequently accept living with symptoms.<sup>19,26</sup> They often do not realize the benefits of being appropriately managed. This problem may be amplified within the Australian primary health care setting, as the majority of guideline-recommended rhinitis treatments can be independently self-selected over the counter (OTC) from community pharmacies without needing a prescription or having to seek pharmacist advice.<sup>22,27,28</sup>

This study was developed to provide more information about the burden of rhinitis in Australia as research related to the way in which rhinitis symptoms are managed and the appropriateness of selected treatment(s) within community pharmacies is scarce. Moreover, examining approaches to rhinitis symptom management may provide evidence for intervention in terms of both prescription policies and pharmacist counseling in OTC medications, which are available in Australia as either schedule 2 (self-selected) or schedule 3 (pharmacist only medicine) requiring pharmacist advice.<sup>29</sup>

This study aimed to identify the way in which people with rhinitis symptoms choose to medicate and to evaluate the appropriateness of their medication management choices.

## METHODS

### Study design

This research took the form of a cross-sectional observational study conducted on a sample of pharmacy customers selecting medications to treat nasal symptom(s) from community pharmacies during July to September 2015 (Australian spring) and April to June 2016 (Australian autumn) (Figure 1). The study was approved by the University of Sydney Human Research Ethics Committee (Ref No. 2015/527).

### Setting

Community pharmacies within the Sydney Metropolitan area that expressed an interest in research or in providing pharmacy services were invited to participate.

### Participants

Data were collected through the process of a researcher standing in the pharmacy for an average of 6 hours per day and approaching each pharmacy customer who fulfilled the following eligibility criteria (Figure 1).

**Inclusion criteria.** Pharmacy customers who independently self-selected an OTC medication(s) or approached a pharmacist for an OTC or prescribed medication for nasal symptoms were eligible for inclusion in this study. Pharmacy customers who were purchasing on behalf of their family members were also included, if they were able to complete the data collection process.

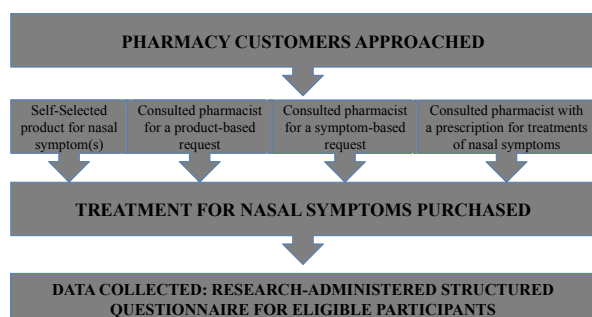


FIGURE 1. Study design overview.

**Exclusion criteria.** Pharmacy customers who were unable to complete the data collection process or subsequently expressed disinterest in participating were excluded.

**Consent obtained.** All eligible participants provided verbal consent before the data collection commenced (Figure 1).

### Variables

Data were collected using a researcher-administered structured questionnaire (Figure 2) based on empirical data, and the framework of the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines.<sup>4</sup> All responses were anonymized, and participants were de-identified. Data were collected over 3 main domains: demographics (age, gender, who the medication was for, method of product selection, diagnosis); symptoms for which the product was being purchased (nature, patterns, frequency and severity of symptoms, triggers (if any), and impact of symptoms on QOL); medication(s) selected to treat the symptoms reported (Figure 2).

### Data measurement

**Classification of participants.** Participants were classified into AR, NAR, and other. Classification was based on the existence of a doctor's diagnosis self-reported by participants or determined by the expert panel of clinical research pharmacists who applied the criteria for the diagnosis of AR outlined in the ARIA guidelines,<sup>4</sup> based on diagnosis, triggers, and symptoms reported. The triggers were reported and identified in response to the following questions: "What brings on/makes your symptoms worse?" and "Is there, if any, a particular time of the year that these symptom(s) occur?" (Figure 2).

**Evaluation of medications appropriateness.** An expert panel team of allergist, specialist respiratory physician, general practitioner, and clinical research pharmacists was established. Members of the expert panel team evaluated the appropriateness of the medication(s) selected by participants with rhinitis, based on the latest ARIA guidelines for participants with AR<sup>14</sup> and the British Society for Allergy & Clinical Immunology (BSACI) guidelines for NAR.<sup>7</sup> The appropriateness of medications was evaluated based on the medications purchased at the time of the study and any other medications currently used. The medication purchased and those currently in use were considered appropriate if they were consistent with either ARIA or BSACI guidelines recommendations.

### Study size

The samples size was calculated to ensure that the data were collected from a representative sample, based on an estimated

proportion of 0.5 (50% of people with AR self-selecting medication in a pharmacy).<sup>23</sup> A sample of 200 participants with AR were required.<sup>30</sup>

### Bias

The potential bias may have arisen as a result of participation of pharmacies within Sydney Metropolitan area who were willing to participated; the collection of data during high allergy seasons; inability to collect data from people who have AR but do not visit a pharmacy.

### Quantitative variables

The ARIA guidelines classified AR into 4 categories: mild or moderate-severe, intermittent, and mild or moderate-severe, persistent. Symptoms that occurred less than 4 days per week or less than 4 weeks per year were classified intermittent, and symptoms that occurred more than 4 days per week and more than 4 weeks per year were classified persistent. The severity of symptoms was determined by the symptom severity and impact on an aspect of QOL self-reported by patients.

### Statistical method

Data were analyzed using SPSS (version 24, IBM Corporation, Armonk, NY). All data were analyzed descriptively and the Pearson  $\chi^2$  test was used to test for differences between severity of rhinitis symptoms and optimal management, and between AR diagnosed by a doctor or an expert panel of pharmacists and optimal management. A significance level of  $P < .05$  was used for all statistical procedures.

### RESULTS

A total of 383 potential participants were approached; 77.3% (296/383) fulfilled the inclusion criteria and agreed to participate (Figure 3). Reasons for nonparticipation at each stage are summarized as a flow diagram in Figure 3. Each structured questionnaire took an average of 5 minutes to administer for each participant.

### Descriptive data

The majority of the participants (66.6%, 197/296) were female, with 58.1% (172/296) aged more than 40 years. Eighteen percent (53/296) of participants were purchasing nasal treatments for their family members and could provide a full account of the nature of the condition. Sixty-three percent (187/296) of participants had a doctor's diagnosis for the symptoms they were treating on this occasion, and 69.5% (206/296) of participants self-selected their own medications, without consulting a pharmacist.

Of the 296 participants, 69.5% (206/296) had rhinitis (Figure 4). Sixty-eight percent (202/296) had AR, of whom 64.9% (131/202) had a doctor's diagnosis (Figure 5). The remainder (35.1%, 71/202) were diagnosed based on the criteria outlined in the ARIA guidelines and described in the methods above. One percent (4/296) had NAR, of whom 50.0% (2/4) had a doctor's diagnosis (Figure 5). With regard to the remaining participants, 19.2% (57/296) had cold/flu or sinusitis or another diagnosis, and 11.5% (34/296) were not able to be defined with a diagnosis from the available data collected (Figure 3); these patients required referral to a medical practitioner.

### Main results

A comparison of symptoms, their severity, pattern, duration, impact on QOL, and triggers that bring on these symptoms are

## Researcher survey:

## The management of nasal symptoms: PATIENT PRODUCT SELECTION FORM

| <b>Do you consent to participate in this study?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      | <input type="checkbox"/> Yes                                                                                                                                                                                                                                                                   | <input type="checkbox"/> No |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
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| <b>PRODUCT (S):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Product(s) selected:</b> _____<br><b>What are you taking it for?</b> _____<br><b>Why did you choose this product(s)?</b><br><input type="checkbox"/> Effective → <input type="checkbox"/> Compared to others of the same class<br><input type="checkbox"/> Price/Advertisement/Catalogue/What's on the box<br><input type="checkbox"/> Recommended, Who? _____<br><input type="checkbox"/> Other: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      | <b>Who for?</b> <input type="checkbox"/> Self <input type="checkbox"/> Other<br><b>Age:</b> <input type="checkbox"/> <18 <input type="checkbox"/> 18-39 <input type="checkbox"/> >40<br><b>Gender:</b> <input type="checkbox"/> M <input type="checkbox"/> F <input type="checkbox"/> Pregnant |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>DIAGNOSIS:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Have you spoken to your doctor about this?</b><br>If 'yes', what was diagnosed and/or recommended?<br>If 'no', did you speak to your pharmacist?<br>If 'yes', what was recommended/advised?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                      | <input type="checkbox"/> Yes, GP/Specialist <input type="checkbox"/> No<br><input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                            |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Has anyone shown(spray)/explained(tablet) how to use this?</b><br>If 'yes', please specify: _____                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                      | <input type="checkbox"/> Yes, GP/Pharmacist <input type="checkbox"/> No                                                                                                                                                                                                                        |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>MEDICATION HISTORY:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Have you tried anything in the past for these condition?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                      | <input type="checkbox"/> Yes, _____ <input type="checkbox"/> No                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Did it work for you?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                      | <input type="checkbox"/> Yes <input type="checkbox"/> No                                                                                                                                                                                                                                       |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Are you using anything else for your condition?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      | <input type="checkbox"/> Yes, _____ <input type="checkbox"/> No                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Do you use a puffer?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                      | <input type="checkbox"/> Yes, _____ <input type="checkbox"/> No                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>SYMPTOM (S):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>What symptom(s) is this product(s) being used to treat?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Do you also have?</b><br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #f2f2f2;"> <th colspan="2">Symptoms</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> Sneezing</td> <td><input type="checkbox"/> Watery Eyes</td> </tr> <tr> <td><input type="checkbox"/> Itchiness</td> <td><input type="checkbox"/> Mucus</td> </tr> <tr> <td>Nose/Eyes/Ears/Palate</td> <td>Clear/Yellow/Green</td> </tr> <tr> <td><input type="checkbox"/> Runny Nose</td> <td><input type="checkbox"/> Headache</td> </tr> <tr> <td><input type="checkbox"/> Blocked Nose</td> <td><input type="checkbox"/> Fever</td> </tr> <tr> <td><input type="checkbox"/> Wheeze</td> <td><input type="checkbox"/> Muscle Ache</td> </tr> <tr> <td colspan="2" style="padding: 5px;"><b>Other:</b></td> </tr> </tbody> </table> |                                      | Symptoms                                                                                                                                                                                                                                                                                       |                             | <input type="checkbox"/> Sneezing | <input type="checkbox"/> Watery Eyes | <input type="checkbox"/> Itchiness                                                                                                                                  | <input type="checkbox"/> Mucus | Nose/Eyes/Ears/Palate | Clear/Yellow/Green | <input type="checkbox"/> Runny Nose | <input type="checkbox"/> Headache | <input type="checkbox"/> Blocked Nose | <input type="checkbox"/> Fever | <input type="checkbox"/> Wheeze | <input type="checkbox"/> Muscle Ache | <b>Other:</b> |  | <b>How severe are the symptoms?</b><br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #f2f2f2;"> <th></th> <th colspan="4">Severity</th> </tr> <tr style="background-color: #f2f2f2;"> <th>Symptoms</th> <th>No</th> <th>Mild</th> <th>Moderate</th> <th>Severe</th> </tr> </thead> <tbody> <tr><td>Sneezing</td><td></td><td></td><td></td><td></td></tr> <tr><td>Itchy Nose</td><td></td><td></td><td></td><td></td></tr> <tr><td>Itchy Ears/Palate</td><td></td><td></td><td></td><td></td></tr> <tr><td>Runny Nose</td><td></td><td></td><td></td><td></td></tr> <tr><td>Blocked Nose</td><td></td><td></td><td></td><td></td></tr> <tr><td>Itchy Watery Eyes</td><td></td><td></td><td></td><td></td></tr> <tr><td>Headache</td><td></td><td></td><td></td><td></td></tr> <tr><td>Wheeze</td><td></td><td></td><td></td><td></td></tr> </tbody> </table> |  |  | Severity |  |  |  | Symptoms | No | Mild | Moderate | Severe | Sneezing |  |  |  |  | Itchy Nose |  |  |  |  | Itchy Ears/Palate |  |  |  |  | Runny Nose |  |  |  |  | Blocked Nose |  |  |  |  | Itchy Watery Eyes |  |  |  |  | Headache |  |  |  |  | Wheeze |  |  |  |  |
| Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <input type="checkbox"/> Sneezing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/> Watery Eyes |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <input type="checkbox"/> Itchiness                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <input type="checkbox"/> Mucus       |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Nose/Eyes/Ears/Palate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Clear/Yellow/Green                   |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <input type="checkbox"/> Runny Nose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input type="checkbox"/> Headache    |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <input type="checkbox"/> Blocked Nose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <input type="checkbox"/> Fever       |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <input type="checkbox"/> Wheeze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <input type="checkbox"/> Muscle Ache |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>Other:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Severity                             |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Symptoms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No                                   | Mild                                                                                                                                                                                                                                                                                           | Moderate                    | Severe                            |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Sneezing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Itchy Nose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Itchy Ears/Palate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Runny Nose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Blocked Nose                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Itchy Watery Eyes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Headache                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Wheeze                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>How often do these symptoms affect your sleep/performance/daily activities?</b><br><br><table border="1" style="width: 100%; border-collapse: collapse;"> <tr style="background-color: #f2f2f2;"><td style="text-align: center;">Weekly</td></tr> <tr><td style="text-align: center;">LESS &lt; 4 times/week &gt; MORE</td></tr> <tr style="background-color: #f2f2f2;"><td style="text-align: center;">Yearly</td></tr> <tr><td style="text-align: center;">LESS &lt; 4 weeks/year &gt; MORE</td></tr> </table>                                                                                                                                                                                                                                                                                                                                                           |                                      | Weekly                                                                                                                                                                                                                                                                                         | LESS < 4 times/week > MORE  | Yearly                            | LESS < 4 weeks/year > MORE           | <b>How often do you use your medications to keep your symptoms under control?</b><br><br><input type="checkbox"/> Everyday<br><input type="checkbox"/> Other: _____ |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Weekly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| LESS < 4 times/week > MORE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| Yearly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| LESS < 4 weeks/year > MORE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |
| <b>What brings on/makes your symptoms worse?</b><br><b>Is there, if any, a particular time of the year that this symptom occur?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                      |                                                                                                                                                                                                                                                                                                |                             |                                   |                                      |                                                                                                                                                                     |                                |                       |                    |                                     |                                   |                                       |                                |                                 |                                      |               |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |          |  |  |  |          |    |      |          |        |          |  |  |  |  |            |  |  |  |  |                   |  |  |  |  |            |  |  |  |  |              |  |  |  |  |                   |  |  |  |  |          |  |  |  |  |        |  |  |  |  |

\* The questionnaire for participants that consulted a pharmacist were formatted in a slightly different way.

FIGURE 2. Researcher survey.

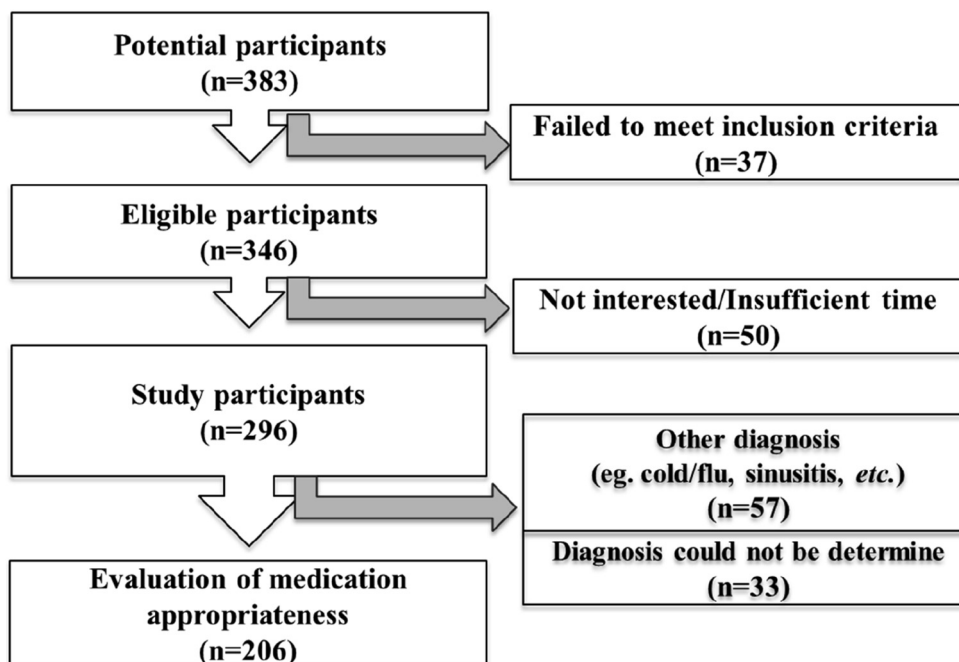


FIGURE 3. Recruitment of participants.

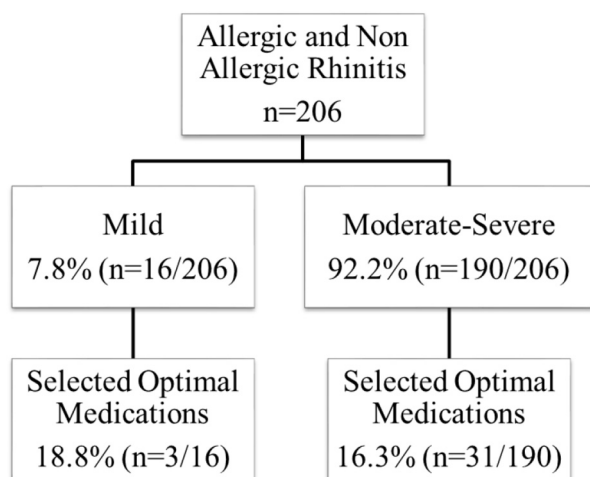


FIGURE 4. Appropriateness of medications selected according to the severity of symptoms reported (n = 206).

summarized in Table I. The most common symptom experienced amongst the AR participants was rhinorrhea (81.2%, 164/202), followed by sneezing (80.2%, 162/202); 15.8% (32/202) also experienced wheezing (Table I). Ninety-three percent (187/202) of participants with AR experienced symptoms at a moderate-severe level, and 55.0% (111/202) experienced persistent symptoms (Table I). Eighty percent (162/202) of participants with AR could identify a trigger (Table I). Sixty percent (122/202) of participants reported that their symptoms had an impact on at least one aspect of their day-to-day living, with restrictions on their daily activities being most troublesome (39.6%, 80/202) (Table I).

All participants with NAR experienced nasal congestion, with 75.0% (3/4) experiencing congestion at a moderate-to-severe level and 50.0% (2/4) experiencing persistent symptoms (Table I). Twenty-five percent (1/4) of participants with NAR could identify a trigger (Table I). Seventy-five percent (3/4) of participants reported that their symptoms had an impact on at least 1 aspect of their day-to-day living, restricted their daily activities (25.0%, 1/4), and disturbed their sleeping patterns (50.0%, 2/4) (Table I).

Overall, 16.5% (34/206) of participants with rhinitis selected optimal medications (Figure 3). There was no statistical significant difference between the proportion of participants with mild and moderate-severe rhinitis symptoms who selected optimal medications (18.8% vs 16.3%, respectively, n = 206, Pearson  $\chi^2 = 0.059$ ,  $P > .5$ ) (Figure 4).

Of the participants with AR, 14.9% (30/202) selected optimal medications (Figure 5). A breakdown of how this relates to participants with a doctor's diagnosis of AR is summarized in Figure 5. There was no statistical significant difference between the proportion of participants with AR with or without a doctor's diagnosis who selected optimal medications (14.5% vs 15.5%, respectively, n = 202, Pearson  $\chi^2 = 0.036$ ,  $P > .5$ ). A summary of the medications chosen for AR compared with the guideline-recommended medications is included in Figure 6. For participants with coexisting asthma (15.8%, 32/202), 6.3% (2/32) selected optimal medications. Overall, oral antihistamines were most commonly selected (56.4%, 114/202), followed by intranasal corticosteroids (INCSs) (31.2%, 63/202) (Figure 6). Thirteen percent (27/202) selected more than one medication, with the most common combination being oral antihistamines and INCSs (6.9%, 14/202) (Figure 6).

All participants with NAR selected optimal medications for their current condition (Figure 5). A breakdown of how this relates to participants with a doctor's diagnosis of NAR is

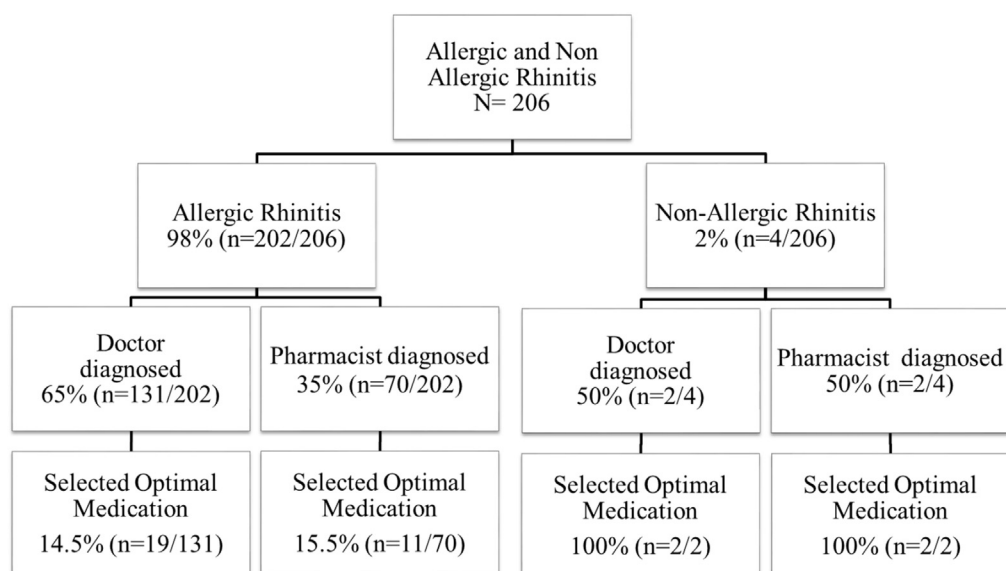


**FIGURE 5.** Appropriateness of medications selected for allergic rhinitis and nonallergic rhinitis; comparing doctor's diagnosis versus clinical research pharmacist's diagnosis (n = 206).

**TABLE I.** A comparison of AR and NAR symptoms—its severity, pattern, impact on quality of life, and trigger that onset these symptoms

|                                                      | AR  |         | NAR |       | P value |
|------------------------------------------------------|-----|---------|-----|-------|---------|
|                                                      | n   | (/202)% | n   | (/4)% |         |
| Nasal symptoms                                       |     |         |     |       |         |
| Sneezing                                             | 162 | 80      | 1   | 25    | .029    |
| Rhinorrhea                                           | 164 | 81      | 2   | 50    | .17     |
| Nasal congestion                                     | 149 | 74      | 4   | 100   | .574    |
| Itchy eyes                                           | 136 | 67      | 0   | 0     | .013    |
| Itchy nose                                           | 81  | 40      | 0   | 0     | .156    |
| Itchy ears/palate                                    | 50  | 25      | 0   | 0     | .574    |
| Wheeze                                               | 32  | 16      | 0   | 0     | 1       |
| Severity reported                                    |     |         |     |       | .278    |
| Mild                                                 | 15  | 7       | 1   | 25    |         |
| Moderate-severe                                      | 187 | 93      | 3   | 75    |         |
| Frequency of symptoms                                |     |         |     |       | 1       |
| Intermittent                                         | 91  | 45      | 2   | 50    |         |
| Persistent                                           | 111 | 55      | 2   | 50    |         |
| Impact of symptoms                                   |     |         |     |       |         |
| AR symptoms impacted on an aspect of quality of life | 122 | 60      | 3   | 75    | 1       |
| AR symptoms impacted on daily activities             | 80  | 40      | 1   | 25    | 1       |
| AR symptoms impacted on performance                  | 20  | 10      | 0   | 0     | 1       |
| AR symptoms impacted on sleep                        | 48  | 24      | 2   | 1     | .248    |
| Identified at least a trigger                        | 162 | 80      | 1   | 0     | .029    |

AR, Allergic rhinitis; NAR, nonallergic rhinitis.

summarized in Figure 5. All participants purchased at least 1 intranasal decongestant, with 1 participant purchasing a combination of intranasal decongestant and INCS (Figure 6).

Sixty-nine percent (143/206) of the rhinitis participants self-selected medications, of whom 86.7% (124/143) reported that they selected medication based on self-perceived effectiveness of the medication for their condition, 57.3% (82/143) reported a recommendation from a health care professional (HCP), 4.2% (6/143) reported advised by family or friends, 3.5% (5/

143) reported based on instructions written on the package, 3.5% (5/143) reported based on price, and 2.8% (4/143) reported based on trial and error.

## DISCUSSION

This study for the first time evaluated the “real-life” management of rhinitis in the Australian community. A vast majority of participants self-selected medications without consulting a

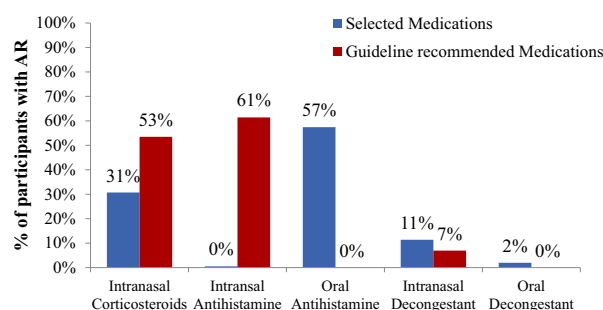


**FIGURE 6.** A summary of the medications chosen for allergic rhinitis (AR) compared with the guideline-recommended medications ( $n = 202$ ). A total of 13.4% participants purchased more than 1 product.

pharmacist. Among the participants with AR, over half had a doctor's diagnosis of AR and just under one-fifth selected optimal medications. Of the 16.0% of participants with AR who reported wheezing, 6.3% selected optimal medications. In contrast, among the participants with NAR, who were a huge minority of the rhinitis population ( $n = 4$ ) participating in this study, half had a doctor's diagnosis and all participants selected optimal medications for their NAR. A majority of participants with rhinitis were experiencing moderate-severe symptoms and half of them were experiencing symptoms on a persistent basis. There was no statistical significant difference in the selection of optimal medications in participants with rhinitis who had a doctor or an expert panel of pharmacists' diagnosis compared with those who self-diagnosed. Twelve percent of participants were also self-medicating for a condition for which a diagnosis could not be determined by the panel of experts.

A high proportion of the participants with rhinitis self-selected their medications without consulting a pharmacist. This is a global trend.<sup>31</sup> What is concerning is that although a majority of participants with rhinitis were self-selecting, they were also experiencing moderate-severe symptoms and they also selected inappropriate medication(s). Many AR participants overselected oral antihistamines, although it has been proven to improve rhinitis symptoms.<sup>32</sup> INCSs were greatly underselected, despite the evidence for their use being first line.<sup>7,14</sup> Although in many countries there may be reasons for the underuse of INCS medications such as lack of access, these barriers to optimal treatment do not exist within an Australian health care system, that is, most people with rhinitis do have access to optimal treatment, and therefore we would expect to see a higher proportion of people with rhinitis to be selecting optimal treatment. Also, with 11% participants purchasing intranasal decongestants, there is a likelihood that there is harm occurring. This suggests that there is a great need for patient education and support, and a proactive approach by pharmacists.

The prominent level of self-medication observed in our study is worthy of discussion. Although this is not a novel finding, it continues to be of concern in that people with rhinitis choose to self-medicate a chronic condition that should not be trivialized, unlike other conditions where nasal symptoms are secondary and of short duration. For rhinitis, there could be several reasons for this; however, the most likely cause is related to people with rhinitis underestimating their condition and having poor

perception of their symptoms. We hypothesize that this leads to a delay in seeking treatment, potentially a failure to continue appropriate treatment and a subsequent failure for symptoms to be effectively treated. The trivialization of rhinitis symptoms has been reported previously,<sup>17</sup> and this could be a cause for the high level of self-medicating by people with rhinitis without seeking advice, even with moderate-severe degree symptoms. This once again highlights the need for pharmacists to be proactive in assisting people with rhinitis to self-assess their symptoms and to recognize the impact they are having on their day-to-day living. This is a critical starting point for optimal treatment and is consistent with research; people with AR treated with recommended treatment conducted under HCP's guidance would have increased likelihood of experiencing reduced symptoms.<sup>33</sup> This has been shown to also reflect on improved QOL.<sup>33</sup>

In our study, a fifth of the participants with AR also had coexisting asthma. This finding is consistent with the literature, which identifies between 15% and 38% of people with known AR to have asthma.<sup>14</sup> People with AR, who are allergic to rye grass pollen, are at risk of having an asthma attack during a thunderstorm,<sup>18</sup> which can have devastating consequences, as was the case in a recent epidemic in Australia.<sup>18</sup> Therefore, the significance of the coexistence of these 2 chronic conditions is important to note and to manage optimally. AR and asthma are the manifestations of 1 chronic inflammatory process in 2 parts of a single airway.<sup>34,35</sup> Moreover, AR is a risk factor for asthma, and uncontrolled AR can worsen asthma control.<sup>11,13,36-39</sup> In this study, a majority of people with AR who experienced wheeze had poorly controlled AR, that is, a significant trigger for their asthma was not being addressed. Unfortunately, in this study, we did not evaluate level of asthma control for those participants with coexisting asthma; however, it would be expected that asthma control was compromised for these patients, even with the best available asthma treatment being prescribed. This research highlights the need for pharmacists to proactively explore the presence and treatment of AR with coexisting asthma to ensure that both conditions are being treated concurrently and optimally.

Another important finding of this study was that approximately 12% of participants were self-medicating for a condition for which a diagnosis could not be determined by the panel of experts. This group of participants may be part of the population with AR that has mixed condition with IR or have IR alone,<sup>4-6</sup> and they require immediate referral to a doctor for diagnosis, further reiterating the fact that although nasal symptoms may be considered trivial by patients, the pattern of presentation can vary and become complex. This again suggests that pharmacists' guidance is critical.

In considering the role of the pharmacist in guiding people with rhinitis to optimal treatment, several factors are noteworthy. First, pharmacists are not able to rely on people with rhinitis approaching them, even when they have moderate-severe presentation of symptoms. Secondly, the determination of the nature and frequency of symptoms and the cause needs to be a structured process, based on evidence-based guidelines and questioning. The structured questionnaire used in this study only took 5 minutes to administer, yet was able to be applied within the community pharmacy setting and equip a pharmacist with data required to determine the optimal treatment required for a fast majority of people with rhinitis. Pharmacists are in an ideal position to deliver community

pharmacy triage service within the community pharmacy<sup>40</sup> and the management of nasal symptoms, which includes rhinitis, that fits this model perfectly. Finally, given the high prevalence of rhinitis and the high level of suboptimally treatment, rhinitis is at least one disorder of the nose in which a pharmacist-based intervention is desperately needed. Pharmacists are in an ideal position to support patients in the self-management of their rhinitis. This can be supported with self-monitoring tools, such as the *Allergy Diary*.<sup>41</sup> Furthermore, app-based support, such as that enabled through the *Allergy Diary*, would allow the pharmacist to engage with people with rhinitis around long-term management and treatment effect, thereby guiding the selection of appropriate treatment for individuals, both in the short and long term.<sup>41</sup>

There are several challenges for pharmacist to carry out this role. First, pharmacists' knowledge needs to be in line with current best evidence.<sup>22,23</sup> This relates not only to knowledge relating to new medications, which become available regularly,<sup>29</sup> but also new concepts relating to rhinitis.<sup>35,42</sup> Secondly, pharmacists need to overcome the perceptions held by of people with rhinitis about their condition and their symptoms, as it is often underrecognized and underreported. Pharmacists need to engage patients appropriately and effectively with efficient questioning. Lastly, pharmacists require tools to help them translate guideline strategies into practice. These tools currently do not exist but should be developed in the future.

In considering the findings of this study, the following factors should be acknowledged. The strength of this study is that it is the first study to explore the burden of rhinitis management in Australian community pharmacy, and it is the first to determine the appropriateness of medication management. It highlights the significant level of suboptimal medication use. Possible limitations are the random selection of community pharmacies, but a convenient sample of geographically located pharmacies across the Sydney metropolitan area; for participants who reported a prior diagnosis of a condition, this diagnosis was not assessed, confirmed, or re-evaluated. Several participants reported on selecting medication for a family member; therefore, in a minority of cases, the data collected were second hand, and because of the low number of people with NAR, conclusions regarding this subset of people with rhinitis should be interpreted with caution.

In conclusion, this study confirms that a majority of the people with rhinitis selected suboptimal medication from community pharmacy despite experiencing moderate-severe symptoms that impact on their day-to-day living. Consequently, this research identifies that there is a significant burden of rhinitis posed on community pharmacy, and the needs of people with rhinitis are currently not being met. Because the majority of people with rhinitis are self-selecting medications OTC, pharmacists cannot rely on people with rhinitis presenting to them, but need to take a more proactive and evidence-based role in the management of rhinitis in the community. Future research should address the evaluation of evidence-based pharmacist interventions in the management of rhinitis in the community pharmacy setting. In addition, optimal management must involve an effective relationship and referral from the pharmacist to medical colleagues such as allergists, who can identify specific allergen sensitivity and evaluate for conditions such as nasal septal deviation and nasal polyps.

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