

Research Article

Knowledge and Awareness of Topical Steroid Phobia in Atopic Dermatitis: Pre and Post Education of Family Medicine Providers, Pharmacist Interns and Dermatology Residents

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Purpose: Treatment nonadherence is a primary barrier in the management of Atopic Dermatitis (AD) and often attributed to Topical Corticosteroid (TCS) phobia. Misinformation of TCS safety and utility among providers perpetuates TCS phobia. We aimed to assess provider knowledge of TCS in AD and determine the feasibility of educational interventions in modifying their beliefs and practices.

Methods: Pharmacy interns and family medicine providers (non-dermatology clinicians) in attendance of virtual education sessions were evaluated before and after an evidence-based lecture on the use of TCS in AD. Dermatology residents were evaluated pre-lecture. All responses were recorded via electronic questionnaires.

Results: Response rates for the pre- and post-questionnaires were 50% and 26%, respectively. Dermatology residents were more likely to believe that TCS used appropriately are safe for patients and scored higher on the pre-lecture evaluation compared to non-dermatology clinicians (62 vs. 27%, $p=0.036$). Non-dermatology clinicians also scored higher in overall knowledge after attending the evidence-based lecture (68 vs. 27%, $p<0.001$).

Conclusions: There may be beliefs and knowledge gaps among non-dermatologist clinicians in the treatment of AD that perpetuate TCS phobia. These beliefs and counseling practices appear modifiable, however, through post-graduate educational interventions. Collaboration of healthcare providers involved in the treatment of AD is important for the dissemination of reliable information to patients.

Keywords: Atopic dermatitis; Topical corticosteroid phobia; Family medicine; Pharmacists; Dermatologists

Abbreviations

TCS: Topical Corticosteroid; AD: Atopic Dermatitis; MCW: Medical College of Wisconsin; QR: Quick Response

Introduction

Patients with Atopic Dermatitis (AD) are most commonly treated by general pediatricians [1]. Other clinicians are also frequently involved including dermatologists, family medicine providers, and pharmacists [2-5], who in the community setting, represent the final interaction with patients before being dispensed their prescriptions [6,7]. Nonetheless, patients often receive conflicting information about AD management, particularly regarding the use of Topical Corticosteroids (TCS) [8]. Patients and caregivers who receive conflicting information about TCS often develop a fear of using them [9]. Additionally, a significant percentage of clinicians mistrust TCS and may perpetuate the phobia experienced by their patients [10,11]. Previous studies have shown that prevalence of TCS phobia is higher among pharmacists and primary care providers compared to pediatricians and dermatologists [10,12,13]. Additionally, dermatologists have reported concerns about

pharmacists' knowledge and lack of communication of dermatologic disease [8,14]. These interprofessional collaboration gaps can result in patient noncompliance and inadequate management of acute AD exacerbations [10,12,15,16]. Dermatologists have proposed two strategies to improve the knowledge gap: re-education of pharmacists and primary care providers [5,8-13,17,18], and maximizing interprofessional collaboration [8,19]. Few interventions, however, have evaluated the efficacy of re-education and improving collaboration in addressing TCS phobia, particularly in the setting of AD [20,21]. Studies have demonstrated knowledge gap improvements after re-education of pharmacists, but this intervention has not been assessed in other healthcare professionals [14,20]. The objective of this study was to assess the knowledge and beliefs of pharmacist interns, family medicine physicians and advanced practice practitioners with baseline comparison to dermatology residents regarding the use of TCS in the treatment of AD and determine the feasibility of educational interventions in modifying their beliefs and practices.

Materials and Methods**Participants**

Pharmacist interns, consisting of residents and senior students,

at the Medical College of Wisconsin (MCW) and family medicine providers in attendance of a virtual, evidence-based education session were evaluated on the knowledge, beliefs, and patient education practices of TCS in the setting of AD. Family medicine providers included nurse practitioners, MCW resident physicians, and attending physicians practicing in various settings in Southeast Wisconsin. Dermatology residents at MCW also participated by completing the pre-questionnaire described below to provide a baseline comparison.

Questionnaires

A cross-sectional questionnaire was designed based on similar studies [5,8,10,13,20]. Those in attendance via virtual Zoom platform were offered the questionnaire before and after an evidence-based education session on the appropriate use of TCS. Attendees were provided a website link and Quick Response (QR) code to complete the questionnaires, which were administered *via* Qualtrics online survey software. Separate links and QR codes were provided for pre- and post-questionnaires, and respondents were able to submit responses anonymously. The pre-questionnaire consisted of 8 multiple choice questions Table 1, 6 Likert scale questions Table 2, and some additional questions that gathered information on profession, frequency of dispensing or prescribing TCS prescriptions, resources used for TCS information, and postgraduate training on TCS Table 3. To evaluate AD beliefs, respondents were given statements and asked to provide their level of agreement based on a 1 to 5 number scale (strongly agree=5; somewhat agree=4; neutral=3; somewhat disagree=2; strongly disagree=1). The post-questionnaire included the 8 multiple choice and 6 Likert scale questions from the pre-questionnaire. The evidence-based education session was made in collaboration with the MCW Department of Dermatology and delivered by a pharmacist.

Analysis

Mann-Whitney U (i.e. Wilcoxon rank-sum) tests were conducted to measure significance in mean ranks for Likert scale items among 1) dermatology resident pre-questionnaire versus non-dermatology providers (pharmacy and family medicine) pre-questionnaire and 2) family medicine and pharmacy pre versus post-questionnaires. A Pearson Chi-Square Test of Independence was used to measure any significant differences in the frequency between these groups. A bonferroni correction was applied to avoid reporting any false significant differences among the groups. Statistical analysis was generated by IBM SPSS 26.0 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp).

Results

Respondent characteristics

Thirty-eight of the 76 participants completed the pre-questionnaire and 16 of the 61 participants (as dermatologists were excluded) completed the post-questionnaire for response rates of 50% and 26%, respectively. Respondents who completed the pre-questionnaire include 7 pharmacy interns, 3 nurse practitioners, 9 family medicine residents, 8 family medicine attending physicians, and 11 dermatology residents. Respondents who completed the post-questionnaire include 6 pharmacy interns, 2 nurse practitioners, 3 family medicine residents, and 5 family medicine attending physicians. Detailed respondent characteristics can be found in Table

3. Among non-dermatology providers, 12% counseled patients and/or prescribed more than 50 TCS in 6 months prior to the questionnaire. Conversely, all dermatology residents had counseled on and/or prescribed at least 50 TCS in the prior 6 months. For obtaining TCS information, pharmacy respondents were most likely to use medication package inserts, and family medicine providers reported the highest use of online continuing education courses. Dermatology residents were most likely to receive TCS information from dermatology-specific resources, including journals, presentations, and professional conferences. All respondents reported frequent use of drug references websites/textbooks. 16% of non-dermatology clinicians who had completed their professional degree at the time of the questionnaire had received additional training on the use of TCS, whereas 64% of dermatology residents reported additional training since completing their degree.

Pre-education responses

Knowledge: Prior to the evidence-based educational session, 52% of pharmacy and family medicine providers believed that skin atrophy was the most common side effect of TCS, and 19% were uncertain of the most common side effect. More pharmacy respondents than family medicine providers acknowledged that occlusion of TCS increases systemic absorption (84 vs. 50%, respectively). Under one third (31%) of non-dermatology respondents demonstrated sufficient knowledge of both maintenance TCS therapy and treatment of an acute flare in an infant, and 52% were aware that poor adherence is a major reason for treatment failure.

Patient education: When counseling patients on duration of use, 71% of pharmacist interns and 55% of family medicine providers believed that they should not be used for more than 2 weeks in AD. When presented with phrases that may encourage TCS phobia in patients (e.g. “use sparingly” and “maximum of 2 weeks”), only 29% of pharmacy respondents and 22% of family medicine providers identified them as phobia-inducing.

Beliefs: Non-dermatology clinicians generally had neutral beliefs regarding both the frequency and types of side effects that can be expected with TCS use. Pharmacy and family medicine respondents believe somewhat that nonadherence is a major issue and that patients often receive conflicting or misleading information on TCS from healthcare providers. Non-dermatology clinicians also believe that it is in the best interest of patients to avoid high-potency TCS. As high-potency TCS should be used in certain situations, this demonstrates the existence of TCS phobia among healthcare provider respondents.

Dermatology residents: Dermatology residents had a strong baseline knowledge of TCS. 46% of dermatology residents believed that skin atrophy and transient burning/stinging upon application is the most frequently encountered side effect. In addition, 73% identified the association between occlusion of TCS and systemic absorption. The majority also chose the correct response in the cases regarding maintenance therapy, treatment of an acute flare in an infant, and awareness of nonadherence. (55, 91 and 100%, respectively). Most dermatology residents identified that TCS should be used until eczema is clear and would advise patients to apply TCS using a thin layer (64 and 82%, respectively). Almost half (46%) were able to identify phrasing that perpetuates TCS phobia. Lastly, dermatology residents strongly believe that TCS are safe and that side

Table 1: Questionnaire questions and correct answer choices 1-8*.

Q1. Most appropriate recommendation for duration of use?
a) Maximum of 3 days
b) Maximum of 1 week
c) Maximum of 2 weeks
d) Maximum of 4 weeks
e) Until eczema is clear
f) Uncertain
Q2. Most appropriate instructions for how the patients/caregivers are to apply TCS?
a) Only the smallest amount possible
b) According to fingertip unit (FTU) guideline
c) Enough to cover a thin layer over affected area
d) Generously
e) Sparingly
f) Uncertain
Q3. Most common side effect that the patient can expect from TCS?
a) Skin atrophy
b) Dyspigmentation and telangiectasia
c) Striae (stretch marks)
d) Burning/stinging upon application that improves with subsequent use
e) Burning/stinging upon application that develops with chronic use
f) Hypothalamic-pituitary-adrenal (HPA) axis suppression
g) Stunted growth in children
h) Uncertain
Q4. Of the following responses, please choose the single response that is CORRECT:
a) Clobetasol propionate cream is a mid-potency TCS
b) Systemic absorption of TCS applied to the eyelids is similar to that when applied to rest of the face or scalp
c) Lotions, creams, and ointments as vehicles for TCS generally have similar pros and cons
d) Systemic absorption of TCS is significantly enhanced by occlusion with bandages or tight-fitting garments
e) TCS potency is determined mostly by the thickness of the skin it is being applied to
Q5. GL is a 4-year-old female with a history of recurrent atopic dermatitis flares who is brought in by her father for follow-up. She was last seen for an acute flare two weeks ago and was treated appropriately. Today, there is erythema over the anterior neck and both popliteal and antecubital fossae, but the skin is smooth with relief of pruritis. The father is interested in the most effective method of acute flare prevention. What do you recommend?
a) Apply 1% hydrocortisone cream to entire body twice daily
b) Appropriate bathing and moisturizing practices along with application of mid potency topical corticosteroid to the previously affected areas twice weekly until follow-up 3 months late
c) Reinforce avoidance of eczema triggers and encourage use of moisturizing lotion twice daily alone
d) Appropriate bathing and moisturizing practices alone
e) There is no proven method to prevent atopic dermatitis acute exacerbations
Q6. JB is a 10-month-old male presenting with xerosis (dry skin) and erythema on the elbows, knees, and cheeks for the last few days. He is brought in by his mother who reports twice daily use of moisturizer and a family history of asthma. On exam, he is comfortable being held by his mother, and there is no oozing, crusting, or lichenification. What is the most appropriate recommendation for management of this patient's condition?
a) Reinforce avoidance of eczema triggers and encourage use of moisturizing lotion once daily as needed
b) Employ "step up" approach and advise high potency topical corticosteroid for 3 days
c) Continue current moisturizing regimen and add low to mid-potency topical corticosteroid until clearance of flare
d) Continue current moisturizing regimen, but avoid topical corticosteroids until he is 12 months old
e) Utilize at-home wet wrap therapy
Q7. CR is a 3-year-old female with moderate atopic dermatitis who presents for follow-up. She has been treated appropriately, but her mother has been reading online and is worried about her child experiencing potential side effects from the topical corticosteroids, including skin atrophy and stunted growth. Which of the following responses to this mother's concerns would be most likely to increase her phobia of topical steroids?

a)	Other therapies can be used, including those that are steroid-sparing such as topical calcineurin inhibitors (e.g. tacrolimus), wet wrap therapy, and frequent use of ointment-based emollients
b)	Although these side effects are possible, they are uncommon and if caught early, are often reversible upon discontinuation of the drug
c)	Thank you for sharing your concerns. Let's discuss them today and send you home with a patient information leaflet written by dermatologists
d)	These side effects won't occur if the topical corticosteroid is applied sparingly and for a maximum of two week
e)	It is important to consider that sequelae of uncontrolled disease (i.e. chronic stress, poor sleep) will likely affect growth more than the drug itself
Q8. ER is 12-year-old male with a chronic history of allergic rhinitis and eczema who presents for follow-up. He still has severe xerosis and erythema on the ankles, wrists, and neck, but he has since developed lichenified plaques in these areas. There is no crusting or oozing. His parents are asking about common reasons for treatment failure. What do you tell them is the most common reason? And how should it be addressed?	
a)	Allergic contact dermatitis; switch to another topical corticosteroid in a different cross-reactivity class
b)	Infection; begin work-up for identifying <i>S. aureus</i> , dermatophytes, and herpes simplex
c)	Incorrect diagnosis; consider skin scrape and biopsy of lesions
d)	Nonadherence; determine the parents' current understanding of the disease and address education gaps
e)	Food and environmental allergies; eliminate dust mites from the house and the "BIG 8" from his diet

*bold print denotes correct answer choice.

Table 2: Questionnaire questions 9-14: PRE and POST education responses.

	Comparison 1			Comparison 2		
	Derm	Non-derm	P value	Non-derm		P value
	PRE	PRE		PRE	POST	
Please select the extent to which you agree or disagree with the following statements ^a :						
Q9. TCS are associated with several side effects, even when used appropriately ^b			0.138			0.036
• Mean score	1.82	2.93		2.93	1.75	
• Mean rank	13.27	22.04		18.07	28.63	
Q10. Patient nonadherence to TCS treatment regimen is the major reason for failure of AD symptom improvement ^b			1			0.006
• Mean score	3.73	3.59		3.59	4.56	
• Mean rank	20.95	18.91		26.72	14.03	
Q11. It is in the best interest of the patient to avoid use of high potency TCS for AD ^c			<0.001			0.102
• Mean score	1.09	3.3		3.3	2.31	
• Mean rank	7	24.59		18.61	27.72	
Q12. Striae (stretch marks) and increased risk of infections are the side effects that patients are typically most concern about			1			1
• Mean score	3.09	2.96		2.96	2.87	
• Mean rank	19.91	18.62		21.08	22.19	
Q13. Patients often receive conflicting information from healthcare providers regarding the use of TCS			0.096			0.546
• Mean score	4.73	3.96		3.96	4.38	
• Mean rank	24.41	15.9		23.34	17.34	
Q14. Patients of healthcare providers who prescribe TCS for AD infrequently experience skin atrophy			1			0.732
• Mean score	3.55	3.19		3.19	3.69	
• Mean rank	21.68	17.87		23.73	17.88	

a) Strongly agree = 5; somewhat agree = 4; neutral = 3; somewhat disagree = 2; strongly disagree = 1; b) Wilcoxon rank-sum test; pharmacy and family medicine, comparison of PRE vs. POST; p<0.05; c) Wilcoxon rank-sum test; comparison of non-dermatology (n=27) vs. dermatology (n=11), PRE only; p<0.05; Derm denotes dermatology residents; Non-derm denotes family medicine physicians, residents, advanced practice providers, and pharmacy residents and senior students.

effects are infrequent with appropriate use.

Comparison of providers in pre-education: In this group of providers, dermatology residents were more knowledgeable of TCS use and appropriate patient education practices compared to non-dermatologists. More dermatology residents recommended that TCS be used until eczema is clear (64 vs. 4%, p=0.003) and strongly believe that patients receive conflicting information from healthcare providers. Dermatology providers were also able to better identify

patient nonadherence (100 vs. 52%, p=0.020) and appropriate use of TCS for managing an acute flare in an infant (91 vs. 31%, p=0.004) when compared with non-dermatology residents. Dermatology residents also have a better understanding of TCS safety, particularly higher potency formulations than non-dermatology providers.

Post-education responses

Non-dermatology clinicians (pharmacy and family medicine) pre vs. post: Post-intervention, fewer believed that skin atrophy was

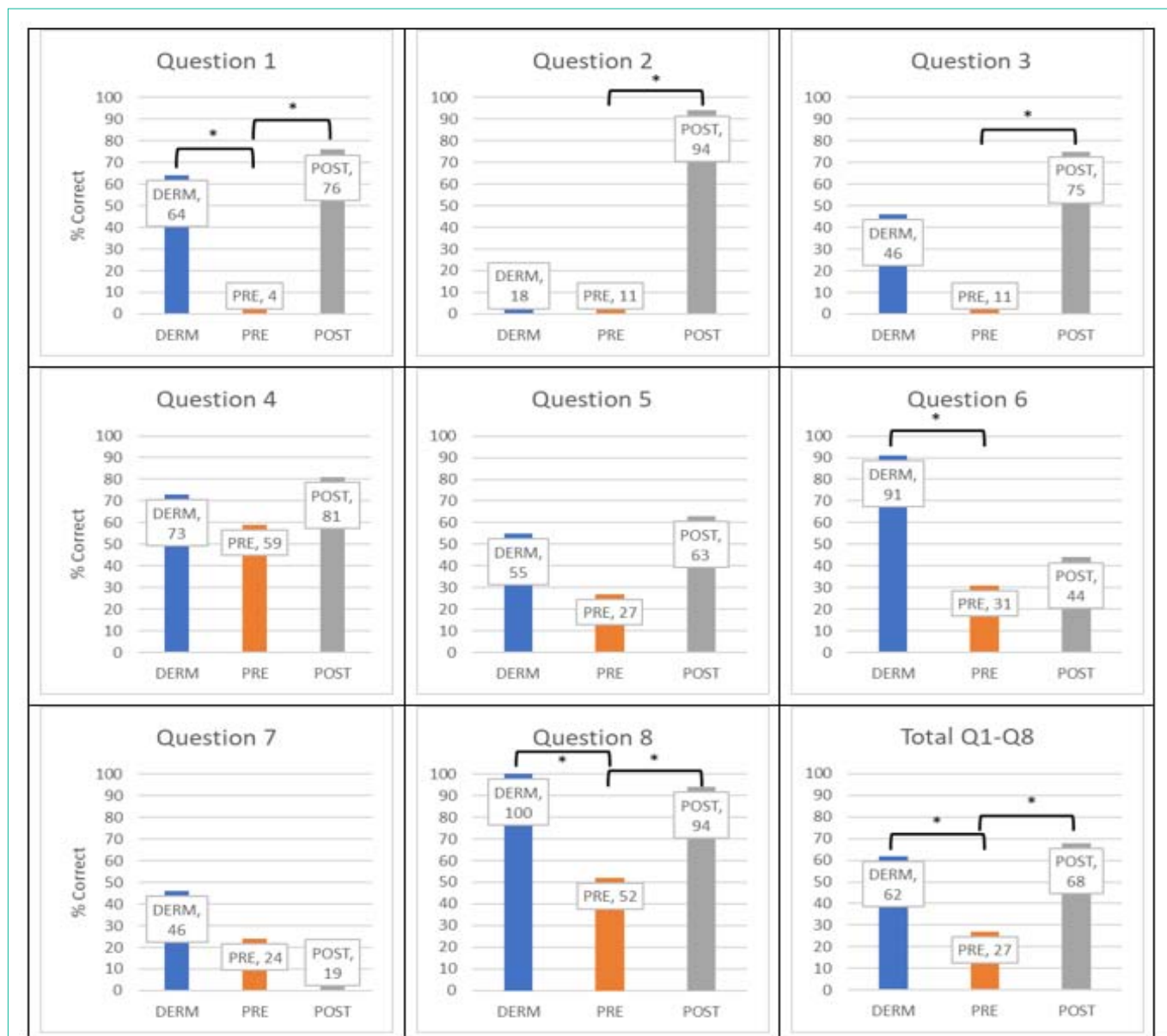


Figure 1: Questionnaire questions 1-8: PRE and POST education responses. DERM denotes dermatology resident responses pre-education; PRE denotes family medicine and pharmacy provider responses pre-education; POST denotes family medicine and pharmacy provider responses post-education. *Pearson's chi-squared test; p<0.05.

the most common side effect dropping from 52 to 6%. Also, more were able to identify transient stinging/burning upon TCS application as the most common side effect that the patient may experience (75 vs. 11%, p<0.001). Likewise, recommendations regarding use of TCS until eczema is clear (76 vs. 4%, p<0.001) were modified. Pharmacy interns and family medicine providers were also more likely to be aware of nonadherence, and fewer respondents associated appropriate TCS use with several side effects. Although not a significant difference, non-dermatology clinicians showed improvement in knowledge of maintenance therapy after the educational intervention (63 vs. 27%, p=0.092). See Table 3 and Figure 1 for responses pre- and post-evidence-based education session.

Discussion

Poor compliance in the treatment of atopic dermatitis has negative medical, psychosocial, and financial implications. As AD often presents in children, these negative implications often impact caregivers and parents as much as patients [22]. Nonadherence is frequently attributed to topical steroid phobia and is commonly experienced by both patients and providers. Although the definition of TCS phobia among patients and caregivers is variable—ranging from general concern to irrational fear—a 2017 review found its prevalence to be between 21-84% [9]. In addition, studies that have compared phobia and non-phobia groups found a significant

Table 3: Respondent characteristics.

	Respondents, n (%)		
	Pharmacy	Family medicine	Dermatology
Number of TCS newly prescribed or refilled/counseled on in the past 6 months?	N=6	N=20	N=10
0	0 (0)	0 (0)	0 (0)
1-10	4 (67)	6 (30)	0 (0)
11-50	2 (33)	11 (55)	0 (0)
51-100	0 (0)	3 (15)	1 (10)
101-500	0 (0)	0 (0)	6 (60)
>500	0 (0)	0 (0)	3 (30)
Primary sources for information on use of TCS? (may choose more than one)	N=12	N=33	N=42
Pharmacy journals	1 (17)	0 (0)	1 (10)
Dermatology journals	1 (17)	1 (5)	10 (100)
General practice journals	2 (33)	5 (25)	1 (10)
Drug reference websites/textbooks	5 (83)	10 (50)	8 (80)
Pharmaceutical representatives	0 (0)	0 (0)	0 (0)
Presentations from dermatologists	0 (0)	3 (15)	9 (90)
Presentations from non-dermatologist healthcare providers	0 (0)	1 (5)	0 (0)
Online continuing education (CE) courses	0 (0)	7 (35)	2 (20)
Clinical meetings or conferences	0 (0)	3 (15)	7 (70)
Medication package inserts	3 (50)	0 (0)	2 (20)
I do not use any informational sources	0 (0)	1 (5)	0 (0)
Other	0 (0)	2 (10)	2 (20)
Additional training on the use of TCS since completing professional degree?	N=7	N=20	N=11
Yes	0 (0)	4 (20)	7 (64)
No	5 (71)	16 (80)	4 (36)
Have not completed yet	2 (29)	N/A	N/A

association of phobia with non-adherence at 29-49% vs. 10-14%, respectively [23,24], and higher degree of phobia correlates with higher rates of non-adherence. The review also found that the concerns most frequently encountered by patients and caregivers are related to topical steroid side effects and the potential for overuse leading to these problems [9,25]. Additionally targeting knowledge gaps in patients and caregivers has not been shown to be effective at reducing TCS phobia and the subsequent nonadherence [26]. Steroid phobia among clinicians is evaluated with a standardized tool and definition via the Topical Corticosteroid Phobia questionnaire for professionals (TOPICOP-P) [10]. The high prevalence of TCS phobia found among providers (32-49%) demonstrates knowledge gaps that reflect their professional recommendations, and ultimately, patient adherence [10,26]. Despite clinical guidelines published from the American Academy of Dermatology [27], the American Academy of Pediatrics [28], and Annals of Asthma Allergy, and Immunology [29], other drug information is readily available from unreliable sources such as websites and other healthcare workers [20,30]. Additionally, other complicating factors that could contribute to provider TCS phobia including potential for adverse effects, complex pharmacokinetics and pharmacodynamics, varying potency groups and formulations, and individual patient considerations such as age, and severity of disease, and duration of therapy. These factors

also likely contribute to providers' inability or unwillingness to offer reassurance to their patients [20,30]. In our study, non-dermatology clinicians have knowledge gaps and held beliefs that may perpetuate TCS phobia in patients. Only 4% believed that TCS should be applied until eczema is clear and that skin atrophy is an infrequent side effect. In addition, pharmacy and family medicine providers demonstrated neutral beliefs regarding safety of TCS even when used appropriately, whereas dermatology residents held stronger beliefs that TCS are safe. Though it may be pertinent for future interventions, evaluation of the quantity and content of healthcare provider TCS education was not assessed in our study. Post-education, most providers were unable to identify subtle phrases that may significantly perpetuate patient and caregiver phobia, such as advising to use TCS "sparingly". A recent study found that general practitioners who educate patients using the phrases "apply sparingly" or "apply thinly" were more likely to believe that skin atrophy was the most common side effect [13]. It is also not uncommon that these phrases end up on pharmacy labels dispensed to patients, even when not explicitly written on the prescription [13,15,20]. Healthcare providers that are unaware of TCS phobia and the impact of using such phraseology are unknowingly altering the perceptions of patients. Rather, providers should recommend that TCS be used until eczema is clear and advise reduced time to follow-up to address potential issues with therapy

(e.g. nonadherence, differential diagnosis, side effects) [13,31]. Healthcare providers can play a role in helping patients understand that AD is a chronic inflammatory disease that often requires ongoing treatment with TCS [13]. The attitudes of pharmacy and family medicine providers toward TCS appear modifiable as demonstrated by significant improvements in overall knowledge and beliefs after attending an evidence-based educational session on the appropriate use of TCS (68 vs. 27%, $p < 0.001$). Frequency of side effects, awareness of TCS phobia, and recommended duration of use were topics with which beliefs appear to be modifiable among non-dermatology providers. Several studies have observed that knowledge gaps among general practitioners are related to lack of postgraduate training in the appropriate use of TCS [13,32,33]. Compared to pharmacists and family medicine providers, dermatology residents have more experience prescribing and counseling on TCS and are more likely to have had additional training on appropriate use. Dermatology providers also demonstrated a stronger overall baseline knowledge compared to non-dermatology providers (62 vs. 27%, $p = 0.036$) and the willingness to reassure patients of TCS safety. Dermatologists may serve a valuable role on a multidisciplinary team providing targeted education in the management of atopic dermatitis. There are several limitations to this study. The survey is not a validated instrument. For example, evaluation based on use of finger-tip units may not be an appropriate method to assess provider knowledge as patients are unlikely to understand its meaning if written on their prescription. The length of the questionnaire may have contributed to the lower response rate of the post-questionnaire and ultimately may limit the study implications. This study is further limited by exclusion of pediatricians who are frequently involved in the treatment of AD patients. Finally, the cross-sectional nature of this study does not provide information on long-term behaviors and patient education. Further research is necessary to determine the impact of re-education on clinical outcomes.

Conclusion

There may be knowledge gaps in pharmacists and family medicine providers that perpetuate TCS phobia among patients and caregivers in the setting of AD, ultimately resulting in nonadherence and undesirable clinical outcomes. TCS phobia can potentially be addressed at the healthcare provider level via re-education with evidence-based interventions. Despite baseline knowledge, beliefs and counseling practices of pharmacists and family medicine providers in the setting of AD appear modifiable through educational interventions. Collaboration of all healthcare providers involved in the treatment of AD will facilitate the dissemination of consistent and reliable information to patients.

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