

## Treatment complexity and caregiver burden are linked in owners of dogs with allergic/atopic dermatitis

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**Background** – Skin disease severity and treatment plan complexity are both related to owner experience of caregiver burden; however, to date they have not been examined simultaneously in owners of dogs with atopic or other chronic allergic dermatitis.

**Hypotheses/Objectives** – We expected to replicate and extend previous work by showing that caregiver burden is linked to treatment complexity and disease severity in this population. Moreover, we hypothesized that a relationship between burden and treatment complexity would be present in both subjective (owner report of experience) and objective (number of weekly treatments) measures, and that these relationships would exist independent of skin disease severity.

**Participants** – Eighty-six owners of dogs with atopic or other chronic allergic dermatitis recruited through social media dog allergy groups.

**Methods and materials** – Cross-sectional online assessments were completed for caregiver burden, treatment plan complexity and skin disease severity.

**Results** – Caregiver burden was correlated with skin disease severity ( $r = 0.40$ ) and both subjective ( $r = 0.37$ ) and objective ( $r = 0.30$ ) measures of treatment complexity ( $P < 0.01$  for all). Relationships between caregiver burden and treatment complexity remained significant after accounting for skin disease severity.

**Conclusions and clinical importance** – Greater treatment plan complexity is associated with higher caregiver burden in owners of dogs with atopic or other chronic allergic dermatitis. The independence of this relationship highlights the importance of simplicity in effective treatment planning.

### Introduction

Accumulating evidence suggests that chronic disease in a companion animal is linked to caregiver burden for the owner.<sup>1,2</sup> Higher burden in the owner is, in turn, related to stress and burnout for the veterinarian via “burden transfer”<sup>3</sup> and contributes to owner consideration of euthanasia.<sup>4</sup> Owner reports of treatment plan complexity<sup>2</sup> and severity of clinical signs<sup>5</sup> both predict burden in general veterinary client samples. Recent work in a canine veterinary dermatology sample demonstrated that greater severity of skin disease in the dog correlated with higher caregiver burden for the owner,<sup>6</sup> and that when skin disease was well-controlled, burden in owners of a dog with dermatological

disease did not differ from that of owners with a healthy dog.<sup>6</sup> Together, findings suggest that dermatological treatment that is effective yet simple would lead to reduced owner distress, potentially impacting upon owners’ decisions about the companion animal and translating to lower stress for the veterinarian. Treatments for atopic and other chronic allergic dermatitis range in complexity from a single monthly (or less frequent) injection,<sup>7</sup> to more complex multimodal interventions requiring combinations of oral, injectable and topical treatments,<sup>8</sup> making this an ideal population in which to examine these relationships.

This study was undertaken to first replicate previous work by showing that caregiver burden in owners of dogs with atopic or other chronic allergic dermatitis is linked to treatment complexity and disease severity. Extending past work, we sought to show that the relationship with treatment plan complexity would be present in not only the owner’s subjective report of difficulty, but also in an objective measure – frequency of skin disease treatments. A final goal was to demonstrate that these relationships would be present after accounting for severity of skin disease, suggesting an independent contribution of treatment complexity to caregiver burden.

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## Methods and materials

### Procedure

This study was approved by the local Institutional Review Board and conducted/reported in accordance with STROBE<sup>9</sup> criteria for cross-sectional studies. Data were collected in the period 2–29 March 2020 using an advertisement posted in social media groups for owners of dogs with allergies ( $n = 14,865$ ), inviting followers caring for a dog with a skin condition to share their experience. The advertisement included a link to an online Qualtrics protocol (Appendix S1). Following informed consent, the protocol opened. Participants could opt into a draw for one of three US\$50 gift cards for an online retailer.

### Participants and power analysis

Participants were required to be (i) English-speaking, (ii)  $\geq 18$  years of age and (iii) reporting on a dog with skin disease. Total number of responses was 151 (~1% response rate). Participants with incomplete measures were removed ( $n = 42$ ), as were those describing a dog without allergic or atopic dermatitis ( $n = 23$ ) for a final analytic sample of 86. The required sample size was determined based on research suggesting medium effects for the relationship between caregiver burden and treatment complexity<sup>2</sup> and skin disease severity.<sup>6</sup> With significance level ( $\alpha$ ) set at  $P = 0.05$  and power ( $1 - \beta = 0.8$ ) for a medium effect ( $\delta = 0.5$ ), 86 participants was sufficient to detect the hypothesized relationships.

### Measures

#### Zarit burden interview (ZBI<sup>10</sup>)

An adapted 18 item ZBI validated for companion animal owner use<sup>1</sup> measured caregiver burden with questions such as "Do you feel strained when you are around your pet?" Likert-type responses [0 (never) to 4 (nearly always)] were summed for a total. Past work suggests that a score of 18 indicates meaningful caregiver burden.<sup>11</sup> Sample internal consistency was  $\alpha = 0.87$ .

#### Skin disease severity

Owners reported severity of skin disease using a previously validated measure;<sup>12</sup> responses on this single item question range from 0 (not at all) to 3 (very much).

#### Treatment plan complexity

Subjective and objective measures of treatment plan complexity were used. Subjective measurement relied on treatment plan-related items from the Pet Owner Adherence Scale (POAS), including "It is simple to follow my dog's medication and/or treatment recommendations."<sup>13</sup> POAS items 4, 5, 7, 10, 11, 12 and 15 were rated [1 (strongly disagree) to 5 (strongly agree)] and reverse-scored as indicated ( $\alpha = 0.61$ ). Objective data were gathered by asking participants to indicate the number of individual treatments used to manage their dog's skin condition (i.e. oral medication, injections, quick topical treatments, intense topical treatments, and other) and the number of weekly treatments was then summed.

#### Demographic information

Participants reported their age, gender, education and income, and the dog's diagnosis, treatment and treatment provider type.

### Statistical analyses

Descriptive statistics (means/standard deviations for continuous, frequencies for categorical data) were conducted. Nonparametric tests were utilized, given the categorical skin disease severity variable. Relationships between caregiver burden, skin disease severity and treatment plan complexity were evaluated using Spearman bivariate correlation coefficients. Spearman partial correlations were used to examine the relationships between burden and treatment complexity after accounting for skin disease severity. Statistical significance was set at  $P < 0.05$  and held to Bonferroni–Holm sequential rejection.

Analyses were conducted using SPSS 26.0 (IBM Corp; Armonk, NY, USA).

## Results

Table 1 presents sample characteristics and Supplemental Table S1 for breakdown of treatment types in the sample. Table 2 provides descriptive statistics and correlations for primary variables. Mean ZBI = 19.29 indicates clinically meaningful caregiver burden. Most dogs (>80%) had moderate to severe skin disease. Significant correlations were observed between caregiver burden and disease severity ( $r = 0.40$ ;  $P < 0.01$ ) as well as subjective ( $r = 0.37$ ;  $P < 0.01$ ) and objective ( $r = 0.30$ ;  $P < 0.01$ ) treatment complexity. Relationships between caregiver burden and treatment complexity, both subjective ( $r = 0.31$ ;  $P < 0.01$ ) and objective ( $r = 0.31$ ;  $P < 0.05$ ), remained significant after accounting for skin disease severity.

## Discussion

These findings replicate and extend previous work to show that caregiver burden is related to skin disease severity and treatment complexity (both subjective and objective) in owners of dogs with atopic or other chronic allergic dermatitis. The significance of the relationship between burden and treatment complexity was present independent of skin disease severity.

This work confirms the previously demonstrated link between severity of a dog's skin disease and caregiver burden in the owner,<sup>6</sup> and extends past research by showing a correlation between treatment plan complexity and burden specifically in a dermatological sample. This relationship, which had been shown in a general

**Table 1.** Sample demographic characteristics of owners of dogs with atopic or other chronic allergic dermatitis

	Total sample, $n = 86$
Gender (n, %female)	86 (100.0)
Age (M/SD)	43.51 (13.09)
Education (n, %)	
Pre-high school	3 (3.5)
High school	18 (20.9)
College	48 (55.8)
Advanced degree	15 (17.4)
Declined to answer	2 (2.3)
Annual income (n, %)	
<US\$25,000	5 (5.8)
US\$25–75,000	29 (33.7)
>US\$75,000	36 (41.8)
Declined to answer	16 (18.6)
Diagnosis (n, %)	
Allergic dermatitis (undetermined/unknown)	45 (52.3)
Atopic dermatitis	19 (22.1)
Both	22 (25.6)
First opinion type (n, %)	
General practitioner	55 (64.0)
Referral clinician	24 (27.9)
Holistic adviser	1 (1.2)
None	6 (7.0)

**Table 2.** Descriptive statistics for primary measures and correlations between caregiver burden and treatment complexity

	Total sample, n = 86	<i>r</i>	Partial <i>r</i>
Caregiver burden			
Zarit burden interview-adapted (M, SD)	19.29 (10.02); Range 0–63	–	–
Disease severity (n/%)			
Not at all severe	1 (1.2)		
A little	15 (17.4)	0.40**	–
Quite a bit	46 (53.5)		
Very much	24 (27.9)		
Subjective treatment complexity			
Pet owner adherence scale items (M/SD)	17.79 (4.24); Range 9–36	0.37**	0.31**
Objective treatment complexity			
Frequency of weekly skin disease	23.50 (12.77);	0.30**	0.25*
Treatments (M/SD)	Range 0–72.23		

M mean; SD standard deviation; *r* correlation with caregiver burden.

Range of weekly treatments is not a whole number as injections given less frequently than weekly result in numbers < 1.

Partial *r* represents this correlation after controlling for severity of skin disease with significance.

\**P* < 0.05.

\*\**P* < 0.01.

veterinary clinic sample, appears robust given its presence in this specialty population.<sup>2</sup>

Also noteworthy is the link between caregiver burden and an objective measure of treatment complexity. Previous work<sup>2</sup> examining only self-reported experience, the owner's *perception* of difficulty following/understanding a treatment plan, could have been influenced by reactivity – that is, high levels of distress in a burdened owner could prompt a more negative view of the treatment plan. A tally of weekly treatments is more objective, yet exhibits a similar relationship; the more involved a treatment plan is, the greater the owner's caregiver burden.

The significance of these correlations after controlling for severity of disease demonstrates the relative independence of this connection. Past work<sup>6</sup> and the current sample show a clear link between owner distress and presence of poorly controlled clinical signs in a dog with dermatological problems. By controlling for the contribution of skin disease severity, these new findings suggest that the complexity of the treatment plan itself contributes to owner experience of burden.

The primary implication of this work is the importance of simplicity in treatment planning. Aetiologies of, and existing treatments for, skin disease are highly varied.<sup>14</sup> Each case is different and successful management will at times require complex treatment planning. However, this study highlights the importance of starting with the simplest effective treatment, as it may reduce owner strain. Reduced burden might, in turn, enhance the owner's treatment compliance, leading to better long-term management and disease control for the dog, and decreased burden transfer for the veterinarian.

Limitations of this work include the low number of dogs with well-controlled skin disease; the current sample does not represent the full spectrum of this population. This range restriction suggests that the strength of the relationships detected here might actually be of greater magnitude in samples including more owners of dogs with well-controlled skin disease. Replication in broader samples, such as combined general veterinary and veterinary dermatology clinic

recruitment, is recommended. Such data would likely yield greater variance in burden (i.e. more participants with low levels of burden), allow for a more objective assessment of disease severity by a veterinarian, provide specific information regarding onset and duration of disease, and could better facilitate understanding of any regionally-specific differences. A further limitation lies in the cross-sectional study design, which precludes determination of directionality. It cannot be ruled out that owners in the current sample are following treatment regimens reflecting the absolute minimum treatment necessary to control their dog's skin disease. However, suboptimal treatment was likely present in at least part of the sample, as <30% were followed by a specialist veterinary dermatologist, and some were managing skin disease with no professional monitoring. Additionally, participant responses in this study precluded direct comparison of how specific treatment types (e.g. oral versus injection or topical treatment) contribute to caregiver burden, an important future direction of study.

In summary, owners of dogs with atopic or other chronic allergic dermatitis demonstrated caregiver burden that was related to skin disease severity and measures of subjective and objective treatment complexity. Because the relationship between burden and treatment plan was not driven solely by skin disease severity, the complexity of treatment itself appears to be an important contributor to owner burden. Findings emphasize the importance of utilizing the simplest effective treatment possible.

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## Supporting Information

Additional Supporting Information may be found in the online version of this article.

**Table S1.** Percentage of sample reporting use of various treatments.

**Appendix S1.** Online Qualtrics protocol utilized in data collection for current study.

## Résumé

**Contexte** – La sévérité et la complexité d'un plan de traitement d'une dermatose sont toutes les deux liées à l'expérience de la charge de soins du propriétaire; cependant, à ce jour, ceci n'a pas été examiné simultanément chez les propriétaires de chiens avec dermatite atopique ou d'autres dermatites allergiques chroniques.

**Hypothèses/Objectifs** – Nous nous attendons à reproduire et étendre les travaux existants en montrant que la charge de soins est liée à la complexité des traitements et à la sévérité de la maladie dans cette population. En outre, nous supposons que la relation entre charge et complexité de traitement devrait être présente dans les mesures subjectives (rapport d'expérience des propriétaires) et objectives (nombre de semaines de traitements) et que ces relations pourraient exister indépendamment de la sévérité de la dermatose.

**Participants** – Quatre vingt six propriétaires de chiens avec dermatite atopique ou autre dermatite allergique chronique ont été recrutés via les groupes de chiens allergiques sur les réseaux sociaux.

**Méthodes** – Les évaluations croisées en ligne ont été réalisées pour la charge de soins, la complexité du schéma thérapeutique et la sévérité de la dermatose.

**Résultats** – La charge des soins est corrélée avec la sévérité de la maladie ( $r = 0.40$ ) et les mesures subjectives ( $r = 0.37$ ) et objectives ( $r = 0.30$ ) de la complexité du traitement ( $P < 0.01$ ). Les relations entre la charge de soins et la complexité du traitement sont restées significatives après la comptabilisation de la sévérité de la dermatose.

**Conclusions et importance clinique** – Un schéma thérapeutique plus complexe est associé avec une charge de soins plus élevée chez les propriétaires de chiens atopiques ou avec d'autres dermatoses allergiques chroniques. L'indépendance de ce lien révèle l'importance de la simplicité d'un plan de traitement efficace.

## Resumen

**Introducción** – la gravedad de enfermedades de la piel y la complejidad del plan de tratamiento están relacionadas con la experiencia del propietario para ejercer de cuidador; sin embargo, hasta la fecha no se han examinado simultáneamente en dueños de perros con dermatitis alérgica crónica atópica o de otro origen.

**Hipótesis/Objetivos** – esperábamos replicar y ampliar el trabajo anterior al mostrar que la cantidad de trabajo del cuidador está relacionado con la complejidad del tratamiento y la gravedad de la enfermedad en esta población. Además, planteamos la hipótesis de que una relación entre la cantidad de trabajo y la complejidad del tratamiento estaría presente tanto en medidas subjetivas (informe de la experiencia del propietario) como objetivas (número de tratamientos semanales), y que estas relaciones existirían independientemente de la gravedad de la enfermedad cutánea.

**Participantes** – Ochenta y seis dueños de perros con dermatitis alérgica atópica u otra dermatitis alérgica crónica reclutados a través de grupos de alergia canina en las redes sociales.

**Métodos** – se realizaron evaluaciones transversales por internet para determinar la cantidad de trabajo del cuidador, la complejidad del plan de tratamiento y la gravedad de la enfermedad de la piel.

**Resultados** – la cantidad de trabajo del cuidador se correlacionó con la gravedad de la enfermedad de la piel ( $r = 0,40$ ) y las medidas subjetivas ( $r = 0,37$ ) y objetivas ( $r = 0,30$ ) de la complejidad del tratamiento ( $P < 0,01$  para todos). Las relaciones entre la cantidad de trabajo del cuidador y la complejidad del tratamiento siguieron siendo significativas después de tener en cuenta la gravedad de la enfermedad de la piel.

**Conclusiones e importancia clínica** – la mayor complejidad del plan de tratamiento se asocia con una mayor cantidad de trabajo para el cuidador en los dueños de perros con dermatitis alérgica atópica u otra dermatitis alérgica crónica. La independencia de esta relación destaca la importancia de la simplicidad en la planificación eficaz del tratamiento.

## Zusammenfassung

**Hintergrund** – Die Schwere der Hauterkrankung und die Komplexität des Behandlungsplans stehen beide im Zusammenhang mit der Belastung der BesitzerInnen durch die Pflege; bis zum heutigen Tag sind sie jedoch noch nicht gleichzeitig bei BesitzerInnen mit atopischen Hunden oder bei BesitzerInnen von Hunden mit anderen chronischen allergischen Dermatitiden untersucht worden.

**Hypothese/Ziele** – Wir erwarteten eine Wiederholung und eine Ausweitung der bisherigen Arbeit, indem wir zeigen wollten, dass die Belastung der Pflegenden mit der Komplexität der Behandlung und der Schwere der Krankheit in dieser Population im Zusammenhang steht. Darüber hinaus stellten wir die Hypothese auf, dass ein Zusammenhang zwischen Belastung und Komplexität der Behandlung sowohl bei subjektiven (Bericht der Erfahrungen durch die BesitzerInnen) wie auch objektiven (Anzahl der wöchentlichen Behandlungen) Messungen bestehen würde, und dass diese Zusammenhänge unabhängig von der Schwere der Hauterkrankung bestehen würden.

**TeilnehmerInnen** – Achtundsechzig BesitzerInnen von Hunden mit atopischer oder chronisch allergischer Dermatitis wurden durch Hundeallergie Gruppen in den Social Media rekrutiert.

**Methoden** – Übergreifende Online Beurteilungen wurden für die Belastung der Pflegenden, der Komplexität des Behandlungsplans und der Schwere der Krankheit fertiggestellt.

**Ergebnisse** – Die Belastung der Pflegenden war mit der Schwere der Hauterkrankung ( $r = 0,40$ ) und sowohl mit subjektiven ( $r = 0,37$ ) wie auch objektiven ( $r = 0,30$ ) Messungen der Komplexität der Behandlung ( $P < 0,01$  für alle) korreliert. Der Zusammenhang zwischen der Belastung für die Pflegenden und die Komplexität der Behandlung blieb auch nach Einbeziehen der Schwere der Hauterkrankung signifikant.

**Schlussfolgerungen und klinische Bedeutung** – Eine höhere Komplexität des Behandlungsplans wird mit einer erhöhten Belastung für die Pflegenden bei BesitzerInnen von Hunden mit atopischer oder mit anderen chronischen allergischen Dermatitiden in Verbindung gebracht. Dies unterstreicht die Wichtigkeit eines einfachen wirksamen Behandlungsplans.

## 要約

**背景** – 皮膚疾患の重症度および治療計画の複雑さは、どちらも飼い主の介護負担の経験と関連しているが、アトピー性皮膚炎やその他の慢性アレルギー性皮膚炎を持つ犬の飼い主を対象に、これらを同時に検討したことは今までなかった。

**仮説/目的** – 我々は、介護負担が集団における治療の複雑さおよび疾患の重症度にリンクしていることを示すことによって、以前の研究を複製し、拡張することを期待している。さらに、介護負担および治療の複雑さの関係は、主観的 (飼い主の経験報告) と客観的 (週の治療回数) の両方の尺度に存在し、これらの関係は皮膚疾患の重症度とは無関係に存在するだろうという仮説を立てた。

**参加者** – アトピーまたはその他の慢性アレルギー性皮膚炎を持つ犬の飼い主86名を対象に、ソーシャルメディアの犬アレルギーグループを通じて募集した。

**方法** – 介護負担、治療計画の複雑さ、皮膚疾患の重症度について横断的オンライン評価を実施した。

**結果** – 介護負担は皮膚疾患の重症度 ( $r = 0.40$ )、治療の複雑さの主観的尺度 ( $r = 0.37$ ) および客観的尺度 ( $r = 0.30$ ) と相関していた (すべてにおいて  $P < 0.01$ )。介護負担および治療の複雑さの関係は、皮膚疾患の重症度を考慮した後も有意であった。

**結論および臨床上的重要性** – アトピーまたはその他の慢性アレルギー性皮膚炎を有する犬の飼い主において、治療計画の複雑さは、介護負担の大きさと関連している。この関係の独立性は、効果的な治療計画におけるシンプルさの重要性を浮き彫りにした。

## 摘要

**背景** – 皮肤病严重程度和治疗计划复杂性, 决定了犬主人的护理负担体验; 然而, 迄今为止, 尚未在患有特应性皮炎或其他慢性过敏性皮炎的犬主人中同时对这两方面进行检查。

**假设/目的** – 我们期望通过展示护理负担与该群体的治疗复杂性和疾病严重程度的相关性, 来复制和扩展以前的工作。此外, 我们假设负担和治疗复杂性之间的关系将存在于主观 (主人体验报告) 和客观 (每周治疗次数) 测试中, 并且这些关系将独立于皮肤病严重程度而存在。

**参与者** – 通过过敏犬群社交媒体, 招募特应性或其他慢性过敏性皮炎患犬的主人, 共86名。

**方法** – 完成护理负担、治疗计划复杂性和皮肤病严重程度的横向在线评估。

**结果** — 护理负担与皮肤病严重程度( $r = 0.40$ )及治疗复杂性的主观( $r = 0.37$ )和客观( $r = 0.30$ )指标均相关 ( $P < 0.01$ )。且不论皮肤病严重程度, 护理负担与治疗复杂性之间的关系仍然显著。

**结论和临床重要性** — 治疗计划复杂性越大, 特应性皮炎或其他慢性过敏性皮炎犬主人的护理负担越大。这种关系的独立性强调了在有效治疗计划中, 简单治疗的重要性。

### Resumo

**Contexto** — A gravidade da doença dermatológica e a complexidade do plano de tratamento estão relacionadas à sobrecarga do cuidador vivida pelos proprietários; entretanto, até o momento, esses fatores não foram examinados simultaneamente em proprietários de cães com dermatite alérgica atópica ou outra dermatite alérgica crônica.

**Hipóteses/objetivos** — Esperávamos replicar e estender o trabalho anterior, mostrando que a sobrecarga do cuidador está ligada à complexidade do tratamento e à gravidade da doença nesta população. Além disso, hipotetizamos que uma relação entre a sobrecarga e a complexidade do tratamento estaria presente tanto nas mensurações subjetivas (relato de experiência do proprietário) quanto nas objetivas (número de tratamentos semanais), e que essas relações existiriam independentemente da gravidade da doença de pele.

**Participantes** — Oitenta e seis proprietários de cães com dermatite atópica ou outra dermatite alérgica crônica foram recrutados através de grupos de alergias em cães nas redes sociais.

**Métodos** — Avaliações transversais online foram concluídas para sobrecarga do cuidador, complexidade do tratamento e gravidade da doença de pele.

**Resultados** — A sobrecarga do cuidador foi correlacionada com a gravidade da doença de pele ( $r = 0,40$ ) e com as medidas subjetivas ( $r = 0,37$ ) e objetivas ( $r = 0,30$ ) da complexidade do tratamento ( $P < 0,01$  para todos). As relações entre a sobrecarga do cuidador e a complexidade do tratamento permaneceram significativas após considerar-se a gravidade da doença de pele.

**Conclusões e importância clínica** — A maior complexidade do plano de tratamento está associada a uma maior sobrecarga do cuidador em proprietários de cães com dermatite atópica ou outra dermatite alérgica crônica. A independência dessa relação destaca a importância da simplicidade no planejamento eficaz do tratamento.