



General Public Knowledge Regarding Topical Corticosteroids: A Nationwide Survey in South Korea

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ABSTRACT

Background: Topical corticosteroids (TCs) are available both as over-the-counter drugs and prescription medicines at pharmacies. Although they are generally safe drugs, inappropriate and excessive use could result in potential side effects. Thus, it is important to have appropriate knowledge regarding the use of TCs. We performed a cross-sectional survey to assess public knowledge and the potential misuse or overuse of TCs. **Methods:** A cross-sectional and nationwide online survey was conducted among participants who were aware of TCs. The survey items included sources of information, indications, potential side effects, and methods of application of TCs. A comparative analysis was conducted between those with (TC users) and without (TC non-users) an experience of using TCs. **Results:** Among 3,000 participants, 74.4% were TC users. The mass media was the most common information source of TCs, and only one-third of the surveyed people relied on pharmacists or doctors for information. Regarding indications and application methods, incorrect answer rate was high in some items, but respondents showed adequate knowledge. However, awareness of the safety of TCs was low. Overall, the TC users showed a higher knowledge of TCs than TC non-users. **Conclusions:** Public knowledge of the use of TCs appears to be appropriate. However, we found potential misuse or overuse of some items and a lack of awareness of the side effects concerning TCs. Thus, healthcare professionals' significant role is required.

KEYWORDS: Topical steroid, survey, public awareness, public knowledge, South Korea

Topical corticosteroids (TCs) are widely used for various skin conditions. Although safe when used appropriately, misuse and abuse of TCs could result in local and systemic side effects.¹⁻³⁾ Reports of misuse and abuse resulting in serious adverse outcomes have been reported in India⁴⁻⁷⁾ and Africa⁸⁾ owing to the high availability of over-the-counter (OTC) TCs.^{7,8)} In South Korea, TCs with various potencies are available without a prescription. Additionally, there is an increasing global trend of self-medication,⁹⁾ and TCs are one

of the most used therapeutics for self-medication against dermatological conditions.^{10,11)} Thus, it is important that the public have appropriate knowledge regarding the TCs.

To our knowledge, no study has assessed the public awareness and knowledge of TCs at a national level. Thus, our study aimed to evaluate the nationwide awareness and knowledge of TCs in South Korea and analyze the potential for misuse and abuse of TCs.

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Methods

In 2015, a nationwide web-based cross-sectional survey was conducted using the largest online panel in South Korea, Tillion. The survey targeted 18-65 adults and used a questionnaire with 42 items including demographic information and TCs specific knowledge. Individuals were asked whether they were aware of TCs after presenting an explanation of what TCs were. If 'yes', they were classified as 'TC informed group' and included in this study as participants. They were recruited until 3,000 participants were obtained using quota sampling stratified according to sex, age, and region of residence for a representative sample of the South Korean population. In contrast, if 'no', they were classified as 'TC non-informed group' and excluded from the survey. However, TC non-informed group was also asked to answer the demographic-related questions in the questionnaire and the difference between the two groups was analyzed. The 3,000 participants were asked whether they had previously used or were currently using TCs. Those with experience of using TCs were defined as 'TC users,' while those without experience were defined as 'TC non-users.' They were asked to answer the TC-specific questions and we compared the results between two groups. Further, TC users were classified into three groups based on the way they obtained TCs and used them as follows: (i) those who obtained TCs through prescription at least once were defined as 'prescription-based TC users'; (ii) those who bought only OTC TCs were defined as 'OTC-TC users'; and (iii) those who were neither 1 nor 2 were assigned to 'others' including using TCs of family members. Subgroup analyses were performed. Among the recruited individuals, the ones who provided informed consent could access the survey. The Institutional Review Board of Chung-Ang University approved the study protocol (approval number: 1041078-201409-HR-142-01C) and all procedures in this study before data collection.

The questionnaire consisted of 42 items that were based on a conceptual framework. It was reviewed by dermatologists, pharmacists, and non-medical persons, and modifications were made based on their feedback. The demographic information, including sex, age, the region of residence, marital status, level of education, occupation, monthly household income, and number and age of children <18 years, if present, were collected. The public knowledge of TCs was evaluated in the following four categories: (i) sources of information; (ii)

indications considered appropriate by the participant; (iii) awareness and knowledge of TCs' side effects; and (iv) appropriate methods of application, including application frequency and duration. The optional items of TC-specific questions were based on the approved label of TCs in South Korea regardless of the strength or whether it was OTC or a prescription drug. Additionally, commonly misunderstood items were included after a review of literature. All of the TC-specific questions were multiple choice. Lastly, the respondents were asked whether they would consult a pharmacist or doctor before purchasing TCs.

All analyses were performed using IBM Statistical Package for the Social Sciences version 23 (SPSS Inc., Chicago, IL, USA). The results of descriptive frequencies were expressed as percentages or mean±standard deviation. Pearson chi-square (χ^2) tests and student's t-tests were used to compare the characteristics of TC users and non-users, and prescription-based TC users and other TC users. All results were considered statistically significant when $p<0.05$.

Results

Of the total 4,138 participants, 3,000 (72.5%) were aware of TCs and were, therefore, included in our study. The demographic characteristics of the TC-informed group and the non-informed group are presented in Table 1. TC-informed and non-informed participants were significantly different in terms of all characteristics; wherein TC-informed participants were mostly female, older, married, had children, lived in a regional area, and had a profession as well as higher education and income (all $p<0.001$). Of the 3,000 participants, 2,231 (74.4%) were TC users, while the rest (25.6%) were TC non-users. Of all TC users, 1,503 (67.4%) were prescription-based TC users, 628 (28.1%) were OTC-TC users, and 100 (4.5%) were other users.

The sources of information among the participants regarding the use of TCs are shown in Table 2. The main sources of information were 'articles or news from magazines, newspapers, and/or broadcasts' followed by the 'friends or family' among TC users and TC non-users, while only one-third of the surveyed people selected pharmacists or doctors for information. However, as a result of sub-analysis, 'doctor' (46.1%) and 'pharmacist' (40.9%) were the most frequently selected information sources among prescription-based TC users, while 'pharmacist' (35.1%) followed 'articles or news from magazines,

Table 1. Demographic information of TC informed and non-informed participants

	TC informed (n=3000)		TC non-informed (n=1138)	
	No.	%	No.	%
Gender				
Male	1508	50.3	694	61.3
Female	1492	49.7	440	38.7
Age (years), mean±SD	41.0±11.6		38.76±12.0	
Marital status				
Single	1016	33.9	512	45.0
Married or other	1984	66.1	626	55.0
Children younger than 18 years				
None	1817	60.6	817	71.8
1	600	20.0	160	14.1
2	511	17.0	146	12.8
≥3	72	2.4	15	1.3
Residential area				
Metropolitan	1518	50.6	660	58.0
Regional	1482	49.4	478	42.0
Occupation				
Professional	480	16.0	120	10.5
Service	1354	45.1	485	42.6
Business	215	7.2	127.0	11.2
Unemployed	893	29.8	367	32.3
Other	58	1.9	39	3.4
Education				
<University degree	779	26.0	448	39.4
≥University degree	2221	74.0	690	60.6
Monthly household income				
No income	31	1.0	39	3.4
Low-income	926	30.9	458	40.2
Mid-income	1174	39.1	439	38.6
High-income	869	29.0	202	17.8

TCs, topical corticosteroids; SD, standard deviation

newspapers, and/or broadcasts' and 'friends or family' among OTC-TC users.

The majority of the study participants (85.5%) selected at least one correct indication. The most frequently selected indication was 'itchy skin', followed by 'atopic dermatitis', 'seborrheic dermatitis', 'eczema', and 'contact dermatitis'. All of these conditions were approved for TC usage. A significantly higher proportion of TC users selected approved indications,

while the TC users also chose most inappropriate indications as appropriate options by a significantly higher proportion than TC non-users, except 'arthritis or pain relief'. These results were similar for the prescription-based TC user group. Of these, 90.6% selected at least one appropriate option, while 78.6% selected at least one unapproved indication. Of the unapproved and commonly misused indications, 'bacterial infection' and 'fungal infection' were the most frequently

Table 2. Source of information

Source	TC informed (n=3000)		TC users (n=2231)		TC non-users (n=769)		p-value
	No.	%	No.	%	No.	%	
Articles or news from magazines, newspapers, and/or broadcasts	1190	39.7	866	38.8	324	42.1	0.110
Friends and/or family	1107	36.9	835	37.4	272	35.4	0.200
Pharmacist	954	31.8	830	37.2	124	16.1	<0.001
Doctor	916	30.5	786	35.2	130	16.9	<0.001
TV health programs	905	30.2	699	31.3	206	26.8	<0.001
Package inserts and/or leaflets	746	24.9	656	29.4	90	11.7	<0.001
Internet search	616	20.5	514	23.0	102	13.3	<0.001
Advertisement	464	15.5	375	16.8	89	11.6	<0.001
Others	26	0.9	17	0.8	9	1.2	0.900

TCs, topical corticosteroids

Percentages do not add up to 100% due to multiple selections.

p-Value is from χ^2 test performed between TC users and TC non-users.

Table 3. Indications of topical corticosteroids as selected by respondents

Indications	Approved	TC informed (n=3000)		TC users (n=2231)		TC non-users (n=769)		p-value
		No.	%	No.	%	No.	%	
Itchy skin	Yes	1425	47.5	1164	52.2	261	33.9	<0.001
Atopic dermatitis	Yes	1240	41.3	996	44.6	244	31.7	<0.001
Seborrheic dermatitis	Yes	1032	34.4	835	37.4	197	25.6	<0.001
Eczema	Yes	1005	33.5	853	38.2	152	19.8	<0.001
Contact dermatitis	Yes	990	33.0	837	37.5	153	19.9	<0.001
Psoriasis	Yes	778	25.9	631	28.3	147	19.1	<0.001
Rash or erythema	Yes	757	25.2	615	27.6	142	18.5	<0.001
Insect bites	Yes	456	15.2	395	17.7	61	7.9	<0.001
Bacterial infection	No	968	32.3	770	34.5	198	25.7	<0.001
Fungi infection	No	900	30.0	717	32.1	183	23.8	<0.001
Wound	No	658	21.9	535	24.0	123	16.0	<0.001
Arthritis or pain relief	No	652	21.7	442	19.8	210	27.3	<0.001
Acne	No	637	21.2	497	22.3	140	18.2	0.017
Cracked skin	No	582	19.4	465	20.8	117	15.2	0.001
Nappy rash	No	346	11.5	291	13.0	55	7.2	<0.001
Moisturizing	No	264	8.8	204	9.1	60	7.8	0.257
Whitening	No	141	4.7	98	4.4	43	5.6	0.175
Others		25	0.8	15	0.7	10	1.3	0.099

TCs, topical corticosteroids

Percentages do not add up to 100% due to multiple selections.

p-Value is from χ^2 test performed between TC users and TC non-users.

Table 4. Side effects of topical corticosteroids selected by respondents

	TC informed (n=3000)		TC users (n=2231)		TC non-users (n=769)		p-value
	No.	%	No.	%	No.	%	
Awareness of side effects							<0.001
Aware of the side effects	1438	47.9	1213	54.4	225	29.3	
Unaware of the side effects	1541	51.4	1009	45.2	532	69.2	
No side effects	21	0.7	9	0.4	12	1.6	
Side effects	(n=1438)		(n=1213)		(n=225)		
Thinning of the skin	607	42.2	533	43.9	74	32.9	0.002
Changes in skin color	535	37.2	468	38.6	67	29.8	0.012
Itchy skin	522	36.3	463	38.2	59	26.2	0.001
Skin irritation	519	36.1	458	37.8	61	27.1	0.002
Telangiectasia	507	35.3	441	36.4	66	29.3	0.043
Dry skin	432	30.0	386	31.8	46	20.4	0.001
Susceptibility to skin infections	267	18.6	232	19.1	35	15.6	0.206
Acne	255	17.7	226	18.6	29	12.9	0.038
Easy bruising	151	10.5	129	10.6	22	9.8	0.700
Hypertrichosis	147	10.2	124	10.2	23	10.2	1.000
Others	31	2.2	24	2.0	7	3.1	0.283
Systemic side effects	26	1.8	24	2.0	2	0.9	0.260

TCs, topical corticosteroids

Percentages do not add up to 100% due to multiple selections.

p-Value is from χ^2 test performed between TC users and TC non-users.

selected in both the TC users and TC non-users. Detailed results of the comparison regarding the selection of appropriate indications between TC users and non-users are presented in Table 3.

Participants showed lower awareness regarding the side effects than regarding the indications for TCs. Approximately >50% of the respondents answered that they were unaware of the side effects of TCs, and 1% indicated that there were no side effects associated with TCs. The degree of awareness in most options was significantly higher in TC users than non-users. Of TC users, prescription-based TC users (60.5%) showed the highest awareness followed by OTC-TC users (42.4%). Among the potential side effects, 'thinning of the skin' was most frequently selected, followed by 'changes in skin color' and 'itchy skin'. 'Systemic side effects' were selected by only 2% of the survey respondents (Table 4).

The responses regarding the appropriate frequency and duration of TC application are presented in Figs. 1 and 2, respectively. Once- or twice-daily application is usually

recommended for TCs,³⁾ although some TCs such as hydrocortisone can be used more frequently. However, 4% (n=115) of the participants chose '≥5 times a day'. With respect to the duration of application, one-fourth (n=710) of the participants concurred that TCs should be used 'until symptoms resolve regardless of the duration'. Of these respondents, 81% (n=572) were TC users and of them, prescription-based TC users accounted for the most at 60.5%. The responses to the knowledge of correct usage of TCs are shown in Table 5. All the items were answered correctly by most of the respondents except for items 7 and 8. Except for item 8, TC users showed a greater likelihood of selecting the correct responses and were less likely to select 'do not know'.

When enquired if the respondent would consult a doctor or pharmacist before purchasing TCs, 2,131 (71.0%) answered 'yes,' 708 (23.6%) answered 'not sure,' and 161 (5.4%) answered 'no'. These results did not differ significantly between TC users and TC non-users (70.6% vs. 72.4%, $p=0.322$). However, there was a significant difference between

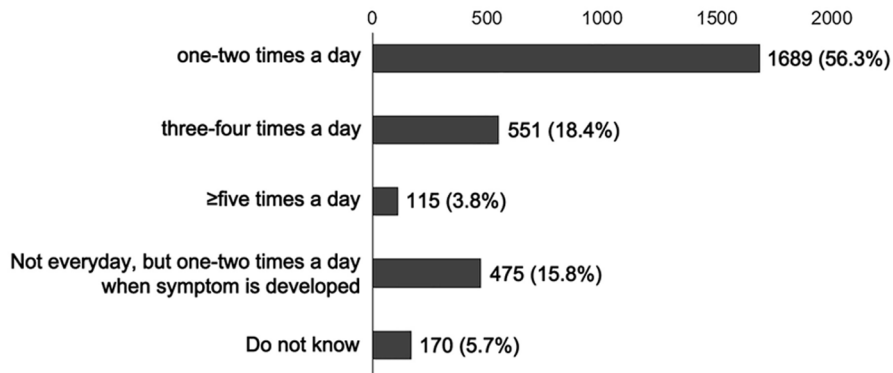


Fig. 1. Appropriate frequency of topical corticosteroid application

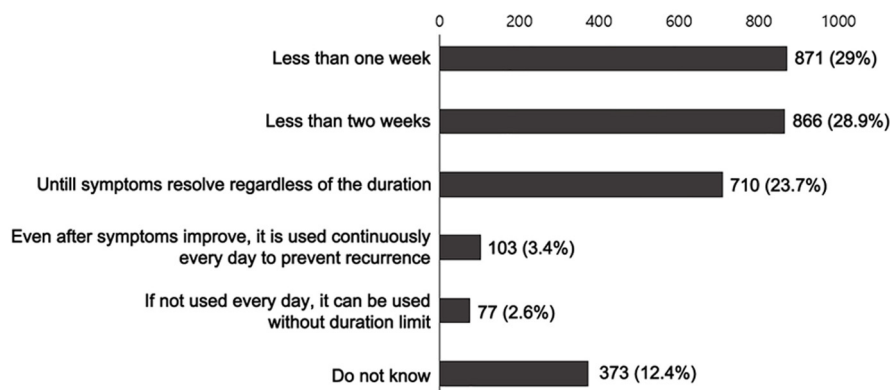


Fig. 2. Appropriate duration of topical corticosteroid application

the prescription-based TC user group and the OTC-TC user group (77.2% vs. 56.1%, $p < 0.001$).

Discussion

This study is the first attempt to assess the level of public awareness and knowledge of TCs, a commonly used medication for various dermatological conditions, at the national level. In South Korea, the public is exposed to an environment with a wide range of topical steroid products that are available without a prescription. The general Korean population has a high interest in health and wellbeing. It is a common topic discussed in the media.¹²⁾ In addition, internet access, one of the important sources of health information, is easy here.¹³⁻¹⁴⁾ Possibly due to such a nature, high awareness of TCs was observed with 73% of the participants answering that they were aware of TCs, despite only 54% of them having used TCs previously.

In support of our theory of high media exposure regarding medication in South Korea, ‘articles or news from magazines,

newspapers, and/or broadcasts’ option was selected most frequently as the source of information, regardless of any previous experience of TC use. Also, ‘TV health program’ was selected by one-third of the participants. In particular, the latter was selected at a higher rate than the doctor or pharmacist in the TC non-user group. In the USA, nearly half of the respondents (49%) reported advertising or promotions from television, newspapers, or magazines as the source of information for non-prescription medications.¹⁵⁾ In our study, advertising was ranked the lowest except ‘others’. This might be related to decreased public advertisements due to the strengthening of regulation and review of medication in South Korea.¹⁶⁾ Previous studies had reported that doctors or pharmacists were the most frequent sources of medications among interpersonal channels.^{15,17-19)} In our study, friends and/or family were most often selected at a higher rate than doctors or pharmacists. Although these sources might sometimes have professional knowledge, they are often unlikely to have any formal training in providing appropriate healthcare advice, which could lead to misuse or overuse.¹⁸⁾

Table 5. Knowledge regarding topical steroids

Item	correct response	TC informed (n=3000)			TC users (N=2231)			TC non-users (N=769)			p-value	
		Yes (%)	No (%)	DN (%)	Yes (%)	No (%)	DN (%)	Yes (%)	No (%)	DN (%)		
1	If you reuse the remaining external medicine (including steroid external medicine) after use, you need to check the expiration date and use it	Yes	74.8	16.5	8.7	75.6	17.3	7.1	72.1	13.8	14	<0.001
2	Steroids have different potency depending on the ingredient and quantity	Yes	73.3	10	16.7	74.2	10.6	15.2	70.3	8.1	22	<0.001
3	Different brands of topical steroids have different ingredients and quantity	Yes	67.3	10.9	21.8	68.7	11.1	20.2	62	10.7	27	<0.001
4	Different steroid potency needs to be used for different parts of the body	Yes	66.4	13.2	20.4	67.5	13.6	18.9	63	11.9	25	0.002
5	For optimal absorption, steroids should be applied in a thick layer	No	17.3	72.2	10.5	19.4	73.2	7.4	10.7	68.8	21	<0.001
6	For optimal absorption, one should cover the area (i.e., with plastic wrap) after application	No	18.5	63.7	17.8	18.6	67.6	13.8	18.2	50.6	31	<0.001
7	For optimal absorption, steroids should be applied repetitively	No	37.3	52.4	10.3	39.7	53	7.3	29.2	50.5	20	<0.001
8	Remaining steroids can be used for other similar symptoms	No	31.7	47.7	20.6	34.1	47.5	18.4	23.5	48.5	28	<0.001

TCs: topical corticosteroids; DN: do not know

Percentages do not add up to 100% due to multiple selections.

p-Value is from χ^2 test performed between TC users and TC non-users.

About one-third of the TC users selected ‘package inserts and/ or leaflets’ as the information sources. These are important information sources for the safe and effective use of medications, especially OTC medications. However, even if package inserts and/or leaflets can provide accurate information to patients, such information obtained without appropriate verbal communication from healthcare professionals could lead to unnecessary panic and lower adherence. ‘Internet search’ as the source of information was also commonly selected by TC users. The internet is not a validated source of information for medications. It provides non-patient-specific data and often inaccurate information to consumers, which could increase the possibility of misuse.²⁰⁾ Thus, the provision of patient-specific and accurate information from healthcare professionals is essential for the rational use of medicines. In our study, ‘doctors’ or ‘pharmacists’ were the main information source among the prescription-based TC users. Of all participants, however, only one-third of the TC users selected them as the source of TC information. In particular, the OTC-TC users showed a low selection of pharmacists and only 56% answered that they were willing to consult a healthcare

professional before purchasing TCs. Such low selection rates of healthcare professional are alarming, as drug use without any correct direction to use may be associated with serious side effects. Thus, pharmacists’ role is crucial to prevent possible problems related to TCs for patients requesting non-prescription TCs.

High awareness regarding indications for TCs was observed in this study. However, interestingly, the TC users showed a significantly higher selection of most inappropriate options and so did the prescription-based TC users. This is related with the result that the TC users agreed with the ‘remaining steroids can be used for other similar symptoms’ by a significantly higher proportion. These results are alarming, as they possibly suggest the potential drug misuse, which can lead to serious side effects. ‘Bacterial infection’ and ‘fungal infection’ were the most frequently selected inappropriate indications. TCs can exacerbate fungal infections when used alone, and long-term use might even lead to secondary infections. A study including the patients who used topical steroids for dermatoses where it is an absolute contraindication, as well as those who developed side effects, reported that the

common incorrect use superficial dermatophytosis in 89% and the most common adverse effect was recurrence/increase in the extent of the infection in 76% patients.²¹⁾ However, combination products containing TC and anti-infective agents can be employed for bacterial or fungal infections. Thus, healthcare professionals should provide more comprehensive and informative counseling to TC users. In particular, community pharmacists need to intervene and evaluate whether TCs are appropriate for patients requesting non-prescription TCs.

Participants showed low knowledge regarding the side effects. Just under half of the respondents answered that they were aware of the TC side effects with 1% answering that there are no side effects with TCs. Fortunately, the awareness of TC side effects among TC users was higher. However, they were mostly aware of the local side effects and only 2% were aware of the systemic side effects. This could be because, with non-prescription medications, users tend to be more interested in the potential benefits than the potential risks.^{22,23)} Thus, providing information on side effects of TCs, including both OTC and prescription, is crucial to ensure the public's safety while using TCs.

Regarding the appropriate use of TCs, considerable respondents, particularly TC users, including the prescription-based TC users, selected 'until symptoms resolve regardless of the duration' as the appropriate duration of TC application, which was a matter of concern about the possibility of overuse. A study conducted in Great Britain that surveyed patients using non-prescription TCs found that most of the respondents would continue using TCs as long as it was necessary until the resolution of the symptoms.²⁴⁾ This possibly suggests that TC users might be unaware of the possible risk of long-term use of TCs. Furthermore, a relatively high proportion of respondents agreed with the statements 'remaining steroids can be used for other similar symptoms' and 'for optimal absorption, steroids should be applied repetitively' as the proper TC use, which could potentially lead to problems associated with misuse and overuse of the drugs. Thus, appropriate education from healthcare professionals is required for safe use of TCs

This study has some limitations. This was a drug-related study that included considerable medical terminology in the questionnaire. Although we provided an explanation of each terminology and the questionnaire was reviewed by non-medical persons as well as pharmacists and dermatologists for improving readability, it might be quite difficult for the

general public to understand completely and thus, may affect the study results. In addition, the TC user group was determined based on the answer whether the respondents had ever used TCs. Thus, the results of this study may have been affected by recall bias. Finally, participants were not instructed that responses regarding all of the TC-specific questions should be made for TC single agents only, except in combination products containing ingredients other than TCs, such as antifungal and TC or antibacterial and TC. This may affect the high selection of bacterial infection and fungal infection as appropriate indications. Despite these limitations, this study is important. Previous studies related to general knowledge of TCs have mostly targeted patients coming to dermatology outpatient departments or pharmacies,^{4,21,24,25)} or health professionals.^{21,26)} However, this study is first nationwide and large scale survey focused on the general public, including those without TC experience. In conclusion, most of the participants were aware of at least one TC indication and how to use TCs, regardless of their experience of using TCs. However, the awareness of TC safety was low. Furthermore, they showed a high response for inappropriate indications and some specific options of frequency and duration of TC usage, especially in the TC user group. These are alarming in terms of the possibility of misuse or overuse; thus, for the correct and safe TC use, healthcare professionals should prescribe or recommend the optimal product to the patients, explain why it should be used and its potential side effects, and provide specific dosage instructions including frequency, duration, and how to apply.

Acknowledgments

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Conflicts of Interest

The authors declare that there is no conflict of interest.

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