Title: ARE PATIENTS SUFFICIENTLY INFORMED ABOUT CONTACT LENS WEAR AND CARE?

Running title: Patient-practitioner communication in contact lens wear

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ABSTRACT

Significance: Frequent and effective patient-practitioner communication is essential to ensure instructions regarding contact lens use, care and maintenance are understood and followed. Given the relevance of good patient compliance, the responsibility of practitioners to provide adequate information may not be neglected.

Purpose: To determine the content and type of information Licensed Optometrists in Spain provide their patients during the first contact lens fitting and at follow-up visits.

Methods: A self-reported *ad hoc* survey was distributed to Licensed Optometrists in Spain to investigate, amongst other factors, whether practitioners provided information on several aspects of contact lens use and maintenance, how was this information provided and whether in-office practical demonstrations were conducted at all contact lens appointments.

Results: Respondents of 321 surveys had a median of 20 years of contact lens fitting experience and worked on independent practices (67.6%), national (29.0%) and regional chains (3.4%). Type of practice influenced continuous education habits (P = .03). Overall, 28.0% of participants did not always instruct patients on the need to rub contact lenses, 34.3% did not always address contact lens replacement and 6.8% did not always explain storage case hygiene and replacement. At the follow-up visit, only 8.4% of respondents asked their patients to demonstrate their care routines. Information was mostly oral (48.6%) or oral and written (43.0%). Contact lens-related complications were reported more frequently by participants with less continuous education training (P = .01), by those not always recommending rubbing (P = .002) and by those not providing written information about storage case hygiene and replacement (P = .002).

Conclusion: Patient-practitioner communication was good, albeit several areas were identified were information was insufficient or not provided in a correct and timely format. Precise, written information

on rubbing and storage case hygiene and replacement may improve compliance and assist in avoiding complications and drop-out.

KEYWORDS: Care and maintenance; Contact lens; Communication; Compliance; Information

Contact lens complications and drop-out are recurrent aspects of contact lens wear with a negative impact on the safety and satisfaction of patients and practitioners. It is commonly accepted that both aspects may be influenced by improving the information patients receive on the diverse wear and maintenance procedures.[1-4] Published research has described compliance as critical in contact lens wear,[3,5,6] with non-compliance rates ranging from 40% to 90%.[7-9] Habitual malpractices include poor hand hygiene, use of tap water, sleeping with or reusing daily disposable contact lenses and extending replacement intervals of both contact lenses and accessories.[8,10-14] Although causes for non-compliance are largely unknown, age, wearing experience and socioeconomic status have all been documented by previous authors.[9]

Fluent communication is essential in all facets of the patient-practitioner relationship and it underpins patient compliance.[15-16] Indeed, compliance may be voluntary or it may originate in a lack of proper understanding of given instructions,[17] with many patients being unaware their practices may be incorrect.[18] For instance, Bui and co-workers observed that, whereas 86% of the patients included in their study believed their care and maintenance practices to be adequate, only 34% of them were actually compliant with given instructions.[19]

In Spain, the Code of Good Practices published by the Spanish Council of Optometrists (Consejo General de Colegios de Ópticos-Optometristas) presents a series of recommendations to Licensed Optometrists. Amongst them, it notes the relevance of empowering patients in the decision-making processes and of listening and understanding their needs, concerns and apprehensions.[20] It also states that communication with patients must be unequivocal and adapted to their level of understanding, and that it should include, if possible, written information regarding contact lens care, wear and replacement,[21,22] although recent research noted that many patients failed to revise these instructions at home.[13] Similar institutions and regulating bodies in other countries, such as the General Optical Council in the United Kingdom, also recommend visual health providers to consider the needs of their

patients when selecting type, use and replacement of contact lenses, and they stress the relevance of fluent patient-practitioner communication.[23]

It was the purpose of this study to determine the type and content of the information Licensed Optometrists in Spain provide their patients about wear, maintenance and replacement of contact lenses and their accessories. The ultimate goal of this research was to investigate possible limitations in the strategies employed by Spanish optometrists to communicate to their patients the need for proper contact lens compliance and, by exposing these shortcomings, to encourage better practices, hopefully leading to improved compliance and to a reduction in the rate of contact lens-related complications and drop-out.

MATERIAL AND METHODS

For the purposes of this cross-sectional research, a self-reported *ad hoc* survey "Contact Lens Information Survey (CLIS)" (was developed with Google Forms (Google LLC, Mountain View, CA, US) (Supplemental Digital Content 1.pdf). The survey did not collect any identifying data and participation was strictly voluntary. On the first section of the survey, participants were informed of the overall aims of the study and were provided with a contact email should they require additional information. Responses were anonymous and a consent was assumed by the action of submitting a complete questionnaire. This study, which resided within the framework of a wide-ranging investigation on contact lens compliance, was reviewed by an independent institutional review board (Universitat Politècnica de Catalunya) to ensure it followed the principles and guidelines for the protection of human subjects in biomedical research.

The survey was created in Spanish and addressed to Licensed Optometrists working in Spain. The items included in the survey were selected based on previous published studies and on the clinical experience of the authors.[1-19] A preliminary version of the survey was administered in face-to-face format to a

convenience sample of nine Licensed Optometrists and their comments were used to rewrite approximately one third of the items for clarity and add response options to two items. The final survey was structured in 5 sections comprising a total of 54 items. As noted above, the first section was of an informative nature and described to whom the survey was addressed. The second section collected demographic data mainly related to type of optometric practice (options were independent or local chain with less than 9 practices, regional chain with up to 49 practices or national chain with 50 centers or more), and to contact lens fitting experience (in years) and continuous education in the previous three years (number of hours of training and number of attended national or international optometry or contact lens meetings). In the third or main section, in addition to items investigating whether contact lens fittings were always conducted in their totality by a Licensed Optometrist, other questions enquired participants on the likelihood of recommending contact lenses to spectacle wearers, and investigated in detail how training and instructions regarding care and maintenance of contact lenses and accessories was provided. Respondents were asked to describe whether they provided information and conducted in-office practical demonstration on insertion and removal of contact lenses, identifying the correct orientation of the contact lens, rubbing and rinsing, storage case cleaning and replacement and various aspects of solution management. In addition, respondents were asked to rate the difficulty they experienced with patients attending follow-up visits at the scheduled times and whether they used any strategy to improve follow-up visits compliance. Whether and how compliance with contact lens maintenance was re-checked at the follow-up visits was also explored. Finally, this section also included items regarding the experience of respondents with contact lens-related complications and provided a space to list three complications (including contact lens type, management of the complication and possible cause). Section four investigated aspects related to contact lens wear and COVID-19 (not reported at this time) and the last section offered the opportunity to add further comments and thanked respondents for their time.

The survey contained a combination of dichotomous responses, multiple-response items and open answers, with both compulsory and non-compulsory items to allow respondents to skip non-applicable questions. The survey required about 10 minutes for completion.

The link to the online survey was distributed during the months of February and March 2022 through personal and social networks of the authors. In addition, the Consejo General de Colegios de Ópticos-Optometristas sent a link to the survey via an e-mail to all Licensed Optometrists in Spain (approximately 17.000) and a contact lens manufacturer with wide-spread representation in Spain also assisted in distributing the survey.

The IBM Statistical Package for the Social Sciences (SPSS) Statistics v.27 (IBM Corp. NY, US) was used for statistical analysis. First, all survey responses were manually reviewed and inconsistent or incomplete responses were identified and removed. Subsequently, according to the nature of each type of response, descriptive statistics were presented as frequency, mean and standard deviation or median and range. Inferential analyses (ANOVA and Kruskal-Wallis tests, with the corresponding post-hoc tests when appropriate) were conducted to explore possible associations amongst variables. A $P \leq .05$ denoted statistical significance.

RESULTS

A total of 338 survey responses were downloaded and manually reviewed for completion and internal coherence, resulting in the exclusion of 17 surveys and leaving a final sample of 321 valid surveys for analysis.

Demographic analysis

Respondents reported a median of 20 years of contact lens fitting experience (range from 0 to 47 years). Regarding type of optometric practice, 217 participants (67.6%) were from independent or local chains,

93 (29.0%) from national chains and 11 (3.4%) from regional chains, with an overall median of 2 Licensed Optometrists per practice (range from 1 to 10). Years of contact lens fitting experience was found to be influenced by the type of optometric practice (F = 11.633; P < .001), with optometrists working for independent or local chains showing statistically significant longer contact lens fitting experience (median of 19.3 years) than those from regional chains (median of 11.9 years) (P < .001). In the previous three years, 109 participants (34.0%) had received between 10 and 30 hours of continuous education training, 82 (25.5%) less than 10 hours, 67 (20.9%) between 30 and 50 hours and only 63 (19.6%) more than 50 hours. During the same time interval, 214 (66.7%) respondents did not attend any national or international optometry or contact lens meetings, with respondents from larger retail chains reporting less attendance (χ^2 = 7.195; P = .03). Collected responses were evenly distributed across Spanish regions.

Information provided to new contact lens wearers

Almost all respondents (316, 98.4%) noted that contact lens fittings were conducted in their totality by a Licensed Optometrist. The number of fittings to new contact lens wearers per month was wide-spread, with 133 (41.4%) of respondents conducting between 5 and 10 new fittings, 120 (37.4%) less than 5, 62 (19.3%) between 10 and 30 and only 6 (1.9%) more than 30 new fittings. Similar findings were found upon exploring follow-up visits, with 116 (36.1%) respondents conducting between 5 and 10 follow-up visits per month, 93 (29.0%) between 10 and 30, 75 (23.4%) less than 5 and 37 (11.5%) more than 30 follow-up visits. Statistically significant differences in the number of new fittings and follow-up visits were found amongst type of optometric practices (F = 52.309; P < .001), with independent or local chains performing less new fittings and follow-up visits than both regional (P < .001) and national chains (P < .001). **Figure 1** shows the likelihood of recommending contact lenses to spectacle wearers, with the highest percentage of respondents (82, 25.5%) rating this likelihood with a 7 (on a scale ranging from 0 “never” to 10 “always”).

Table 1 presents a summary of the frequency with which respondents informed their patients of the various aspects of contact lens care and maintenance. More experienced practitioners tended to provide information about storage case hygiene and replacement more frequently than those participants with less years of experience ($F = 7.119$; $P < .001$). The other topics of information were not influenced by the experience of practitioners.

Regarding replacement schedule of contact lens solutions, 68 (21.2%) of participants recommend starting a new solution each 1 – 2 months, 54 (16.8%) each 2 – 4 months and 9 (2.8%) each 4 – 6 months, although the majority of respondents (173, 53.9%) refer to the recommendations of manufacturers. Participants recommending longer solution replacement schedules were those with less contact lens fitting experience ($F = 3.072$; $P = .02$). More than half of the respondents (184, 57.3%) reported selling their own brand of solution and 147 (45.8%) applied promotional offers to solutions, such as "three for the price of two". These responses were given more frequently by those participants working in national retail chains ($P < .001$ and $P = .004$, respectively). Most respondents recommended replacing the storage case with each new bottle of solution (222, 69.2%) or every 1 – 2 moths (75, 23.4%), irrespective of their fitting experience. In fact, 310 (96.6%) of participants include a storage case with each new bottle of solution and 143 (44.5%) hand their patients a new storage case at all follow-up visits.

At the follow-up visits

Participants expressed their concern about managing the attendance of their patients to follow-up visits, with most respondents (195, 60.8%) rating their experienced difficulties between 5 and 8 (where 1 was "very easy" and 10 "very difficult") (**Figure 2**). Follow-up appointments are commonly notified to patients on the previous visit (237, 73.8%), with a later reminder via messaging apps (106, 33.0%), phone call (78, 24.3%) or e-mail (15, 4.7%). At the follow-up visit, only 27 (8.4%) of respondents asked their patients to

show them how they manipulated and cleaned their contact lenses to ascertain whether patients had understood their instructions correctly, and 162 (50.5%) only occasionally reinforced the initial instructions, while 132 (41.1%) did not address these issues with their patients beyond the initial fitting session.

How was information provided?

Most participants provided information to their patients orally only (156, 48.6%), followed by a combination of oral and written information (138, 43.0%). A minority of respondents (27, 8.4%) complemented oral information with other strategies, such as messaging apps, e-mail, social media (including YouTube videos) or web pages of manufacturers. In particular, 253 (78.8%) of participants did not always provide written information to their patients regarding storage case hygiene and replacement. Written information was provided more frequently by those participants with more fitting experience (P = .001). Whereas informed consent was provided irrespective of type of contact lens fitting by 74 (23.1%) of participants, 109 (33.9%) participants only provided it when fitting specialty contact lenses, and 138 (43.0%) never provided informed consent to their patients. No statistically significant differences were found between independent or local chains, regional and national chains regarding the use of informed consent (P = .33).

Contact lens complications

More than half of the participants (187, 58.3%) reported encountering patients with one or several contact lens-related complications. Of these, the most frequent complication was conjunctivitis (61, 32.5%), followed by non-infectious keratitis (47, 25.3%), corneal ulcers (27, 14,5%) and toxicity to

solutions (11, 6.0%). Four and two participants noted a case of infectious keratitis caused by *Pseudomonas aeruginosa* and *Acanthamoeba*, respectively. Non-compliant behaviours frequently associated with these complications were overextending contact lens wear and replacement, poor hygiene of contact lenses and accessories, poor handling, sleeping with contact lenses when not recommended and contact with tap water. Participants with more experience reported complications more frequently than those with less experience (F = 5.815; P = .02). Complications were also reported more frequently by participants with less continuous education training in the last three years (χ^2 = 10.805; P = .01), by those not always recommending to rub contact lenses (χ^2 = 11.986; P = .002) and by those not providing written information about storage case hygiene and replacement (χ^2 = 12.118; P = .002).

DISCUSSION

The purpose of this self-reported survey was to determine the type and content of information Spanish practitioners provide their patients in order to identify areas in which this information may be incomplete or inaccurate, thus enabling possible strategies to improve patient-practitioner communication, hopefully leading to better compliance and less contact lens-related complications and drop-outs. The findings revealed that, in general, Licensed Optometrists provide sufficient information to their patients at the initial fitting visit, with a combination of oral and written formats, and conduct practical in-office demonstrations on several aspects of contact lens wear such as insertion and removal, orientation identification and cleaning. However, analysis of responses identified three particular areas in which there was a lack of information or the relevance of the information was not sufficiently stressed to patients: contact lens rubbing, contact lens replacement and storage case hygiene and replacement. In effect, 28.0% of respondents noted not always instructing their patients on the need to rub contact lenses, 34.3% did not always address contact lens replacement and 6.8% did not always explain storage case hygiene and replacement, the latter information seldom provided in writing. These areas have been traditionally

associated with patient non-compliance on the one hand,[24,2,13] and with contact lens-related complications or increased risk of microbial contamination, on the other.[25,2,26]

Overall, information to patients was provided orally only (48.6%) or orally and in written format (43.0%), with only 8.4% of respondents using other strategies such as messaging apps to remind their patients of wear and care instructions. The actual effects on compliance of handing written information to patients, or even providing videos or graphic material to improve their awareness of potential complications associated with non-compliance, however, remains uncertain.[27-29] For instance, a recent survey addressed to Spanish wearers revealed that, of those users receiving written instructions, 60.3% never revised these instructions afterwards.[13] Other authors have noted that patient anxiety and large volume of simultaneous oral information shared at the initial fitting visit may reduce retention of details,[30] thus encouraging practitioners to provide writing guidance to all patients.[31] This information should be adequate to the literacy and comprehension level of the patients, must be accompanied by abundant photographic and video material,[32] and should add explanations to justify the need for each recommendation.[9] Information may be presented regularly to patients, and in small packets, which suggests that delivery through messaging apps may be ideal.

Messaging apps were more frequently used to remind patients of follow-up visits (33.0%), albeit many respondents expressed their concern with non-compliance to scheduled appointments. The utility of messaging apps has been explored in other health-related disciplines, showing promising results to engaging patients, improving attendance to follow-up visits and compliance,[33] albeit careful consideration to aspects such as frequency of messaging, content and etiquette, and data protection and privacy when using these apps is required.[34]

Interestingly, at the follow-up visit, only 8.4% of respondents requested their patients to demonstrate contact lens and accessories care and cleaning procedures, and 41.1% of them did not use the opportunity of the follow-up visit to reinforce initial instructions. These results are in agreement with previous

reports,[35] but fail to follow recommended guidelines, such as those published at the Asia Pacific Contact Lens Summit in 2009.[36]

Related to written information, only 23.1% of respondents implemented informed consent for all contact lens fittings, while 33.9% participants only used it for specialty contact lenses. Informed consent may be viewed by patients as a sort of legal contract binding practitioners to patients and, as such, may improve compliance. In Spain, although the use of informed consent is recommended at the Code of Good Practices,[21,22] each practitioner decides on its actual implementation. In contrast, for example, in the United Kingdom a valid informed consent must be obtained before examining a patient, providing treatment or involving patients in teaching and research activities.[37]

Years of fitting experience had a positive impact on several aspects of patient-practitioner communication. More experienced respondents tended to be more disposed to provide written information and to explain to their patients the need to clean and replace storage cases. Other items of information were not found to depend on fitting experience.

In addition, contact lens-related complications were more frequently described by participants with more fitting experience. This finding may be explained by a more careful approach to eye examination or case history recording of those participants, by the amount of time allocated to each visit, by the fact that experience and type of optometric practice may determine whether more complex fittings are conducted, or other factors. Indeed, in general, participants from larger retail chains tended to report less years of fitting experience and less attendance to optometry or contact lens meetings. Interestingly, more complications were also documented by respondents not always recommending to rub contact lenses and by those not providing information on storage case hygiene and replacement, although the nature of the present research precludes establishing a causal relationship between these items of information, actual patient compliance and contact lens-related complications. It must be noted that the design of the current study prevented an estimation of the actual incidence of these complications. Besides,

respondents may have reported those complications they considered more interesting or remarkable, overestimating their real occurrence.

Large retail chains also tended to sell their own brand of solution and to offer promotions to their patients, such as three solutions for the price of two. It may be interesting to determine whether providing patients with additional bottles of solution may lead to less frequent attendance to follow-up visits and to mismanagement at home resulting in a higher risk of solution contamination. Besides, this type of promotion may prevent compliance with regular storage case replacement, which has been documented to improve if a new storage case is provided with each new solution. [38]

Finally, other trends were observed regarding hours of continuous education and attendance to optometry and contact lens meetings in the previous three years. However, these findings should be interpreted with caution, as the sanitary recommendations related to COVID-19 may have influenced meeting attendance and face-to-face continuous education options, albeit online alternatives were often available.

In conclusion, the present findings evidenced fluent communication between Spanish Licensed Optometrists and their contact lens patients, although information about certain areas of contact lens wear and care and storage case maintenance may be improved. New communication strategies, such as messaging apps, may be useful to provide regular, brief, information packets in multimedia format to increase compliance to contact lens wear and care and attendance to follow-up visits, and to reduce complications and drop-out.

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Table 1. Frequency of reported information provided to patients about different aspects of contact lens use and maintenance

Did you inform your patients about…	N (%)
Different options of material, use and replacement:	
• *Never*	1 (0.3)
• *Always*	305 (95.0)
• *Not always*	15 (4.7)
Insertion and removal of contact lenses:	
• *Never*	0 (0.0)
• *Always*	320 (99.7)
• *Not always*	1 (0.3)
Correct orientation of contact lenses:	
• *Never*	0 (0.0)
• *Always*	316 (98.4)
• *Not always*	5 (1.6)
Need to rub contact lenses:	
• *Never*	14 (4.3)
• *Always*	231 (72.0)
• *Not always*	76 (23.7)
Need to change storage case solution daily:	
• *Never*	0 (0.0)
• *Always*	317 (98.8)
• *Not always*	4 (1.2)
Storage case hygiene and replacement:	
• *Never*	2 (0.6)
• *Always*	299 (93.2)
• *Not always*	20 (6.2)
Cosmetics and contact lens wear:	
• *Never*	22 (6.9)
• *Always*	226 (70.4)
• *Not always*	73 (22.7)
Contact lens replacement:	
• *Never*	72 (22.5)
• *Always*	211 (65.7)
• *Not always*	38 (11.8)

Figure 1. Likelihood of recommending contact lenses to spectacle wearers (1 “never” to 10 “always”).

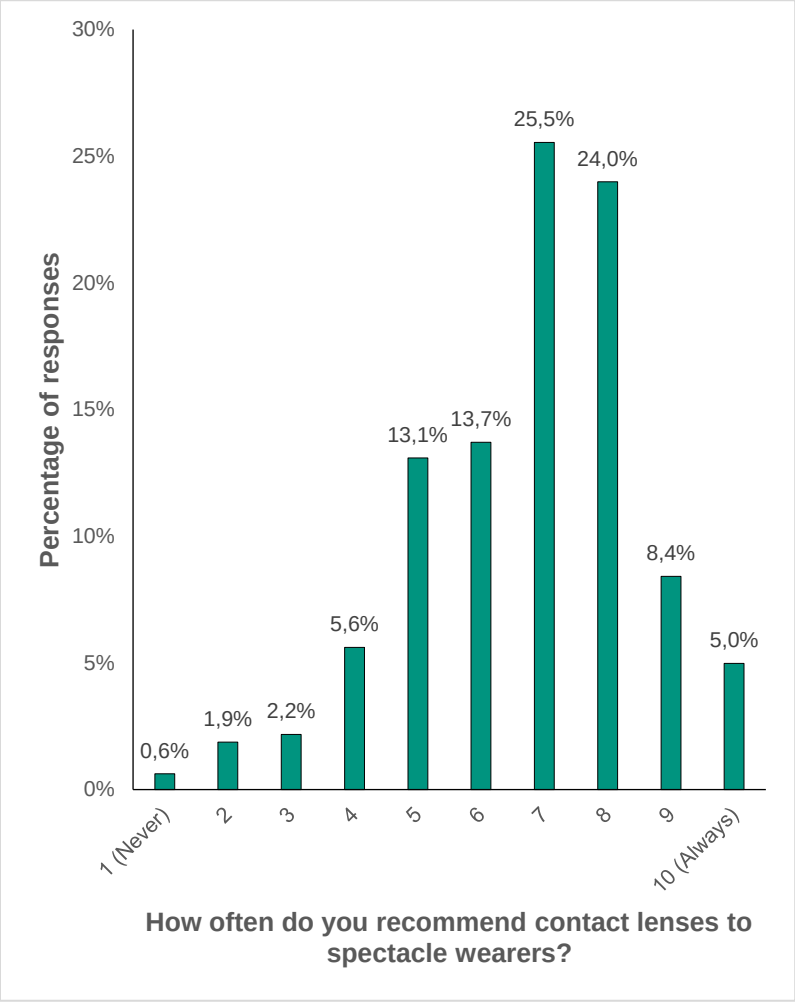
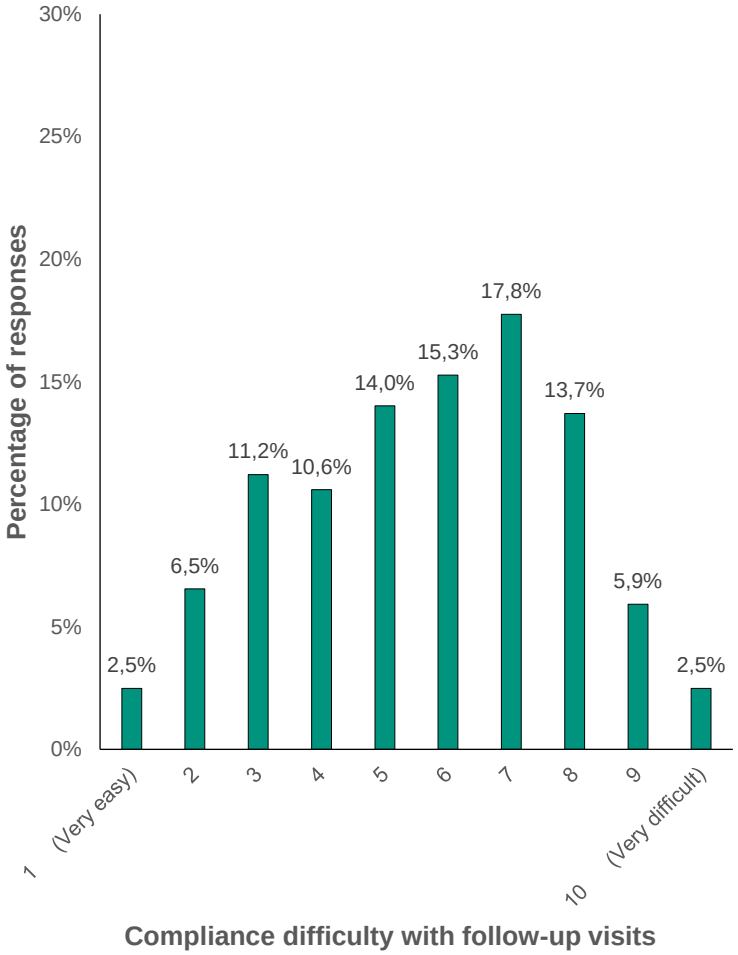


Figure 2. Degree of difficulty with compliance with follow-up appointments (1 “very easy” to 10 “very difficult”).



SUPPLEMENTAL DIGITAL CONTENT

Supplemental Digital Content 1. Self-reported questionnaire addressed to Spanish Licensed Optometrists.

pdf