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Factors influencing the electronic capture of patient-reported contact lens performance data

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ABSTRACT

Purpose: Electronic data capture is becoming increasingly common for collecting real-time patient responses. The purpose of this study was to investigate compliance with a daily electronic questionnaire regarding night-time contact lens visual performance.
Method: Forty-eight subjects (34 females) were fit and dispensed two contralateral pairs of soft contact lenses (SCLs) for one week each. Subjects were sent a nightly e-mail at 8 PM containing a secure, individualized link to an electronic questionnaire asking 30 questions of varying response styles (e.g., multiple choice, short answer, etc.) about SCL visual performance. Subjects were instructed to complete the questionnaire before going to bed.
Results: The overall completion rate based on 676 electronic questionnaires was 95.1%. Of these, only 3.6% were completed late (<24 h). The percentage of subjects completing all questionnaires was significantly higher on weekdays (96.5%; Sunday through Thursday) than on weekends (91.1%; Friday and Saturday). Fisher exact tests indicated no significant association with gender for either weekday ($p = 0.25$) or weekend ($p = 0.73$). Although odds ratio estimates suggested that participants 23 and older were more likely to complete the questionnaire (weekday: OR = 4.39, $p = 0.10$; weekend: OR = 2.93, $p = 0.19$), these associations did not reach statistical significance.
Conclusions: E-mail based questionnaires provide an effective method for acquiring time specific responses, making them a viable clinical and research tool. The day(s) of the week on which assessments occur need to be strongly considered, as on-time compliance may be affected on weekend evenings, or possibly situations in which a typical schedule may not be followed.

1. Introduction

Often wearers of bifocal or multifocal contact lenses will rate their vision as quite good while viewing the high-contrast, high-illumination visual targets in the office, but after taking the lenses home or to work, may experience more difficulties [1]. Predicting patient satisfaction from the short time spent within a doctor's office may be ineffective at predicting long-term satisfaction and often fails to provide the doctor with the insight necessary to trouble-shoot problems that may arise [1].

Recently, electronic means such as email [2], text message/SMS [3–5], or web-based/online [6–10] questionnaires have been investigated as cost effective [11], efficient user-friendly methods of attaining single or multiple responses from individuals while in the comfort of their own home. Electronic questionnaire collection continues to increase as user and researcher friendly software interfaces improve in design and functionality [12]. Electronic capture is especially convenient for research applications as the resulting data are already available for analysis in an electronic form [13]. In addition, investigators can monitor real-time participation, easily send reminders, or even program follow up questions based on individual subject responses.

Although there are clear advantages to electronic data capture, disadvantages surrounding electronic capture methods mirror those found with postal and telephone questionnaires, namely response rates may remain low [2] and may result in a biased sample (e.g., only those with skill to use or who own a computer) [6,14–16]. Additionally, there are some patient security concerns with some types of electronic communication, particularly text message/SMS [17]. Of the 88% of the U.S. adult population that own a mobile phone [18] approximately 55% use their phone to access the internet [19], potentially allowing the user to access an online questionnaire at their convenience. Therefore, as web-enabled hand-held devices become even more commonplace, access to this technology may become more prevalent and convenient, leading to increased response rates with online questionnaires. Although

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growing in all population groups, web-enabled mobile phone use is especially high in younger (e.g., 25–34 years of age) populations [18]. Similar to what has been experienced with computer use [20], it is expected that as these users age, their use of this technology will continue and the total market-share of these devices will only increase culminating in the vast majority of all the population utilizing web-enabled mobile phones in the not-so-distant future.

In order to properly understand patient satisfaction, an effective real-time method for monitoring patient's contact lens performance in their typical day-to-day environment, needs to be identified and evaluated. Recent studies have shown good response rates with SMS (text messaging) to query subjects for subjective results at different study days and times [4,5]. Dumbleton et al. [10] and Woods et al. [9] provided loaned, web-enabled Blackberry devices to subjects, on which they received an email with a link to questionnaire queries following varied hours of contact lens wear. Although these studies using modern SMS or email methods achieved exceptional completion rates of over 90% [4,9,10], possible factors influencing completion rates were not discussed. The purpose of the current study was to investigate compliance with a daily request to complete an electronic questionnaire regarding nighttime contact lens visual performance in a young adult population utilizing their native/habitual electronic devices.

2. Materials and methods

2.1. Subjects, visit schedule

This study was conducted at the Indiana University School of Optometry, and was ethically approved by the Indiana University Institutional Review Board. Prior to enrollment, written consent was obtained from each potential subject after they had been explained the study purpose, procedures and potential risks. The tenets of the Declaration of Helsinki were followed.

This was a 2-week prospective, randomized, double-masked contralateral study comparing the visual performance of two different soft contact lenses. The current report does not focus on a comparison of the performance of these two contact lenses, but rather on the subject compliance with the electronic questionnaire tool utilized during the course of this study. Forty-eight subjects were enrolled in and completed the study. All participants were naïve to the eye care profession (e.g., not in the field themselves, such as optometry students), but were previous soft contact lens (SCL) wearers. Subjects ranged from 19 to 34 years of age with a mean (±std) age of 23.9 ± 3.9 years, had best corrected visual acuity (VA) of 20/25 or better, a SCL prescription between −5.25 D and −7.00 D, and ≤0.75 D of astigmatism in each eye. The prescription of −5.25 to −7.00 D was used because the overall intent of the study was to investigate the nighttime visual performance with the contact lenses, and it was anticipated that this prescription range would have the most problems with night vision (i.e., aberrations) in their contact lenses. For example, all spherically surfaced contact lenses have levels of spherical aberration, which vary with lens power, with high negative lenses have high levels of negative spherical aberration. As the average human eye has a small level of positive spherical aberration [21], typically contact lenses of −3.00 to −4.00 D roughly counteract for this level of ocular spherical aberration when on the eye, but lenses of higher minus power accordingly induce levels of negative spherical aberration [22]. These levels of negative spherical aberration have been shown to impact night vision quality [23]. Our target population was younger adults, who may be expected to have a higher visual demand in the evenings (e.g., college age students, graduate students, and young professionals). For example, because of the target age group and the demographics of the small college town in which this study was completed, the vast majority of subjects were either undergraduate students, graduate students, or employed by the university (47 of the 48 participants). Of these subjects, 34 were female (mean age 24.1 ± 4.4 years) and 14 were male (mean age 23.4 ± 2.7). The only other entry requirements were that all subjects were free of ocular or systemic disease that would prevent safe SCL wear, were willing to read and sign the consent form, and were willing to comply with the SCL wear and study procedures.

2.1.1. Visit one

At the initial baseline visit, which took place on any one of the 5 weekdays, a sphero-cylindrical subjective refraction (sphere and cylinder) was performed. The ocular surface health was verified using a slit-lamp biomicroscope. A randomized pair (Pair 1 or Pair 2) of contralateral ("test" in one eye and "control" in other) study SCLs was inserted into the appropriate eye according to a randomization schedule. Both pairs of study lenses were manufactured of lotrafilcon B material, and identical in every way (e.g., diameter, base curve, etc.) except for their inherent level of spherical aberration (e.g., one lens with a higher level of spherical aberration as might be inherent in high minus lenses and another lens with a lower level of spherical aberration which might be inherent to lower minus or plano lenses). After at least 5 min of on-eye lens settling time, a subjective spherical over-refraction was performed, and the power of the contact lens was adjusted if necessary. The final lens power was defined as the maximum plus lens that provided optimal high contrast visual acuity.

After the optimal lens powers were chosen, the lenses were determined safe to be worn, and the lenses had settled on the eyes, subjects completed an in-office online questionnaire. One purpose of this questionnaire was so the subjects could familiarize themselves with the question wording and style, as well as be able to ask study personnel any technical questions or for clarification on any questions they encountered while completing it. Once the in-office questionnaire was complete, subjects were given instructions on wear schedule (i.e., daily wear, no sleeping in SCL) and cleaning regimen. Clear-Care (Alcon Vision Care, Ft. Worth, TX, USA) solution was given to all subjects and they were instructed on proper use. Subjects were informed they would be emailed a link to an electronic questionnaire identical to the one they just completed each evening at approximately 8 PM, and that we requested they complete the questionnaire while still wearing the study lenses prior to going to bed that evening. Subjects were paid for each questionnaire completed. Estimating it took roughly 10 min per out-of-office questionnaire, each subject received payment equaling US$ 6.67.

2.1.2. Visit two

After one week (±3 days) of wearing the lenses, there was a follow-up visit (visit two). The study lenses were removed and the second pair was inserted. Similar to as described for visit one, an over-refraction and in-office questionnaire were completed for the second pair of lenses. At the end of the visit, subjects were reminded of the evening electronic questionnaires, wear schedule, and cleaning regimen.

2.1.3. Visit three

A third and final visit took place one week (±3 days) after wearing the second pair of lenses. The lenses were removed and ocular health was evaluated to confirm the subject could successfully exit the study wearing their own glasses or contact lenses.

2.2. Questionnaire instrument

The electronic questionnaire was developed using commercially available web-based software (Qualtrics Labs, Provo, UT, USA)