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An international analysis of contact lens compliance

Philip B. Morgan[a,*], Nathan Efron[b], Hiroshi Toshida[c], Jason J. Nichols[d]

[a] Eurolens Research, The University of Manchester, Carys Bannister Building, Dover Street, Manchester M13 9PL, United Kingdom
[b] Institute of Health and Biomedical Innovation, and School of Optometry, Queensland University of Technology, 60 Musk Avenue, Kelvin Grove, Queensland 4059, Australia
[c] Juntendo University Shizuoka Hospital, Department of Ophthalmology, Shizuoka, Japan
[d] The University of Houston College of Optometry, Houston, TX, United States

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ABSTRACT

Purpose: To evaluate compliance to contact lens use in 14 countries, and to identify wearer attributes which indicate lower compliance levels.
Methods: A web-based survey was undertaken by 4021 contact lens wearers, revealing information about demographics, and lens and solution information including daily handling details, case care and aftercare frequency. Particular attention was paid to eight modifiable compliance-related behaviours which are associated with an increased risk of microbial keratitis.
Results: Full compliance was very rare for most lens users, although better (15% of wearers) for daily disposable lenses. Reduced compliance was demonstrated in South Korea, and for young male full-time contact lens users, especially those who have not consulted their eyecare practitioner for some time. The behaviours associated with the lowest levels of compliance were rubbing and rinsing, handwashing, correct lens replacement and case cleaning.
Conclusions: Given other recent literature, which suggests improved contact lens compliance with regular self-review exercises, we encourage clinical colleagues to particularly examine case cleaning, handwashing and rubbing and rinsing at aftercare examinations, especially in young male wearers.

1. Introduction

Two key outstanding problems remain in the contact lens industry: (a) end of day discomfort with soft lenses, and (b) corneal inflammation and infection during wear. The former issue appears to have stunted the growth of the contact lens market given that the number of patients ceasing contact lens wear appears to be significant and that most of this group cite discomfort as the main cause of their discontinuation [1]. The latter issue is well known to eyecare practitioners worldwide and may affect their likelihood to offer contact lenses to their patients.

While the 'health journey' for patients with a range of contact lens associated keratitis responses is similar [2], one subset of these events – usually termed 'microbial keratitis' – has received significant attention in the literature due to its potentially sight-threatening consequences. A number of epidemiological studies have identified risk factors, which are associated with an increasing likelihood of microbial keratitis during contact lens wear [3–13]. Many of these are 'non-modifiable' and include age, gender and socio-economic status. Others, are 'modifiable'; in turn, these can be sub-divided into factors which are or are not related to 'compliance'. In the contact lens field, 'patient compliance' can be defined as the adherence of the contact lens wearer to a series of steps of lens care and usage recommended by their eyecare practitioner and the manufacturers of their contact lenses and prescribed care regimen.

The identification of modifiable, patient compliance-related behaviours (MPCRBs) which put the patient to increased risk for microbial keratitis is an important step in the desire of practitioners and industry to reduce the incidence of infections associated with contact lens wear. Furthermore, it seems that MPCRBs themselves may be associated with a range of attributes – they could be more frequent in certain parts of the world or within some sections of the contact lens wearing community – and identification of these factors would provide eyecare practitioners with positive information which could be used to improve patient management with the ultimate goal of mitigating the risk of microbial keratitis for each contact lens wearer.

To this end, we have identified eight MPCRBs which have been shown in epidemiological reviews to increase the likelihood of contact lens associated microbial keratitis (Table 1). Four of these relate to the use of care regimens and the lens case, three to lens wear and one to hand-washing. The aim of this project was to assess differences in MPCRBs between markets and which individual attributes can influence these behaviours.

* Corresponding author. Tel.: +44 161 306 4441; fax: +44 161 200 4442.
E-mail address: philip.morgan@manchester.ac.uk (P.B. Morgan).

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Table 1
Modifiable patient compliance-related behaviours which have been shown to be related an increase in contact lens associated infections for daily disposable (DD), daily wear reusable (DW) and extended wear (EW) lens use.

Behaviour	Lens type	Relative risk/odds ratio[a]	Required steps for compliance
Inadequate hand-washing	DD, DW, EW	4.5 [13] 1.5 [4]	Hands washed before application and removal with soap, hand sanitizer or wet wipe.
Non-prescribed overnight wear	DD, DW	4.0 if worn overnight at least once per fortnight [12]	No accidental or intentional overnight wear
Excessive duration of extended wear	EW	6.7 if used for six or more nights [12]	No overnight use beyond that recommended by eyecare practitioner.
Excessive lens replacement interval	DD, DW, EW	4.8 [10]	Lenses not used beyond the recommended replacement interval
Inadequate case cleaning	DW, EW	4.0 [5]	Case cleaned with contact lens solution each time lenses used.
Failure to use correct disinfecting solution	DW, EW	55.9 if no disinfection employed [9] 21.8 if lenses stored in tap water [5]	Multi-purpose solution or hydrogen peroxide used on a regular basis.
Failure to rub and rinse lenses	DW, EW	3.5 [8]	Lens rub-cleaned and rinsed after removal, unless care regimen is specifically a 'no-rub' product.
Topping off solution	DW, EW	2.5 [10]	All solution replaced with fresh solution for each lens storage occasion. No reporting of topping off.

[a] In the case of events with very low incidence (such as contact lens infections), values for relative risk and odds ratios are numerically very similar.

2. Methods

In order to access the significant number of subjects required, a market research company was engaged to execute data collection. In 14 countries with relatively high current or potential use of contact lenses, an 'access panel' of people who have previously volunteered to be approached for surveys of this kind was contacted via e-mail to invite them to complete a web-based survey.

The survey questions answered by these contact lens-wearing volunteers covered a range of demographic information, detailed descriptions of lens usage including duration with current lenses, frequency of use and overnight wear, solution information, practitioner type, precise daily handling and care regimen use, case care and aftercare details. Importantly, all the MPCRBs identified from the literature were incorporated in the questionnaire. Responses gathered from the contact lens wearers were generally in the form of 'drop down boxes' which offered a range of options; in each case, there was always an option to respond 'don't know' or 'other' which allowed for free text data entry.

Given the novelty of this international approach and the likely range of lens types used in each market an accurate *a priori* power analysis was not possible. However, a sample size of at least 200 wearers for each market was judged to be likely to provide sufficient statistical power for meaningful analysis. All data collection was undertaken in the second half of 2010. The survey was exempt from ethics review and subjects completed the survey voluntarily with the option of discontinuing the survey at any time; the work complied with the Code of Conduct (April 2010) of the UK Market Research Society which ensures appropriate confidentiality and data handling.

For each MPCRB relevant to their mode of lens use (three behaviours for daily disposables and seven behaviours for other lens types (Table 1)), each subject was judged to be compliant or non-compliant according to the required steps outlined in Table 1 and the total number of non-compliant steps was calculated for each respondent. Using analysis of variance, univariate assessment was then undertaken for the following factors of interest: country, lens type, gender, age, duration of lens wear, days per week of lens wear, time since last examination by an eyecare practitioner and educational level. All factors demonstrating a statistically significant effect (defined as $p < 0.05$), were then entered into a multivariate linear regression model to determine significant independent factors.

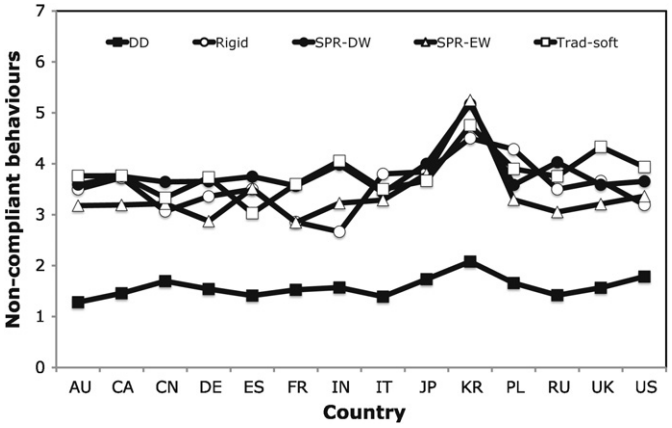

Fig. 1. Number of non-compliant behaviours across surveyed countries, by lens type. See Table 2 for country and lens type abbreviations.

3. Results

In total, 4021 contact lens wearers responded. The group comprised 2141 females and 1880 males with a mean ± standard deviation age of 36.8 ± 11.7 years with a range of 21–60 years. An overview of respondents and their lens types is provided in Table 2. Fig. 1 shows the number of non-compliant steps performed for respondents in each country, stratified by lens type.

Fig. 2 shows the rate of compliance for all nations combined with respect to the eight identified MPCRBs. Given the tight 95% confidence limits around each data point (about 1.5%), the presented differences can be considered to be statistically meaningful. Fewer non-compliant steps were evident for those sleeping in lenses (i.e. not doing so beyond the recommended period) (82% of respondents), and for use of a correct care solution (61%). More than 50% of respondents reported no topping off of lens care solution and not sleeping in prescribed daily wear lenses. Correct handwashing and replacing lenses after the correct number of days of wear was undertaken by about 40% of wearers. Rubbing and rising of lens surfaces after removal (discounting those respondents prescribed a 'no rub' solution) was performed by 20% of wearers and correct case care was practiced by 4% of wearers. In all, about 15% of daily disposable wearers were fully compliant, compared to close to zero per cent for all other lens types (Table 3). Fig. 3 shows compliance