



A multi-country assessment of compliance with daily disposable contact lens wear



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ABSTRACT

Purpose: To investigate compliance with daily disposable contact lens (DDCL) wear and investigate re-use of lenses according to country and DDCL material worn.

Methods: Optometrists invited eligible DDCL patients from their practices to participate in a survey on DDCL wear in Australia, Norway, the United Kingdom (UK) and the United States (US). Eligible participants completed an online or paper version of the survey.

Results: 805 participants completed the survey (96% online): Australia 13%, Norway 32%, UK 17%, US 38%. The median age was 38 years; 66% were female. Silicone hydrogel (SiHy) DDCLs were worn by 14%. Overall, 9% were non-compliant with DDCL replacement; Australia 18%, US 12%, UK 7% and Norway 4%. There were no differences with respect to sex, years of contact lens wear experience or DDCL material (SiHy versus hydrogels). The primary reason for re-use was "to save money" (60%). Re-use of DDCLs resulted in inferior comfort at insertion and prior to lens removal ($p = 0.001$). 75% reported occasional napping and 28% reported sleeping overnight for at least one night in the preceding month, while wearing their DDCLs.

Conclusion: Non-compliance with replacement of DDCLs occurred in all countries investigated; the rate was highest in Australia and lowest in Norway. Re-use of DDCLs was associated with reduced comfort. DDCL wearers often reported wearing lenses overnight. It is important for optometrists to counsel their patients on the importance of appropriate lens wear and replacement for DDCLs.

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1. Introduction

Daily disposable contact lenses (DDCLs) are becoming increasingly popular among patients and eye care practitioners (ECPs) worldwide [1,2]. In addition to the benefits and convenience of a fresh new lens each day and no requirement for a contact lens care system, this modality of lens wear has been shown to offer many health benefits when compared with reusable contact lenses [3]. Superior comfort, vision and relief from allergies have also been reported with the use of DDCLs [4–7]. While very few complications have been reported to occur with DDCL wear when compared with spectacle wear, [8] serious complications have been reported to occur with this modality [9,10].

Unfortunately, not all patients wearing DDCLs are compliant with their replacement. In previous studies conducted in Canada

and the United States, non-compliance with DDCL replacement has been reported to occur at rates between 12 and 13% [11–13]; however, the numbers of DDCL wearers in these studies were relatively low and the figures reported may not be representative of compliance with wear and replacement of DDCLs in other countries. At the time that these studies were conducted, silicone hydrogel DDCLs [14,15] were not available commercially, and compliance rates for replacement of these lenses has not been investigated to date.

The purpose of this survey was to further evaluate compliance with replacement of DDCLs since the introduction of these new materials, and to investigate any differences in compliance with the replacement of DDCL among several countries around the world. The survey was also designed to investigate the reasons for non-compliance; the frequency of overnight lens wear with DDCLs; the regular source of purchase of the participants' lenses; the lens storage procedures and care system commonly used during non-replacement; an estimation of the participants understanding of the risk of non-replacement; and the reported subjective comfort of DDCLs when they are re-used.

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2. Methods

This survey was conducted in four countries: Australia, Norway, the United Kingdom (UK) and the US. These countries were selected because they have different approaches to lens prescribing and supply [1]. Norway has an extremely high proportion of DDCL wearers (44%) [16]. The UK also has a high proportion of DDCL wearers (38%) [16] and it is thought that the vast majority of patients who are prescribed their lenses by their eye care practitioner in the UK are linked with a Direct Banking Debit/Order; this system allows the eye care practitioner to receive payment for the contact lenses directly from the patient's bank account at regular intervals and is linked to automatic re-ordering, and usually delivery of replacement lenses directly to the patient. Australia also has a relatively high penetration of DDCL wearers (24%) [16], but probably with a less well developed Direct Banking Debit/Order system. The US has the largest worldwide contact lens market and although penetration of DDCL is not as high as in many other countries at only 16% [16], there are offices where this modality is more popular and only offices prescribing at least 20% of their patients with DDCLs were selected to take part in this survey.

Ethics approval was obtained through the Office of Research Ethics at the University of Waterloo and the Research Review Boards at the University of Manchester, United Kingdom and Deakin University, Australia. The Norwegian Social Data Science Services, Norway was also informed of this survey. The survey was conducted following the tenets of the Declaration of Helsinki.

The survey was conducted using similar methodology to that employed in a previous study conducted at the Centre for Contact Lens Research (CCLR) at the University of Waterloo, in which ECPs (optometrists) in one region in Canada identified eligible participants and invited them to complete a questionnaire on behalf of the CCLR [17]. In the current survey, participation in each country was coordinated by a local investigator. The local coordinator was asked to recruit optometry offices/practices to take part and to invite eligible DDCL wearers from their offices to complete the questionnaire. In Australia, Norway and the USA, ten practices or offices took part and in the UK, one group, which comprised seventeen offices with centralized patient records, participated. The survey was conducted from April to October 2012.

Patients were considered eligible to participate if they were at least 18 years of age; were current wearers of DDCLs and not any other lens type; had worn DDCLs for at least 6 months; were currently wearing DDCLs for at least one day each week; and had given implied consent to participate in the survey at the start of the online questionnaire.

Prospective participants were mailed a cover letter from their optometrist explaining the survey purpose and procedures and inviting them to complete an online questionnaire regarding their wearing experiences with DDCLs. Each participant was provided with a Uniform Resource Locator (URL) which pointed to the web page describing the survey and allowed participants to give their permission to participate. Participants were advised to have their lens packages available when completing the questionnaire in order to be able to report which lens brand they were currently wearing. There were two versions of the web page and the online questionnaire, one version in English (for Australia, the UK and the US) and one in Norwegian. A paper version of the questionnaire was also made available to prospective participants in the US and Australia towards the end of the survey. Participants were provided with a code to enter into the questionnaire that identified their country, and practice or office (or group of practices in the case of the UK) at which they were registered as a patient. A series of preliminary questions were used to confirm eligibility before the questionnaire started. Individuals whose responses indicated that they were not eligible were advised of this and were not able to

continue with the online questionnaire. Further attempts at entry to the questionnaire were also declined for repeated Internet Protocol (IP) addresses. The questionnaire took approximately 5–10 min to complete. Participants completing the questionnaire could elect to take part in a prize draw in return for their participation.

The questionnaire included specific questions to evaluate the following:

- Demographic and lens wearing history questions.
- Ranking of various aspects of DDCL wear.
- Selection of current lens brand.
- Regular source of lens supply.
- Method of payment.
- Recommendations given for lens replacement.
- Current DDCL wearing patterns.
- Re-use of lenses over the course of the day and if so, method of storage.
- Re-use of lenses for more than one day and if so, for how long and method of storage.
- Reasons for re-use.
- Frequency of napping and/or sleeping in lenses.
- Comfort ratings for new and, where applicable, re-used lenses.
- Participants' understanding of the risk(s) of non-replacement.

The online version of the questionnaire was developed by the CCLR using PHP, an open source general purpose server-side scripting language designed to produce dynamic Web pages. A MySQL database was used. The questionnaire incorporated forced choice questions, ranking questions and rating scales. A series of self-populating questions were also incorporated into the online version, which were presented according to participants responses to preceding questions.

Compliance with replacement of DDCLs was defined as replacing lenses at an interval which is equal to the Manufacturer Recommended Replacement Frequency (MRRF), i.e. reuse of a DDCL on a subsequent day was considered to be non-compliant. Where relevant, data analyses were conducted using Statistica 10.0 (StatSoft Inc., Tulsa, OK). Fisher's Exact tests were used to compare differences in counts and two-sided difference between two proportions tests were used when comparing proportional differences between the groups investigated. Where appropriate, Mann–Whitney *U* tests were used to compare non-parametric data from two independent groups. A significance level of $p \leq 0.05$ was used for all analyses.

3. Results

3.1. Participant demographics and lenses worn

A total of 805 participants completed the questionnaire (770 on-line and 35 using a paper version); since only 4% of the questionnaires received were completed on paper, the results from all the questionnaires were combined and no separate analyses were conducted from the paper versions. The participant demographics are shown in Table 1. The median number of years of contact lens wear was 14 (range of 6 months to “greater than 20 years”) and 56% of participants had worn DDCLs for at least five years. Seventy-five percent of participants reported wearing other lens types prior to DDCLs; of these, 6% reported wearing rigid gas permeable lenses, 25% two-week replacement soft lenses, 51% one-month replacement soft lenses, 16% soft lenses with no scheduled replacement and 2% another lens type (corneal refractive therapy lenses, hard lenses, two-monthly replacement soft lenses and yearly replacement soft lenses). The median time for wearing their current DDCLs was 3 years (range 1 month to “10 or more years”). Participants

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