

Contact Lens Compliance

Author: Dr Amit Jinabhai, PhD MCOptom

Contact lenses provide a convenient method of correcting refractive error, offering several advantages over spectacles. Although contact lens-related complications are rare, and most are managed without any lasting side-effects, loss of vision can occur (Morgan et al., 2011). Microbial keratitis (MK) is the most severe sight-threatening condition associated with contact lens wear (Morgan et al., 2011, Keay et al., 2006). Along with reduced vision, the disease burden, such as loss of income due to days off work and any associated treatment costs, may be significant to the individual (Wu et al., 2010). Several reports have identified a variety of risk factors associated with lens wear complications in an attempt to boost successful lens wear burden (Butcko et al., 2007, Cho et al., 2009, Wu et al., 2010, Jansen et al., 2011, McMonnies, 2011, Morgan et al., 2011, Toshida et al., 2012). Among these risk factors, some are unalterable, such as age or gender (Dart et al., 2008). Others, however, are modifiable, for example, poor lens case hygiene or hand-washing (Morgan, 2011, Stapleton et al., 2008, Bui et al., 2010, McMonnies, 2012) and, therefore, can be targeted to maximise successful lens wear, minimising potential vision loss. This article reviews different aspects of contact lens non-compliance to alert Eye Care Practitioners (ECPs) of patient behaviour towards contact lens wear and care once they leave the practice. This information will be useful to identify areas that require further patient education, particularly as non-compliance with practitioner recommended lens wear and care regimens remains a persistent clinical problem.

Compliance is classically defined as the process of fulfilling instructions within a regimen of treatment (Morgan, 2007). In the contact lens field, compliance may be interpreted as a wearer who correctly adheres to the guidelines provided by the ECP in order to achieve optimum lens wear and care. Contact lens patients may be required to comply in the following areas of a care or maintenance regimen: the use of cleaning, rinsing and disinfecting solutions; hygiene recommendations, including the washing of hands and lens cases; recommended wearing times and replacement periods for the contact lenses; and attendance of regular aftercare appointments. Contact lens patients may also be given a wide range of recommendations such

as: behaviour in the case of a red eye, swimming as a contact lens wearer, or storing lenses during intermittent wear.

In contact lens wear, the balance between the bio-burden (the number of microorganisms present at the ocular surface) and the ocular defence becomes significantly altered, as demonstrated by the calculations performed by Brennan and Coles (2000). Brennan and Coles' (2000) results suggested that although the risk of a corneal infection during the daily wear of contact lenses is very low, lens wearers are approximately 60 times more likely to develop a corneal infection compared to non-contact lens wearers. These findings agree with a previous study examining the biological microflora of the eyes of previous and current contact lens wearers (Fleiszig and Efron, 1992). For successful lens wear, it is important that the shift in balance between the ocular defence and the bio-burden is minimised as much as possible (Morgan, 2007). The impact of lens wear on the ocular defence system is difficult to remedy as most alterations that occur are directly related to the physical presence of the lens at the ocular surface. However, it is probable that the increase in bio-burden occurring during lens wear can be dramatically reduced through good hygiene and appropriate lens handling practices by the contact lens wearer. Therefore, compliance with appropriate instructions and guidelines plays a significant role in this aspect of minimising ocular infection and inflammation.

Before methods to implement improvements in compliance can be considered, the rate of actual compliance must first be determined. Establishing a true level of compliance, however, is extremely difficult, especially since there is no direct quantitative measure of compliance. In the contact lens field, a number of studies have attempted to evaluate compliance, many using self-reported written questionnaires, which have generated estimates of non-compliance ranging between 40 % and 91 % (Collins and Carney, 1986, Claydon and Efron, 1994, de Oliveira et al., 2003, Donshik et al., 2007, Wu et al., 2010). More recently, a UK-based study reported that for daily lens wearers, only 0.3 % of patients were fully compliant, compared with 2.7 % for extended lens wear users (Morgan,

www.academyofvisioncare.com



2007). A factor perhaps contributing to this alarmingly high rate is that lens wear recommendations are predominantly preventative in nature. Contact lens wearers do not receive any immediate benefit from following the ECP's recommendations, nor do they perceive any direct threat as a result of failing to follow the ECP's recommendations. Factors such as the time requirements and effort needed to maintain an optimal cleaning regime or inadequate knowledge and awareness about safe lens wear may also contribute to non-compliant behaviours (Claydon and Efron, 1994, Wu et al., 2010).

Non-compliance can occur in a number of different forms, such as not attending aftercare visits; failure to wash hands before handling lenses and cases; over-wearing lenses; sleeping in lenses; exposure of the lens or lens case to water; inserting lenses which have fallen on the floor, or other surfaces; improper cleaning, disinfection, or replacement of the lens case and topping-up of old solutions in the lens storage case (Claydon and Efron, 1994, Butcko et al., 2007, Bui et al., 2010, Morgan et al., 2011). Wu et al.'s (2010) study of 111 contact lens wearers (mean age 34 ± 12 years [$1 \pm SD$]) found that 51 % of patients claimed that they could not remember, or that no advice was given regarding a habitual aftercare schedule. When questioned about what hand hygiene measures were carried out before handling their lenses, 12 % of patients reported that they did not habitually wash their hands. Fifty-nine per cent of participants reported engaging in water sports (either surfing or swimming) while wearing their contact lenses without swimming goggles or the use of daily disposable lenses. Morgan's (2007) comprehensive web-based survey of 1,402 contact lens wearers (range 16 to 64 years) found that approximately 35 % of daily wear lens users slept in their lenses, with 68 % of patients reported napping in their lenses. Furthermore, approximately 37 % of daily wear lens users reported wearing their lenses beyond the recommended wear time. Morgan's (2007) results also found that approximately 91 % of extended wear contact lens users did not clean their lens case as frequently as recommended, with approximately 76 % of participants not changing their cases as often as required.

Morgan's (2007) study proposed that the following series of standardised questions should be used to ascertain the level of compliance among contact lens wearers:

1. How many days do you wear your lenses before throwing them out?
2. Do you sleep overnight in your lenses?
3. Do you nap in your lenses?
4. How often do you sleep in your lenses?
5. Do you wash your hands before inserting and removing, and what with?
6. What do you use to clean/store your contact lenses?
7. Where do you store your contact lenses?
8. Do you replace your solution or top up?
9. Do you cover your contact lens completely?
10. Do you close your lens case tightly?
11. Do you clean your case?
12. How often do you change your case?
13. Do you close the cap of your bottle tightly?
14. Do you ever check the expiry date of your solution bottle?
15. Do you ever share your contact lens case with other people?

Contact lens care non-compliance can also involve missing out crucial steps in the lens cleansing regimen such as not rubbing lenses before disinfection, not rinsing lenses thoroughly after rubbing and prior to disinfection, or even neglecting both the rubbing and rinsing steps before overnight disinfection (Cardona and Llovet, 2004). Hiti and co-workers (2006) have stressed the importance of digital, mechanical cleaning by contact lens users because *Acanthamoeba* cysts and trophozoites are able to adhere to the contact lens surfaces. The author's results strongly suggested that removing the digital rub step eliminated a crucial preventative technique in reducing the risk of developing *Acanthamoeba* keratitis. Similar findings have also been revealed in other reports (Butcko et al., 2007, Cho et al., 2009). Rosenthal and colleagues (2004) microbiological study evaluated the effective contribution of regimen steps on the overall performance of three different soft contact lens disinfecting solutions. Their results indicated that eliminating the rubbing and rinsing steps associated with multipurpose solutions may allow hundreds to thousands of microorganisms to remain on the lens, some of which the disinfectant may not be able to kill.



The author's results showed a direct correlation between the number of steps in the cleaning regimen and the multipurpose solution's disinfecting efficacy. Rosenthal and colleagues (2004) reported that in the event of a complete lens rubbing and rinsing regimen, there were essentially no microorganisms left on the lenses with any of the multipurpose solutions tested. However, when the digital rubbing step was eliminated but rinsing remained, the efficacy of some products was found to be dramatically lowered. When both the rubbing and rinsing steps were eliminated, all three solutions evaluated failed to meet the study's hygiene safety criteria. Dumbleton et al. (2011) have also reported that patients who neglected the rubbing and rinsing steps of their care regimen experienced a significantly higher rate of self-reported contact lens problems compared to those who completed their regimen correctly. Rosenthal and colleagues (2004) recommended a minimum rinsing time of 5 seconds per lens surface to adequately reduce the number of microorganisms, in the absence of digitally rubbing the lenses.

Due to their convenience, the use of daily disposable contact lenses (DDCL) has steadily grown over the last decade, particularly among teenage patients (Efron et al., 2010b). Prior to their introduction, it was envisaged that the incidence of contact lens-related disease, including MK, would be reduced as a result of daily lens replacement and the avoidance of the need for regular contact lens care. Somewhat surprisingly, this has not been observed and is likely to be due to a failure to comply with the regime (Dart et al., 2008, Stapleton et al., 2008). Users have been reported to extend the wear of DDCL well beyond the practitioner's/manufacturer's recommended schedule, through one or more sleep cycles before removal (Weissman and Mondino, 2002). Morgan et al. (2005) have confirmed that overnight wear of DDCL significantly increases the risk of MK. Other issues of non-compliance with DDCL include inadequate hand washing (Weissman and Mondino, 2002) and re-using the lenses (Dumbleton et al., 2010). The re-use of lenses poses a significant risk for DDCL wearers as they are unlikely to have received proper training in cleaning and disinfecting lenses and typically do not use a lens case or disinfecting solutions. Boost et al.'s (2011) microbiological study revealed that overnight storage of DDCLs in the original blister package solution resulted in lens contamination, which, if re-used, substantially increases the risk of a Staphylococcal infection. Boost et al. (2011) concluded that it was critical that ECPs

carefully educated their patients on the correct use of DDCLs. As the cost of DDCLs is believed to be a major factor in the willingness to re-use DDCLs (Efron et al., 2010a), ECPs must ensure that DDCLs are the most suitable choice for the patient when prescribing. Whilst the purchase of contact lenses over the internet appears convenient and is becoming more common (Fogel and Zidile, 2008), there are some major concerns regarding this method of lens supply. Some on-line retailers may not require a valid, in date, prescription from lens users before dispensing contact lenses; therefore, patients may not recognise or believe in the clinical importance of regular aftercare appointments. Consequently, ocular signs may remain undetected until an actual complication arises. Stapleton et al. (2008) have suggested that a 4.8-fold increase in the risk of MK is associated with on-line lens purchasing. Furthermore, Fogel and Zidile (2008) have demonstrated that users who purchased their lenses online were less likely to adhere to the ECP's lens care recommendations. Wu et al.'s (2010) study found a 14 % increase in internet-based contact lens purchases compared to Stapleton et al.'s (2008) previous report; in this regard, the impact of internet purchases should not be over looked as a contributory factor to contact lens non-compliance.

In summary, this report highlights common non-compliant behaviours amongst contact lens users. A better understanding of what contact lens users do with their lenses and cleansing products away from the consulting room could be useful in managing non-compliant patients. Improvements in compliance may be achieved through probing questioning of lens wear and care habits; observing the lens user's habits as they insert/remove their own lenses; providing detailed demonstrations of the correct procedures (e.g. how to rub and rinse lenses) and dispensing users written and verbal instructions (Wu et al., 2010, Hickson-Curran et al., 2011). However, some patients, even when provided with detailed guidance on the correct practices and procedures, do not comply due to their own free will (Robertson and Cavanagh, 2011); which unfortunately with some users, we cannot sufficiently influence. ECPs frequently find themselves in a difficult trade-off with such patients, as they wish to keep the patient in lens wear, and to retain their business; however, their non-compliance can be frustrating, especially as the ECP becomes progressively concerned at the patient's ever-increasing risk of a serious, sight-threatening infection. The ECP's main armoury against non-compliance is

www.academyofvisioncare.com



the provision of a high-quality aftercare service; this is crucial for the early detection of ocular physiological changes, whilst simultaneously providing the opportunity to question the user's habits, perhaps re-educating them where necessary. Aftercares also present the opportunity to pass on new 'top tips' and research findings. Where appropriate, the aftercare visit can even be used to trial the user with a different lens modality. In conclusion, the problem of non-compliance is persistent and has showed no signs of regressing over the last decade. As the exact nature of what causes patients to not comply is still poorly understood, the solution to eliminate it still eludes us.

References

- BOOST, M., POON, K.-C. & CHO, P. (2011) Contamination Risk of Reusing Daily Disposable Contact Lenses. *Optom Vis Sci*, 88, 1409-1413.
- BRENNAN, N. A. & COLES, M. L. (2000) Proposed performance criteria for extended wear contact lenses. *Cont Lens Ant Eye*, 23, 135-39.
- BUI, T. H., CAVANAGH, H. D. & M. ROBERTSON, D. (2010) Patient Compliance During Contact Lens Wear: Perceptions, Awareness, and Behavior. *Eye Cont Lens*, 36, 334-339.
- BUTCKO, V., MCMAHON, T. T., JOSLIN, C. E., et al. (2007) Microbial Keratitis and the Role of Rub and Rinsing. *Eye Cont Lens*, 33, 421-423.
- CARDONA, G. & LLOVET, I. (2004) Compliance amongst contact lens wearers: comprehension skills and reinforcement with written instructions. *Cont Lens Ant Eye*, 27, 75-81.
- CHO, P., CHENG, S. Y., CHAN, W. Y., et al. (2009) Soft contact lens cleaning: rub or no-rub? *Ophthal Physiol Opt*, 29, 49-57.
- CLAYDON, B. E. & EFRON, N. (1994) Non-compliance in contact lens wear. *Ophthal Physiol Opt*, 14, 356-364.
- COLLINS, M. J. & CARNEY, L. G. (1986) Patient compliance and its influence on contact lens wearing problems. *Am J Optom Physiol Opt* 63, 952-956.
- DART, J. K., RADFORD, C. F., MINASSIAN, D., et al. (2008) Risk factors for microbial keratitis with contemporary contact lenses: a case-control study. *Ophthalmology*, 115, 1647-54, 54 e1-3.
- DE OLIVEIRA, P. R., TEMPORINI-NASTARI, E. R., ALVES, M. R., et al. (2003) Self-Evaluation of Contact Lens Wearing and Care by College Students and Health Care Workers. *Eye Cont Lens*, 29, 164-167.
- DONSHIK, P. C., EHLERS, W. H., ANDERSON, L. D., et al. (2007) Strategies to better engage, educate, and empower patient compliance and safe lens wear: Compliance: What we know, what we do not know, and what we need to know. *Eye Cont Lens*, 33, 430-433.
- DUMBLETON, K. A., RICHTER, D., WOODS, C. A., et al. (2010) Compliance with contact lens replacement in Canada and the United States. *Optom Vis Sci*, 87, 131-39.
- DUMBLETON, K. A., WOODS, C. A., JONES, L. W., et al. (2011) The relationship between compliance with lens replacement and contact lens-related problems in silicone hydrogel wearers. *Cont Lens Ant Eye*, 34, 216-222.
- EFRON, N., EFRON, S. E., MORGAN, P. B., et al. (2010a) A 'cost-per-wear' model based on contact lens replacement frequency. *Clin Exp Optom*, 93, 253-60.
- EFRON, N., MORGAN, P. B., HELLAND, M., et al. (2010b) Daily disposable contact lens prescribing around the world. *Cont Lens Anterior Eye*, 33, 225-27.
- FLEISZIG, S. M. & EFRON, N. (1992) Microbial flora in eyes of current and former contact lens wearers. *J Clin Microbiol*, 30, 1156-61.
- FOGEL, J. & ZIDILE, C. (2008) Contact lenses purchased over the Internet place individuals potentially at risk for harmful eye care practices. *Optometry*, 79, 23-35.
- HICKSON-CURRAN, S., CHALMERS, R. & RILEY, C. (2011) Patient attitudes and behavior regarding hygiene and replacement of soft contact lenses and storage cases. *Cont Lens Ant Eye*, 34, 207- 215.
- HITI, K., WALOCHNIK, J., MARIA HALLER-SCHÖBER, E., et al. (2006) Efficacy of contact lens storage solutions against different *Acanthamoeba* strains. *Cornea*, 25, 423-27.
- JANSEN, M. E., CHALMERS, R., MITCHELL, G. L., et al. (2011) Characterization of patients who report compliant and non-compliant overnight wear of soft contact lenses. *Cont Lens Ant Eye*, 34, 229- 235.
- KEAY, L., EDWARDS, K., NADUVILATH, T., et al. (2006) Microbial keratitis: predisposing factors and morbidity. *Ophthalmology*, 113, 109-16.



References (cont)

- MCMONNIES, C. W. (2011) Improving contact lens compliance by explaining the benefits of compliant procedures. *Cont Lens Ant Eye*, 34 249- 252.
- MCMONNIES, C. W. (2012) Hand hygiene prior to contact lens handling is problematical. *Cont Lens Ant Eye*, 35, 65-70.
- MORGAN, P. B. (2007) Contact lens compliance and reducing the risk of keratitis. *The Optician*, July, 20-25.
- MORGAN, P. B., EFRON, N., HILL, E. A., et al. (2005) Incidence of keratitis of varying severity among contact lens wearers. *Br J Ophthalmol*, 89, 430-36.
- MORGAN, P. B., EFRON, N., TOSHIDA, H., et al. (2011) An international analysis of contact lens compliance. *Cont Lens Ant Eye*, 34 223- 228.
- ROBERTSON, D. M. & CAVANAGH, H. D. (2011) Non-Compliance with Contact Lens Wear and Care Practices: A Comparative Analysis. *Optom Vis Sci*, 88, 1402-1408.
- ROSENTHAL, R. A., HENRY, C. L. & SCHLECH, B. A. (2004) Contribution of regimen steps to disinfection of hydrophilic contact lenses. *Cont Lens Ant Eye*, 27, 149-156.
- STAPLETON, F., KEAY, L., EDWARDS, K., et al. (2008) The incidence of contact lens-related microbial keratitis in Australia. *Ophthalmology*, 115, 1655-62.
- TOSHIDA, H., KADOTA, Y., SUTO, C., et al. (2012) Multipurpose soft contact lens care in Japan. *Clin Ophthalmol*, 6 139-144.
- WEISSMAN, B. A. & MONDINO, B. J. (2002) Risk factors for contact lens associated microbial keratitis. *Cont Lens Anterior Eye*, 25, 3-9.
- WU, Y., CARNT, N. & STAPLETON, F. (2010) Contact lens user profile, attitudes and level of compliance to lens care. *Cont Lens Ant Eye*, 33, 183–188.

