Impact of Dry Eye Disease on Work Productivity, and Patients' Satisfaction With Over-the-Counter Dry Eye Treatments

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Submitted: February 24, 2016
Accepted: March 26, 2016

Citation: Nichols KK, Bacharach J, Holland E, et al. Impact of dry eye disease on work productivity, and patients' satisfaction with over-the-counter dry eye treatments. *Invest Ophthalmol Vis Sci*. 2016;57:2975–2982. DOI:10.1167/iovs.16-19419

Purpose. To assess the effect of dry eye disease on work productivity and performance of non–work-related activities, and patients' satisfaction with over-the-counter (OTC) dry eye treatments.

Methods. In this prospective, noninterventional, cross-sectional study, conducted at 10 U.S. optometry/ophthalmology practices, 158 symptomatic dry eye patients naïve to prescription medication underwent standard dry eye diagnostic tests and completed Work Productivity and Activity Impairment (WPAI) and Ocular Surface Disease Index (OSDI) questionnaires. Use of OTC dry eye medication, and satisfaction with OTC medication and symptom relief were also assessed.

Results. On average, dry eye resulted in loss of 0.36% of work time (~5 minutes over 7 days) and ~30% impairment of workplace performance (presenteeism), work productivity, and non–job-related activities. Presenteeism and productivity impairment scores showed significant correlation with OSDI total ($r = 0.55$) and symptom domain ($r = 0.50$) scores, but not with dry eye clinical signs. Activity impairment score showed stronger correlation with OSDI total ($r = 0.61$) and symptom domain ($r = 0.53$) scores than with clinical signs ($r \leq 0.20$). Almost 75% of patients used OTC dry eye medication. Levels of patient satisfaction with OTC medication (64.2%) and symptom relief from OTC (37.3%) were unaffected by administration frequency (≥3 vs. ≤2 times daily).

Conclusions. Dry eye causes negligible absenteeism, but markedly reduces workplace and non–job-related performances. Impairment of work performance is more closely linked to dry eye symptoms than to clinical signs. Patients' perceptions of OTC dry eye medication tend to be more positive than their perceptions of symptom relief.

Keywords: dry eye, absenteeism, presenteeism, work productivity, over-the-counter medication, treatment satisfaction, patient-reported outcomes, quality of life

Dry eye disease, which is characterized by tear film instability and symptoms of ocular discomfort and visual disturbance,[1] is one of the most common reasons for patient visits to eye care providers in the United States.[2] Nationally, approximately 4.9 million people (3.2 million women and 1.7 million men) over the age of 50 years are estimated to suffer from moderate to severe dry eye,[3,4] while tens of millions of Americans experience milder, episodic dry eye symptoms, which are often triggered by environmental factors such as wind, low humidity, air conditioning and air pollution, or contact lens use.[5,6] Established risk factors for development of dry eye include older age, female sex, smoking, postmenopausal estrogen therapy, refractive surgery, vitamin A deficiency, and a diet low in omega-3 essential fatty acids.[5,6]

For the patient, the burden of chronic dry eye symptoms, ranging from ocular discomfort (burning, stinging, itching, foreign body sensation) to ocular fatigue, blurred vision, photophobia, and pain, can be considerable. Dry eye is associated with reduced functional visual acuity,[7–9] as well as impaired performance of vision-dependent daily activities such as reading, driving, watching TV, and using a computer.[10–12] Quality of life studies indicate that dry eye symptoms have a detrimental effect on social and physical functioning, vitality, psychological well-being, and general health.[13–16]

Many patients with dry eye symptoms defer seeking medical advice and diagnosis and instead prefer to self-treat with over-the-counter (OTC) medications in an attempt to minimize ocular symptoms. An online consumer survey of 2411 U.S.

adults conducted in 2011 found that 48% of respondents routinely experienced dry eye symptoms and 19% used OTC eye drops on a daily or near-daily basis, yet the majority (69%) of those reporting dry eye symptoms had not visited an eye care professional for evaluation.[17]

Dry eye symptoms are highly prevalent not only in the elderly, but also in the working-age population, particularly among office workers who spend a large proportion of time using a computer.[18,19] It is reasonable to expect that dry eye would affect workplace performance, and findings from an online survey of employees with self-reported dry eye point to reduced work productivity across all severity levels.[20] The present study was undertaken to quantify the effect of physician-diagnosed dry eye on patients' work productivity and daily activities outside work, as well as their level of satisfaction with available OTC treatments for dry eye.

Methods

Patients and Study Design

Patients $\geq$ 18 years of age seeking clinical consultation for relief of dry eye symptoms were enrolled consecutively into this prospective, cross-sectional, noninterventional study, which was conducted between July and October 2014 at five optometry and five ophthalmology practices across the United States. For study inclusion, patients were required to be treatment naïve to prescription medications for dry eye, but were allowed to have used OTC medications for dry eye. Patients were excluded if they had active ocular allergy or ongoing uveitis or anterior segment infection; had previously used punctal plugs; had undergone ocular surgery in the preceding 6 months; or had used systemic or topical corticosteroids, antibiotics, nonsteroidal anti-inflammatory drugs, antivirals, or other immunosuppressive medication in the previous month. The study protocol was approved by the ethics committee or Institutional Review Board at each study center. The study followed the tenets of the Declaration of Helsinki. All subjects provided their written informed consent prior to study participation.

The study was conducted over the course of a single clinic visit, during which patients underwent an ophthalmologic examination and completed a battery of self-administered questionnaires covering dry eye symptoms, vision-related functioning, work productivity and daily activities, use of OTC dry eye medication, and satisfaction with OTC medication and symptom relief. Information on patients' demographics, medical and medication histories, and current comorbidities was also collected during the clinic visit.

Study Assessments

Ophthalmologic examination included standard dry eye diagnostic tests (Schirmer's test with local anesthesia, tear breakup time [TBUT], corneal fluorescein staining, and conjunctival lissamine green staining), which were performed on the eye with worse dry eye symptoms (or the right eye if both eyes were equally affected). Based on composite dry eye signs and presenting symptoms, dry eye severity (worse eye) was graded by the clinical investigator on a 4-point scale ranging from level 1 (mild to moderate conjunctival signs and symptoms) to level 4 (conjunctival scarring/severe corneal staining and severe symptoms) in accordance with International Task Force (ITF) classification guidelines.[21,22]

Dry eye symptoms and their effects on vision-related functioning were assessed using the patient-administered Ocular Surface Disease Index (OSDI) questionnaire.[23] The questionnaire comprises 12 questions assessing the frequency over the past 7 days of ocular symptoms (five items: sensitivity to light, grittiness, eye soreness/pain, blurred vision, and/or poor vision), visual problems affecting daily activities (four items: reading, driving at night, using a computer/bank machine, watching TV), and ocular discomfort triggered by environmental factors (three items: wind, low humidity, air conditioning). Each item is scored for frequency on a 5-point Likert scale ranging from 0 (none of the time) to 4 (all of the time), and OSDI total score (12 items) and subscale domain (Ocular Symptom, Visual-Related Function, and Environmental Trigger) scores are expressed on a scale of 0 to 100. Ocular disability due to dry eye was categorized as none (OSDI total score $<$ 13), mild (OSDI total score 13–22), moderate (OSDI total score 23–32) or severe (OSDI total score 33–100), based on recommended cutoff values.[24]

The effects of dry eye on work productivity and performance of non–work-related activities was determined using the patient-administered Work Productivity and Activity Impairment (WPAI) questionnaire,[25] adapted for dry eye. The questionnaire poses six questions concerning (1) employment status (Q1), (2) number of work hours missed during the past 7 days because of dry eye–related problems (Q2), (3) number of work hours missed during the past 7 days for other reasons (Q3), (4) number of hours worked during the past 7 days (Q4), (5) impact of dry eye on performance at work during the past 7 days, rated on a visual analog scale of 0 (dry eye had no effect on my work) to 10 (dry eye totally prevented me from working) (Q5), and (6) impact of dry eye on performance of non–job-related daily activities (e.g., housework, shopping, childcare, study, and exercise) during the past 7 days, rated on a visual analog scale of 0 (dry eye had no effect on my activities) to 10 (dry eye totally prevented me from performing my activities) (Q6).

Over-the-counter medication utilization and patient satisfaction were assessed through completion of a patient survey covering (1) type of previous or current OTC treatment used, (2) frequency of administration and duration of use of current OTC treatment, (3) satisfaction with current OTC dry eye treatment (based on consideration of treatment effectiveness and treatment burden), and (4) satisfaction with overall care of dry eye symptoms (including symptom relief and avoidance of triggers).

Study Outcomes

Productivity. Primary work productivity indices of absenteeism, presenteeism (on-the-job effectiveness), and productivity impairment (combined absenteeism plus presenteeism) (for employed patients) and the non–work-related productivity index of activity impairment (for all patients) were generated from WPAI questionnaire responses as follows (Q represents the question number):

Absenteeism (percent of work time missed due to dry eye)

$$= [Q2/(Q2 + Q4)] \times 100$$

Presenteeism (percent impairment of work performance due to dry eye) $= (Q5/10) \times 100$

Productivity impairment (percent of overall work productivity lost due to dry eye) $=$

$$\Big([Q2/(Q2 + Q4)] + \Big[1 - \Big\{\Big(Q2/(Q2 + Q4)\Big) \times (Q5/10)\Big\}\Big]\Big) \times 100$$

Table 1. Patients' Demographic and Clinical Characteristics

	Overall, $N = 158$
Age, mean (SD), y	55 (16)
Sex, *n* (%)	
Female	130 (82.3)
Ethnicity, *n* (%)	
Caucasian	136 (86.1)
Region, *n* (%)	
Midwest	7 (4.4)
Northeast	37 (23.4)
South	80 (50.6)
West	34 (21.5)
Employment status, *n* (%)	
Employed	103 (65.2)
Retired/disabled	47 (29.7)
Nonemployed	8 (5.1)
Ocular comorbidity, *n* (%)	
Cataract	48 (30.4)
POAG	8 (5.1)
Ocular hypertension	2 (1.3)
Sjögren's syndrome	4 (2.5)
Ocular allergy	2 (1.3)
Nonocular comorbidity, *n* (%)	
Hypertension	55 (34.8)
Hyperlipidemia	37 (23.4)
GERD/PUD	20 (12.7)
Diabetes	17 (10.8)
Rheumatologic disease	14 (8.9)
Asthma	11 (7.0)
Current/prior OTC treatment, *n* (%)	
Artificial tears	128 (81.0)
Lubricating eye ointment	66 (41.8)
Anti-allergy/anti-inflammatory eye drops	66 (41.8)
Other eye drops	33 (20.9)
ITF dry eye severity, *n* (%)	
Level 1	52 (33.0)
Level 2	54 (34.0)
Levels 3 and 4	52 (33.0)
OSDI dry eye disability, *n* (%)	
None	27 (17.1)
Mild	28 (17.7)
Moderate	30 (19.0)
Severe	73 (46.2)

GERD/PUD, gastroesophageal reflux/peptic ulcer disease; POAG, primary open-angle glaucoma.

$$\textit{Activity impairment}\ (\text{percent impairment of non-work-related activities due to dry eye}) = (Q6/10) \times 100$$

Absenteeism and work productivity were adjusted to account for individual differences in number of contracted work hours per week and hours missed due to vacations and other reasons. Productivity indices were determined for the overall study population and were further categorized by ITF dry eye severity level (level 1, level 2, and levels 3 and 4 combined) and OSDI ocular disability level (none, mild, moderate, and severe).

Treatment Satisfaction. The type of OTC medication currently used for treatment of dry eye, the pattern (frequency and duration) of administration, and the degree of satisfaction with current OTC dry eye treatment and dry eye symptom relief were determined within each ITF severity level (levels 1, 2, and 3/4). Relationships between frequency of OTC use and satisfaction with OTC treatment or dry eye symptom relief were also determined.

Statistical Analysis

The study aimed to enroll 50 patients in each ITF level (levels 1, 2 and combined 3+4); level 4 was combined with level 3 as there were few patients naïve to prescription treatment with this level of disease severity. Demographic and comorbidity data were summarized with descriptive statistics. Intercohort (based on ITF severity) comparisons of OTC treatment use were performed using analysis of variance (ANOVA) and the χ^2 test. Intercohort (based on ITF and OSDI severity) comparisons of WPAI domain scores were performed using ANOVA with adjustment for covariates (variously age, sex, hypertension, and employer insurance status). Relationships between WPAI domain scores and OSDI scores, as well as between WPAI domain scores and dry eye diagnostic marker scores, were explored using Pearson's correlation analysis. Satisfaction with OTC treatment and satisfaction with dry eye symptom relief were stratified and compared by frequency of OTC use ($\leq$2 times daily vs. $\geq$3 times daily) using the χ^2 test. Statistical significance was set at a P value of 0.05 or less.

Results

Study Population

The study population comprised 158 patients with a mean (SD) age of 55 (16) years, who were predominantly female (82.3%) and Caucasian (86.1%). The most frequent ocular comorbidities were cataract (30.4%) and primary open-angle glaucoma (5.1%) (Table 1). Dry eye severity was graded (ITF classification) as level 1 in 52 patients (32.9%), level 2 in 54 patients (34.2%), and level 3/4 in 52 patients (32.9%). Ocular disability due to dry eye was graded (OSDI classification) as none in 27 patients (17.1%), mild in 28 patients (17.7%), moderate in 30 patients (19.0%), and severe in 73 patients (46.2%) (Table 1).

Work Productivity Outcomes

Of the study population, 102 patients (64.6%) (35 in ITF level 1, 36 in ITF level 2, and 31 in ITF level 3/4) were in full- or part-time employment at the time of the study. Within this currently employed cohort, four patients (3.9%) reported taking time off work in the past 7 days because of dry eye symptoms. For the overall cohort ($n = 102$), a mean of 0.08 hours of work per patient was lost due to dry eye over this period (mean 0.00, 0.19, and 0.03 hours in ITF levels 1, 2, and 3/4, respectively) (Table 2).

Among the 102 currently employed patients, 95 patients had worked during the past 7 days; accordingly, WPAI questionnaire Absenteeism, Presenteeism, and Productivity Impairment scores were derived for this patient subgroup (ITF category: 32 in level 1, 33 in level 2, and 30 in level 3/4; OSDI category: 15 with no, 19 with mild, 16 with moderate, and 45 with severe ocular disability). Over the past 7 days, the proportion of total work time missed due to dry eye (absenteeism) averaged 0.36% (SD 2.0%); impairment of work performance due to dry eye (presenteeism) averaged 28.6% (SD 24.5%); and overall work productivity lost to dry eye (productivity impairment) averaged 28.8% (SD 24.7%). Where-

Table 2. Work Productivity and Activity Impairment Questionnaire Item Outcomes, Categorized by ITF Dry Eye Severity Level

WPAI Questionnaire Items	ITF Dry Eye Severity			
	ITF 1, $n = 52$	ITF 2, $n = 54$	ITF 3/4, $n = 52$	Overall, $N = 158$
Q1. Currently employed, *n* (%)	35 (67)*	36 (67)	31 (60)	102 (65)
Q2. Work hours missed due to dry eye during past week, mean (SD)†	0 (0)	0.19 (0.67)	0.03 (0.18)	0.08 (0.41)
Q3. Work hours missed for other reasons during past week, mean (SD)†	2.89 (9.62)	4.31 (9.82)	5.16 (11.28)	4.08 (10.16)
Q4. Hours worked during past week, mean (SD)†	34.3 (17.6)	29.0 (15.9)	37.2 (13.4)	33.3 (16.0)
Q5. Impact of dry eye on work performance during past week, mean (SD) score on a scale of 0 to 10‡	2.56 (2.53)	2.76 (2.50)	3.30 (2.34)	2.86 (2.45)
Q6. Impact of dry eye on non–work-related daily activities during past week, mean (SD) score on a scale of 0 to 10§	2.42 (2.11)	2.76 (2.43)	3.87 (2.64)	3.01 (2.47)

* Thirty-six patients reported employment when responding within the demographics section of the case report form, whereas 35 patients reported employment when responding within the WPAI section of the case report. The discrepancy may be a result of interpretation of the WPAI question regarding "current" employment.

† Mean values of currently employed patients (ITF levels 1, 2, and combined 3/4: $n = 35, 36, 31$, respectively).

‡ Mean values of currently employed patients, excluding 7 patients who worked 0 hours during past week (ITF levels 1, 2, and combined 3/4: $n = 32, 33, 30$, respectively).

§ Mean values of all patients (ITF levels 1, 2, and combined 3/4: $n = 52, 54, 52$, respectively).

as Absenteeism score did not differ significantly across OSDI ocular disability levels after adjustment for sex, Presenteeism and Productivity Impairment scores increased markedly as OSDI ocular disability level increased (mean scores for both domains ranged from ~16% to 43%), and were significantly higher in patients with severe versus mild or moderate ocular disability, after adjusting for sex (Fig. 1). However, Absenteeism, Presenteeism, and Productivity Impairment scores did not differ significantly across ITF levels after adjustment for intercohort differences in sex, hypertension, and age or employer insurance status (Fig. 2). Presenteeism and Productivity Impairment scores showed significant correlation with OSDI total score ($r = 0.5$, $P < 0.0001$) and OSDI Symptom domain score ($r = 0.5$, $P < 0.0001$), but not with dry eye diagnostic signs (Table 3).

Activities of Daily Living Outcomes

The effect of dry eye on daily activities outside work, as expressed by the WPAI questionnaire Activity Impairment domain score, was determined for the full study population, regardless of employment status ($n = 158$). Overall, impairment by dry eye of non–work-related performance (activity impairment) averaged 30.1% (SD 24.7%). Activity impairment increased with worsening OSDI ocular disability: patients with severe ocular disability had a significantly higher mean Activity Impairment score (42.6%) than those with mild (18.9%) or moderate (28.3%) ocular disability, after adjusting for sex (Fig. 1). Similarly, activity impairment increased with ITF severity, with patients in ITF level 3/4 having a significantly higher mean Activity Impairment score (38.7%) than those in level 1 (24.2%) or level 2 (27.6%), after adjusting for covariates of sex and hypertension (Fig. 2). Activity Impairment score was correlated with OSDI total score ($r = 0.6$, $P < 0.0001$) and OSDI Symptom domain score ($r = 0.5$, $P < 0.0001$); correlations with corneal staining intensity and TBUT were statistically significant but weak ($r \leq 0.2$) (Table 3).

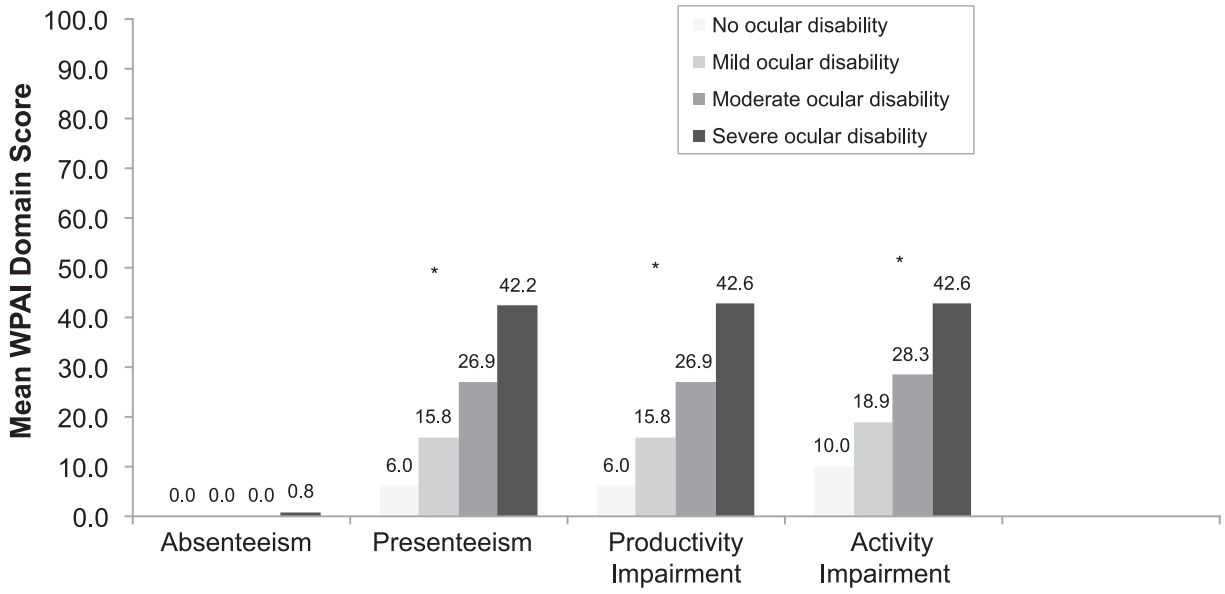
Utilization of OTC Dry Eye Treatments

Of the study population, 116 patients (73.4%) were using OTC dry eye medication (mainly artificial tears, lubricant eye ointments, and anti-allergy or anti-inflammatory eye drops) at the time of the study; the mean duration of OTC medication use was 28 months. Current use of artificial tears + lubricant eye ointment combination treatment was significantly higher ($P = 0.0032$) among patients in ITF level 3/4 (28.8%) than in level 1 (7.7%) and level 2 (9.3%) (Table 4). For those patients who specified their current treatment frequency ($n = 109$), OTC medication was administered less than once daily by 36 patients (33.0%), once daily by 17 patients (15.6%), twice daily by 20 patients (18.3%), and ≥3 times daily by 36 patients (33.0%). Treatment frequency increased numerically with increasing ITF severity level: for ITF levels 1, 2, and 3/4, respectively, twice daily administration was reported by 12%, 17%, and 23% of patients, and ≥3 times daily administration by 18%, 31%, and 43% of patients.

Satisfaction With OTC Treatment and Symptom Relief

Among respondents to the question about satisfaction with current OTC treatment for dry eye ($n = 109$), 70 patients (64.2%) were satisfied, 17 patients (15.6%) were neutral, and 22 patients (20.2%) were dissatisfied (Table 4). Dissatisfaction with OTC medication was more common in ITF level 2 (23.1%) and level 3/4 (23.7%) than in level 1 (12.5%); conversely, satisfaction with OTC medication was more common in ITF level 1 (75.0%) than in level 3/4 (65.8%) (Table 4). The proportions of patients expressing satisfaction with ≥3 times daily and ≤2 times daily administration did not differ significantly (68.6% vs. 80.7%, respectively; $P > 0.05$).

Among respondents to the question about satisfaction with dry eye symptom relief achieved with OTC medication and/or medical care ($n = 158$), 59 patients (37.3%) were satisfied, 40 patients (25.3%) were neutral, and 59 patients (37.3%) were dissatisfied (Table 4). Dissatisfaction with dry eye symptom relief was more frequent among patients in ITF level 2 (46.3%) and level 3/4 (44.2%) than among those in ITF level 1 (21.2%); conversely, satisfaction with dry eye symptom relief was more frequent in ITF level 1 (50.0%) than in level 2 (31.5%) and level 3/4 (30.8%) (Table 4). Satisfaction with dry eye symptom relief was similar with ≥3 times daily versus ≤2 times daily administration (45.2% vs. 50.9% of patients, respectively; $P > 0.05$).

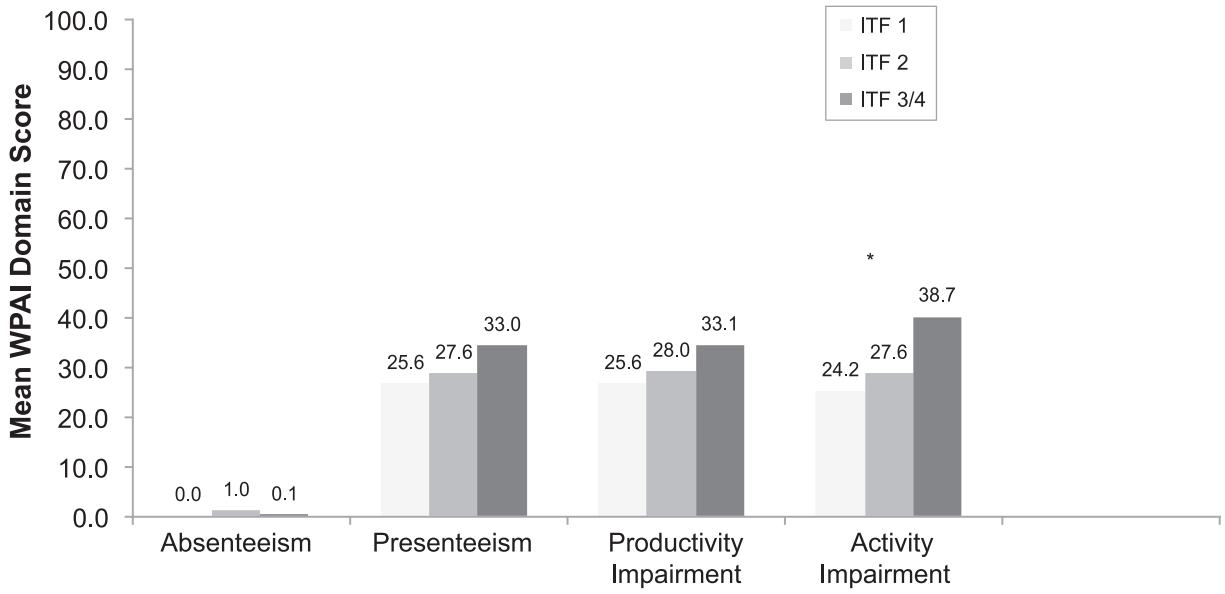


* Significant inter-cohort difference (P<0.0001) after adjustment for sex

Figure 1. Work Productivity and Activity Impairment questionnaire domain scores, categorized by OSDI ocular disability level. Absenteeism, Presenteeism, and Productivity Impairment: $n = 15$, 19, 16, and 45 for OSDI categories none, mild, moderate, and severe, respectively. Activity Impairment: $n = 27$, 28, 30, and 73 for OSDI categories none, mild, moderate, and severe, respectively. ANOVA, analysis of variance; OSDI, Ocular Surface Disability Index; WPAI, Work Productivity and Activity Impairment.

Discussion

Findings from this small-scale, cross-sectional study in patients attending clinics for relief of dry eye symptoms indicate that work productivity and performance of non–job-related daily activities are negatively impacted by dry eye disease. Although dry eye had a negligible effect on work attendance (on average, each patient lost ~5 minutes of work time during the preceding week because of dry eye), its impact on workplace performance, and hence on overall work productivity, was substantial, with both indices showing an average 29% impairment. The degree of impairment of work performance and productivity did not vary appreciably with physician-rated dry eye severity (defined by ITF level), but was sensitive to



* Significant inter-cohort difference (P=0.0054) after adjustment for sex and hypertension

Figure 2. Work Productivity and Activity Impairment questionnaire domain scores, categorized by ITF dry eye severity level. Absenteeism, Presenteeism, and Productivity Impairment: $n = 32$, 33, and 30 for ITF levels 1, 2, and 3/4 combined, respectively. Activity Impairment: $n = 52$, 54, and 52 for ITF levels 1, 2, and 3/4 combined, respectively. ANOVA, analysis of variance.

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Table 3. Association of Dry Eye Clinical Signs and OSDI Scores With Work Productivity and Activity Impairment Domain Scores

	WPAI Presenteeism Score		WPAI Productivity Impairment Score		WPAI Activity Impairment Score	
	Pearson Correlation Coefficient	*P* Value	Pearson Correlation Coefficient	*P* Value	Pearson Correlation Coefficient	*P* Value
Correlation of WPAI scores with clinical symptoms						
OSDI total score	0.55	<0.0001	0.55	<0.0001	0.61	<0.0001
OSDI Symptom domain score	0.50	<0.0001	0.50	<0.0001	0.53	<0.0001
Correlation of WPAI scores with clinical signs						
Central corneal staining	0.07	0.54	0.07	0.52	0.20	0.02
Mean conjunctival staining	0.07	0.53	0.06	0.54	0.16	0.05
Mean Schirmer score	0.07	0.52	0.07	0.53	−0.09	0.27
Mean TBUT score	−0.004	0.97	−0.0009	0.99	−0.17	0.04

changes in dry eye–related ocular disability (defined by OSDI total score). Impairment of workplace performance and productivity was more closely linked with patients' symptoms than with clinicians' evaluations of clinical signs of dry eye. Similarly, performance of daily activities outside work was impaired on average by 30% because of dry eye, with the effect being most pronounced in patients with severe dry eye (mean 39% impairment) and severe ocular disability (mean 43% impairment). Performance of non–job-related activities appeared to be influenced in equal measure by changes in dry eye severity and dry eye–related ocular disability.

The findings of the present study are consistent with the previously published data on the effects of self-reported dry eye on workplace performance. An online survey of 9034 U.S.-based employees reporting physician-diagnosed dry eye indicated that absenteeism due to the condition was uncommon, amounting on average to 1 hour per week among patients with severe dry eye.[20] The survey likewise found that work performance and productivity, assessed using the WPAI questionnaire, were reduced by dry eye, with the effect being greater in severe disease (35%–36% impairment) than in moderate (18%–19%) or mild (11%) disease.[20] Total or near-total (≥70%) impairment of work performance was reported by 15% of patients with severe dry eye compared with 1% and 3%, respectively, of those with mild and moderate disease. Quantitatively similar impairment was seen in the performance of non–work-related activities, again with the effect being most pronounced in patients with severe dry eye. Additionally, several small-scale surveys ($n < 100$) have indicated that dry eye symptoms interfere with workplace performance on average ~190 to 200 days per year, and are responsible for 2 to 5 days of absenteeism per year.[26–28]

The present study provides no indication of which occupations and activities are most affected by dry eye. However, in view of the high prevalence of dry eye symptoms among intensive computer users,[18,19] and the contribution of air conditioning in triggering dry eye,[29] it might be anticipated that productivity loss from dry eye would be especially high

Table 4. Patient Satisfaction With Current OTC Medication and Dry Eye Symptom Relief, Categorized by ITF Dry Eye Severity Level

	ITF Dry Eye Severity			
	ITF 1, $n = 52$	ITF 2, $n = 54$	ITF 3/4, $n = 52$	Overall, $N = 158$
Current OTC medication utilization	$n = 52$	$n = 54$	$n = 52$	$N = 158$
Type of medication, *n* (%)				
Any dry eye medication	34 (65.4)	42 (77.8)	40 (76.9)	116 (73.4)
Artificial tear + lubricant eye ointment combination	4 (7.7)	5 (9.3)	15 (28.8)	24 (15.2)
Artificial tear + lubricant eye ointment + anti-allergy/anti-inflammatory eye drop combination	0 (0)	2 (3.7)	4 (7.7)	6 (3.8)
Patient satisfaction				
Satisfaction with current OTC medication, *n* (%)	$n = 32$	$n = 39$	$n = 38$	$N = 109$
Very satisfied	10 (31.3)	4 (10.3)	5 (13.2)	19 (17.4)
Somewhat satisfied	14 (43.8)	17 (43.6)	20 (52.6)	51 (46.8)
Neutral	4 (12.5)	9 (23.1)	4 (10.5)	17 (15.6)
Somewhat dissatisfied	2 (6.3)	4 (10.3)	6 (15.8)	12 (11.0)
Very dissatisfied	2 (6.3)	5 (12.8)	3 (7.9)	10 (9.2)
Satisfaction with dry eye symptom relief, *n* (%)	$n = 52$	$n = 54$	$n = 52$	$N = 158$
Extremely satisfied	2 (3.8)	6 (11.1)	5 (9.6)	13 (8.2)
Moderately satisfied	4 (7.7)	11 (20.4)	12 (23.1)	27 (17.1)
Slightly satisfied	5 (9.6)	8 (14.8)	6 (11.5)	19 (12.0)
Neutral	15 (28.8)	12 (22.2)	13 (25.0)	40 (25.3)
Slightly dissatisfied	6 (11.5)	8 (14.8)	3 (5.8)	17 (10.8)
Moderately dissatisfied	14 (26.9)	6 (11.1)	13 (25.0)	33 (20.9)
Extremely dissatisfied	6 (11.5)	3 (5.6)	0	9 (5.7)

among clerical and administrative staff working in office environments. In our (LS) experience, certain industrial occupations and outdoor activities that are associated with specific environmental factors, such as metal working, automotive repair, and lawn maintenance, are also often accompanied by moderate or severe dry eye symptoms, which may prove work limiting.

Almost three-quarters of patients in this study were using topical OTC medication for relief of dry eye symptoms. In keeping with known dry eye treatment patterns,[20] the frequency of OTC treatment, ranging from less than once daily to $\geq$3 times daily, tended to increase with dry eye severity. However, OTC treatment burden was not a significant factor affecting patients' satisfaction either with treatment itself or with the level of symptom relief experienced. The finding that patients' opinions of their OTC dry eye treatment were more positive than their assessments of dry eye symptom relief would suggest that a management strategy based solely on the use of OTC medication may be inadequate. Future research, using the validated Impact of Dry Eye on Everyday Life (IDEEL) questionnaire, which includes a dry eye treatment satisfaction module covering satisfaction with treatment effectiveness and treatment-related bother/inconvenience,[30] may give a better indication of those aspects of OTC dry eye treatment that are important to patients.

The WPAI questionnaire is a validated and reliable instrument for quantifying the effects of health problems on work productivity and regular activities[25] and has been used in a wide range of chronic conditions, including asthma,[31] gastroesophageal reflux disease,[32,33] irritable bowel syndrome,[34] and rheumatic disease.[35,36] Comparison of WPAI questionnaire findings suggests that dry eye has an impact quantitatively similar to that of rheumatoid arthritis, irritable bowel syndrome, and gastroesophageal reflux disease on workplace productivity, but unlike these conditions has no appreciable effect on absenteeism.[32,34,36] The WPAI questionnaire has the advantage of being patient-friendly; limitations of the questionnaire include the potentially confounding influence of disease comorbidity and wider factors (e.g., personal, quality of life) that affect work performance. Patients in this study showed a high frequency of ocular comorbidity, notably cataract and primary open-angle glaucoma, and it is possible that some of the effects ascribed to dry eye were due to other ocular disorders and/or treatments. The cross-sectional design of the study precluded identification of extraneous factors that may have contributed to impairment of performance and productivity. In addition, in the absence of a control arm of non–dry eye patients, the study may have overestimated the effects of dry eye. Despite these caveats, our estimates of the effect of dry eye on work productivity and performance of daily activities, obtained in a representative cross-sample of the U.S. dry eye population, are in good agreement with those reported previously.[20]

In conclusion, this study indicates that dry eye has an appreciable impact on work productivity, particularly among individuals with severe disease, and that this is predominantly due to reduced on-the-job performance rather than to absenteeism. Impairment of workplace performance appears to be more closely related to dry eye symptoms than to clinical signs. Performance impairment caused by dry eye also carries through into patients' activities outside work. Patients' perceptions of OTC dry eye treatment are generally more positive than their perceptions of dry eye symptom relief, suggesting that current OTC management strategies for dry eye require further refinement.

Acknowledgments

Sponsored by Allergan Plc, Dublin, Ireland. The sponsor participated in the design of the study, data analysis, and data interpretation. Allergan also supervised the preparation, review, and approval of the manuscript. Writing and editorial support was provided to the authors by Andrew Fitton, PhD, of Evidence Scientific Solutions (Horsham, UK) and was funded by Allergan Plc, Irvine, CA, USA.

Disclosure: **K.K. Nichols**, Eleven Biotherapeutics (F), Insite (C, R), Kala Corporation (C, F, R), Science Based Health (R), Shire (C, F, R); **J. Bacharach**, Allergan (C, R); **E. Holland**, Alcon (C, F, R), Allergan (C, F, R), Bausch & Lomb (C, R), Kala Corporation (C), Mati Therapeutics (C, F), Omeros (C, F, R), PRN (C, F), Senju Pharmaceuticals (C, F, R), Shire (C), TearLab (C), TearScience (C, R); **T. Kislan**, Allergan (F, R); **L. Shettle**, None; **O. Lunacsek**, None; **B. Lennert**, None; **C. Burk**, Allergan (C); **V. Patel**, Allergan (E)

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