

Smoking and Blindness

What Optometrists Want their Patients to See

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ABSTRACT

Most smokers are not aware that their tobacco use is a preventable cause of blindness. Despite the important role optometrists can have impacting patient health choices; their voice has been largely silent in the development of tobacco cessation practice guidelines and health promotion strategies. In this study, we use the International Tobacco Control Policy Evaluation Project (ITC) Four Country Survey to describe the level of Canadian smokers' knowledge of the association of smoking with blindness and we use focus groups to elicit ideas from Canadian optometrists and senior optometry students about blindness-related graphic warning labels.

Keywords: Smoking, blindness, graphic warning labels, optometry practice

Introduction

While tobacco use is widely known as a preventable cause of premature death, its causal association to blindness is relatively unknown by smokers. There is strong evidence that healthcare providers can positively affect tobacco cessation among their patients yet the voice of optometrists has been largely silent in the development of tobacco cessation practice guidelines and health promotion strategies such as social marketing campaigns and graphic warning labels. Our research group has begun to examine Canadian optometrists' key behaviors and attitudes toward patients who use tobacco. In this paper, we describe the level of Canadian smokers' knowledge of the association of

smoking with blindness and the ideas that Canadian optometrists and senior optometry students have about blindness-related graphic warning labels.

Tobacco Use & Health Impacts

Optometrists routinely encounter patients who have, do, or will smoke cigarettes. A 2008 report¹ by the Propel Centre for Population Health Impact provides a compelling average profile of smoking among Canadians. An estimated 17.9% of Canadians over 14 years of age smoked cigarettes¹, with higher rates among males (20%) than females (16%). Among daily smokers, who were the majority (75.4%), almost 15 cigarettes were smoked daily. Provincial rates of smoking varied from a low of

14.7% in British Columbia to a high of 20.8% in Manitoba with only two provinces having rates below the national average (Ontario and British Columbia). The highest smoking prevalence (27%) existed among 20 to 24-year-olds and almost 19% of students in grades 5 to 9 had tried smoking. According to this report, two-thirds of smokers were seriously considering quitting in the next 6-months.

The leading causes of premature death causally linked to smoking are coronary artery disease, leading to myocardial infarctions and cerebrovascular accidents, lung cancer, and chronic obstructive pulmonary disease.² Public awareness of the negative consequences of smoking is generally high for these diseases; for example, studies in Canada, the United States, the United Kingdom, Australia and Singapore have reported that most surveyed respondents knew that smoking causes lung cancer (>90%), heart disease (>83%) and stroke (>70%).^{3,4,5}

Public knowledge that smoking causes sight threatening eye disease is generally much lower, typically less than 10%.^{3,6,7} Only one study⁴, which focused on eye care seeking smokers, found higher knowledge

levels between 31 and 37%. This limited awareness is a significant problem because smoking has been shown to cause several eye diseases through ischemic and oxidative mechanisms.⁸ Smoking has been causally associated with age related macular degeneration⁹⁻¹³, nuclear and posterior subcapsular cataract¹⁴⁻¹⁹, thyroid-associated ophthalmopathy²⁰⁻²², optic neuropathies²³⁻²⁵ and uveitis.^{26,27} While public knowledge of smoking-induced eye disease is relatively low, fear of blindness is not. A study⁶ of British youth (16-18 years old) found that, in comparison with lung cancer, heart disease and stroke, blindness was the least known but most feared consequence of smoking cigarettes. Interestingly, some healthcare practitioners (e.g., pharmacists) are finding that linking smoking to blindness has been a successful part of their tobacco cessation advice.²⁸

The common occurrence of smoking, the limited public knowledge of smoking-associated eye disease, and the public's fear of vision loss all provide important incentives for optometrists to engage in patient education regarding tobacco prevention and cessation.

Health Practitioners Supporting Tobacco Prevention & Cessation

Addressing tobacco use in clinical practice is supported by an increasing recognition that tobacco use and dependence is a preventable cause of morbidity and mortality and healthcare providers can be effective facilitators of tobacco cessation among their patients.²⁹⁻³⁴

The U.S. Surgeon General's web-site provides clinical practice guidelines, entitled, Treating Tobacco Use and Dependence: 2008 Update.³⁵ This document was developed by stakeholders including those from medicine, nursing, dentistry, pharmacy, epidemiology, public health, and psychology. Unfortunately, optometry is notably missing as a stakeholder informant or as an identified user of the document. Optometry has also yet to be a stakeholder in the development of Health Canada's graphic warning labels for tobacco products. Graphic warning labels can be a useful tobacco prevention and cessation strategy, either on cigarette packages or posters. For example, they have been shown to increase the intentions of smokers to quit because of their heightened knowledge of the health effects of smoking.³⁶ Health Canada has had the same graphic warning labels on tobacco products for about ten years but it has not yet adopted an eye disease related warning label for smoking despite having one under consideration since 2006 (see the Tobacco Labeling Resource Centre for current and test Canadian warning labels: www.tobaccolabels.ca). In contrast, other countries³⁷⁻³⁸ have already adopted eye-related messages in their tobacco campaigns.


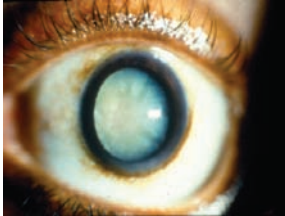





In this paper, we describe Canadian smokers' knowledge of the link between tobacco use and blindness as well as the recommendations of Canadian optometrists and senior optometry students about warning graphic labels specific to eye disease.

Methods

Canadian Smokers' Knowledge of Smoking Causing Blindness

Subsequent to institutional ethics clearance, we accessed data on Canadian smokers' knowledge about the health impacts of smoking using the International Tobacco Control Policy Evaluation Project (ITC) Four Country Survey. It is a longitudinal cohort study conducted approximately annually with adult smokers in Canada, the United States, the United Kingdom, and Australia. For the purposes of this study, we focused on the Canadian data. The ITC Four Country survey began in 2002 and has included a measure of respondents' knowledge of smoking and blindness since the third survey in 2004 (called Wave 3). Eligibility for the ITC Canada sample required participants to live in Canada, be at least 18-years-old, have smoked more than 100 cigarettes in their life and at least once in the previous 30 days, and be willing to complete the ITC Four Country phone survey. Further details about the ITC Four Country survey and methods have been published elsewhere.³⁹⁻⁴¹ This evaluation method has been found to provide a reliable indicator of national smoking behavior trends. The ITC-4 survey question pertaining to smoking and blindness was worded, *I am going to read you a list of health effects and diseases that may or may not be caused by smoking cigarettes. Based on what you know or believe, does smoking cause blindness?*

TABLE 1
Graphic Warning Label Features Discussed

Category	#1	#2	#3	#4
Eye Disease (4 choices)				
Vision Impact (3 choices)				
Information (3 choices)	<p>WARNING SMOKING CAUSES BLINDNESS</p> <p>Smoking causes permanent nerve damage to the inner eye which leads to blindness.</p>	<p>WARNING SMOKING CAUSES BLINDNESS</p> <p>Smoking causes irreversible damage to the back of the eye. This is known as macular degeneration. Central vision is lost, leading to blindness.</p>	<p>WARNING SMOKING CAUSES BLINDNESS</p> <p>Smoking is a major cause of blindness. Smoking at least doubles your risk of losing your sight. When you stop smoking, the risk decreases over time.</p>	

The response options were: ‘Yes’, ‘No’, or ‘Don’t know’. The analysis in this paper is limited to respondents answering the blindness knowledge question for their first time. Since each wave (i.e., year) incorporates new participants to replenish those who have been lost to follow-up, there are new participants in each wave. Combining respondents from waves 3 to 7 (i.e., 2004 to 2008), provided a total weighted sample of 3,839 Canadian daily smokers. Response data were calculated provincially (by count and percentage of respondents); proportions were compared using 2-tailed z-tests with an alpha of 0.05 used for significance testing.

Perceptions of Eye-Related Graphic Warning Labels

Focus groups were conducted with optometry students and community optometrists. The study occurred in the Waterloo Region of southwestern Ontario, Canada in the summer of 2009.

Detailed descriptions of recruitment and sampling for this study have been published previously.^{42,43} The potential participant pool included 51 practicing optometrists and 30 fourth-year optometry students (60 additional fourth-year students were away on external clinical placements). Eighteen fourth-year optometry students (15 women, 3 men) were scheduled into three focus groups (S1, S2,

and S3) and eleven optometrists (7 women, 4 men) were scheduled into two focus groups (O1 and O2). These optometrists had been practicing for approximately 20 years, on average, with an individual range from 5 to over 30 years. All but one had graduated from the local Doctor of Optometry program. The 29 participant identities were represented by numbers; for example, the seven members of student focus group S1 were numbered S1-1 to S1-7, and the six members of optometrist group O1 were numbered O1-1 to O1-6.

The multi-disciplinary research team, which drew from optometry, nursing, and psychology, developed a two-phase interview. The first

TABLE 2

Smokers' Knowledge that Smoking Causes Blindness by Canadian Province

PROVINCES			NL	PE	NS	NB	QC	ON	MB	SK	AB	BC	Total
Blindness	Yes	Count	10	1	16	15	213	162	18	21	32	55	543
		%	14.7%	5.3%	12.9%	14.3%	20.5%	11.5%	13.6%	16.4%	8.3%	13.2%	14.2%
	No	Count	48	16	87	69	681	1,016	94	82	294	279	2,666
		%	70.6%	84.2%	70.2%	65.7%	65.7%	71.9%	71.2%	64.1%	76.0%	67.1%	69.6%
	Don't Know	Count	10	2	21	21	143	236	20	25	61	82	621
		%	14.7%	10.5%	16.9%	20.0%	13.8%	16.7%	15.2%	19.5%	15.8%	19.7%	16.2%
Total		Count	68	19	124	105	1,037	1,414	132	128	387	416	3,830
		%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

phase addressed attitudes, practices and training regarding smoking behavior and smoking cessation referrals in optometric practice. The second phase focused on collecting reactions about the design content for possible tobacco product warning labels that included messages about tobacco use and eye health. Focus group respondents were given colour print-outs of ten different graphic warning label features designed for the current study by the research team. Some designs used images from graphic warning labels already used in Australia, New Zealand, and Iran. The ten warning labels addressed three categories: 1) 'Eye Disease' (four designs intended to communicate eye disease), 2) 'Vision Impact' (three designs aimed to communicate the experience of vision loss), and 3) 'Text Information' (three designs showed different text messages). The labels were designed to encourage discussion about what features or approaches the respondents felt were important. Table 1

shows the ten graphic label features discussed by the informants. Focus group facilitators (RDK & KM) were experienced in tobacco control research. A research assistant (VZ) made field notes during the focus group discussions, which were audio-recorded and later transcribed verbatim.

We followed an inductive qualitative framework approach⁴⁴ where data analysis informs theory. Consistent with a framework approach, reading the focus group transcripts allowed the members of the research team to familiarize themselves with the data. Next, the team identified key issues, themes and concepts by which the data could be further examined. The team identified five broad themes to examine: current practices, rationalizations, barriers, opportunities and graphic label recommendations. Data excerpts that fit with the identified themes were indexed in the transcripts and then rearranged into thematic charts (a few exemplar excerpts are included

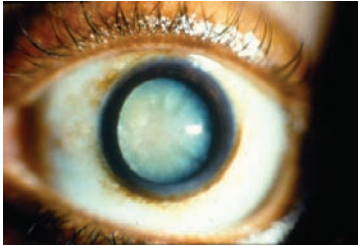

in this paper). Finally, the thematic charts were examined with the goal of finding associations and explanations for the findings; a process referred to by Bryman and Burgess⁴⁴ as 'mapping and interpretation'. Analysis of the first four themes is reported elsewhere⁴²⁻⁴³; theme five, 'graphic label recommendations', is reported herein.

Results & Discussion

Canadian Smokers' Knowledge of Smoking Causing Blindness

Table 2 summarizes the provincial knowledge data among sampled smokers from Canada in the ITC Four Country phone survey between 2004 and 2008. The proportion of Canadian smokers that knew smoking can cause blindness was notably lower (14.2%) than those who discounted the link (69.6%). Knowledge of this association among Quebec respondents (20.5%) was significantly higher than the rest of Canada (z-score value 6.878, $p < 0.0001$). Only two other provinces, Newfoundland

TABLE 3**Preferred Graphic Warning Labels Per Category**

Label Category	Preferred Label Content
Eye Disease Graphics (4 choices)	
Vision Impact Graphics (3 choices)	
Text Information (3 choices)	WARNING – SMOKING CAUSES BLINDNESS Smoking is a major cause of blindness. Smoking at least doubles your risk of losing your sight. When you stop smoking, the risk decreases over time

and Labrador, and New Brunswick, showed knowledge slightly above the national average. Health Canada's website (www.hc-sc.gc.ca) provides an 'Inventory of Canadian Tobacco Cessation Programs and Resources' provided in each province and territory; in each jurisdiction there is a variety of tobacco prevention and cessation programs yet none of these include any information or explicit content on eye diseases caused by smoking. At this point, we are unsure why knowledge of the link between smoking and vision loss is higher in Quebec than any other province. Yet, even if we focus on the province with the highest knowledge,

we are left with the reality that only 1 in 5 smokers know about the link between smoking and blindness. More likely, 1 in 7, at best, know this information. Thus, Canadian optometrists can have an important role in improving patient education about the link between smoking and eye disease. These Canadian findings are comparable with measures of American and UK smoker's knowledge; however, less than that in Australia where social marketing has included the eye and nearly half of smokers were aware of the link.⁴⁵

Perceptions of Eye-Related Graphic Warning Labels

Analysis of the focus group discussions regarding the graphic warning labels revealed two sub-themes: 1) Accurately Linking Smoking and Blindness, and 2) Framing Desirable Messages. Respondents thought that both the views of optometrists and the public should be considered ultimately in designing a suitable eye-focused graphic warning label.

Both the optometrists and senior optometry students placed high importance on graphic warning labels that accurately linked smoking and blindness. Respondents felt that these labels should

performance and fertility (i.e., ability of female rats to become pregnant). However, these doses were highly toxic and had significant toxic effects on the pregnancies, and the survival and development of the offspring. Maternal toxicity, possible occurrence of abnormalities and growth retardation started at 10 times the Alex® clinical dose.

Neurologic

Disturbances and suppression of the Hypothalamic-Pituitary-Adrenal (HPA) axis can occur with systemic exposure to corticosteroids. However, given the very low systemic exposure to loteprednol etabonate when using Alex® as directed, these possible effects are not likely.

Endocrine and Metabolism

Glucocorticoids, mostly when systemic exposure occurs, decrease the hypoglycemic activity of insulin and oral hypoglycemics, so that a change in dose of the antidiabetic drugs may be necessitated. In high doses, glucocorticoids also decrease the response to somatotropin. The usual doses of mineralocorticoids and large doses of some glucocorticoids cause hypokalemia and may exaggerate the hypokalemic effects of thiazides and high-ceiling diuretics. In combination with amphotericin-B, they also may cause hypokalemia. Glucocorticoids appear to enhance the ulcerogenic effects of non-steroidal anti-inflammatory drugs. They decrease the plasma levels of salicylates, and salicylism may occur on discontinuing steroids. Glucocorticoids may increase or decrease the effects of prothrombopenic anticoagulants. Estrogens, phenobarbital, phenytoin and rifampin increase the metabolic clearance of adrenal steroids and hence necessitate dose adjustments.

However, given the very low systemic exposure to loteprednol etabonate when using Alex® as directed, these possible effects are not likely.

Immune

Cortisol and the synthetic analogs of cortisol have the capacity to prevent or suppress the development of the local heat, redness, swelling, and tenderness by which inflammation is recognized. At the microscopic level, they inhibit not only the early phenomena of the inflammatory process (edema, fibrin deposition, capillary dilation, migration of leukocytes into the inflamed area, and phagocytic activity) but also the later manifestations, such as capillary proliferation, fibroblast proliferation, deposition of collagen, and, still later, cicatrization.

Clinical Trial Adverse Drug Reactions

Possibly or probably related adverse events from two Phase III studies are listed below:

	Alex® 0.2% N = 133	Placebo N = 135
SPECIAL SENSES (EYE DISORDERS)		
Intraocular Pressure		
- elevation of 6 to 9mm Hg*	2% to 12%*	0% to 6%*
- elevation of ≥10mm Hg	1 (1%)	1 (1%)
Chemosis	6 (5%)	7 (5%)
Vision, Abnormal or Blurred	4 (3%)	5 (4%)
Burning/Stinging, on instillation	3 (2%)	6 (4%)
Itching Eye	3 (2%)	3 (2%)
Dry Eye	2 (2%)	4 (3%)
Burning/Stinging, not on instillation	2 (2%)	2 (1%)
Epiphora	1 (1%)	9 (7%)
Discharge	1 (1%)	3 (2%)
Foreign Body Sensation	1 (1%)	1 (1%)
Discomfort Eye	1 (1%)	0 (0%)
Injection	1 (1%)	0 (0%)
Eye Pain	1 (1%)	0 (0%)
Sticky Eye	0 (0%)	7 (5%)
Erythema Eyelids	0 (0%)	2 (1%)
Eye Disorder	0 (0%)	2 (1%)
BODY AS A WHOLE		
Face Edema (Head)	1 (1%)	0 (0%)
Allergic Reaction	1 (1%)	0 (0%)
MUSCULOSKELETAL SYSTEM		
Twitching	0 (0%)	1 (1%)

* for IOP increase of 6 to 9 mm Hg, please see below

One patient in the Alex® group and one patient in the placebo group experienced increases in IOP of ≥10 mm Hg. Among these, one in each group had an IOP increase of ≥15 mm Hg, reaching IOP values over 30 mm Hg. In both studies, there were more patients with IOP increases of 6 to 9 mm Hg in the Alex® group than in the placebo group (see table below). In study A, among the patients with IOP increases of 6 to 9 mm Hg, four reached an IOP value of 22 to 23 mm Hg, and one patient reached 29 mm Hg and was discontinued (clinically significant increase in IOP). All these five patients were from the Alex® groups.

Incidence of IOP increases of 6 to 9 mm Hg from baseline (number of patients and percentages)

	Duration of treatment		
	Day 7	Day 14	Day 28
Alex®			
Study-A	6 (9%)	6 (9%)	8 (12%)
Study-B	3 (5%)	1 (2%)	4 (6%)
Placebo			
Study-A	0 (0%)	4 (6%)	1 (2%)
Study-B	0 (0%)	0 (0%)	0 (0%)

Due to the sample size for each arm of the two phase III studies in SAC, all events captured are greater than 1% of n.

SYMPTOMS AND TREATMENT OF OVERDOSAGE

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depict either common eye diseases associated with smoking (e.g., age-related macular degeneration or cataract) or communicate the experience of vision loss expected from these diseases (e.g., the impact of central vision loss with ARMD). Table 3 shows the most preferred graphic warning label features in the categories of ‘Eye Disease’, ‘Vision Impact’ and ‘Text Information’. It was very important to respondents that the graphic image be a plausible risk of smoking; for example, respondents objected to one ‘Eye Disease Graphic’ that appeared more illustrative of eye trauma than smoking. Optometrist O1-1, highlighted this concern, saying, “I think a lot of people smoking are going to go, ‘Yeah, right, like that’s going to happen to my eye if I smoke! Like give me a break!’”.

Numerous respondents voiced a concern that a majority of the public do not know enough about eyes, eye disease and the links to smoking; thus the graphic label must seem a plausible consequence of smoking despite most viewers having a limited knowledge of the eye and eye disease. The respondents felt that most people could recognize an obviously diseased lung or heart but few would recognize a photo of age-related macular degeneration or cataract. As O1-4 noted after looking at the four ‘Eye Disease Graphics’, “You know when a lay person looks at these pictures, half of the time they won’t recognize them”. In part, because of this lack of knowledge, more of the respondents preferred graphic warning labels that

showed smoking-induced impacts on vision rather than the related ocular pathology. As one optometry student noted looking at the preferred 'Vision Impact Graphic' (Table 2), "You're putting yourself in those eyes and saying, 'Oh, my God, I won't be able to see my loved ones'. And that hits home" (S3-4). Respondents also preferred text that included direct language, stats and incentives about reducing risk. As S3-2 argued, "I think if you want people to stop smoking you should provide them with the facts."

Respondents also placed a high priority on framing desirable messages. Interestingly, the optometrists and optometry students believed that graphic warning labels are largely intended to motivate quitting through scare tactics but they would rather motivate quitting through education and empowerment. For example, it should be important to those who smoke to know how much their risk of blindness is lowered by tobacco cessation. Numerous respondents indicated that different strategies were needed for youth (e.g., unable to drive a car) than seniors (e.g., unable to see grandchildren). Several respondents also felt that eye diseases seen predominantly in seniors (e.g., AMD, cataract) would not motivate youth to avoid or quit smoking and if there was an age cohort where scare tactics might be successful, it was the youth. As O2-4 noted, "Your older group would appreciate macular degeneration but not if you're targeting the young ones... So, I think you need to have multiple messages".

While optometrists may not have specific training in social judgment, message framing, and statistical heuristics deployed by health psychologists and public health experts, these focus group data show that optometrists have important ideas to contribute to this discussion. Many of the informants in this study supported the idea of having posters and other promotional materials in their practices, provided they judged the materials to be accurate, sensitive and suitable. Thus, if the tobacco control community begins to use eye health related messaging, it will be important to develop messages with which eye care professionals feel comfortable.

Implications

Consistent with studies of other countries, knowledge is low among Canadian smokers about the causal association of smoking and blindness. Further research is needed to identify the reasons for this limited knowledge; however, with, on average, only 1 in 7 Canadian smokers knowing about this link, there is a clear opportunity for increased patient education by optometrists, other healthcare practitioners and public health workers. Knowing both about the age at which smoking often starts⁴⁶ and its addictive qualities, optometrists should be routinely incorporating interview questions about smoking, starting with patients over 10 years of age. Tobacco use assessment should include the onset, the amount (e.g., number of cigarettes per day) and the type of tobacco use (e.g., smoking, chew, snuff), the interest

in quitting and past quit attempts. Tobacco dependence intervention by optometrists can help reduce the health consequences incurred with tobacco use. Toward this end, optometrists can contact their local public health department to learn more about tobacco cessation programs in their area and incorporate some of this information into their patient counseling, including contacts for the national and provincial quit lines.² Like other healthcare providers, optometrists can facilitate higher quit rates among smokers who learn about its health effects and cessation strategies. The 29 optometry participants in this study were clear in their conviction that optometrists should be at the table, helping to design effective educational tools linking smoking to blindness. The findings of this preliminary study may help inform the development of tobacco prevention and cessation tools and materials ultimately used by optometrists in their practices. Optometrists seem to want more of their patients to see the causal association of smoking and blindness, the ocular and systemic benefits of tobacco cessation, and informative, motivating eye health messages about tobacco use.

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Footnote

- i The 2008 Canadian study found tobacco users included those who used cigars (2.6%), chewing tobacco and snuff (0.5%), and pipes (0.4%).
- ii The national Smoker's Helpline can be contacted via its web-site (<http://www.smokershelpline.ca>) or phone line (1-877-513-5333). Provincial quit lines are listed on the Health Canada web-site (<http://www.hc-sc.gc.ca>), following the links: Home > Health Concerns > Tobacco > Quit Smoking > Quit Now > 1-800 Quit Lines).

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Table 1: Graphic Warning Label Features Discussed

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