Title page

**Migraine screening in primary eye care practice: current behaviours
and the impact of clinician education**

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Structured abstract

Background: Migraine is underdiagnosed and undertreated. Optometrists are primary eye care providers, who regularly encounter people with migraine as an incidental finding during routine eye examinations, or when patients present to rule out whether visual or ocular problems are contributing to headache symptoms. Knowledge and use of a migraine screening tool in optometric practice is therefore important to be able to identify and refer people with migraine for appropriate management.

Objective: We sought to investigate optometrists' current behaviours regarding screening for migraine, and to assess the effectiveness of an educational resource in promoting the use of a three-item validated migraine screening questionnaire, the ID-Migraine.

Methods: We first conducted a cross-sectional study using an electronic survey to assess optometrists' current knowledge and behaviours about migraine screening and willingness to participate in a pilot implementation program. Participants who provided their contact details were invited to watch an online educational resource about a validated migraine screening tool. After six weeks, these participants were invited to participate in a follow-up cohort study involving a survey to assess the effectiveness of the educational resource.

Results: Ninety-eight optometrists completed the initial survey as part of the cross-sectional study. We found that most optometrists actively asked patients about migraine (79/98 respondents, 81%) as part of routine eye examinations and self-rated themselves as confident in identifying migraine (71/98 respondents, 72%). However, the majority (90/98 respondents, 92%) were not aware of any validated migraine screening tools. Seventy-eight respondents provided their contact details to receive information about the subsequent cohort study. In response to the follow-up study survey (31/78 participants, 40%), 45% (14/31 respondents) of participants self-reported using the ID-Migraine tool after watching our educational video,

and most of these participants (12/14 respondents, 86%) were likely or extremely likely to continue to use the tool in their practice.

Conclusions: From our initial cross-sectional survey, we conclude that optometrists do not currently use validated screening tools for migraine and as such, there is an opportunity for continuing professional development in this area. Our follow-up cohort study demonstrates that educating optometrists on the importance and utility of a validated migraine screening tool is achievable with a relatively simple, low-time investment intervention (an online educational video). Such education may result in improved identification of migraine, which may lead to improved management.

Introduction

Migraine is a primary headache disorder affecting about 15% of the population.¹ Migraine has a considerable social, economic, physical and emotional burden on individuals, communities and health systems, but remains underdiagnosed and undertreated. Less than half of current migraine sufferers have ever been formally diagnosed^{2, 3} or consult their general practitioner about their migraines,² and only one-third receive appropriate treatment with migraine-specific prescription medications.⁴ People with migraine typically present in primary healthcare settings,^{3, 5} with most remaining in primary care rather than being treated at tertiary or specialised headache clinics.⁵ Previous studies have investigated the feasibility and effectiveness of different clinician education modalities (e.g. face-to-face continuing medical education, distribution of resources, multifaceted workshop/lecture/supervised practice approach) to improve migraine diagnosis and management in primary care,⁶⁻⁸ showing variable degrees of success with clinician education. These studies, however, have exclusively involved primary care physicians (e.g. general medical practitioners).

Optometrists are primary healthcare clinicians who are likely to encounter people with migraine as part of routine eye examinations,⁹ because of the prevalence of migraine and because visual symptoms often occur during attacks (e.g. blurred vision, visual aura)¹⁰. People with non-specific headache symptoms also regularly present to optometrists for consultations to ascertain whether or not visual system problems are contributing to their headache susceptibility or severity. Optometrists are therefore ideally placed to recognise that a person is suffering from migraine, as a specific primary headache disorder, and to differentiate their symptoms from other vision and ocular related aetiologies (e.g. eye strain, ocular pain, systemic disease with ocular manifestations, inappropriate refractive correction).

Optometrists may also play an important role as primary healthcare providers by identifying and referring people with migraine for appropriate management. Identification of migraine in an individual for the first time can support the initiation of referral for treatment, with treatment potentially leading to improved quality of life (e.g. see clinical trials of pharmacological management of migraine^{11, 12}). The ability to manage migraine depends on an accurate migraine diagnosis. To screen for migraine, short validated questionnaires that are quick to administer and interpret (e.g. the ID-Migraine¹³) have been recommended for healthcare professionals to identify migraine in primary care settings.¹⁴ To date, no study has formally evaluated whether optometrists use a validated screening tool for identifying migraine. The first part of our study was designed to investigate the hypothesis that optometrists do not currently use migraine screening tools in their clinical practice. We also hypothesised that optometrists would be willing to engage in education about the use of a validated migraine screening tool. The second part of our study (a follow-up cohort study) involved an assessment of the effectiveness of an online continuing professional educational resource for optometrists about a validated migraine screening tool. We hypothesised that

optometrists would incorporate the migraine screening tool into their clinical practice after exposure to the online educational resource.

Methods

Participants and informed consent

Ethics approval was granted by The University of Melbourne Human Research Ethics Committee (ID #1953530), and the protocol adhered to the tenets of the Declaration of Helsinki. Participants were invited to participate in a cross-sectional study about migraine screening (initial survey) followed by a cohort study to evaluate an online educational resource about migraine screening (follow-up survey). The target population was a convenience sample of currently practising optometrists. The initial cross-sectional survey was intended to be distributed to qualified, practising optometrists in Australia (n=5,791, <https://www.optometryboard.gov.au/About/Statistics.aspx>). To achieve a margin of error (which reflects how much the survey results can be expected to reflect the views of the overall population) of 10% from a total population size of 5,791 optometrists, with a confidence level of 95%, a sample size of n=95 was required.

Prior to entering either survey, the first page contained explanatory information about the study where participants were advised of the length of the time of the survey, which data were stored, where and for how long, who the study investigators were, and the purpose of the study. Participants gave their informed consent to participate in each part of the study (initial and follow-up survey separately) by ticking a box after reading the study information. Personal identifiable information (i.e., names and contact email addresses) was only collected if participants opted in at the relevant survey sections (e.g., to be contacted to receive further

information about the second part of the study). This information was only available to the study investigators by password protected data spreadsheets.

Survey development and pre-testing

The cross-sectional and follow-up surveys were developed specifically for this study and were pre-tested by non-participants (students and research laboratory members of the study investigators, including non-optometrists) to determine their estimated duration for completion and to undergo face validity assessment. Surveys were assessed for question format, wording and order, visual layout, and ambiguity in interpretation. To confirm usability and technical functionality of the electronic versions of the questionnaires, a private link was sent to pre-test participants. The hardcopy versions of the surveys were also tested for duration and usability in paper format.

Survey recruitment, design and administration

Initial contact with potential participants was made electronically using advertisements via an online departmental newsletter, online optometry professional association news publication (Optometry Australia news), and relevant community groups on social medial channels (e.g., Facebook pages of optometry department alumni groups, optometric professional associations, optometry peer support groups). Potential participants were also advised of the project in person at a Department booth at the largest Australian optometry education conference ('O=MEGA', Melbourne, July 2019). In addition, participants were able to distribute the survey link via their personal and professional networks. Continuing professional development is mandatory in Australia; as an incentive for participation, potential participants were advised that completion of both parts of the study (including

watching the educational resource) would enable them to receive continuing professional development points, as an independent learning activity.

Participants completed the study between July and November 2019. Participants could complete the surveys in hardcopy form at the continuing education conference, which were collected by the study investigators, or by web-based data entry via Qualtrics e-survey links (automated method for capturing responses). The surveys were open for each visitor to the designated site (via an anonymous link, both surveys), or for each participant who handed in their hardcopy of the completed survey to the study investigators (initial survey only). Although both surveys were open, completion of the follow-up survey required a unique identifier to be entered (pre-selected by the researchers after completion of the initial survey) so that demographic information could be matched between the initial and follow-up surveys. The surveys were voluntary and participants could opt-out at any time by not completing the survey/s.

The order of the survey questions was consistent for all participants (see Appendix S1 for the initial survey and Appendix S2 for the follow-up survey). However, to minimise bias for questions where participants had to rank order their preferences from a list (question 18, Appendix S1) or choose their level of agreement for each statement (questions 3 and 13, Appendix S2), we randomised the order in which the statements/options appeared for each participant. Adaptive questioning was implemented such that certain items were conditionally displayed based on responses to previous items to reduce the number and complexity of the questions. In the online versions, survey questions were limited to a maximum of five items per page, distributed over a maximum of six pages. The questions of the hardcopy version of the initial survey were continuous across four pages. Completeness of all mandatory items

was checked after the questionnaire was submitted. As can be seen in Appendix S1 and S2, all mandatory items in the surveys required selection of one response option only, unless otherwise indicated. Respondents were not able to review or change their answers once the survey questions on each page were completed.

Initial survey

The first survey was a self-administered questionnaire consisting of 20 items, taking approximately six minutes to complete (Appendix S1). The questionnaire consisted of the following sections: (1) Practitioner demographics (Questions 1-7, quantitative and qualitative data); (2) Current knowledge and behaviours regarding migraine screening (Questions 8-16, quantitative and qualitative data); (3) Preferences regarding receiving continuing professional education about migraine (Questions 17-19, qualitative data); and (4) Preferences regarding receiving a summary of the results of the study (Question 20, qualitative data). Surveys were considered complete and included in the data analysis if all items up to and including Question 17 were answered. Question 18 was designed to collect data about preferred methods for receiving continuing professional education for future planning purposes; hence that data was not considered critical for answering our research questions. Questions 19-20 were designed to collect opt-in contact information from the participant and not reported herein; as such, survey answers were not necessarily anonymous if these questions were completed.

Educational resource

Participants in the initial survey were invited to participate in a pilot implementation program, which involved watching an educational resource about a validated migraine screening tool, the ID-Migraine,¹³ and completing a follow-up survey. The educational

intervention was in the form of an online video (hosted on the departmental Vimeo page at <https://vimeo.com/dovs/id-migraine>) of approximately five minutes' duration. Participants could access the video any number of times. The full transcript to the video is provided in Appendix S3.

Follow-up survey

After six weeks and two email reminders encouraging participants to watch the educational resource, a follow-up survey was sent to all participants in the pilot implementation program. The follow-up survey consisted of 14 questions (Appendix S2), taking approximately five minutes to complete. The questions were designed to ascertain the following information in sections: (1) Participant engagement with the educational resource (Questions 1-2, quantitative and qualitative data); (2) Feedback about the educational resource in terms of content, delivery and what was learned (Questions 3-5, qualitative data); (3) Use of the migraine screening tool (Questions 6-8, quantitative and qualitative data); (4) Behaviours regarding migraine screening since watching the educational resource (Questions 9-12, qualitative data); (5) Possible reasons why the tool was not implemented in optometric practice (Question 13, qualitative data); and (6) Preferences regarding receiving a summary of the results of the study (Question 14, qualitative data).

Data analysis

This was the primary analysis of these data. The data collected for the study was the first of its kind and not analysed elsewhere. Survey responses were collated by a single co-investigator (author SS) who was not involved in the initial development or implementation of the surveys. Descriptive statistics were calculated for quantitative survey data (number of responses, proportion of responses, median, interquartile range). For the initial cross-

sectional survey (Appendix S1), age, years in optometric practice and hours per week in clinical optometric practice were discrete ratio data and were described using median and interquartile range. Similarly, for the follow-up survey (Appendix S2), the number of times the educational video was watched, and the reported use of the migraine screening tool, were discrete ratio data and summarised using median and interquartile range. All other questions resulted in ordinal data (Likert scale). Text-based, open-ended answers were analysed thematically by a single co-investigator (author BNN) by manually coding individual survey question answers into distinct labels to describe the content, and then collating similar codes into themes for qualitative analysis.

While we hypothesised that optometrists do not currently use validated screening tools for migraine, optometrists (similar to other health professionals) can make judgments about whether a person is likely to have migraine using other means (hence the inclusion of Question 16b in the initial cross-sectional survey, see Appendix S1). It was therefore of interest, as a sub-analysis of the demographic data, to predict which factors may influence an optometrists' confidence in identifying migraine. For example, a lack of confidence might be associated with willingness to learn about a migraine screening tool to assist with clinical decision-making, or vice versa, which would impact on the success of our pilot implementation program. Univariate and multiple ordinal logistic regression analyses using several predictors were therefore performed to assess predictive factors for optometrists' confidence in identifying migraine using IBM SPSSTM (IBM SPSS, version 21.0, Armonk, NY, USA). A forced entry method was used to include the predictors derived from our demographic data (gender, years of optometric practice experience, principal practice type, frequency of clinical care to patients who specifically report a history of migraine, self-reported history of migraine, frequency of asking patients about a history of migraine,

frequency of referral of migraine patients to a general practitioner, awareness of the International Classification of Headache Disorders for the diagnosis of migraine). Multicollinearity in multiple regression (a high degree of correlation between two predictors) was not present in our model, as confirmed by a variance inflation factor of less than 2 across all predictors. For the regression analyses, the dependent variable was on an ordinal scale. The ordering was determined by sorting the values of the dependent variable in ascending order. The lowest value defined the first category. For the independent variable, the factor used as a reference was coded as the highest value, followed by consecutive descending numbering of the other factors. A p value of less than 0.05 was considered statistically significant for the two-tailed regression analysis tests.

Results

Initial cross-sectional survey response rate

In total, 108 participant responses to the initial cross-sectional survey were recorded. Of these, 10 responses were incomplete (7/10 response or 70% of the incomplete responses did not move past the consent page; the remainder of partially complete survey responses did not complete all mandatory items) and were therefore excluded from the analysis. The final sample size of $n=98$ respondents represents approximately 2% of the total population size of registered, practising optometrists in Australia ($n=5,791$). Actual response rates derived from the number of surveys sent out could not be estimated as most surveys were completed online via an open, anonymous link in response to recruitment across several social media webpages, with a small proportion completed in hardcopy form (3/98 respondents, 3%) in response to an open advertisement at the continuing optometric education event. The first survey completion rate was 98/108 respondents or 91% (ratio of users who finished the survey/users who agreed to participate), which amounted to an attrition rate of 9%. As we did

not have an automated means to reliably confirm the number of unique site visitors, we confirmed *post hoc* that no two IP addresses were the same. While this does not rule out the possibility for multiple entries from the same individual, we consider this prospect to be unlikely given that no two survey responses were the same and that for the majority of respondents (81/98 respondents, 83%), we were able to collect unique contact information (in response to Questions 19 and 20) to verify an individual's survey response was not duplicated.

Participant demographics

Median age of the 98 initial cross-sectional survey respondents was 32 years (interquartile range [IQR]: 15 years). Median years of optometric practice and hours per week in clinical practice were 6 years (IQR: 14 years), and 35 hours (IQR: 18 hours), respectively. The breakdown in participant demographics is shown in Table 1. Most respondents worked in corporate (46/98 respondents, 47%) or independent (32/98 respondents, 33%) community optometry practice. The majority of participants were female (80/98 respondents, 82%), therapeutically endorsed to prescribe topical medications (80/98 respondents, 82%), completed their optometry training in Australia (84/98 respondents, 86%), and had been in optometric practice for 20 years or less (79/98 respondents, 81%). Eighty-eight percent of practitioners (86/98 respondents) reported providing clinical care to patients presenting with any type of headache at least once per week. Specifically, 76% (74/98 respondents) of optometrists surveyed thought that they provided clinical care to patients with migraine at least once per week. Forty-four percent (43/98 respondents) self-reported a history of migraine, compared to 52% (51/98 respondents) who reported never having experienced migraine before, and 4% (4/98 respondents) not knowing whether they had previously experienced a migraine.

298

299 *Current optometric behaviours regarding migraine diagnosis*

300 We first determined whether optometrists self-reported actively asking whether their patient
301 has a history of migraine as part of a routine eye examination. Figure 1 shows that less than
302 20% of survey respondents reported rarely (17/98 respondents, 17%) or never (2/98
303 respondents, 2%) asking a patient about a history of migraine, indicating that optometrists
304 typically actively enquire about migraine at least some of the time. In general, the
305 optometrists surveyed self-reported that they felt confident about identifying migraine; 72%
306 (71/98 respondents) reported being very or somewhat confident (Figure 2), despite most not
307 being aware of the International Classification of Headache Disorders for the diagnosis of
308 migraine (61/98 respondents, 62%) nor any validated screening tools for migraine (90/98
309 respondents, 92%).

310

311 The majority of respondents (93/98 respondents, 95%) reported not currently using a
312 validated screening tool for migraine, and instead relied on a range of techniques for
313 ascertaining whether a patient might have migraine. For those who did not report the current
314 use of a validated screening tool for migraine (n=93), a conditional open-ended, text-based
315 question appeared (“How do you determine if a patient may have migraine?”). These were
316 thematically coded so that the dominant theme of each response counted as a unique code.
317 All but one respondent answered this non-mandatory question (n=92), and indicated that
318 optometrists most commonly asked about symptomatology (59/93 respondents, 64%) or
319 patient demographics such as age, gender and/or family history (14/92 respondents, 15%).
320 Less commonly, the optometrists surveyed relied on a previous physician’s diagnosis of
321 migraine, or referral to a physician for diagnosis (8/92 respondents, 9%), patient’s self-report
322 of migraine (7/92 respondents, 2%), or the International Classification of Headache

Disorders¹⁰ (2/92 respondents, 2%) to ascertain whether a patient may have migraine. Only one participant (1/92 respondents, 1%) reported using the Migraine Screen Questionnaire,¹⁵ which is an alternative migraine screening tool but was not the focus of our educational resource.

Predictive factors for confidence in identifying migraine

Table 2 summarises our sub-analysis of the demographic data investigating predictive factors for optometrists' confidence in identifying migraine. Goodness of fit was assessed using Pearson Chi-square tests to examine how well the predicted model matched the observed data. In the univariate analysis, the predicted model of all but one variable (frequency of provision of clinical care to patients who specifically report a history of migraine: $\chi^2(6)=16.73$, $p=0.010$) matched the observed data. This variable was therefore removed from the univariate and multiple regression analysis. Taken together, the univariate analysis showed that optometrists were more likely to be confident about identifying migraine if they had more than 10 years' experience as a clinician (odds ratio, OR 3.71, 95% CI 1.59 to 8.67, $p = 0.002$), if they always referred patients with migraine to a general practitioner (OR 4.4, 95% CI 1.00 to 19.1, $p = 0.050$), or if they were aware of the International Classification of Headache Disorders for the diagnosis of migraine (OR 3.16, 95% CI 1.37 to 7.3, $p = 0.007$). For the multiple regression analysis, the data and model predictions were similar (goodness of fit $\chi^2(40)=51.60$, $p=0.103$) and confirmed that all three factors identified in the univariate analysis (years of experience, referral to general practitioner, awareness of the diagnosis guidelines) remained statistically significant predictors of clinician confidence in identifying migraine (Table 2, $p < 0.05$ for all comparisons).

Pilot implementation program and continuing professional education

Of the 98 initial survey respondents, the majority expressed interest in receiving continuing professional development education about migraine (90/98 respondents, 92%). Following on from this question, a non-mandatory question appeared where participants were asked to rank the top three methods for receiving continuing education from a randomised list of options. Of the respondents who answered this question (n=88), the most preferred method (ranked first) to receive education were through digital and online resources (i.e. webinars: 30/88 respondents, 34%; information packs by email: 17/88 respondents, 19%; opportunities to download educational material from a website: 10/88 respondents, 11%) and face-to-face education (i.e. optometric continuing education meetings and conferences: 17/88 respondents, 19%). The top-ranked methods that were less commonly preferred were via a smartphone application (6/88 respondents, 7%), opportunities for direct contact with headache physicians (4/88 respondents, 5%), online forums to discuss cases with peers (2/88 respondents, 2%) or information packs by mail (2/88 respondents, 2%).

Eighty-three percent (81/98 respondents) of optometrists were interested in receiving information by email about an online educational video specifically regarding a validated screening tool for migraine, and to participate in the pilot implementation program. In total, we sent emails to 78 interested participants that included the link to our online educational video, with two email reminders within six weeks.

Follow-up survey about the educational resource

For the follow-up study, no two survey responses were from the same individual as a unique participant identifier was entered as part of the survey questions. Thirty-one of 78 participants completed the follow-up survey, representing a 40% response rate. The distribution of participant demographics for those who completed the follow-up survey

(Table 3) was similar to the initial survey, including participants' principal type of optometric practice, years of optometric practice experience, and personal history of migraine. The median number of times the educational resource was watched, according to self-report, was 1 (interquartile range = 1).

Overall, the feedback about the educational resource was positive. In response to the mandatory question 3 (see Appendix S2, "To what extent do you agree with the following statements?"), participants were asked to rate their agreement (on a five-point Likert scale) in response to each statement (in randomised order) about the educational video. Responses were coded as 'in agreement' if 'Agree' or 'Strongly Agree' was selected. Eighty-eight percent (27/31 respondents, 87%) agreed that the educational video was informative, worth their time watching and that the content of the video was appropriate for their level of knowledge. Most participants also agreed that after watching the educational video, they felt equipped to use the ID-Migraine screening tool on patients in their clinical practice (24/31 respondents, 77%), and would recommend for other optometry colleagues to watch the educational resource (22/31 respondents, 71%).

Our main indicator of behaviour change post-educational intervention was uptake of the migraine screening tool. Fourteen of 31 participants (45%) self-reported using the ID-Migraine tool since watching the educational video, with the frequency of use ranging from once in four weeks (0.25 times/week) to five times per week (median [interquartile range] = 1.25 [2.25] times/week). Of those participants who used the ID-Migraine tool (n=14), the majority (12/14 respondents, 86%) were likely or extremely likely to use the tool again in their clinical practice. For most clinicians who reported using the tool, the number of self-reported referrals to general practitioners regarding patients with migraine stayed the same

(12/14 respondents, 86%) after implementation of the screening tool into their practice, whereas for the remaining two respondents (2/14 respondents, 14%) there was a self-reported increase in the number of referrals. On the other hand, the number of referrals stayed the same for the optometrists who did not report using the ID-Migraine tool (neither increased nor decreased, 17/17 respondents, 100%). Whether the clinician self-reported a history of migraine in the first cross-sectional survey did not significantly influence implementation of the tool in clinical practice; of the 13 participants with a history of migraine who completed the follow-up survey, six participants (6/13 respondents, 46%) reported using the tool and seven participants (7/13 respondents, 54%) did not.

Perceived barriers to the implementation of a migraine screening tool in optometric practice

To explore perceived barriers to the implementation of a migraine screening tool in optometric practice (Table 4), we presented a series of 12 randomly ordered statements that alluded to possible reasons why participants did not implement the ID-Migraine tool (without asking the question directly). The statements appear in Appendix S2. Only participants who did not self-report using the ID-Migraine screening tool after watching the video (n=17) were asked to answer all questions and rate (using a five-point Likert scale) their agreement with each statement (“To what extent do you agree with the following statements?”). Hence, we were not asking for a unique reason for not incorporating the migraine screening tool into clinical optometric practice, but aimed to explore multiple possible barriers to implementation in the same individuals. Answers were coded as ‘in agreement’ if the participant responded with ‘Agree’ or ‘Strongly Agree’. Participants most commonly agreed with the statement “I forgot to use the migraine screening tool” (9/17 respondents, 53%). The next statements with which participants most commonly agreed were: “I did not incorporate the migraine screening tool into my clinical practice because it is not a mandatory

requirement for optometrists” (7/17 respondents, 41%) and “I would like to know more about migraine and headache before I decide to incorporate a migraine screening tool into my clinical practice” (6/17 respondents, 35%). None of the survey respondents agreed with the following statements: “Incorporating a migraine screening tool into my clinical practice would warrant a higher fee for service”, “The use of a migraine screening tool is an unnecessary burden for my patients”, and “Incorporating a migraine screening tool is outside the scope of optometric practice.”

Discussion

Our study is the first to investigate the current knowledge and behaviours of eye care clinicians (specifically, optometrists) as related to the screening of migraine in primary eye care practice. Optometrists are primary healthcare providers who regularly encounter people with migraine as part of routine clinical practice.⁹ Indeed, the optometrists surveyed here identified frequently providing care to patients with migraine but were not aware of, and therefore not using, validated migraine screening tools. The main outcome of our research study was self-reported behaviour change in the implementation of the ID-Migraine¹³ screening tool in 45% of optometrists, following exposure to an online educational resource about screening for migraine in primary eye care practice. Our main outcome measures were captured by surveys. We acknowledge that the surveys used in this study have not undergone a formal reliability assessment to determine the extent to which the same results would be observed if the measurement were to be taken again under the same conditions. Both the cross-sectional and follow-up surveys were pre-tested by non-participants to determine the estimated duration for completion, as well as to confirm usability and assess face validity. As such, we consider that our survey design adequately provided a consistent data collection experience for all survey respondents with unambiguous wording of questions.

448

449 According to our baseline survey, many optometrists felt confident in identifying migraine,
450 based primarily on patient symptomatology, clinical history and demographic information.
451 However, counter to this finding, most respondents were unaware of validated migraine
452 screening tools that could assist in migraine screening in primary care, and were motivated to
453 learn more about it and participate in our pilot implementation program. A previous survey of
454 primary care physicians in Switzerland¹⁶ demonstrated that approximately three-quarters (255
455 of 350 participants) of survey participants expressed an interest in further education about
456 headache, with half of the group providing their email address to receive further information.
457 We achieved a similar, slightly higher, degree of participation in the current optometrist
458 cohort (80%). This may be due to the ability for optometrists to claim compulsory continuing
459 professional development points (as a self-directed learning activity), which was not
460 explicitly offered by previous survey studies.¹⁶ Our high degree of participation in the study
461 may also be, at least in part, due to the higher-than-expected self-reported history of migraine
462 (43/98 respondents, 44%) in initial survey respondents (and 13/31 respondents, 42%, with
463 history of migraine in the follow-up survey) relative to the general population prevalence of
464 ~15%¹, which may have introduced a selection bias towards participation in a migraine-
465 related survey. Those who are more knowledgeable on or interested in the topic of migraine
466 may be more likely to contribute than those who are not. Similarly, while only a minor
467 proportion of our recruitment occurred at a face-to-face optometric continuing education
468 event (3/98 respondents, 3%), it is possible that people who attend such events are more
469 likely to be receptive to a research study with an educational focus. Whilst we acknowledge
470 the potential for such selection biases, the avenues selected to distribute the survey (via
471 general professional Facebook groups for optometrists, nation-wide optometry-related
472 newsletters, and non-subspecialty optometric continuing education events) were intentionally

chosen to capture the attention of clinicians with a diversity of expertise and interest and not from a certain segment of the profession (i.e., members of a specific optometric special interest group).

The current study demonstrates that optometrists, as primary care clinicians, can be educated using online methods about the importance and utility of a validated screening tool for migraine to assist in detecting undiagnosed cases of migraine. Clinical guidelines, such as the Migraine in Primary Care Advisors guidelines in the United Kingdom,¹⁷ recognise the importance of adopting a team approach to primary care management of migraine, and explicitly acknowledge the role of community nurses, pharmacists, dentists and optometrists as primary care professionals in migraine management. Optometrists already frequently write patient reports to general practitioners as part of their routine clinical practice, and may be able to contribute to alleviating the public health burden by identifying migraine sufferers and providing advice to patients about consulting their general practitioners. However, no study to date has considered migraine education specifically for optometrists. Our study provides evidence, by self-report, of short-term clinical uptake of the tool amongst participants after watching a brief educational video (approx. 5 minutes duration). We do not have data on whether this self-reported behaviour change was maintained for longer than six weeks, as long-term follow-up fell outside the scope of the study. Nevertheless, the majority of respondents self-reported being likely or extremely likely to continue using the tool. These data reinforce the potential to support practice change through effective continuing professional development and training.

The current project is beneficial for improving understanding of optometrists' knowledge, beliefs and behaviours about screening for migraine, which may assist with the future design

of education programs to improve headache differentiation practices in eye care settings. Our chosen form of continuing professional educational resource for optometrists was effective in achieving 45% uptake of the ID-Migraine questionnaire as a validated migraine screening tool for primary care clinicians. Given the alternative hypothesis that none of the optometrists would self-report use of the tool after watching the video, we consider this finding to be of practical significance in the clinic. We opted to create an online video because a previous systematic review investigating medical education found that live media was more effective than print material,¹⁸ although having educational materials in audiovisual form does not necessarily lead to a positive outcome on continuing healthcare education.¹⁹ We also sent email reminders¹⁹ and encouraged participants to watch the video more than once, because of the positive reinforcing effect of multiple exposures.¹⁸ Further research is required to ascertain and develop interventions for practitioners who were not receptive to this form of intervention.

In our study, the observed inter-individual variation in implementation of the ID-Migraine¹³ may be attributable to an individual's readiness to change, including the clinician's ability to diagnose migraine using existing, viable methods and their initial perceived confidence in migraine identification. Note that perceived confidence was self-reported in this study and it was not the intent of this study to validate competence relating to correct identification of migraine. It is possible that our educational resource, focussed on the ID-Migraine tool, could be more effective in a different clinical setting, particularly among clinicians who are not already trained to recognise migraine, or perhaps earlier in the education of clinicians (such as during their tertiary training). While our educational video was created by optometrists for a target audience of practicing optometrists, the video is widely accessible and could be

minimally altered (see transcript, Appendix S3) to train students and other allied health professionals who do not routinely enquire about migraine.

We were motivated to undertake the current study to consider whether optometrists have capacity to contribute to recognising and referring undiagnosed migraine. Such skills would add to the pool of available primary healthcare practitioners at the ‘frontline’ of headache screening and ideally increase the prevalence of migraine identification, with appropriate subsequent referral for management. While not a key outcome measure of our study, we provided advice in our educational video that if migraine was identified using the ID-Migraine tool, that referral for formal diagnosis and ongoing care and management by a general practitioner may be appropriate. We did not find evidence for a significant increase in the self-reported referral of migraine patients by optometrists to general practitioners after the use of the ID-Migraine tool. However, it is difficult to know how our survey respondents interpreted the meaning of ‘referral’ (i.e., a verbal recommendation at the end of a consultation or a written letter to the general practitioner with clear instructions to make an appointment). Our study also did not address whether optometrist referrals for migraine were accurate, which may be a topic of future research.

Another line of future research and healthcare implementation relates to how optometrists and other primary care providers can assist in improving the current situation of undertreatment of migraine. Inadequate migraine management may not necessarily stem from failure to achieve a diagnosis, but a deficit in understanding the need for treatment based on migraine severity and disability.²⁰ Future continuing education of primary healthcare professionals could focus on the importance of reducing the burden of migraine with appropriate treatment, by including information and training about the function and quality of

547 life of people with migraine, such as the Headache Impact Test²⁰ and Migraine Disability
548 Assessment (MIDAS) questionnaire.²¹ Even though optometrists do not manage migraine
549 treatment *per se*, being able to identify that current treatment, or lack thereof, is suboptimal
550 and to then initiate referral to an appropriate medical practitioner is an important step towards
551 ensuring that people with migraine receive the care they need.²²

552

553 **Conclusions**

554 Many of the optometrists in this study were not aware of resources for primary healthcare
555 providers to screen effectively for migraine. We demonstrate the feasibility of educating
556 optometrists, as primary care clinicians, on the importance and utility of a validated migraine
557 screening tool with a relatively simplistic, low-time investment intervention. Such education
558 may result in improved identification of migraine amongst primary eyecare clinicians, which
559 may in turn lead to improved management of migraine sufferers.

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Figure legends

Figure 1. Frequency of optometrists who self-reported actively asking whether a patient has a history of migraine (n=98 survey respondents)

Figure 2. Self-rated confidence of optometrists regarding migraine identification (n=98 survey respondents)

Table 1. Initial cross-sectional survey participant demographics

Characteristic (<i>n</i> = 98)	Number of responses (%)
Gender	
Male	18 (18)
Female	80 (82)
Other	0 (0)
Completed optometry training in Australia	
Yes	84 (86)
No	14 (14)
Endorsed to prescribed scheduled topical medicines	
Yes	80 (82)
No	18 (18)
Principal type of optometric practice	
Academic	10 (10)
Corporate practice	46 (47)
Hospital clinic	0 (0)
Public health clinic	6 (6)
Private (independent) practice	32 (33)
Refractive surgery clinic	2 (2)
Other *	2 (2)
Years of optometric practice experience	
0-5	45 (46)
6-10	15 (15)
11-15	13 (13)
16-20	6 (6)
21-30	11 (11)
31-40	7 (7)
41-45	1 (1)
Hours currently working in optometric practice per week	
< 10	11 (11)
10 – 30	28 (29)
31 – 50	58 (59)
> 50	1 (1)
Personal history of migraine	
Yes	43 (44)
No	51 (52)
Don't know	4 (4)

*Other = locum optometrist, corporate supplier

Table 2. Factors that predict confidence amongst optometrists in diagnosing migraine

Factors	Univariate analysis		Multiple regression analysis	
	OR (95% CI)	P value	OR (95% CI)	P value
Gender				
Male	Reference			
Female	0.374 (0.136 – 1.03)	0.057		
Years of optometric practice experience				
≤ 10 years	Reference		Reference	
>10 years	3.71 (1.59 – 8.7)	0.002	5.7 (2.32 – 14.0)	<0.001
Principal practice type				
Academia	Reference			
Corporate practice	0.97 (0.242 – 3.90)	0.968		
Private (independent) practice	3.52 (0.80 – 15.6)	0.097		
How often do you provide clinical care to patients who specifically report a history of migraine?				
Once a month	Reference			
At least once a day	1.01 (0.259 – 3.91)	0.992		
More than once a week	2.67 (0.89 – 8.0)	0.079		
Once a week	1.54 (0.47 – 5.0)	0.477		
Do you suffer/have you previously suffered from migraine yourself?				
No	Reference			
Yes	2.18 (0.98 – 4.8)	0.056		
How often do you refer patients with migraine to a general practitioner?				
Rarely	Reference		Reference	
Always	4.4 (1.00 – 19.1)	0.050	5.4 (1.12 – 26.3)	0.036
Very often	1.94 (0.60 – 6.3)	0.270	3.15 (0.93 – 10.7)	0.066
Sometimes	1.15 (0.354 – 3.75)	0.814	1.44 (0.43 – 4.9)	0.554
Are you aware of the International Classification of Headache Disorders for the diagnosis of migraine?				
No	Reference		Reference	
Yes	3.16 (1.37 – 7.3)	0.007	3.46 (1.42 – 8.4)	0.006

Table 3. Follow up survey participant demographics

Characteristic (n = 31)	Number of responses (%)
Gender	
Male	6 (19)
Female	25 (81)
Other	0 (0)
Completed optometry training in Australia	
Yes	27 (87)
No	4 (13)
Endorsed to prescribed scheduled topical medicines	
Yes	27 (87)
No	4 (13)
Principal type of optometric practice	
Academic	2 (6)
Corporate practice	12 (39)
Hospital clinic	0 (0)
Public health clinic	2 (6)
Private (Independent) practice	13 (42)
Refractive surgery clinic	2 (6)
Other *	0 (0)
Years of optometric practice experience (years)	
0-5	11 (35)
6-10	4 (13)
11-15	6 (19)
16-20	1 (3)
21-30	3 (10)
31-40 years	5 (16)
41-45 years	1 (3)
Hours currently working in optometric practice per week	
< 10	3 (10)
10 – 30	12 (39)
31 – 50	16 (52)
> 50	0 (0)
Personal history of migraine	
Yes	13 (42)
No	17 (55)
Don't know	1 (3)

*Other = locum optometrist, corporate supplier

Table 4. Perceived barriers to implementing the migraine screening tool into optometric practice. The statements are shown in Appendix S2. Survey respondents selected one answer from the five-point Likert scale for each statement. Number of responses = number of participants who reported 'agreement' ('agree' or 'strongly agree') with the statements presented in the follow-up survey.

Reason	Number of responses (%)
Forgot to use	9 (53)
Not a mandatory requirement for optometrists	7 (41)
Need more information/training	6 (35)
Difficulty changing old routines	4 (24)
Not applicable to current practice	4 (24)
No added benefit to clinical practice	2 (12)
Lack of confidence	2 (12)
Time consuming	1 (6)
Prefer not to use standard protocols	1 (6)
Warrants a higher fee for service	0 (0)
Unnecessary burden for patients	0 (0)
Outside the scope of optometric practice	0 (0)

Appendix S1: Initial cross-sectional survey questions

Mandatory items for inclusion in analysis are marked by a *

1. *Age: [give integer number]
2. *Sex: (Select one option only)
 - a. Male
 - b. Female
 - c. Other
3. *Years in optometry practice: [give integer number]
4. *Average hours per week consulting in clinical optometric practice: [give integer number]
5. *Which of the following best describes your principal type of work: (Select one option only)
 - a. Academic
 - b. Corporate practice
 - c. Hospital clinic
 - d. Public health clinic
 - e. Private (independent) practice
 - f. Refractive surgery clinic
 - g. Other (please specify)
6. *Did you complete your optometry training in Australia? (Select one option only)
 - a. Yes
 - b. No. If no, please nominate your place of graduation.
7. *Are you endorsed to prescribe topical therapeutic medications? (Select one option only)
 - a. Yes

b. No

8. *On average, how often do you provide clinical care to patients presenting with (any type of) headache, as the main symptom? (Select one option only)

- a. At least once a day
- b. More than once a week
- c. Once a week
- d. Once a month
- e. Once in three months
- f. Never

9. *How often do you provide clinical care to patients who specifically report a history of migraine? (Select one option only)

- a. At least once a day
- b. More than once a week
- c. Once a week
- d. Once a month
- e. Once in three months
- f. Never

10. *Do you suffer/have you previously suffered from migraines yourself? (Select one option only)

- a. Yes
- b. No
- c. Don't know

11. *How often do you actively ask whether a patient has a history of migraine? (Select one option only)

- a. Always

- b. Very often
- c. Sometimes
- d. Rarely
- e. Never

12. *How confident are you in diagnosing migraine? (Select one option only)

- a. Very confident
- b. Somewhat confident
- c. Neither confident or unconfident
- d. Somewhat unconfident
- e. Very unconfident

13. *How often do you refer patients with migraine to a general practitioner? (Select one option only)

- a. Always
- b. Very often
- c. Sometimes
- d. Rarely
- e. Never

14. *Are you aware that there is an International Classification of Headache Disorders for the diagnosis of migraine? (Select one option only)

- a. Yes
- b. No

15. *Are you aware of any validated screening tools for migraine? (Select one option only)

- a. Yes
- b. No

16. *Do you use a validated screening tool for migraine? (Select one option only)

- a. Yes. If yes, please specify the name of the tool that you use (non-mandatory open text box).
- b. No. If no, how do you determine if a patient may have migraine? (non-mandatory open text box).

17. *Are you interested in receiving continuing professional development education about migraine? (Select one option only)

- a. Yes. *Please go to question 18.*
- b. No. *Please go to question 19.*

18. Through what methods would you prefer to receive migraine education? [Select your top 3 preferences in order of preference, where 1 is your most preferred option].

Optometric continuing education meetings and conferences

Opportunities for direct contact with headache physicians

Online forums to discuss cases with peers

Online webinar

Smartphone application

Information pack by mail

Information pack by email

Opportunities to download educational material from website

19. *Are you interested in receiving information by email about an online educational video about a validated screening tool for migraine, and to participate in a pilot implementation program worth 1 CPD point? (Select one option only)

- a. Yes.

Name

Email

- b. No

20. Are you interested in receiving a final report about the findings of this research study? (Select one option only)

- a. Yes. Please provide your name and email.
- b. No

Thank you for completing the survey.

Appendix S2: Follow up survey questions

Mandatory items for inclusion in analysis are marked by a *

1. *Did you watch the educational video about screening for migraine? (Select one option only)
 - a. Yes. If yes, how many times did you watch the video? [give integer number] *Please go to question 3.*
 - b. No. *Please go to question 2.*
2. *Please give at least one reason why you did not watch the educational resource: [open box for answer] *Please go to question 14.*
3. *To what extent do you agree with the following statements about the educational video: [Likert scale response of Strongly disagree, Disagree, Neither agree or disagree, Agree, Strongly agree] (Select one option only per statement)
 - a. The educational video was informative
 - b. The educational video was engaging
 - c. The educational video was clear
 - d. The educational video content was appropriate given my level of knowledge
 - e. The educational video was worth my time watching
 - f. After watching the educational video, I felt equipped to use the validated migraine screening tool with a patient
 - g. I would recommend for my optometry colleagues to watch this educational video
4. Do you have any other feedback about the content and/or delivery of the educational video? [open box for answer, or tick a box if no feedback to give]

5. What are the two most important things that you learned from the educational video?

[two open boxes for two answers, or option to tick a box if nothing was learned]

6. *Since watching the educational video, have you used the ID-Migraine screening tool in your practice with your patients? (Select one option only)

a. Yes. *Please go to question 7.*

b. No. *Please go to question 12.*

7. *Since watching the educational video, how many times have you used the ID-Migraine screening tool? [open boxes for answers] (Give integer number) times in (give integer number) weeks

8. *How likely are you to continue using the ID-Migraine screening tool in your clinical practice? (Select one option only)

a. Extremely likely

b. Likely

c. Neither likely or unlikely

d. Unlikely

e. Extremely unlikely

9. *Since watching the educational video, have your number of patient referrals to general practitioners regarding patients with migraine: (Select one option only)

a. Increased

b. Decreased

c. Stayed the same

10. *How confident are you in diagnosing migraine? (Select one option only)

a. Very confident

b. Somewhat confident

c. Neither confident or unconfident

- d. Somewhat unconfident
- e. Very unconfident

11. *Have you discussed this educational video with your colleagues? (Select one option only) *Please go to question 14.*

- a. Yes
- b. No

12. *Since watching the educational video, have your number of patient referrals to general practitioners regarding patients with migraine: (Select one option only)

- a. Increased
- b. Decreased
- c. Stayed the same

13. *To what extent do you agree with the following statements: [Likert scale response of Strongly disagree, Disagree, Neither agree or disagree, Agree, Strongly agree] (Select one option only per question)

- a. Incorporating a migraine screening tool into my clinical practice would warrant a higher fee for service
- b. Incorporating a migraine screening tool into my clinical practice would take up too much time
- c. The use of a migraine screening tool is an unnecessary burden for my patients
- d. There is no benefit in incorporating a migraine screening tool into my clinical practice
- e. A migraine screening tool is not applicable to me and my clinical practice
- f. I did not incorporate the migraine screening tool into my clinical practice because it is not a mandatory requirement of optometrists

- g. Incorporating a migraine screening tool is outside the scope of optometric practice
- h. I would like to know more about migraine and headache before I decide to incorporate a migraine screening tool into my clinical practice
- i. I have difficulty changing my old routines
- j. In general I do not prefer to use standard protocols
- k. I did not feel confident in using the migraine screening tool
- l. I forgot to use the migraine screening tool

14. Are you interested in receiving a final report about the findings of this research study?

(Select one option only)

- a. Yes [will be prompted to enter name and email address]
- b. No

Thank you for completing the survey.

Appendix S3: Educational video transcript

Hi, my name is Dr Bao Nguyen, optometrist and researcher, and one of my research areas of interest is in migraine. As you know migraine is a common headache disorder, affecting 10-15% of the population worldwide.

Migraine is the 7th highest cause of disability in the world. Specifically out of all neurological conditions, migraine is the most debilitating condition in terms of years of life lost to disability, more so than epilepsy, Alzheimer's and Parkinson's disease, and multiple sclerosis.

Part of the public health and economic burden of migraine is the fact that most sufferers are young and are of working age. For many migraine sufferers, it is a long and winding road in search of help. We know that barriers to effective care of migraine occurs on at least three levels:

1. Large epidemiological studies show that less than half of migraine sufferers have ever consulted a physician, and fewer than 20% of frequent migraine sufferers (who have more than 5 migraines in a month) had seen a healthcare professional.
2. Despite the prevalence, severity, and burden of migraine, it remains significantly under-diagnosed. Less than half of current migraine sufferers have ever received a medical diagnosis of migraine.
3. Fewer than 10% of migraine sufferers are deemed to receive adequate treatment. The majority of people with migraine self-medicate, and mostly ineffectively.

So, can optometrists play a role in improving screening for migraine?

In a typical working day, you as an optometrist might see 10-15 patients in your clinical practice. Given how common migraine is, it is likely that you will come across almost one person with migraine each day. Rather than relying on a person's self-report of migraine which can often be

wrong, optometrists, as primary health care providers, have an opportunity to identify migraine in the first instance, and refer patients to their GP for appropriate management.

The International Headache Society is the world's leading organisation for those with a professional commitment to helping people affected by headache. One of its most important roles is in the standardisation of headache diagnosis through the International Classification of Headache Disorders, which gives explicit diagnostic criteria for every disease entity.

While ideal for tertiary care, and physicians and researchers who specialise in headache disorders, the diagnostic criteria for migraine, as you can see, is very detailed and overly complex for use in primary care. So here we introduce a brief, 3-item screening instrument called 'ID-Migraine' that has been validated by experts and has sufficient sensitivity and specificity to be useful in a primary care setting.

Here's an example of what it might look like in practice:

Optometrist: So you've been getting headaches recently?

Patient: Yes

Optometrist: Well I'd like to know a little bit more about them. During the last 3 months, did you have the following with your headaches? Felt nauseated or sick to your stomach?

Patient: Yes

Optometrist: Did light bother you, a lot more than when you don't have headaches?

Patient: Yes

Optometrist: Did your headaches limit your ability to work, or study, or do what you needed to do?

Patient: Yes

In the original validation study of the ID-Migraine screening tool, scoring at least 2 out of 3 items gave a sensitivity of 81% and specificity of 75% for migraine diagnosis. These sensitivity and specificity values are on par with other medical screening tests, such as the Pap test for cervical cancer.

Because of the prevalence of migraine in the general population, the high sensitivity and specificity of the ID-Migraine screener translates into a very high positive predictive value of 93%, the probability that people with a positive screening test result truly have the condition, which indicates that the tool is particularly useful in a primary care setting.

However, it is important to remember that the ID-Migraine is a screening tool and not a diagnostic instrument. There is a false positive rate of 19%, which means that about one in five people with a positive result may not actually have migraine. Further medical evaluation is required to confirm the diagnosis, and so we recommend for patients who score at least 2 out of 3 on the ID-Migraine tool to be referred to their GP for further investigation, and management, as appropriate.

Now that you have seen how easy it is to screen effectively for migraine, we encourage you to implement the ID-Migraine screening tool into your everyday optometric practice when you routinely ask about headache, or when a patient has a presenting complaint of headache.

Note in your history taking that you have used the ID-Migraine screening tool, the score (how many yes answers out of three), and whether you have referred your patient to their GP for ongoing care.

If you need a reminder about the 3-item ID-Migraine screening tool, you can download a copy of the questions using the link below.

Minerva Access is the Institutional Repository of The University of Melbourne

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Title:

Migraine Screening in Primary Eye Care Practice: Current Behaviors and the Impact of Clinician Education

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