

An evaluation of Australian pharmacists' knowledge of glaucoma: Effectiveness of continuous professional development education events

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Abstract

Objectives: We aimed to determine the effectiveness of a series of Continuous Professional Development (CPD) seminars on glaucoma therapy for pharmacists and to identify potential gaps in knowledge.

Methods: We evaluated pharmacists' knowledge using a questionnaire distributed to pharmacists attending a glaucoma seminar conducted by the Pharmaceutical Society of Australia or the Society of Hospital Pharmacists of Australia, in conjunction with Glaucoma Australia, before (pre-test) and after (post-test) each seminar. The seminars were conducted at seven locations in Australia and there were 138 respondents.

Results: Of the 138 pre-test and 124 post-test responses around Australia, there were 105 matched-pairs. Overall, the seminar significantly improved post-test responses compared with pre-test responses (Wilcoxon Matched Pairs test, $p < 0.05$), except for one case-based question.

Conclusion: While there was reasonable glaucoma knowledge in pharmacists, improvements are needed for step-up therapy for patients with co-morbidities. One of the case-based style questions highlighted a significant gap in knowledge despite the intervention; thus case-based learning could be useful in assessing participants' level of understanding and incorporated into educational presentations.

Keywords: *Continuous Professional Development, Pharmacy Education, Pharmacist Knowledge, Continuing Education*

Introduction

Glaucoma refers to a group of conditions, which cause a characteristic pattern of optic nerve damage; it is the leading causes of irreversible, preventable visual disability in Australians aged 55 and over (Bratzler *et al.*, 2005). Glaucoma's multi-factorial pathology includes loss of retinal ganglion cells, morphologic changes in the optic disc, and defects in the visual field (Agarwal *et al.*, 2009). Glaucoma risk factors include family history, ethnicity, age, raised intraocular pressure (IOP), systemic hypertension, diabetes, corticosteroid therapy, migraine, and myopia or hyperopia (Myers, 2011). Not all risk factors are completely understood.

Current medical glaucoma therapy decreases IOP, a proven effective strategy to delay glaucoma progression (National Health and Medical Research Council, 2010).

Medications reduce IOP by increasing aqueous outflow or decreasing aqueous production (Maren, 1987; Lim *et al.*, 2008; Toris *et al.*, 2008). First-line therapies are prostaglandin analogues or beta blockers; second-line therapies include alpha2-agonists, carbonic anhydrase inhibitors and proprietary fixed combination eye drops; third-line therapies include acetazolamide and/or cholinergics (National Health and Medical Research Council, 2010).

Adherence to medical treatment in an otherwise generally asymptomatic disease is one of the challenges to successful therapy outcomes (Okeke *et al.*, 2009; Robin & Grover, 2011). Pharmacists play significant roles, not only to educate glaucoma patients about medications, but also to raise awareness and understanding of the disease, to help to identify those at risk, and to encourage regular

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eye-checks in the community (Myers, 2011). Pharmacists need adequate knowledge about glaucoma aetiology, risk factors and management to fulfil these responsibilities (Myers, 2011).

Australia has a Continuing Professional Development (CPD) system as the platform for lifelong learning for pharmacists and other health professionals (Driesen *et al.*, 2007). CPD is a practitioner-driven process which involves a cycle of reflection, planning, action and evaluation (Rouse, 2004b). Currently, the Pharmacy Board of Australia requires pharmacists to participate in a specified number of CPD activities, including self-directed and traditional learning through education seminars, workshops, conferences and lectures similar to the glaucoma education seminar assessed in this study (Pharmacy Board of Australia, 2014).

Continuing education platforms have been established worldwide and have been identified as an important tool in maintaining professional competence and lifelong learning. Furthermore, the International Federation of Pharmacists has stated the importance of 'systematic maintenance, development and broadening of knowledge, skills and attitudes, to ensure competence' (International Pharmaceutical Federation [FIP], 2002). Various studies have shown that CPD has been associated with improved learning behaviours and acquisition and retention of knowledge as reported by participants (McConnell *et al.*, 2012). Furthermore, CPD and other related activities have been associated with a change in health professional performance and health care outcomes (Davis, 1998).

There have been no studies investigating the effectiveness of CPD for Australian pharmacists and few internationally apart from comparisons between continuing professional education and continuing education programs in some countries (Maren, 1987; Rouse, 2004a). Thus, the current evaluation could provide an insight into the effectiveness of CPD for Australian pharmacists.

Objectives of the Study

We evaluated the effectiveness of a Continuous Professional Development (CPD) seminar on glaucoma therapy for pharmacists and to identify potential gaps in knowledge.

Ethical Approval

This was an evaluation of pharmacist knowledge and ethics permission was deemed unnecessary.

Methods

The evaluation of pharmacists' knowledge involved using a glaucoma questionnaire comprising of 14 multiple-choice questions (see Appendix). The topics included glaucoma aetiology, treatment, risk factors, management and case-based questions (McGowan, 1991). The maximum score attainable was 14/14. The questionnaire

was trialled on pharmacy under-graduate students for clarity and to eliminate potential ambiguity.

The glaucoma education seminar (intervention) was a didactic lecture, which covered glaucoma aetiology, epidemiology, risk factors, and management. The presentation slides for the seminar were prepared by Glaucoma Australia.

Pharmacists (total sample size = 138) completed the questionnaires immediately prior to (pre-intervention) and after (post-intervention) each glaucoma education seminar conducted by the Pharmaceutical Society of Australia (PSA) and the Society for Hospital Pharmacists of Australia (SHPA), in conjunction with Glaucoma Australia, in various locations in New South Wales (NSW), Victoria (VIC) and Queensland (QLD). No demographic data was collected from the participants. These CPD education seminars were not mandatory, rather, a part of optional CPD activities offered by pharmaceutical societies. Answering the questionnaires was voluntary, though the majority of seminar attendees in all sites participated in the study.

The pre-intervention questionnaire (pre-test) was distributed to participants upon arrival at the education seminar; they completed it before the lecture. The pre-intervention questionnaire was then collected and the education seminar began. The post-intervention questionnaire (post-test) was distributed to participants after the seminar and was collected before they departed.

The glaucoma questionnaires were distributed in Concord NSW, Warrnambool VIC, Balwyn VIC, Parkville VIC, Clayton VIC, Sunshine Coast QLD and Townsville QLD.

The data was then collected, tabulated and statistically analysed using GraphPad Prism, Version 21.0 Armonk, NY. Pooled data from pre-test and post-test by location in Figure 1 were statistically analysed using unpaired t-test. Matched pairs were statistically analysed in Figure 2 using Wilcoxon Matched Pairs test. Results with $p < 0.05$ were considered significant.

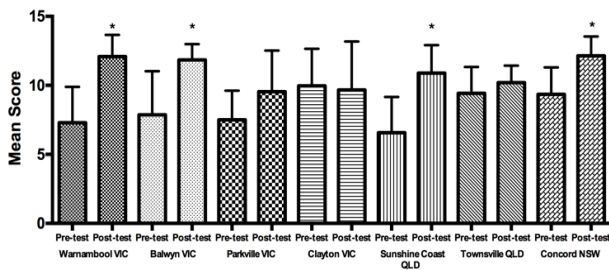
Results

Of a total of 138 pre-test and 124 post-test responses from around Australia, there were 105 matched-pairs.

The glaucoma education seminars significantly ($p < 0.05$) improved mean post-test scores compared to mean pre-test scores in four locations (Warrnambool VIC pre-test: 7.3 ± 0.5 vs. post-test: 12.1 ± 0.3 , Balwyn VIC pre-test: 7.7 ± 0.8 vs. post-test: 11.9 ± 0.3 , Sunshine Coast QLD pre-test: 6.6 ± 0.6 vs. post-test: 10.9 ± 0.5 , and Concord NSW pre-test: 9.3 ± 0.3 vs. post-test: 12.1 ± 0.2). There were 3 locations (Parkville VIC, Clayton VIC and Townsville QLD) where the education seminar did not significantly improve post-test scores.

Pooled pre-test and post-test scores from all locations were compared which showed mean post-test scores were significantly higher than mean pre-test questionnaire scores ($p < 0.05$, Wilcoxon Matched pairs).

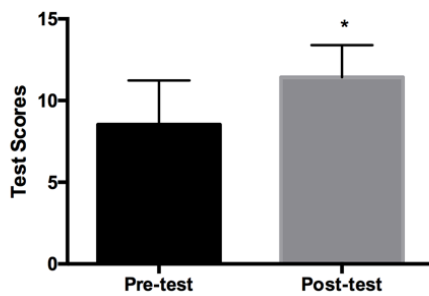
Figure 1: Mean scores by location pre-test vs post-test



* $p < 0.05$ unpaired t-test

Figure 2: Matched pairs analysis of pre-test vs post-test questionnaire mean scores

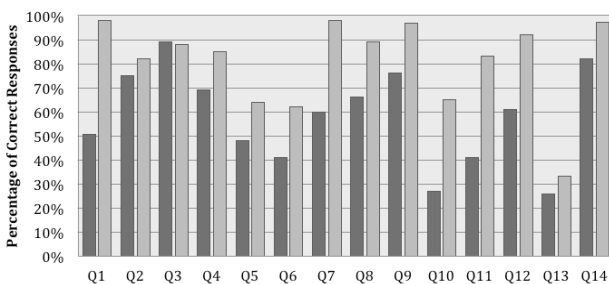
Glaucoma Questionnaire Pre-test VS Post-test



* $p < 0.05$ Wilcoxon Matched Pairs Test

Percentages for correct responses improved for most questions compared to pre-test responses; with only a marginal improvement for Q13 (Case-based question, see Appendix) where the pre-test correct response was 26% and the post-test correct response increased to 33%.

Figure 3: Percentage of correct responses by question pre-test vs post-test



Discussion

The National Strategy for Quality Use of Medicines (QUM) defines QUM as safe and effective use of medicines (Commonwealth of Australia, 2002). Pharmacists need an adequate knowledge of glaucoma

and its therapies to contribute to proper use of medicines, to help to monitor outcomes and to help patients manage multiple medications. With the expanding international scope of practice for pharmacists (e.g. vaccinations and prescribing) and national requirements for CPD, pharmacists must ensure their therapeutic knowledge is adequate and current (Emmertson *et al.*, 2005).

One of the biggest hurdles in glaucoma management is detection of cases before significant visual loss; pharmacists are well placed to explain the importance of screening family members to patients who are already on treatment. First-degree relatives of glaucoma patients have a 22% lifetime risk for the condition themselves (Wolfs *et al.*, 1998).

The results showed that glaucoma education seminar significantly improved post-test scores compared to pre-test scores in four out of seven locations. The apparent lack of improvement in the other three locations may have been due to the low number of post-test responses in these smaller locations.

Our evaluation demonstrates a reasonable overall pharmacist knowledge of glaucoma, although, the question with the least improvement even after the CPD education seminar was one of two case-based questions (question 13; see Appendix) which required participants to choose a step-up therapy for a patient with co-morbidities. The design of the evaluation meant we were unable to determine the reason for the lack of improvement. Possibly it was due to the type of question, however, results improved for question 12, another case-based question. The lack of improvement could also result from the complexity of the question relating to step up therapy in a patient with systemic medications that was in actual fact testing two distinct areas of knowledge – add on or ‘second line’ therapy as well as the possible interactions between topical and systemic medications. Perhaps providing examples of clinical scenarios during the intervention could facilitate improvement in understanding. This could be investigated in future studies.

As this was a once-only intervention, we could not assess the effects of time on increased knowledge. It would be relevant for participants to retain this knowledge over the longer term; future studies could investigate whether time since the intervention has an effect on its impact.

While the size of our sample may not provide statistically significant representation of the estimated 27,000 pharmacists in Australia, (this would require a sample size of 379 (Pharmacy Board of Australia, 2013)) it does provide some indication of benefit from the intervention.

Despite an overall improvement in post-test results, there were persisting gaps in participants' understanding of glaucoma management, especially with regard to application of basic knowledge. Future glaucoma education events could address step up therapies beyond first-line treatments, and also the relation between glaucoma therapies and patients' co-morbidities.

Case-based learning (CBL) has been identified as an important learning and teaching method which promotes an interactive learning environment and draws on scientific enquiry, clinical reasoning and application of theoretical knowledge to a particular scenario (Savery, 2006; Thistlethwaite *et al.*, 2012). This method has been adopted worldwide as it encourages learners to develop their skills in critical thinking and deductive reasoning, which can generate experience in students to draw upon in clinical practice (Savery, 2006; Thomas *et al.*, 2001). Health professionals enjoy a CBL platform as it enhances their learning while teachers enjoy the engagement and motivation associated with students (Thistlethwaite *et al.*, 2012). The fact that one of the case-based questions was answered poorly, both pre and post test, might indicate that in addition to traditional didactic teaching, more case-based components to the presentation may add to the intervention's overall effectiveness.

Conclusion

Our evaluation illustrates the effectiveness of a series of CPD education events in raising the level of knowledge regarding glaucoma and its management among pharmacists. To build on this, and to address the apparent gap in the ability to apply this knowledge in more complex clinical scenarios future similar interventions could employ more case-based scenarios in the educational material, as well as case-based questions to assess its educational impact.

Conflict of Interest Declaration

The authors declare no conflict of interests. This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

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Appendix: Glaucoma Questionnaire

Questionnaire- Correct answers are underlined

Q1 Which of the following statements about glaucoma is MOST CORRECT?

1. All patients with glaucoma require treatment
2. Patients with glaucoma do not require close monitoring by an ophthalmologist if adherence to medication is greater than 70%
3. Glaucoma is always due to raised pressure in the eye, and is also known as ocular hypertension
4. Glaucoma is a progressive optic neuropathy with characteristic optic nerve changes and visual field loss

Q2 Which of the following is TRUE regarding glaucoma screening and diagnosis?

1. Which of the following is TRUE regarding glaucoma screening and diagnosis?
2. Diagnosis is usually relatively straightforward as patients are often symptomatic. Patients with a family history of glaucoma tend to have good awareness about the disease and know to get tested
3. All those patients under treatment for glaucoma would lose vision if they weren't being treated
4. Approximately half the cases of glaucoma in Australia remain undiagnosed

Q3 Which of the following is TRUE regarding glaucoma therapy?

1. If patients use their drops diligently, visual loss from glaucoma can be eliminated
2. Some clinically proven therapies protect the optic nerve without lowering pressure
3. Vision loss can always be prevented if the pressure is lowered into the normal range
4. Many studies have shown that lowering pressure in the eye helps prevent vision loss

Q4 Of the available glaucoma agents in Australia:

1. Beta blockers are usually first line treatment due to greatest efficacy and systemic safety
2. The newer combination medications are recommended as first-line therapy
3. Medications from different classes can be combined for additional pressure lowering effect
4. With the benefit of newer medications, problems with patient compliance/adherence have virtually been eliminated

Q5 Which of the following patients would require the greatest amount of pressure lowering?

1. 45 year old female with IOP 24mmHg, and full visual field
2. 80 year old female with IOP 22mmHg and early visual field changes
3. 68 year old male with IOP 30mmHg, healthy optic disc and full visual field
4. 52 year old male with IOP 22mmHg and extensive optic disc cupping

Q6 Anticholinergic agents:

1. Used systemically, hold no ophthalmic contraindications
2. Topically, are one of the classes used in glaucoma therapy
3. Systemically, are contraindicated in all glaucoma patients
4. Topically, are safe to use provided the patient does not have angle closure status

Q7 Which of the following classes of glaucoma medication has the GREATEST pressure-lowering efficacy?

1. Alpha agonists
2. Prostaglandin analogues
3. Beta blockers
4. Topical carbonic anhydrase inhibitors

Q8 Which is TRUE regarding patients' prescriptions for glaucoma medication?

1. Their prescription will always come from the same medical practitioner and be filled at the same pharmacy
2. With their low drug concentrations, topical medications do not interact with systemic medications
3. Ocular corticosteroids would never be prescribed for patients with glaucoma as these can raise pressure in the eye
4. Preservative in the bottles of glaucoma medication can cause problems to the ocular surface and eye health

Q9 Which of the following is TRUE about glaucoma eye drops?

1. Studies have shown that side effects from these medications are rare, and never serious
2. Clinical studies have demonstrated that physically instilling the drops is usually straight forward for patients
3. Data shows that patients fill their scripts so that, on average, they have enough of an ongoing supply to last them each month
4. There are resources for patients and physical aids to help with drop delivery and compliance

Q10 When medical therapy is used for Primary Open Angle Glaucoma (POAG), which of the following is CORRECT?

1. *Where patients have asthma or reactive airways disease, ocular betaxolol is less risky than timolol*
2. Glaucoma eye drops should be always be used in both eyes, as the condition is bilateral
3. Patients with high presenting intraocular pressures, may be started on a combination medication
4. Latanoprost is the most efficacious at lowering IOP of the Prostaglandin-analogue medications

Q11 In which of the following scenarios would a patient with a history of acute angle closure is able to safely use oxybutynin?

1. *Previous laser iridotomy or cataract extraction on the affected eye*
2. Treated with timolol on the affected eye
3. Treated with ophthalmic prednisolone on the affected eye
4. Has not had visual field loss on either eyes

Q12 Mrs. Smith has IHD, depression, RA, osteoporosis, raised cholesterol, and is prescribed ramipril, isosorbide mononitrate, metoprolol, simvastatin, sertraline and methotrexate. She has been diagnosed with raised intraocular pressure and there is evidence of visual field loss. Her BP is 130/85mmHg and HR=50bpm. Cholesterol is 5.5mmol/L and Triglycerides 1.5mmol/L. Treatment is required for glaucoma. Which of the following would be the MOST APPROPRIATE option for medical therapy for Mrs. Smith?

1. Timolol
2. Bimatoprost-timolol fixed combination
3. *Travaprost*
4. Pilocarpine

Q13 Mrs. Smith returns to her ophthalmologist 2 years later and despite good compliance and a reduction of IOP of 20% from baseline, there is ongoing visual field loss. Which of the following treatment choices would be MOST APPROPRIATE?

1. Change to one of the combination medications
2. Continue the first line medication and add betaxolol
3. *Continue the first line medication and add dorzolamide to one eye to assess response*
4. Recommend Glaucoma filtering surgery

Q14 Mr. Jones has a father with glaucoma, and wishes to prevent his risk of developing glaucoma. Which of the following may assist in preventing glaucoma in patients with a family history?

1. Timolol
2. Surgery
3. Vitamin C, Vitamin E, Zinc, Copper
4. Acetazolamide
5. *Regular screening*