Exploring the influence of patient-provider communication on intraocular pressure in glaucoma patients

Delesha M. Carpenter[a,*], **Gail E. Tudor**[b], **Robyn Sayner**[c], **Kelly W. Muir**[d], **Alan L. Robin**[e], **Susan J. Blalock**[f], **Mary Elizabeth Hartnett**[g], **Annette L. Giangiacomo**[h], and **Betsy L. Sleath**[f]

[a]Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Asheville, USA

[b]Department of Mathematics and Statistics, Husson University, Bangor, USA

[c]School of Medicine, Stanford University, Stanford, CA, USA

[d]School of Medicine, Duke University, & Durham VA Medical Center, Durham, USA

[e]Wilmer Institute and Bloomberg School of Public Health; Johns Hopkins University, & University of Maryland, Baltimore, MD, USA

[f]Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, USA

[g]John A. Moran Eye Center, University of Utah, Salt Lake City, USA

[h]School of Medicine, Emory University, Atlanta, USA

Abstract

Objective—We examined whether six patient-provider communication behaviors directly affected the intraocular pressure (IOP) of glaucoma patients or whether patient medication adherence and eye drop technique mediated the relationship between self-efficacy, communication, and IOP.

Methods—During an 8-month, longitudinal study of 279 glaucoma patients and 15 providers, two office visits were videotape-recorded, transcribed, and coded for six patient-provider communication behaviors. Medication adherence was measured electronically and IOP was extracted from medical records. We ran generalized estimating equations to examine the direct effects of communication on IOP and used bootstrapping to test whether medication adherence and eye drop technique mediated the effect of communication on IOP.

[*]Corresponding author at: Eshelman School of Pharmacy University of North Carolina, CPO 2125 Asheville, NC, 28804 USA. Fax: +1 828 250 3842. dmcarpenter@unc.edu (D.M. Carpenter).

Informed consent and patient details

I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

Conflicts of interest

Drs. Blalock, Carpenter, Giangiacomo, Hartnett, Muir, Sayner, Sleath, and Tudor indicate no conflict of interest. Dr. Robin has been a consultant for Biolight, Lupin Pharmaceuticals, Sucampo, and TEVA pharmaceuticals and he does paid lectures for Merck and Allergan. Also, Dr. Robin has been a consultant for and has stock options in Glaukos and Aerie Pharmaceuticals, and is on the board of Aerie Pharmaceuticals. All authors have contributed to, read, and approved the final article.

Results—Provider education about medication adherence ($B = -0.50$, $p < 0.05$) and inclusion of patient input into the treatment plan ($B = -0.35$, $p < 0.05$) predicted improved IOP. There was no evidence of significant mediation.

Conclusion—The positive effects of provider education and provider inclusion of patient input in the treatment plan were not mediated by adherence and eye drop technique.

Practice Implications—Providers should educate glaucoma patients about the importance of medication adherence and include patient input into their treatment plan.

Keywords

Glaucoma; Patient-provider communication; Medication adherence; Eye drop technique; Mediation analysis

1. Introduction

Glaucoma is the leading cause of irreversible blindness worldwide [1–3]. Over the next 35 years, the global prevalence of glaucoma is projected to nearly double from 60 million to 111.8 million patients [2], and a concomitant increase in glaucoma-associated blindness is likely unless patients receive and adhere to treatment. Topical glaucoma medications (i.e., eye drops) are commonly used to treat glaucoma and slow disease progression by lowering intraocular pressure (IOP); lowering IOP is the only intervention that has been shown to reduce vision loss in glaucoma [4,5]. However, patients are unlikely to experience the clinical benefits of their glaucoma medications if they: (1) are non-adherent to their medication regimen and (2) do not instill their eye drops correctly [6–9].

Street and colleagues posit that patient-provider communication can improve a clinical outcome like IOP directly as well as indirectly via increased patient engagement in self-care skills [10,11]. Glaucoma is an ideal condition in which to examine whether self-care skills (e.g., medication adherence and eye drop technique) mediate the effects of patient-provider communication on clinical outcomes for two reasons. First, there is great variability in patients' medication-taking behaviors and taking medications properly is associated with better-controlled IOP [6–9,12]. Specifically, non-adherence rates range from 40 to 72% [6,7,13,14], and approximately half of glaucoma patients demonstrate incorrect eye drop technique [15–18]. Second, there is an association between patient-provider communication and glaucoma patients' medication adherence and their eye drop instillation technique [17–21]. Although previous studies have provided piecemeal links between communication, medication-taking behaviors and skills, and IOP; no studies have examined whether communication-related changes in patients' medication-taking behaviors translates to improved clinical outcomes.

Both patient-provider communication and self-efficacy are important correlates of medication-taking behaviors [22]. More patient question-asking during medical visits, a component of patient activation, is associated with improved adherence to glaucoma medications [20,23] as well as better adherence and outcomes in other diseases [24,25]. In addition to patient question-asking, provider education about adherence is associated with better adherence in glaucoma [20] and other diseases like diabetes and asthma [26]. Because

glaucoma is an asymptomatic disease and patients may not notice any direct benefits when they take their medications, positive reinforcement and encouragement to take medications from providers may be important for improving adherence and patient outcomes [27]; however, these relationships have not been formally examined in glaucoma. Many patients are unaware that they use their eye drops incorrectly [15,16,18], and provider education about how to use eye drops is associated with better patient technique [17,18]. Additionally, provider inclusion of patient input in the treatment plan is associated with better clinical outcomes for diabetes patients [28,29] and has been posited as important for glaucoma patients [30]. Last, medication self-efficacy is associated with better adherence and better clinical outcomes for glaucoma patients [8] and patients with diabetes [31].

Building upon prior research, our objective was to apply Street's model of communication [10,11] to examine the direct and indirect effects of patient-provider communication and self-efficacy on glaucoma patient IOP. We hypothesized that more frequent patient-provider communication and higher patient self-efficacy would indirectly improve IOP through better patient medication adherence and improved eye drop technique (Fig. 1). In terms of communication, we specifically examined whether more patient question-asking, more provider education about adherence and eye drop installation, more instances of provider encouragement and positive reinforcement for patients to take medications, and more frequent provider inclusion of patient input in the treatment plan were associated with better patient medication adherence, eye drop technique, and IOP.

2. Methods

2.1. Participants and procedures

We collected data for this multisite cohort study between 2009 and 2012. Providers from 6 ophthalmology practices (2 private offices and 4 academic ophthalmology departments) from five distinct geographical regions participated in the study. Providers were told that the goal of the study was to learn about communication during glaucoma visits. Fifteen of the 16 providers approached to participate in the study agreed to participate. This study was approved by the Institutional Review Boards at the University of North Carolina, Duke University, Emory University, and the University of Utah. All patients and providers gave written informed consent.

Providers completed a demographic questionnaire and clinic staff referred potentially eligible patients to a research assistant, who explained to patients that the purpose of the study was to improve health services provided in clinics. Eligible patients: (1) were ≥18 years of age; (2) spoke English; (3) were glaucoma or glaucoma suspect patients; and (4) were mentally competent as determined by the Mental Status Questionnaire [32]. Ineligible patients were thanked and given $5. Eligible patients were enrolled and had their office visit videotape-recorded. Videotapes were kept and the patient was followed for the 8-month study period if the patient was either: (a) newly-diagnosed with glaucoma and received a new prescription for glaucoma medications or (b) was already taking glaucoma medications.

Participants had their medical visits videotape-recorded at two visits (baseline and a 4–6-week follow-up). Immediately after their medical visits, a research assistant interviewed

patients in a private examination room and videotaped their eye drop administration. Patient medication adherence was electronically monitored over the 8-month study period using a Medication Events Monitoring System (MEMS 6 SmartCap; MWV Healthcare, Richmond, VA, USA). Patients received $20 at each visit.

2.2. Measures

The videotapes from the medical visits were deidentified and transcribed verbatim. The transcripts were reviewed by a research assistant who met twice a month with the investigators to develop a study codebook that contained the coding categories and rules. Three independent coders then used this codebook to code the transcripts for the patient-provider communication behaviors listed in Table 1.

Over the course of the study, the three coders coded 25 of the same transcripts and met monthly to discuss discrepancies. Inter-rater correlations were used to assess intercoder reliability. Inter-rater reliability for the variables ranged from 0.75 to 1.0. If there was not enough variability to calculate reliability then we calculated percent agreement between the coders; percent agreement was 0.72 to 1.00 for these variables.

2.2.1. Patient question-asking about glaucoma medications—The glaucoma medication question-asking coding categories were developed using the patient question-asking literature [33–35] and ophthalmologists' input. After the original categories were developed and defined, patient questions were reviewed and the categories were further refined with input from the principal investigator and the research team. As a result, patients' medication-related questions were classified into six areas: (a) general information about glaucoma medications, including the name, strength, and side effects; (b) information about the medication regimen, such as dosing, which eye(s) to instill the medication, and frequency of use; (c) how to administer the medication, including questions about how to instill eye drops and procedures for instilling multiple medications (e.g., time between drops); (d) cost or supply of the medication; (e) information about the purpose or importance of using glaucoma medications and adherence strategies; and (f) other medication questions. A question-asking summary score was then created by adding together the total number of medication questions the patient asked at the baseline and 4–6-week follow-up visit.

2.2.2. Provider communication behaviors—For each visit, coders recorded whether the provider: (1) educated about adherence and adherence strategies; (2) educated about eye drop instillation; (3) encouraged the patient to take their medications; (4) gave the patient positive reinforcement to take their medications; and (5) included patient input into the glaucoma treatment plan. Results were then summarized across both visits and coded as: 0 = provider did this at neither visit, 1 = provider did this at one visit, and 2 = provider did this at both visits.

2.2.3. Self-efficacy—Immediately after the 4–6-week follow-up medical visit, patients completed a 35-item, validated, glaucoma medication self-efficacy questionnaire [36]. The questionnaire possesses two scales: (1) 14 items that assess confidence in carrying out specific tasks to use eye drops correctly (i.e., eye drop task self-efficacy), including

squeezing the bottle, getting the right number of drops into the eye, and not touching the eye with the bottle; and (2) 21 items that assess confidence in overcoming adherence-related barriers (i.e., adherence-related barriers self-efficacy), such as being able to take medications when travelling or when they cost a lot of money. Response options ranged from 1 = 'not at all confident' to 3 = 'very confident.' Items were summed for each scale and ranged from 14 to 42 for eye drop task self-efficacy (Cronbach $\alpha = 0.84$) and 21 to 63 for adherence-related barriers self-efficacy (Cronbach $\alpha = 0.92$). Higher scores indicated greater self-efficacy.

2.2.4. Patient eye drop technique—After the 8-month medical visit, a trained research assistant asked patients to use a bottle of artificial tears to instill a single drop onto their eye as they normally would at home. If the patient normally instilled drops in both eyes, he/she was asked to administer a drop onto the right eye. Otherwise, the patient was asked to instill the eye drop into the eye that he/she normally uses for glaucoma medications. Patients' eye drop technique was video-tape recorded.

A trained coder then watched each eye drop technique videotape and used a checklist to evaluate the number of steps each patient performed correctly. The checklist was developed with input from the ophthalmologists on the study team and was informed by the literature on improving the effectiveness of topically applied drops [37–42]. The following steps were coded as "yes," "no," or "unclear": (a) able to squeeze the bottle to produce a single drop, (b) instills a single drop onto eye, and (c) does not touch bottle tip to eye or face. An eye drop technique score was then calculated by adding together the number of steps the patient performed correctly. If any of the three steps were unclear, the patient's summary score was not calculated.

2.2.5. Medication adherence—Medication adherence over the 8-month (or 240-day) study period was measured using electronically-recorded data from the MEMS caps system. The percentage of correct doses the patient took each day was calculated using the following formula: number of doses taken/ number of prescribed doses for each day. We then took the average of the daily percentage of correct doses taken each day across the 240-day period. For example, if the patient was prescribed a once daily medication and opened the MEMS bottle one time each day over the 240-day period, then the patient's adherence was 100%. If the patient was prescribed more than one glaucoma medication, then an overall adherence variable was created by adding together the subject's adherence for each glaucoma medication and dividing it by the total number of glaucoma medications. Adherence ranged from 0 to 100%, with higher scores indicating a higher percentage of doses taken each day.

2.2.6. Intraocular pressure—We extracted intraocular pressure (IOP) measurements from each patient's medical record at both the baseline and 8-month follow-up visit. For both time points, a mean IOP variable was calculated by averaging the IOP across both eyes. Change in IOP over the 8-month period was then assessed by calculating the difference in mean IOP. Negative values indicated that IOP improved over the 8-month period.

2.2.7. Sociodemographic characteristics—Patients reported their age (in years), gender, and race. Race was measured as a categorical variable (White, African American, Asian, Native American, and Hispanic) and then dichotomized to African American and

non-African American. We also recorded whether the patient was prescribed glaucoma medication for the first time. On the provider questionnaire, providers reported their age, gender, and race. Provider race was measured as a categorical variable (White, African American, Asian, Native American, and Hispanic).

2.3. Data analysis

We used SAS Version 9.3 (Cary, NC) to perform all analyses. We used descriptive statistics to characterize the sample and then ran a generalized estimating equation (GEE) to explore the direct effects of patient-provider communication and self-efficacy on IOP. We set the a priori significance level at $\alpha = 0.05$. Specifically, the model examined whether the patient-provider communication variables and self-efficacy were associated with change in IOP. The model controlled for: provider age and gender; patient age, gender, race, and years of education; whether the patient was new to glaucoma medications; and patient baseline IOP. Provider race was not included as a control variable because we only had one non-White physician.

We then used a bootstrapping approach [44,45] to run two mediation models to explore whether patient-provider communication and self-efficacy had indirect effects on IOP. In the first mediation model, we examined medication adherence as the mediator; whereas, in the second model, eye drop technique was the mediator. We chose to run two separate mediation models because 95 participants had missing eye drop technique scores due to blocking the video camera during their technique assessment or having videos that were not focused enough to clearly assess technique. Each mediation model controlled for: baseline IOP; patient gender, and whether the patient was new to glaucoma medications. We used bias-corrected 95% confidence intervals to determine whether the point estimates for each indirect effect were significant; confidence intervals that contained zero were considered non-significant.

3. Results

3.1. Sample characteristics

Eighty-six percent ($n = 279$) of eligible patients participated in the study and completed the baseline visit. Final 8-month IOP values were missing for 31 patients; 21 who were lost to follow-up and 10 due to missing or illegible medical chart entries. Those without IOP values at the 8-month follow-up visit were more likely to be male (Pearson $\chi^2 = 4.82$, $df = 1$, $p < 0.05$), less adherent ($t_{(246)} = -3.15$, $p < 0.01$), and have better eye drop technique ($t_{(182)} = 2.24$, $p < 0.05$) than those who had 8-month IOP values. Table 2 presents the demographic and clinical characteristics of patients for whom we had 8-month IOP values.

Ten of the fifteen (67%) providers were male. Fourteen providers were White and one was African American. Provider age ranged from 26 to 66 years (mean 40.8 years, SD = 11.7 years). Eighty percent (12) of providers were glaucoma specialists. The average years since graduation from medical school was 12.2 years (SD = 11.4 years, range = 1–38 years).

3.2. Direct effects of self-efficacy and patient-provider communication on IOP

Table 3 presents the GEE results examining whether patient-provider communication and self-efficacy had direct effects on change in IOP over the 8-month study period. The GEE revealed that provider education about medication adherence and provider inclusion of patient input into the treatment plan both predicted a significant decrease in IOP. Male gender and being new to glaucoma medications were both associated with a greater decrease in IOP.

3.3. Indirect effects of patient-provider communication on IOP

Figs. 2 and 3 present the mediation analysis results. As shown in Fig. 2, adherence-related barriers self-efficacy and positive reinforcement from the provider to take medications were both significantly associated with greater medication adherence. Fig. 3 shows neither self-efficacy nor any of the patient-provider communication variables were significantly associated with better eye drop technique. Table 4 shows that neither medication adherence nor eye drop technique significantly mediated the effect of communication or self-efficacy on patient IOP.

4. Discussion and conclusion

4.1. Discussion

This is the first article to explore whether medication adherence and eye drop technique mediated the effects of self-efficacy and patient-provider communication on the IOP of glaucoma patients. Based on prior studies and Street's conceptual model linking communication to health outcomes [10,11], we had hypothesized that medication adherence and eye drop technique would mediate the relationship between self-efficacy and patient-provider communication on IOP. Although provider education about medication adherence and provider inclusion of patient input into the treatment plan both predicted lower IOP at 8-month follow-up; contrary to our hypothesis, we did not find evidence of significant mediation.

Provider inclusion of patient input in the treatment plan predicted a significant decrease in IOP. Previous studies with diabetes patients have also reported that inclusion of patient input in the treatment plan was associated with better clinical outcomes [28,29]. We had anticipated that the effects of including patient input on IOP would be mediated through improved medication-taking behaviors (e.g., adherence and technique), but inclusion of patient input in the treatment plan was not significantly associated with either of these variables. It is possible that including patient input in the treatment plan could affect different intermediate variables, such as patient commitment to treatment, motivation to adhere, or outcome expectations [10,11]. Because outcome expectations have been associated with better short-term medication adherence in glaucoma patients [46]; testing more complex mediation models in which including patient input leads to more positive outcome expectations for medications, which then improves medication adherence and ultimately decreases IOP is warranted. Alternatively, providers who include patient input may switch patients to more aggressive therapies, which may more effectively lower their IOP without affecting the patients' medication adherence. As it seems unlikely that

including patient input in the treatment plan would have a direct effect on IOP, future studies should examine whether commitment to treatment, motivation to adhere, outcome expectations, or changes to the medication regimen do, in fact, mediate the relationship between including patient input in the treatment regimen and patient IOP.

Provider education about adherence and adherence strategies also was associated with improved patient IOP at 8-month follow-up; however, the effect was not mediated by medication adherence or eye drop technique. These findings are perplexing, since improved adherence seems like the most logical mediator between adherence education and IOP. It may be that patients in our sample perceived provider education about adherence as demonstrative of the provider's overall concern for the patient's well-being. Thus, a variable such as rapport, may have mediated the effect of adherence education on IOP. Alternatively, if providers were educating about adherence in a way that was not relevant to patients, that could potentially explain why education was unrelated to adherence in our sample. Future studies should examine whether providing adherence education that is more tailored to each patient's adherence-related barriers predicts better adherence and clinical outcomes for glaucoma patients.

Adherence-related barriers self-efficacy was associated with greater medication adherence, but the increases in adherence did not translate to improved IOP at 8 months. Interestingly, previous analyses from these data found that both adherence-related barriers self-efficacy and provider education about how to administer drops were associated with better medication adherence at 60 days [23]. Because periodic retraining has been associated with better medication behaviors for conditions like asthma [47,48], it is possible that the beneficial effects of adherence education and technique education may deteriorate over time or that education about medications may need to adapt to patients' changing circumstances. Future studies should investigate how often medication education is needed in order to maintain improvements in medication adherence and promote greater patient confidence to take medications correctly.

We were surprised that neither patient-provider communication nor eye drop task self-efficacy was associated with better eye drop technique. Because using eye drops involves both knowledge and skill, it may be that more hands-on forms of education and repeated practice sessions are necessary to improve patients' eye drop technique. Alternatively, patients' techniques may improve immediately after receiving education but then deteriorate over a short period of time. Thus, our data collection time points may have been spaced too far apart to detect the beneficial effects of patient-provider communication on eye drop technique.

Other factors may have caused variation in IOP and may partially explain why we did not find evidence of significant mediation in our sample. For example, IOP can vary throughout the day (diurnal variation) and we were unable to capture some of this fluctuation since we only measured IOP one time at each office visit [49]. Although other studies have been able to assess glaucoma progression without accounting for diurnal variation [6,50], future studies should attempt to schedule each participant's baseline and follow-up visits at approximately the same time of day in order to control for this important factor. Also, we

were unable to account for several other variables that could be associated with changes in IOP, including changes to the medication regimen, the presence of other medications that could affect IOP (e.g., beta blockers), and whether the patient had other IOP-lowering treatments, such as surgery. Future studies should include these variables as covariates in regression models. Additionally, future research should consider investigating whether medication adherence and eye drop technique mediate the relationship between communication and other clinical outcomes, such as changes to the optic nerve that can be measured with optical coherence tomography (OCT).

4.1.1. Limitations—This study has several limitations and results should be interpreted with caution. First, study staff did not track the characteristics of patients who declined to speak with the research assistant, so we could not calculate a patient participation rate or estimate the effects of selection bias. Moreover, patients who were missing 8-month IOP values were demographically different from patients who had IOP values; thus, our results may not generalize to the larger population of glaucoma patients. Second, providers and patients both knew the visit was being recorded, but they did not know the study hypotheses. Even if there was a Hawthorne effect, it was likely small, as patient-provider communication behaviors occurred infrequently. Third, as noted above, our clinical outcome variable, IOP, can be influenced by a number of other factors, including the time of day the IOP was measured and whether changes were made to the patient's medication regimen, which we did not control for in these analyses. Our ability to detect mediating relationships was also limited by the weak association between medication adherence and eye drop technique with IOP. Furthermore, having a large number of unclear technique videotapes resulted in missing eye drop technique scores for 95 patients; which limited our power to detect whether eye drop technique significantly mediated the relationship between self-efficacy, communication, and IOP.

Lastly, we quantified communication behaviors in order to include them in GEE and mediation models. Accounting for the quality of communication could have explained additional variance in medication-taking behaviors and clinical outcomes and may be equally, if not more important, for patient outcomes. For example, educating about eye drop technique on two separate occasions may not result in improved eye drop technique if the provider's instructions were confusing to the patient. Frequency of education may also fail to yield an effect on behavioral outcomes like medication adherence and eye drop technique if they are delivered generically and do not apply to a patient's circumstances. For example, patients who have arthritis may not be able to squeeze the bottle to produce a single drop. In these cases, generic education about how to instill eye drops would not help those patients address the problem of squeezing the bottle; additional education and provision of aides to help instill drops may be necessary in those situations. Thus, future studies should examine both the quality and quantity of communication in order to make recommendations about optimal timing and content of educational messages.

4.2. Conclusion

We found that including patient input in the treatment regimen led to a significant decrease in IOP. The exact mechanisms through which including patient input resulted in improved

IOP are unknown but should be considered for future studies. Adherence education from providers was also associated with better IOP at 8-month follow-up. Greater adherence-related barriers self-efficacy and positive reinforcement from providers to take medications were each associated with better patient medication adherence, although medication adherence did not act as a mediator between these variables and IOP.

4.3. Practice implications

Our findings demonstrate that provider communication is important to improving behavioral and clinical outcomes for glaucoma patients. Providers should give patients positive reinforcement to take medications since this behavior was associated with better adherence to glaucoma medications. Providers should also work with patients to increase their adherence-related barriers self-efficacy, as this also increases patients' medication adherence. Providers should also educate patients about adherence and include patient input into the treatment plan, since engaging in these behaviors can lead to improvements in IOP.

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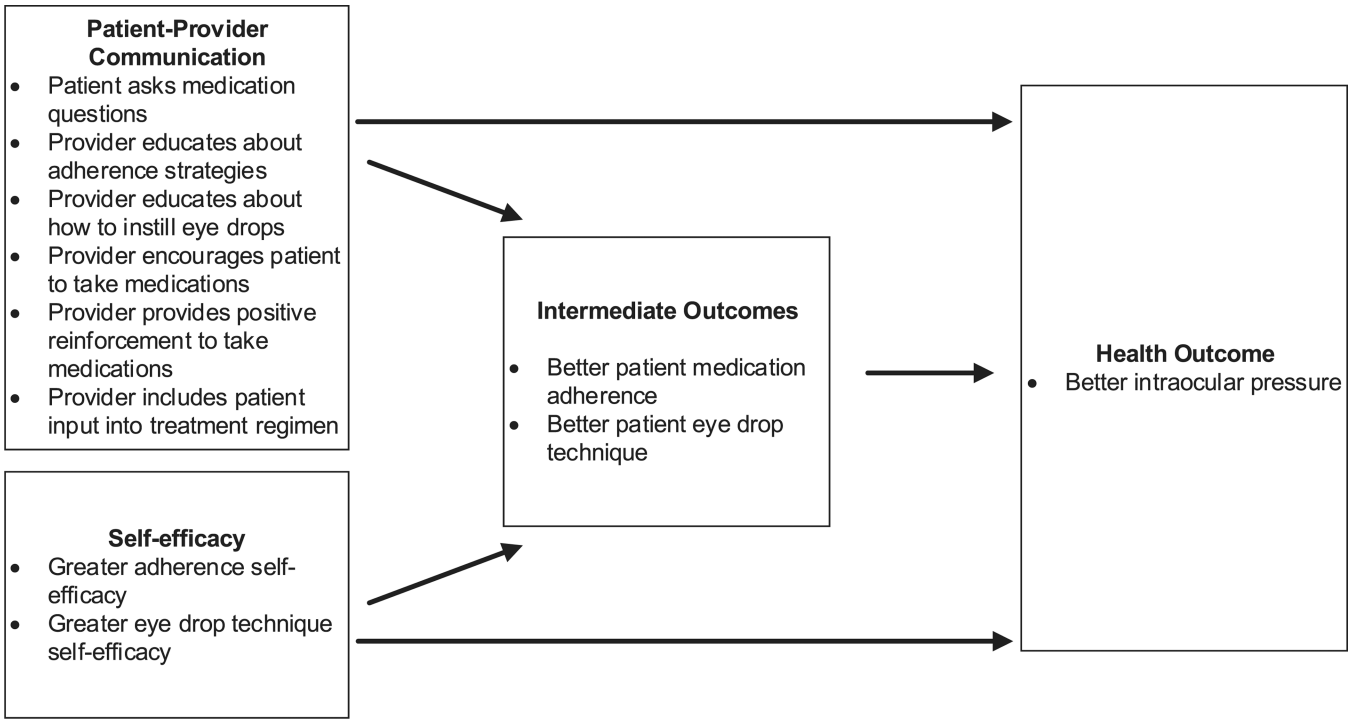

Fig. 1.

Conceptual model showing the potential direct and indirect effects of medication-related communication on glaucoma patient intraocular pressure.

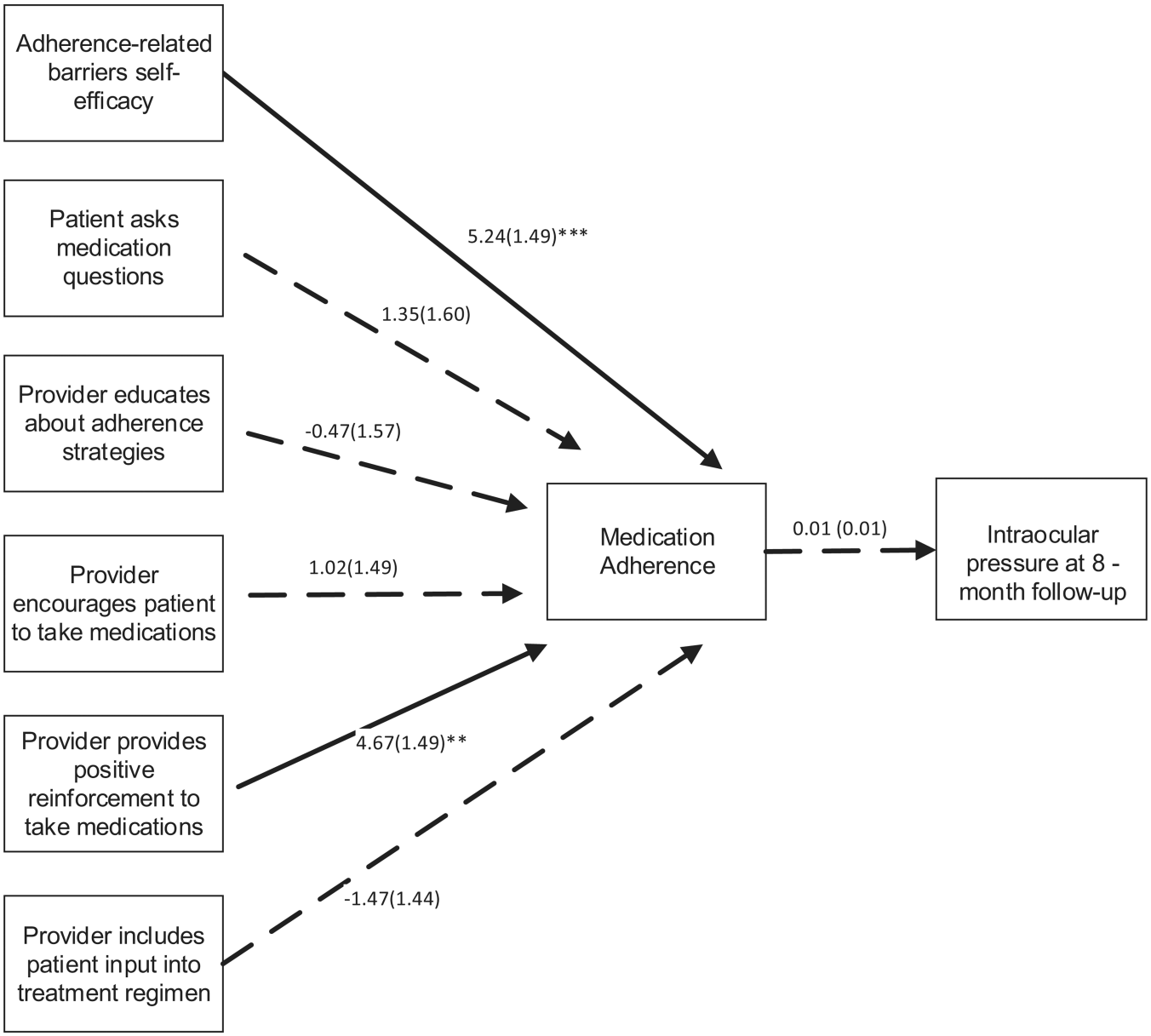

Fig. 2.

Modeling the indirect effects of adherence-related barriers self-efficacy and patient-provider communication on patient intraocular pressure (n = 223). Note: Model controlled for baseline IOP; patient gender, and whether the patient was new to glaucoma medications relationships. Dashed lines indicate insignificant relationships and solid lines indicate significant relationships; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

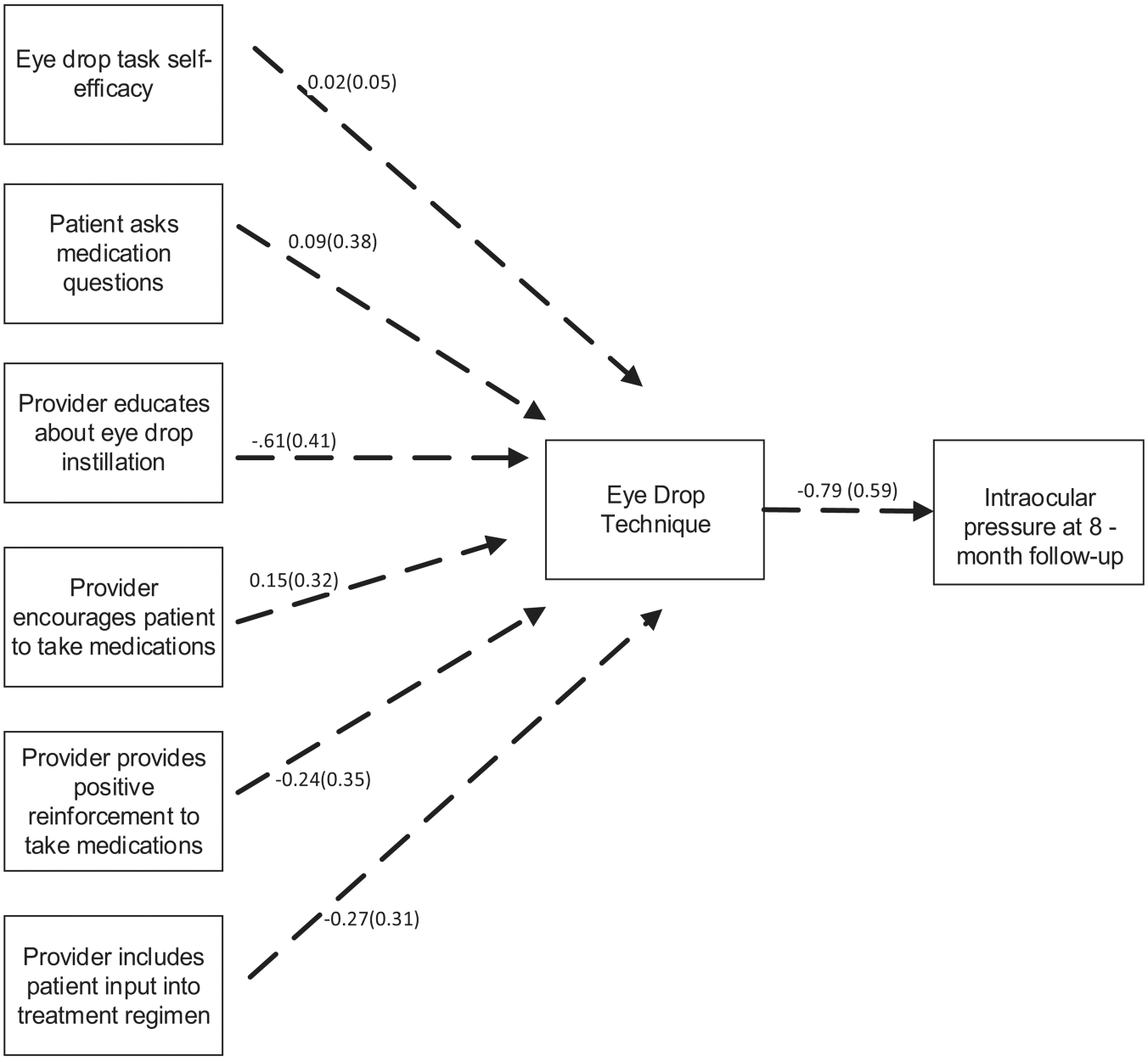

Fig. 3.

Modeling the indirect effects of eye drop task self-efficacy and patient-provider communication on patient intraocular pressure (n = 172). Note: Model controlled for baseline IOP; patient gender, and whether the patient was new to glaucoma medications relationships. Dashed lines indicate insignificant relationships.

Table 1

Codebook definitions and example quotations from transcripts.

Codebook variable and definition	Example quotations from transcript text
Patient question-asking about glaucoma medications Whether the patient asks one or more questions about their glaucoma medications or using eye drops, including how to administer eye drops, the medication regimen, side effects, cost or supply, adherence strategies, purpose, and importance of medications	"Now does, do the drops reverse the damage or do they just slow it, or?" "How often will I have to take those?" "Those drops don't affect your sleep does it?" "Does it make a difference if you take if you use your drops say uh a few - thirty minutes before bedtime or right at bedtime? "
Provider educates about medication adherence and/or adherence strategies Whether the provider educates the patient about adherence and adherence strategies, missed doses, and/or extra doses taken	"It is good to match taking these eye drops with something that you do already, like when you take out your contacts at night."
Provider educates about eye drop instillation Whether the provider educates the patient about how to use eye drops correctly	"When we have you put in eye drops, we recommend that you wash your hands before you do it. Keep a real clean area. Don't, you know, start, I don't know - in the bottom of your kitchen sink or something. I tell people that if you bring your chin up and keep your eyes kind of flat and look up, you have a better aim, ok, and you have taken drops before."
Provider encourages the patient to take medications Whether the provider expressed encouragement for the patient to take their glaucoma medications	"You should really use the eye drops every night."
Provider gives positive reinforcement to take medications Whether the provider reinforces that medications are linked to positive outcomes	"If you take your medications regularly, then your vision should stay fine."
Provider includes patient input in treatment plan Whether provider solicits patient input about whether they want to initiate or change their glaucoma medication regimen	Example 1: "Are you okay with taking the drops for the next month to see if we can reduce your intraocular pressure?" Example 2: Provider- "We had you taking Travatan last time is that right?" Patient- "Uh yes." Provider- "And um … And we switched you back to Xalatan right?" Patient- "Right." Provider- "Which one do you prefer? Can you tell the difference?" Patient- "I can't really tell the difference. Uh I know I was getting better results before um from the Xalatan." Provider- "Ok." Example 3: Provider- "So the effect of the Latisse is a little stronger than this for growing lashes. Another option would be to switch you to Lumigan. So could you use Latisse? Yes you can. Um another option would be to switch you from the Latanoprost to Lumigan. Lumigan is literally the same drug that is Latisse. It's used for glaucoma. It makes your lashes grow like crazy." Patient- "Like can we do that so I won't have to use Latisse? Since I have to take the drops anyway. I'd much rather do that." Provider- "So the one thing with that is it has a little- I think a little bit higher risk of side effects around the eye. So let's talk about that again. It can make the skin around your eye a little bit darker. It can make the blue part of your eye a little bit more brown. Um so otherwise I think it's fine. If you're up for that I think it's fine."

Table 2

Patient sample characteristics (n = 248).

Characteristic	N(%) or Mean(SD)
Sociodemographic	
Age (range: 25–93)	66.00 (12.6)
Years of education (range: 5–26)	15.12 (3.5)
Male	107 (43.1)
Race	
African American	83 (33.5)
White	153 (61.7)
Other	12 (4.8)
Clinical	
Patient new to glaucoma medications	45 (18.1)
Patient baseline IOP (mm Hg) (range: 7.0–47.5)	16.17 (4.7)
Medication adherence (range: 6.6–100)	76.30 (23.2)
Eye drop technique score (range: 0–3)	2.04 (0.6)
Change in IOP from baseline to 8-month follow-up (mm Hg) (range: −35.0 to 27.5)	−0.83 (5.0)
Patient-provider communication	
Total number of patient questions about glaucoma medications (range: 0–17)	2.50(3.0)
Provider educates about medication adherence	
Neither visit	176 (71.0)
1 visit	66 (26.6)
Both visits	6 (2.4)
Provider educates about eye drop technique	
Neither visit	206 (83.1)
1 visit	42 (16.9)
Both visits	0 (0.0)
Provider encourages patient to take medications	
Neither visit	169 (68.1)
1 visit	69 (27.8)
Both visits	10 (4.0)
Provider provides positive reinforcement to take medications	
Neither visit	144 (58.1)
1 visit	85 (34.3)
Both visits	19 (7.7)
Provider includes patient input into treatment regimen	
Neither visit	202 (81.5)
1 visit	39 (15.7)
Both visits	7 (2.8)

Table 3

Linear generalized estimating equation predicting change in patient intraocular pressure (IOP) at 8-month follow-up (N = 246).

Independent variables	Beta (SE)
Total number of patient questions about glaucoma medications	0.12 (0.16)
Provider educates about medication adherence	−0.50 (0.24)*
Provider educates about eye drop technique	−0.26 (0.23)
Provider encourages patient to take medications	0.15 (0.15)
Provider provides positive reinforcement to take medications	0.07 (0.18)
Provider includes patient input into treatment regimen	−0.35 (0.15)*
Adherence-related barriers self-efficacy	−0.04 (0.25)
Eye drop task self-efficacy	−0.11 (0.36)
Provider age	0.12 (0.16)
Provider gender	0.11 (0.13)
Patient age	−0.70 (0.45)
Patient years of education	0.28 (0.31)
Patient gender	0.53 (0.20)**
Patient race	−0.29 (0.41)
Patient new to glaucoma medications	−0.79 (0.30)**
Patient baseline IOP	−3.01 (0.23)***

* p<0.05.

** p<0.01.

*** p<0.001.

Table 4

Indirect effects of patient-provider communication variables and self-efficacy on glaucoma patients' intraocular pressure.

Indirect effect	Point estimate (SE)	Bias-corrected 95% confidence interval	
Medication adherence (*n* = 223)			
Adherence-related barriers self-efficacy	0.375 (0.71)	−0.092	0.196
Patient asks medication questions	0.001 (0.03)	−0.020	0.121
Provider educates about adherence strategies	−0.003 (0.02)	−0.087	0.028
Provider encourages patient to take medications	0.007(0.03)	−0.020	0.102
Provider provides positive reinforcement	0.034 (0.07)	−0.082	0.191
Provider includes patient input	−0.011 (0.03)	−0.139	0.020
Eye drop technique (*n* = 172)			
Eye drop task self-efficacy	−0.014 (0.06)	−0.184	0.066
Patient asks medication questions	0.073 (0.07)	−0.008	0.298
Provider educates about eye drop instillation	0.007 (0.05)	−0.063	0.137
Provider encourages patient to take medications	−0.009 (0.04)	−0.120	0.050
Provider provides positive reinforcement	0.026 (0.05)	−0.036	0.202
Provider includes patient input	0.006 (0.05)	−0.064	0.135