

Instilling Drops

Adherence is a more complex issue than it at first appears.

BY ALAN L. ROBIN, MD

We often spend a great deal of time educating patients newly diagnosed with glaucoma about the disease and the importance of medical therapy. We then hand them a sample of or prescription for the appropriate topical therapy and ask them to return for an IOP check in approximately 1 month. At that time, we evaluate their IOP-lowering response to the topical therapy and make a therapeutic decision based on the results. If their response is adequate, we continue the same therapy. If the response is minimal or does not meet our goals, we frequently add a second IOP-lowering drug or switch medications.

Regrettably, despite excellent intentions, we often do not adequately follow up on patients' adherence to prescribed therapy. We may ask them if they have adhered to their treatment regimen, but patients most often overestimate their adherence. During the last decade, our interest in this subject has grown. We have begun to consider patients' reports of their behavior, pharmacy refill logs, and the documentation provided by electronic monitoring. All of these are important and suggest that greater than 50% of patients may be noncompliant more than 75% of the time.¹

The problem of adherence is more complex than the data just presented imply. With oral medications, we can safely assume that patients can successfully place the pill in their mouths unless they are dysphagic, have a psychiatric issue, or suffer from significant tremors. Instilling a drop in the eye is much more difficult than ingesting a pill for a large number of our patients, but we do not observe patients or their caregivers as they instill the drops. We therefore do not know how many drops are instilled, whether the bottle is contaminated during use, or if the medication reaches the eye. Recent studies indicate that these are matters of significance.^{2,3} This article discusses the issues in detail.

NUMBER OF DROPS DISPENSED

How often do patients report that a bottle of their medication did not last as long as their insurance plan stipulated it would? We know the volume of medications within a bottle and the drop's size, depending on the angle of the bottle and ambient temperature. We do not know, howev-

"I watched more than 300 videos of experienced patients placing eye drops on their eyes, and I found that they used a mean of seven drops (on the eye and elsewhere) for each administration."

er, the number of drops actually delivered (to the eye, adenexae, floor, etc.) when patients squeezed the bottle. I watched more than 300 videos of experienced patients placing eye drops on their eyes, and I found that they used a mean of seven drops (on the eye and elsewhere) for each administration (<http://eyetube.net/?v=sewam>).

This wastage is expensive with medications that cost more than \$1 per drop. Additionally, for patients on pharmacy refill plans, wastage causes them to run out of their medication before they may obtain a refill. These individuals then must decide whether (1) to pay out of pocket to purchase an additional bottle (possibly at inflated prices) to last them until they may get another from their insurance plan, (2) to take the medication less frequently than prescribed until the prescription may be refilled, or (3) to cease using the medication until they may refill the prescription. Based on the work of Cynthia Mattox, MD; Samuel Solish, MD; and myself, the Centers for Medicare & Medicaid Services have recognized this problem. The agency issued a statement that a greater supply should be given by pharmacy benefit management and insurance companies each month.⁴

CONTAMINATION

We may hardly consider it, but the potential contamination of the eye drop bottle and its tip is a problem (<http://eyetube.net/?v=feliw>). It is more significant when patients have multiple-use bottles or are using a single-use container multiple times. Geyer and colleagues recovered bacteria (91% gram-positive) from 28% of glaucoma medication bottles, and the percentage of contamination increased to 40% among those that had been open for at least 8 weeks.⁵ These findings may explain the

“Along with our staff, we should observe patients as they instill their eye drops. If they are unsuccessful, we should try to train them on proper technique.”

rate of endophthalmitis observed among postoperative patients.

ADMINISTRATION

We may wonder why the success rates of various treatment groups in studies such as the Early Manifest Glaucoma Trial (EMGT) and Ocular Hypertension Treatment Study (OHTS) are so poor. In the EMGT,⁶ the disease progressed in 57% of treated patients with early glaucoma during the follow-up period while they were under careful supervision. The reasons are many, but poor administration of their eye drops possibly may have contributed.

If the medication does not reach the eye, it is unlikely to lower the patient's IOP. How often does this problem occur? One study found that almost 20% of patients rely upon others for the administration of eye drops.⁷ There is nothing in the literature about the abilities of spouses, aids, family members, or significant others to administer drops. When I instill drops into patients' eyes, however, I occasionally either place more than one drop on the eye or contaminate the bottle's tip.

In a study² of patients referred to my practice who said they instilled their own eye drops, my co-investigators and I looked at three things: the patient's ability to place a drop onto the eye, potential contamination, and his or her ability to squeeze only one drop from the bottle onto the eye. Two-thirds of the patients had no comorbid conditions that could limit their abilities to properly instill an eye drop (eg, prior cerebrovascular accident, tremors, severe arthritis). Ninety-five percent stated that they had administered their own eye drops for more than 1 year, with 75% having more than 5 years' experience. Depending on the type of bottle, between 27% and 33% of the patients needed to dispense at least five drops in order to get one onto their eye. More than one-half of the patients instilled multiple drops. Between 17% and 25% of these experienced patients could not place a drop on their eye despite many attempts. Most of them did not realize they were unsuccessful. Finally, approximately one-half of the patients allowed contact between the bottle's tip and their eyelids or eye.

WHAT IS THE SOLUTION?

Along with our staff, we should observe patients as they instill their eye drops. If they are unsuccessful, we should try to train them on proper technique. Regrettably, there are no proven ways of successfully administering eye drops, but some suggestions are to

- use at least one finger to keep the eye open during administration
- maximize the effects of gravity by ensuring that the eye drop is directly above the eye
- stabilize the hand administering the eye drop (ie, squeezing the bottle) on the hand parting the eyelids
- briskly squeeze the bottle

Finally, we must recognize that topical drops are not suitable for every patient. Fear, poor hand-eye coordination, or other physical or psychological limitations may make it hard for some individuals to administer drops. We should attempt to identify such problems early in the course of therapy, before a patient's inability allows an irreversible loss of axons. We should also urge pharmaceutical companies to develop medications that can last for prolonged periods of time and be administered by physicians. □

Alan L. Robin, MD, is a clinical professor of ophthalmology at the University of Maryland. He is also an associate professor of international health at the Bloomberg School of Public Health and an associate professor of ophthalmology at the School of Medicine, Johns Hopkins University, Baltimore. Dr. Robin may be reached at (410) 377-2422; arobin@glaucomaexpert.com.



1. Okeke CO, Quigley HA, Jampel HD, et al. Adherence with topical glaucoma medication monitored electronically: the Travatan Dosing Aid Study. *Ophthalmology*. 2009;116(2):191-199.
2. Stone JL, Robin AL, Novack GD, et al. An objective evaluation of eye-drop instillation in glaucoma patients. *Arch Ophthalmol*. 2009;127(6):732-736.
3. Hennessy A, Robin AL, Katz J, Covert D. Videotaped evaluation of eye drop instillation in glaucoma patients with visual impairment or moderate to severe visual field loss. *Ophthalmology*. In press.
4. Tudor CG. Early Refill Edits on Topical Ophthalmic Products. Baltimore, MD: Centers for Medicare & Medicaid Services, US Department of Health & Human Services; 2010.
5. Geyer O, Bottone EJ, Podos SM, et al. Microbial contamination of medications used to treat glaucoma. *Br J Ophthalmol*. 1995;79(4):376-379.
6. Leske MC, Heijl A, Hyman L, et al; EMGT Group. Predictors of long-term progression in the Early Manifest Glaucoma Trial. *Ophthalmology*. 2007;114(11):1965-1972.
7. Tsai T, Robin AL, Smith JP 3rd. An evaluation of how glaucoma patients use topical medications: a pilot study. *Trans Am Ophthalmol Soc*. 2007;105:29-33; discussion 33-35.



eyetube
Ophthalmic Video Resource