

# Do Ophthalmic Nonsteroidal Anti-inflammatory Drugs Reduce the Pain Associated With Simple Corneal Abrasion Without Delaying Healing?

From the Department of Emergency Medicine, Spectrum Health and Michigan State University Program in Emergency Medicine, Grand Rapids, MI,\* and the Emergency Medicine and Trauma Center, Methodist Hospital, Clarian Health Partners, and Indiana University School of Medicine, Indianapolis, IN.†

**Michael D Brown, MD\***  
**William H Cordell, MD†**  
**Andrew S Gee, MD\***

[Brown MD, Cordell WH, Gee AS: Do ophthalmic nonsteroidal anti-inflammatory drugs reduce the pain associated with simple corneal abrasion without delaying healing? *Ann Emerg Med* October 1999;34:526-534.]

Received for publication March 6, 1998. Revisions received May 19 and July 6, 1999. Accepted for publication July 7, 1999.

**Address for reprints:** Michael D Brown, MD, Department of Emergency Medicine, 100 Michigan Ave, NE, Grand Rapids, MI 49503; 616-391-3588, fax 616-391-3674; E-mail brownm@pilot.msu.edu.

Copyright © 1999 by the American College of Emergency Physicians.

0196-0644/99/\$8.00 + 0  
 47/1/101367

## CLINICAL SCENARIO

A 25-year-old man arrives in your community hospital emergency department complaining of right eye discomfort and irritation. He recalls getting a fleck of metal shaving in the eye at work in a tool and die shop 12 hours earlier. He was not hammering metal and was not around welders. He verbally rates his pain intensity as an 8 on a 0 to 10 pain scale. His visual acuity is 20/30 in the affected eye and 20/20 in the normal eye. He does not wear glasses or contact lenses. He is slightly photophobic, but has no other complaints other than the eye discomfort and irritation. On examination, the right conjunctiva is injected and extraocular movements and pupillary reaction are normal. No foreign bodies are visible on lid eversion.

You instill 0.5% tetracaine hydrochloride ophthalmic solution that completely relieves his pain. Slit lamp examination reveals a moderate-sized right corneal abrasion without embedded foreign body or rust ring. You then instill 2% homatropine ophthalmic solution and sulfacetamide ophthalmic ointment. The patient then asks you, "Are you going to give me something for pain when these eye drops wear off?"

When you phone the on-call ophthalmologist to arrange follow-up, she recommends an ophthalmic nonsteroidal anti-inflammatory drug (NSAID) for pain control. She remarks that she and her colleagues routinely use NSAID eye drops after ophthalmic surgery. Although you have never prescribed an ophthalmic NSAID, you recall reading an on-line discussion about them. One of the messages touted the use of NSAID eye drops such as diclofenac sodium and ketorolac tromethamine drops for the treatment of corneal abrasions. You are interested in learning more about this topic, but first have to decide

how much time you can devote to the topic and how soon you need the information.

There are several levels of urgency regarding information need. A first-level need means you require information "right now" (usually at the point of care). In the ED, this need is usually met by conducting a "quick and dirty" search of MEDLINE or an on-line emergency medicine database, skimming a textbook, or consulting a colleague. A second-level need is less urgent and allows more time to formulate a question and search strategy and assess the validity of the evidence. This level requires a more thoughtful, less rushed approach to filling a "knowledge gap" that can be applied to future similar patients. A third-level need entails developing a policy or care guideline for a department, hospital, health care delivery system, or organization, and requires a much more rigorous analysis of the evidence. (An example of this approach, the consideration of implementing a stroke thrombolysis protocol, appeared in a previous installment of this series.<sup>1</sup>)

You are too busy during this shift to give the question of ophthalmic NSAIDs further consideration. Because you are so unfamiliar with ophthalmic NSAIDs, you instead write a prescription for acetaminophen and hydrocodone tablets, your standard outpatient opioid analgesic regimen. However, rather than ignore this learning opportunity, you write yourself a reminder note to conduct an evidence-based review of this topic after your ED shift. This exercise, now becoming familiar if not rote to practitioners of evidence-based medicine (EBM), consists of 4 parts: formulating the question, searching for and selecting the best evidence, analyzing the evidence, and applying the evidence.

## FORMULATING THE QUESTION

Numerous questions can be generated regarding the "simple" corneal abrasion. Questions could include issues of harm ("Do therapies retard healing?") and prognosis ("What is the natural course of an untreated corneal abrasion?"). Questions regarding therapy alone are numerous. "Does eye patching promote (or impair) healing and relieve pain?" "Is tetanus prophylaxis warranted in all corneal abrasions?" "Should topical antibiotics be instilled to 'prevent infection' and promote healing?" "Should contact lenses be used to serve as 'eye bandages' or 'splints'?" "Are these therapies useful in related ophthalmic conditions such as rust rings and ultraviolet injuries?" Given the constraints of your busy ED practice, you do not have the time today to address all these ques-

tions. Instead you choose the "eat the elephant one bite at a time" approach and begin framing the question to answer the issue of interest today—ophthalmic NSAIDs in corneal abrasions.

The elements of a well-built clinical question are based on PICO, where *P* stands for stating the problem, *I* the intervention, *C* the comparison intervention (if necessary), and *O* the outcome(s) of interest.<sup>2</sup> You construct a PICO table (Figure 1) considering each of the 4 elements. The clinical problem to be addressed is patients with acute corneal abrasions. You recognize that not all corneal abrasions are created equal. They may be caused by different mechanisms of injury including foreign bodies, burns, scrapes with tree limbs, and finger pokes and may range considerably in size.

The intervention to be addressed is ophthalmic NSAIDs. Because pain relief is a major outcome of interest, you would also like to identify studies that compare ophthalmic NSAIDs with a standard therapy such as an oral analgesic (an opioid-acetaminophen combination or an oral NSAID) or placebo. You note that ophthalmic NSAIDs should either be at least as efficacious as the comparison analgesic or better in relieving the pain of corneal abrasions for you to consider incorporating this treatment into your practice. (You will later wrestle with what "better" means in comparing pain control therapies and when an improvement in pain relief is clinically significant.)

Next, you consider which outcomes are most important and should have been addressed in a quality study. The major outcome of interest is pain relief for a traditionally painful condition. At the same time, ophthalmic NSAIDs should not delay healing or increase infection rate. You now remind yourself to view the question and pertinent outcomes from other perspectives and not just a "clinician-centric" point of view. What outcomes and considerations will be most important to patients? They will undoubtedly be interested in obtaining rapid pain relief—both in the ED and once they go home. But they would likely be concerned about cost and how quickly they can return to work and normal activities such as driving. Although you identify pain relief and time to healing (Figure 1) as the main outcomes of interest, you will also look to see if the studies you retrieve address the others you have listed. You also decide to carefully scrutinize what type of follow-up was conducted in the studies you retrieve since such patients are almost invariably treated as outpatients.

You next consider the setting of the studies. Realizing that patients with corneal abrasions may be treated in pri-

vate offices and occupational clinics, you are less concerned that the studies must have been conducted in an ED. On the other hand, you are not interested in post-ophthalmic surgery patients as this setting and group of patients is likely quite different from your ED.

Your final statement of the question is, "In patients with acute corneal abrasions treated in the acute care setting, will ophthalmic NSAIDs decrease the pain associated with acute corneal abrasion as well as or better than placebo, oral analgesics, or standard therapy without delaying healing?" You now prepare to search for the best evidence to answer your question.

**SEARCHING FOR AND SELECTING THE BEST EVIDENCE**

Two questions must be answered before the search is conducted: "What is my search strategy?" and "Which databases will I search?" The purpose of your search is to rapidly identify the best evidence that answers your clinical question. You are not attempting to identify every study on the topic as you would if you were writing a rigorous systematic review or preparing background information for a formal research project. Because you are a

busy clinician with many professional and personal obligations, your time to research this question has limits. Therefore, you must choose article selection criteria to winnow the possible playing field from many articles to a manageable handful that best answer your question. At the same time, the search strategy should not be so restrictive that relevant articles are overlooked.

You want to conduct a search using the following concepts—NSAIDs for treatment of corneal abrasions in an acute care setting population. You next conduct a Web-based search of the 1966-1999 MEDLINE database using the Ovid (Ovid Technologies, Inc, New York, NY) search engine, the one available to you at your institution. (Other search engines are similar in concept and implementation to Ovid, although each has its own unique features and nuances.) In searching the concept "corneal abrasion," you wonder which search term you should enter—"cornea," "corneal," "corneal abrasion," or "corneal injury." (Searching with each of these terms will in fact yield markedly different results.) One strategy to resolve this is to enter the word "cornea" in the "Enter Keyword or Phrase" dialog box. The Ovid search engine then maps this concept to a specific Medical Subject Heading (MeSH) term. Once the MeSH term is identified,

**Figure 1.**  
*The 4 elements of well-built clinical questions (PICO).*

<b>Patient or Problem</b>	<b>Intervention (A treatment, a cause, a prognostic factor, etc.)</b>	<b>Comparison Intervention (If necessary)</b>	<b>Outcome(s) (Consider relevant outcomes from the perspective of the clinician, patient/family, payer/health care administrator)</b>
Patients with acute corneal abrasions	Ophthalmic NSAID solution	Placebo ophthalmic solution <b>or</b> Oral analgesic (opioid plus acetaminophen or an NSAID) <b>and/or</b> "Standard" therapy (cycloplegics, ophthalmic antibiotic, and/or eye patch)	<b>Main outcomes of interest</b> Pain intensity reduction Time to healing (improved or delayed) <b>Other important outcomes</b> Onset of relief Reduction of associated symptoms (tearing, photophobia), Sedation Return to work and normal function Sleep disturbance Global satisfaction Infection rate Other adverse events <b>Other considerations</b> Cost Ease of administration and compliance
<b>Statement of the question</b> In patients with acute corneal abrasions treated in the acute care setting, will ophthalmic NSAIDs decrease the pain associated with acute corneal abrasion as well as or better than placebo, or standard therapy without delaying healing?			

the Ovid search engine allows you to either “explode” or “focus” the search on this Medical Subject Heading (MeSH) term “cornea.” The explode option allows you to retrieve citations for the selected terms as well as its more specific term. The focus option limits your search to those documents in which your subject heading is considered the major point of the article. You choose the former option. After you explode the subject heading “cornea,” you are given the option of choosing subheadings from a lengthy list of options. In this case, you choose to limit the search to the subheading of “Injuries.” Choosing and exploding the term “cornea,” then selecting the subheading of “injuries” yields 2,145 articles.

You next search using the concept of “NSAIDs.” Should you enter “NSAIDs,” “nonsteroidal anti-inflammatory drugs,” or “nonsteroidal anti-inflammatory agents”? Unsure, you enter the term “NSAIDs.” Fortunately, the Ovid search engine automatically maps the term to the correct MeSH term “Anti-inflammatory agents, non-steroidal.” You explode this term, but do not choose a subheading, a strategy that yields 80,819 articles. Next, you combine the first and second searches, yielding 29 articles. You then click on the Ovid screen icon “Limit” to further narrow your search

to human clinical trials written in English. This yields 5 articles.<sup>3-7</sup> The final search strategy is displayed in Figure 2. None of the retrieved articles are systematic reviews.

After reviewing the abstracts of the 5 selected articles, you exclude 2 that do not appear to address your question. The trial by Donnenfeld et al<sup>6</sup> evaluated a contact lens bandage and a topical NSAID for treating corneal abrasions. The study by Haynes et al<sup>7</sup> evaluated the use of NSAIDs for the relief of pain from corneal rust rings. Because none of the remaining articles<sup>3-5</sup> are available to you as full-text on-line articles, you request and receive copies of the 3 studies from your hospital’s interlibrary loan service within 24 hours.

ANALYZING THE EVIDENCE

You note that 2 of the articles<sup>4,5</sup> were published in United Kingdom journals, where the study descriptions tend to be more parsimonious. You now proceed to assess the validity of each of the three studies using the User’s Guide to articles about therapy by Guyatt et al.<sup>8,9</sup> This will entail determining if the study was randomized and if all patients who entered the trial were properly accounted

**Figure 2.** Computer screen capture illustrating the MEDLINE search conducted in July 1999 using the Web-based Ovid search engine. The screen icons above the Search History allow combining and limiting of searches, as well as the searching of medical databases other than MEDLINE.

The screenshot shows the Ovid Medline search interface. At the top, it says "OVID Medline 1966 to August 1999 Week 3" with a "Help" button. Below this is a row of icons for search tools: Author, Title, Journal, Search Fields, Tools, Combine, Limit, Basic, Change Database, and Logoff. The main part of the screen is a table with the following data:

#	Search History	Results	Display
1	exp Cornea/in [Injuries]	2145	<a href="#">Display</a>
2	exp Anti-inflammatory agents, non-steroidal/	80819	<a href="#">Display</a>
3	1 and 2	29	<a href="#">Display</a>
4	limit 3 to (human and clinical trial)	5	<a href="#">Display</a>

Below the table are three radio buttons: "Run Saved Search", "Save Search History", and "Delete All Searches". At the bottom, there is a text input field with the label "Enter **Keyword** or phrase:" and a checked checkbox for "Map Term to Subject Heading". To the right of the input field is a "Perform Search" button.

for at its conclusion. You will also assess whether the treatment allocations were blinded, whether the groups were similar at the start of the trial, and whether patients were treated equally apart from the study intervention.<sup>9</sup>

#### Are the results of the studies valid?

Brahma et al<sup>5</sup> studied the use of flurbiprofen 0.03% eye drops in a large number of patients with corneal abrasions. Although the assignment to 1 of the 4 treatment groups was randomized, the methods for masking (blinding) the treatment allocation were not stated, a particular concern in a pain control study. Study outcomes were assessed using a postal questionnaire. Only 224 (55.8%) of the 401 enrolled patients returned the questionnaire. As noted by Guyatt et al,<sup>9</sup> completeness of follow-up is a major determinant of the validity of a study regarding therapy. The greater the number of subjects who are lost, the more the results of the trial may be subject to error because patients who are lost often have different prognoses from those who are retained. For example, subjects may disappear from follow-up because they suffer adverse outcomes or because they are doing so well they did not follow-up. Because the loss of nearly half the subjects to follow-up raises serious concern about the validity of the Brahma et al<sup>5</sup> study, you decide to exclude it from further consideration. This is not done to “trash” the article or imply that the study is without merit. This study had by far the largest number of subjects of the 3 studies and evaluated a meritorious number of pertinent outcomes. But because your goal is to efficiently retrieve and analyze the highest validity evidence that answers your question, you choose to stop your analysis of this article and move to the other two.

The Table summarizes the study methodologies and results from the remaining 2 studies. Jayamanne et al<sup>4</sup> compared diclofenac 0.1% ophthalmic solution with normal saline solution in 40 patients with corneal abrasion. The treatment assignment was randomized and the study agents double-blinded. However, baseline characteristics of the 2 groups were not provided. You are therefore unable to determine whether the 2 study groups were balanced at start of the trial for such potentially important prognostic variables as age, sex, size of corneal abrasion, and time from injury to ED presentation. Determining if groups are similar at the start of the trial is an important determinant of study validity. You would like to know that the treatment and control groups are similar for all the factors that determine the clinical outcomes of interest save one—whether they received the experimental therapy.<sup>9</sup>

Kaiser and Pineda<sup>3</sup> compared ketorolac 0.5% ophthalmic solution in 100 patients with either a corneal abrasion or following removal of a superficial corneal foreign body. Patients were randomly assigned to either the control or the treatment group and the study drugs were double-masked. Interventions other than the treatment under study are called “cointerventions.” In both the Jayamanne et al<sup>4</sup> and Kaiser and Pineda<sup>3</sup> studies, subjects in both study groups were allowed the use of mild oral analgesics including NSAIDs (ibuprofen or aspirin) as needed, although the amount of self-medication was not reported. This emphasizes the need to carefully assess study co-interventions to make sure that apart from the experimental intervention that both groups were treated equally. Differences in self-medication between the ophthalmic NSAID group and the control group may have profoundly influenced the results of the study. Without knowing which group took what additional analgesics, you cannot determine the direction of the effect. For example, if the subjects receiving ophthalmic NSAIDs took more oral analgesics than the control group subjects, the pain relief attributed to the ophthalmic NSAIDs may have been overestimated.

You rate the validity of the Jayamanne et al<sup>4</sup> study as “fair” and the validity of the Kaiser and Pineda<sup>3</sup> study as “good.” Other clinicians reviewing the same studies may not necessarily agree with your rating, whereas others may use a different assessment scale. Nevertheless, such an informal and arbitrary study rating is your way of summarizing your assessment of the validity of the study.

#### How large were the results?

The next step is to determine if the treatment effect (difference) between the study drug and control groups was clinically significant. For pain control studies, there are 2 major ways to assess how large the treatment effect was—number needed to treat (NNT) and minimal clinically significant changes in pain scores. NNT, discussed in a previous installment of the evidence-based emergency medicine series,<sup>10</sup> is one method to assess the magnitude of treatment effect and equals the inverse of Absolute Benefit Increase (ABI). It is tempting to compute ABI directly from reductions in mean pain intensity. However, this would be erroneous because NNT calculations require dichotomous data and cannot be computed directly from the ordinal visual analog scale (VAS) data. Dichotomous data contain only 2 classes such as male or female (sex) or lived or died (mortality). For VAS pain scores, NNT can be computed if dichotomous data such as number of subjects experiencing 50% pain relief at a

given time are presented—either they experienced 50% relief or they did not. However, because neither the study by Jayamanne et al<sup>4</sup> nor Kaiser and Pineda<sup>3</sup> reports pain scores as dichotomous data, we must use other means of determining how large a treatment effect existed.

When only mean (average) pain scores are given, how can you determine if the changes are clinically significant? Todd et al<sup>13</sup> conducted a study of patients 18 years or older who presented with acute pain resulting from trauma at an urban county hospital ED with a Level I trauma center. They concluded that the minimum clinically significant change in patient pain severity measured with a 100-mm VAS was 13 mm. This widely cited article

suggests that studies of pain experience that report less than a 13-mm change in pain severity, although statistically significant, may have no clinical importance. You recognize, however, that because of the limitations of the study site and population, these results may not be generalizable to patients with pain secondary to corneal abrasions.

In the study by Jayamanne et al,<sup>4</sup> no raw pain score VAS data were presented and the categorical pain scale data were presented only in tables. Although the authors report that statistical analysis of visual analog and categorical pain scores revealed a significant reduction in pain experienced by subjects in the diclofenac

**Table.**  
Summary of 2 studies of ophthalmic NSAIDs for corneal abrasions.

Study Characteristic	Kaiser and Pineda <sup>3</sup> (1997)	Jayamanne et al <sup>4</sup> (1997)
NSAID ophthalmic solution	Ketorolac 0.5%	Diclofenac 0.1%
Comparison group(s)	"Control vehicle"	Normal saline solution
<b>Are the results of the study valid?</b>		
Randomized?	Yes	Yes
Method of follow-up	"Reviewed daily" plus outpatient diary	"Reviewed daily" until complete corneal reepithelialization occurred
Was follow-up complete?	No; of 100 enrolled, 12 were excluded	Yes; all 40 enrolled subjects completed the study
Treatment blinding?	Double-blinded	Double-blinded
Groups similar at start of trial?	Yes	Not known
Cointerventions		
Eye patch	No eye patching	No eye patching
Cycloplegics	All given cycloplegics initially	No cycloplegics
Eye antibiotics	Erythromycin or polymyxin ointment for 5 days	Chloramphenicol ointment
Oral analgesics	Oral analgesics permitted—amount not reported	"Patients were advised to take adequate oral analgesia as required"—amount not reported
<b>What were the results? How large was the treatment effect?</b>		
Results		
Pain intensity	Ketorolac subjects had a mean pain intensity reduction of 2.7 compared with 1.4 in controls day 1 Pain scores not presented as dichotomous data—unable to calculate NNT	Diclofenac subjects experienced significant reduction in pain on day 1 (and less on day 2) by both VAS and categorical pain scales Pain score data not provided—difficult to assess how large a treatment effect exists
Subjective symptoms	Fewer ketorolac subjects had photophobia and foreign body sensation day 1 compared with controls	Ketorolac subjects experienced foreign body sensation and photophobia less frequently than controls
Sleep disturbance	Not reported	Not reported
Return to work	Ketorolac subjects had significantly earlier return to work	Not reported
Supplemental oral analgesics	Not reported	Not reported
Time to healing	No significant difference	Not reported
<b>Will the results help me in caring for future similar patients in the ED?</b>		
Setting	Eye and ear infirmary in United States	Eye casualty department in United Kingdom
Adverse events	No systemic complications and no allergic reactions noted in either group	Not stated
Infection rates	Not studied	Not studied

group, not enough data were presented to assess how large a treatment effect exists. In the Kaiser and Pineda<sup>3</sup> study, the mean change in pain score from presentation to day 1 using the ordinal scale (0 to 10) was 2.7 for the ketorolac group and 1.4 for the control, a difference of 1.3 between the groups. The results were reported using SDs instead of confidence intervals (CIs). The group receiving ketorolac had a statistically significant reduction in photophobia and foreign body sensation by day 1. There was no difference in regard to tearing or blurry vision. The study also evaluated the number of days before the patient returned to normal activities, with an absolute difference of 0.6 days in favor of the treatment group. There was no delay in wound healing in the NSAID group, as the mean time to complete healing was 2.6 days for the treatment group versus 2.9 days for the control. The amount of oral analgesics used by each study group was not reported. During the subsequent 3 to 8 months, 3 patients returned with recurrent corneal abrasions, 2 in the placebo group and 1 in the ketorolac group.

To this point, you have winnowed the field to 2 studies, 1 with a "fair" rating and 1 with a "good" rating. Both studies showed treatment differences in favor of the ophthalmic NSAID groups for pain reduction and other outcomes, although the determination of how large a treatment effect for pain reduction exists is difficult. The final step is to consider how you will apply the evidence to future ED patients presenting with corneal abrasions.

#### APPLYING THE EVIDENCE

You now assess how the results of the studies by Kaiser and Pineda<sup>3</sup> and Jayamanne et al<sup>4</sup> will help you care for future patients presenting to the ED with corneal abrasion. To assess this, you will determine if the study populations are similar to your own and if the likely treatment benefits are worth the potential harm and costs.

In the Kaiser and Pineda<sup>3</sup> study, the study population consisted mostly of adult males. Thirty-five percent of the corneal abrasions related to removal of corneal foreign bodies and the other causes of the corneal abrasions were specifically listed. You are comfortable that these subjects are similar enough to your own ED patients. The results, however, would have to be applied with caution in other populations such as women, children, and the elderly. As mentioned earlier, the demographic details of the subjects in the Jayamanne et al<sup>4</sup> study were not well described.

The adverse events of alternative therapies must also be considered. The adverse events associated with oph-

thalmic NSAIDs appear to have been minimal and included mild burning on instillation. Although delayed healing with ophthalmic NSAIDs has been a concern, the Kaiser and Pineda<sup>3</sup> study results actually trended toward faster healing in the treatment group. The adverse events associated with ophthalmic NSAIDs must be compared with the well-known side effects of oral analgesics such as sedation and constipation with opioids and the risk of gastrointestinal irritation and bleeding with oral NSAIDs. Infection rates were not addressed in any of the 3 studies.

Cost and availability are yet other important issues in deciding on the applicability of this therapy. Because you are unable to identify a cost-benefit analysis of ophthalmic NSAIDs in corneal abrasion therapy, you look up the AWP (Average Wholesale Price) and conduct an informal sampling of local hospital and pharmacy pricing. The AWP of 5-mL diclofenac 0.1% solution and ketorolac 0.5% ophthalmic solutions are \$42.19 and \$38.95, respectively (February 1999). The cost to the patient in a sampling of local pharmacies for these 2 drugs is around \$50. You also find that the generic formulation of flurbiprofen is available at a hospital cost of \$5.41 for 2.5 mL and a charge of \$15.99 at a local pharmacy. From this informal sampling, you also learn that pharmacy prices vary widely depending on location, competition, and contracts and that not every pharmacy even stocks ophthalmic NSAIDs.

In summary, the advantages of using ophthalmic NSAIDs include improved relief of pain and other symptoms (compared with placebo) and the lack of sedation that may be associated with opioid therapy. The disadvantages include increased cost and burning on instillation. You also note the limitations of the studies you reviewed. In general, few studies regarding ophthalmic NSAIDs have been conducted in acute care settings, and none of the retrieved studies compared ophthalmic NSAIDs with oral opioids or oral NSAIDs, assessed infection rates, or carefully controlled which oral analgesics subjects could take on their own. Furthermore, the magnitude of the treatment effect was difficult to determine in the 2 studies completely reviewed.

How do you reconcile these pros and cons? And how do you also address the concerns of the individual patient about pain when the topical anesthetic wears off? The solution lies in one of the most important philosophies of EBM: involving the patient in the decisionmaking process. The actor James Stewart said, "I never think of my audiences as customers. I think of them as partners." Health care is

similarly a partnership between clinician and patient and the philosophies and the skill set of EBM can help promote this partnership. EBM is not just practicing medicine by evidence alone. It includes the melding of best evidence with the clinician's experience and the patient's rights, values, and preferences. Because EBM is the translation of scientific evidence into clinical practice, the clinician must be able to distill and communicate the evidence in understandable language for the patient. Then the patient must weigh the risks and benefits of the therapy, as well as other considerations unique to them as individuals. For example, do oral opioids make them sleepy or nauseated? Do they drive a forklift or school bus? Will they have to pay the full prescription price or do they have a co-payment? Do they find eye drops difficult to use?

You also note that EBM exercises such as this often create more questions than they answer. Furthermore, it is not just the "bottom line" conclusions that are always important, but the process of arriving at the answer (formulating the question, searching for evidence, and analyzing the evidence) that keeps clinicians continually learning and improving. EBM exercises also expose the soft underbelly of clinical practice—many of our decisions and beliefs are based on sparse data or studies of limited validity.

Because new biomedical information is constantly becoming available, you decide to revisit this topic in the next year. Finally, you decide to present this topic to your colleagues at your next departmental meeting and discuss whether ophthalmic NSAIDs should become part of the routine treatment of patients with corneal abrasions. You also have an increased curiosity whether other "time-honored" treatments such as eye patching, antibiotic ointments, and cycloplegics should not be reevaluated in a similar fashion. But you choose to save those questions for another day. The sun is shining. The golf course beckons.

## REFERENCES

1. Wyer PC, Osborn HH: Recombinant tissue plasminogen activator: In my community hospital ED, will early administration of rt-PA to patients with the initial diagnosis of acute ischemic stroke reduce mortality and disability? *Ann Emerg Med* 1997;30:629-638.
2. Sackett DL, Richardson WS, Rosenberg W, et al: *Evidence-based Medicine: How to Practice and Teach EBM*. New York: Churchill Livingstone, 1997.
3. Kaiser PK, Pineda R II: A study of topical nonsteroidal anti-inflammatory drops and no pressure patching in the treatment of corneal abrasions. Corneal Abrasion Patching Study Group. *Ophthalmology* 1997;104:1353-1359.
4. Jayamanne DG, Fitt AW, Dayan M, et al: The effectiveness of topical diclofenac in relieving discomfort following traumatic corneal abrasions. *Eye* 1997;11:79-83.
5. Brahma AK, Shah S, Hillier VF, et al: Topical analgesia for superficial corneal injuries. *J Accident Emerg Med* 1996;13:186-188.
6. Donnenfeld ED, Selkin BA, Perry HD, et al: Controlled evaluation of a bandage contact lens and a topical nonsteroidal anti-inflammatory drug in treating traumatic corneal abrasions. *Ophthalmology* 1995;102:979-984.
7. Haynes RJ, Walker S, Kirkpatrick JN: Topical diclofenac relieves pain from corneal rust ring. *Eye* 1996;10:443-446.
8. Guyatt GH, Sackett DL, Cook DJ: Users' guides to the medical literature. II. How to use an article about therapy or prevention. B. What were the results and will they help me in caring for my patients? Evidence-Based Medicine Working Group. *JAMA* 1994;271:59-63.
9. Guyatt GH, Sackett DL, Cook DJ: Users' guides to the medical literature. II. How to use an article about therapy or prevention. A. Are the results of the study valid? Evidence-Based Medicine Working Group. *JAMA* 1993;270:2598-2601.
10. Cordell WH: Number needed to treat (NNT). *Ann Emerg Med* 1999;33:433-436.
11. Moore A, McQuay H, Gavaghan D: Deriving dichotomous outcome measures from continuous data in randomised controlled trials of analgesics. *Pain* 1996;66:229-237.
12. Hulley SB, Cummings SR: Planning the measurements: Precision and accuracy, in Hulley SB, Cummings SR (eds): *Designing Clinical Research*. Baltimore: Williams & Wilkins, 1988:32.
13. Todd KH, Funk KG, Funk JP, et al: Clinical significance of reported changes in pain severity. *Ann Emerg Med* 1996;27:485-489.