The Advanced Ocular Therapeutics (AOT) course is a 23-hour certificate course on systemic and injectable medications used in eye care. This course currently meets the didactic requirements for optometrists in Oregon, Washington and Alaska. After viewing all 18 segments of the course, the doctor will take a written exam over the course materials. This exam will be administered through an approved proctor site (state board offices, university, or at Pacific University College of Optometry). Doctors will have 30 days to view the 18 segments of the course from the time their registrations have been processed. To register for Advanced Ocular Therapeutics (AOT), please complete the registration form and email to Jeanne Oliver at jeanne@pacificu.edu or by fax at 503-352-2929. Online registration is also available (below). Upon receipt of your completed registration form and 50 percent deposit ($900), you will receive a password to access the video courses. After you've completed the 18 segments, the balance of the registration ($900) will be due and the written exam will be sent to your designated proctor. The exam will consist of 50 multiple choice questions. The exam is returned to Pacific University College of Optometry for scoring. A passing score is 75 percent. Course materials were recorded August 16 – 18, 2010, during the PUCO/OOPA AOT course at Pacific University in Forest Grove, Oregon. The instructors are: Ken Eakland, OD (Course Master), Bruce Flint, OD, Blair Lonsberry, MS, OD, MEd, Dennis Smith, OD, MS, Jeffrey Urness, OD, Lesley Walls, OD, MD. Washington requires an additional eight hours of supervised clinical workshop and four hours of injections workshop for licensure. Please contact Optometric Physicians of Washington for information on upcoming workshops. Alaska requires an additional 7 hour injections workshop.

Part 1: Principles of Systemic Therapy and Prescription Writing

Corresponding author: Lesley L. Walls, O.D., M.D.

It is a pleasure to be here. If you've ever heard me lecture before, I usually don't have anything to say, and I try to make it humorous so you think I've said something. This is a little different, because it's a certification course and it has to stand the scrutiny of the state legislatures and other professions like medicine, so I hope I don't bore you to death. The material that has been put together for this course has stood the test of time, and by that I mean that we originally put this course together for a number of states, and I worked with a number of other people putting this together – you may remember Lee Carr along with some folks at Pacific University and SCCO, so the course has really been put together as a consortium course and has been taught in multiple, multiple states, and because of that we can honestly say it's stood the test of time because, over the years, the optometrists who have passed this course have very successfully utilized medications of all kinds. I have a very dear friend up in California who I went to school with, who took this course kicking and screaming like a pig under a gate. He said, "All I do is contact lens and refractions, that's all I ever want to do. I don't want to use any of these medications." He obviously used topical dilating medications, he was referring to systemic medications. He called me one day a few weeks after the course and said, "You know all that kicking and screaming I did? That was all a bunch of hooey." He'd had a patient who needed a systemic antibiotic and pain meds, it was a holiday and he could not get ahold of any of his ophthalmology friends and stuff, and he said, "Wait a minute – I can do this!" And he did it, then he called me and he was so proud of himself that he'd actually taken the course. He had to take it, of course, to keep his license and VSP was 85% of his practice. There is always a concern about this type of stuff. I believe that if it weren't for the legislative process, we wouldn't have to take a course like this.

We are going to go over some things, and I've tried to include the key concepts here. By the way, I've taught this in medicine, for many of you who don't know, I've spent many years in my career teaching full time at the medical school and only part time in optometry. This is the very stuff that we were teaching our fourth year medical students, interns and residents who were going out into practice. Why is that important? Because we are physicians by anybody's definition. We are key members of the health care team, and we treat the ill and sick.

One of the things that is very important, and I believe it is needed, as my good buddy in California is a living example of, you will be stranded with a patient who will need this at some time in your career. I think we can build a good case for need, and if you have been following any of the healthcare reform stuff that is going on in this country, I don't know if you've noticed, but they are predicting an incredible shortage of healthcare practitioners, especially in primary care. Everybody wants to be a neurosurgeon or an ophthalmologist, and not the primary care. OBGYN, family practice, general surgery, and pediatrics are all primary care disciplines and it's hard to find people who want to go into that – they want this super technology stuff, to be able to dilate coronary arteries with catheters and all of this stuff. Thus, there is a shortage of primary care doctors, and I truly believe that the whole spinoff means that there is even a brighter, brighter future for optometry in the healthcare arena.

One of the things that I've found over the years, practicing medicine and practicing optometry, is that I would like to have thought I knew everything, but I was just smart enough to know I didn't. I knew I needed help. If you hear nothing else about this, hear that you have ready access to help with the internet. Everyone has a computer and internet, and you can get instant access to the medicines that we are talking about today, and you can basically get it for free. Table 1 shows a basic list of internet resources for medications that you have access to. I happen to own a Palm Pilot, and the reason for that is that I'm a tightwad. You can buy the entry level Palm Pilot very inexpensively and you would get Epocrates for free! They update Epocrates once a week with thousands of medications that are instantly at your hand. All of these other resources are quality sites, as well.

Table 1

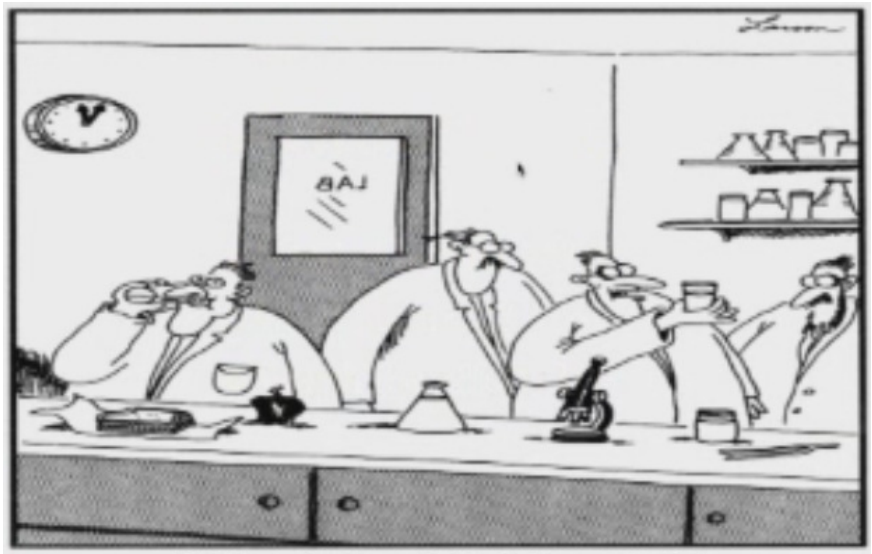
Tools
Palm Pilot and Epocrates.com
Other Hand-Held PDA's and Drug Lists
www.drugs.com, www.rxlist.com
Etc. – Dr.Drugs.com and so on
Use a Search Engine (Google, etc.)
PDR, PDR for OTC's, PDR for Drug Interactions and Side Effects
PDR for Ophthalmology

Why did I bring this up? I can tell you that under judicious prescribing, I've been burned. I think that was why they wanted me to give this lecture: I've had everything possible that can go wrong, go wrong. Therefore, I am experienced. I've had people that we've given medications to who have had allergic reactions that knew they were allergic to the drug, I've had my prescription pad stolen, I've had people

call in and use my DEA number, and therefore I'm an expert. I tell you, it's very distressing to have to deal with this stuff. I'll tell you more about some specific cases in just a little while. What I've found, overall, is that I can't remember everything. Most doctors, everything from dentists to optometrists to MD's, they have just a handful of drugs – three, four or five medications that provide the bulk of what you need. If you use it regularly, you will be very familiar with it. However, if you don't use it regularly, the safest thing to do is to run out, hit your Palm Pilot, www.PDR.net, Dr.Drugs, or whatever you use, and look it up. That is the safest thing to do.

Let me give you one example where I screwed up. This is when I was just practicing mostly medicine. I had a patient come in with low back pain – they would bend over to pick something up and *boom*. Most of us have had our back go out at one time or another. The patient came in to see me and they could barely walk. They didn't rupture a disc, just pulled a muscle in their back. So I put them on a muscle relaxant. I'd just seen the drug representative and they had a new form of the same medication. The pill I'd been using was almost as big as my thumb and hard to swallow. Then they came out with one that was smaller than the end of my little finger and was easy to swallow. I assumed, incorrectly, that it was the same medicine. It was the same medicine, but in that little mini-pill, it had about five times the strength of that large pill that was the size of my thumb. Out of ignorance, because I did not look it up, I put the patient on the same amount as the old pill – 2 pills QID, which was five times the maximum dose. Boy did it relax the patient! This guy came back to my office with two people – one under each arm pulling him in. I mean, you talk about every muscle in his body was relaxed! His intercostal muscles, his skeletal muscles, his diaphragm… he said, "My back doesn't hurt, but I'm having a little trouble breathing!" I looked the drug up really fast and went, "AAAHHH!" I'm a very honest person – I went out and told the patient what I did. The patient said, "Well, I'm alive, so what now?" I said, "Let's skip a few doses." That is my point – that was the wrong way to use a systemic medicine. A new medicine I'd never used, and I should not have made the assumption. Even if it's an old medicine that you haven't used in awhile, don't assume. Look it up! If you're a genius, maybe you can get away with that, but I am not a genius, so I have to look this stuff up. Please use the help sources listed in Table 1.

Figure 1: The Far Side by Gary Larson



"What the? . . . This is lemonade! Where's my culture of amoebic dysentery?"

Another one of the things that's important when we talk about systemic medicine, is to know the definition. What is a systemic medication? By definition, the medication is distributed entirely within the body, respecting the barriers such as the blood-brain barrier, retinal-blood barrier that will keep the medications out. Within those limits, the

medication goes everywhere within the body. If you want to treat an eyelid with a systemic medication, you can bet that the follicles in the nail bed, the skin, kidney and liver are all going to be exposed to that medication, because it will be distributed system-wide. Therefore systemic medications that are more likely to cause problems because they are in all tissues of the body. That makes sense.

Table 2

Systemic Routes of Administration
Intrathecal
Intraarterial
Intravenous
Intramuscular
Subcutaneous
Rectal (Suppository)
Sublingual
Oral
Topical

If you look at routes of administration, we all think of swallowing a pill or getting a shot, but there are a bunch more ways to do it. (Table 2) Intrathecal – you can inject medicine directly into the cerebrospinal fluid. I've had to do that once in my career when I had a patient with a resistant meningitis. That gets absorbed and goes throughout the whole system, but you get high doses in the central nervous system to treat a resistant meningitis. Intra-arterial: you can give medicines directly into the artery and get specific high dosages. Do we use this in optometry? No. But some cancer treatments and the like can actually require this. Intra-venous is a famous way, and you guys who have done injections like during a fluorescein angiography, that fluorescein goes everywhere even though we just want it in the eye. It goes into the kidney, into the liver, and everywhere else. Intra-muscular is common for antibiotics, such as a shot of penicillin. Subcutaneous – the subcutaneous tissue is richly vascularized and can quickly absorb the medication for a rapid systemic effect. Rectal – for those of you who have had children, you've had to shove a slick thing up their behind when they are vomiting because the rectal mucosa will absorb the medication because it's an absorptive surface. Sublingual – this is often used for nitrates for chest pain or glucose, because you can get a nice, rapid absorption under the tongue. Oral is another big one, and the one that is clinically relevant for us.

When you look at how dependably a systemic medication is absorbed, and how predictable it is, the oral route is considered overall the safest way to give medicines systemically. That's important because if we want to get an antibiotic into the system, you can't rub it in the skin or squirt it on the conjunctiva, you need to swallow it. The oral drug studies that we have are very good. Yes, there are alternatives – we have a narcotic patch, but that is really more for chronic pain, people who have been on a medication and they are trying to taper them down. You don't get the dependable, predictable absorption from the patch that you get from swallowing the narcotic pill. The most predictable, and therefore the safest way to bet that you're going to get the effect you want is by swallowing a pill. The next-best way, really, is intra-venous, but we don't need that in optometry other than fluorescein angiography, because we have such good oral systemic medications.

Yes, we can also get topical systemic absorption, but it is not as predictable or dependable as oral. For ladies in menopause, you can get a topical estrogen patch. For people who are trying to quit smoking, you can get a topical nicotine. However, if you are trying to get nicotine, the best way is to smoke a cigarette, if that is what you are trying to do. Please keep in mind for predictability and safety

standards, oral route is by far the best. When we talk about systemic medications in optometry, we are really talking about oral medications.

There are a lot of risks related to the use of systemic medications (Table 3), but these are all common sense. This is stuff that, as a doctor, you don't even have to think about, because you know that the higher the dosage the higher the risk. The more times you use a drug, the higher the risk. If you use a drug for a long time, the more the risk. Of course, there are certain properties of medications, which we will talk about in a minute, that increase the risk. If the patient is taking other medicines, there is a risk for drug interactions – that makes sense. Remember this especially: the very young, and the very old cannot be treated the same way you treat a standard adult. With medications, we talk about milligrams per kilogram, while a child may not be able to handle that amount. The surface area of the patient is also important, and in an aging patient when all of the systems are wearing out, we worry about their kidneys, liver and heart. It's the standard, healthy adult that gets standard dosages. Just keep that in mind – the pediatric and the geriatric populations are a little different. And then, of course, the associated systemic conditions play a role. For instance, in a patient that is diabetic or with severe hypertension, or a patient who is on chemotherapy for cancer with a suppressed immune system – we need to keep those things in mind.

Table 3

Related Risks
Dosage
Number of Administrations
Duration
Properties of Medications
Concurrent Medications
Age of the Patient
Size of the Patient
Associated Systemic Conditions

Table 4

At-Risk Patients
Polypharmacy
Multiple Doctors
OTC's
Elderly
Systemic Disease(s)

We often forget about over-the-counter (OTC) medicines. There are a lot of OTC medications that can have dangerous interactions with our prescriptions. Here is a big one that I'm going to get to in judicious prescribing: people who see multiple doctors – seeing you as an optometrist, then they are seeing an ophthalmologist, a neurologist, an internist and a family doctor, and everybody is treating the same thing. It's amazing how much of that I've seen, and I'll talk about that in a little while.

What I wanted to make sure to say was that we need to be aware of the pharmacologic properties of the drug we are prescribing; absorption, distribution, metabolism and excretion. We all had this in pharmacology. A medicine is absorbed from the GI tract, if it's an oral medication, it's distributed throughout the body, and metabolized – where is it metabolized? This is, in my opinion, one of the most important things you have to keep in mind. That is, most medications, but not all, are metabolized in the liver, and excreted in the urine. Therefore, people who have had hepatitis, nephritis, kidney failure, etc. we need to be extra-careful with these patients, or any who have had liver or kidney disease, because most medications metabolize in the liver and are excreted by the kidney. Those are two very important organs to be aware of.

I know we are just talking about general concepts here, but let me throw this in – how much of your liver, kidney and cardiac function will you lose by the time you're my age compared to when we 'peak' at about age 25? (I'm currently 68) There's a gradual loss, and somewhere around age 70, we have lost 50% of the liver function, kidney function, and maximum cardiac output is down by somewhere between 30-50%. That's why you don't see a 67 year old running the Boston Marathon in 3 hours – we don't have the cardiac output, lungs, or any of that stuff. And you cannot stop it – we may be able to delay it with a healthy lifestyle, but we cannot stop it. If you're interested in this, we do have an 80% reserve because, at age 25, you are over-supplied by both the liver and the kidney by almost 90%. That's why you can lose 50% and still have a reserve, but you lose that large homeostatic reserve and don't have as many cells working on things, so you're more likely to have a side effect from a medication even though you still have a little bit of a reserve.

Table 5

Rules for "Good Practice"
Use Safest/Best Medication
Use the Safest/Best Route of Administration
Keep Cost in mind

There are some other things that I want to cover: Rules for Good Practice. (Table 5) You use the safest and best medication – what do I mean by that? I mean common-sense stuff. This is stuff we should already know. The safest and best medicine means that you know what you're doing, you see something that needs a medication, and then think about the medications that have worked for us, and which have the least amount of side effects. When the drug companies come out with a new medication, remember that one that I told you before about the large pill vs the small pill at the beginning of this lecture? Don't be the first to use a new medication, because it may cause cancer, other side effects; they may find out after awhile that the new medication is causing some very serious side effects. Wait until the new medication has been in use awhile and keep using the standard medication, until the standard medication is not working anymore and you need a new one. I call the pharmacists a lot – the pharmacist is our friend. Most doctors won't call a pharmacist because they view them as technicians that are just counting pills. Listen – these folks are smart, and they will help you. Not long ago, I was treating a child patient who had a cellulitis on their eyelid, and I was worried about H flu, which we will talk about in a little while. I called the pharmacist because I hadn't treated that in a while, and I said, "Hey – I've got this patient where I'm worried about H flu. The child is 10 years old. Are the pediatricians still using Ceclor?" And he said, "Oh, yes – we use that all the time." I said, "Thank you very much," and wrote the prescription for Ceclor. The pharmacist can help you a lot – that is another tool I should have included in Table 1 above.

We also need to use the safest and best route of administration. You will take this course, and then suddenly have the ability to write a prescription for a systemic medication. In the eye, if you can treat it topically, that is the safest way to treat the condition, because you get minimal systemic absorption. If you are treating something in the eye that can be treated topically, that's the safest way because we don't want systemic absorption, we want topical absorption. Does that make sense? That should be common sense.

Also, keep cost in mind. All of these medications cost different amounts based on different healthcare plans. I went to see my doctor, who used to be one of my interns when I taught at the medical school, and I thought he was just one of the best doctors I've ever had in my life. He's a good guy, works well with optometry, and all that. He's a family doctor, and he put me on a medication because he wanted me to really get a good result from my high cholesterol. He thought I needed something that was a little more potent than I was currently on. I went down to the pharmacy and, get this, it was not covered under my drug plan, and it was $230 a month! I went back to that doctor and told him I didn't need the 'gorilla' stuff for cholesterol – give me something standard. I went back with the new Rx and it was free! I'm just a poor retired educator, and I need to keep cost in mind.

I had some pitfalls in practice, and while this is common sense stuff that you already know, since we are talking about principles of systemic drug use, that it would be good to mention. (Table 6) First off, if you don't need a medication, don't use it. I was one of the most anti-prescription medical doctors in history, and I lost a lot of patients because of that. They would come in with a cold and want a shot of penicillin, because the old family doctor always gave them penicillin when they got a cold and they got well. But, they get well just as fast without it, and you don't run the risk. That's overuse – using it if you don't need it. If you don't need it, don't use it, and make sure you tell the patient why. For example, "I understand why you are here, and a lot of doctors would give a medication for this, but let me tell you what I'm absolutely convinced that you have, and medicine won't help. You have a virus, and an antibiotic won't help." That sort of stuff, because otherwise you are overusing.

Table 6

The 13 Pitfalls	
Overuse	Failure to Recognize Rx Failure
Underuse	Failure to Understand Pharmacology
Overtreatment	Changing Rx Too Son
Undertreatment	Inadequate History
Wrong Dose	Failure to Warn of Side-Effects
Wrong Duration	Failure to Instruct on How to Handle Side-Effects
Failure to Adjust with Lab	

However, if they need it, use it. Don't be someone who decides, "Well, I'm anti-pills, so your immune system will take care of this as soon as we get your temperature down below 106 degrees, and then, when you come out of this coma, you'll be fine." If they need it, use it – that's judicious, and we'll cover this again in judicious prescribing.

Also, don't overtreat. If your patient needs treatment for three days, don't treat them for a month. By the same logic, don't undertreat. If they need 7 to 10 days' worth of treatment, don't treat it for three days. When you start treating these diseases, you get so accustomed to what you're doing, it becomes automatic and you know, "I have this bacterial infection and we'd better give the minimum of 7 days," or, "This is a bad one and I'd better treat them for 10 days." You will get used to it.

Don't use the wrong dose! Remember what I did with that little itty bitty pill in my example at the beginning of this lecture? If you're going to use it, use the correct dose.

The wrong duration. Don't give your patient three days when they need 10 or 10 days when they need three.

If you order a lab, look at the results. I will tell you about a case that I had: I had a patient with a really bad infection who came into my medical practice, and I took a culture. I put the patient on antibiotics because I thought they had a bad infection, a facial cellulitis. They also had some drainage, so I took a culture and sent it in. I had inherited this practice when I went into practice with a group of older doctors, and they didn't have some of the office procedures in place that we later established after this. What happened was the culture and sensitivity came back that the infection was resistant to the medicine I had them on. Well, guess what: it was Friday evening when the lab report came in, and everyone was trying to get out for the weekend. That sheet got put in the patient's chart but I didn't see it. By Monday this patient had a raging infection, they were really sick and toxic. If you order a lab, look at it and make sure it does not go into your chart until your signature is on it. That was the new policy we instituted. All lab tests had to go into a box and be reviewed by the person who ordered it before going into the chart. If I had seen that report on Friday, I'd have called the patient, changed their prescription, and saved them a lot of grief. I told you – I've made every mistake known to the field.

If you're putting a person on a treatment, such as a patient with a preseptal cellulitis and we give them Ceclor or a cephalosporin, does that get better after the first dose? No – that infection is on a crescendo; it's on its way up. It will take hours before that levels off and then, if your treatment is working, the inflammation will start to get better. You can't swallow the pill and then immediately at their eye and decide the medication didn't work. You have to give it time. But, if in your experience, they should be getting better within 24-48 hours and they are not, then you have to wonder if our treatment is working.

Failure to understand the pharmacology. Again, a live case: we had a very, very ill patient with terminal cancer that had spread to their lungs, and they had developed pneumonia. This person was terminal, with a lovely family that I was taking care of. I talked to the family, and I said, "There's no reason that if this person does get over the pneumonia, they should be able to go home, and have another three or four weeks of quality life," because the patient was doing fairly well prior to developing the pneumonia. I had interns and residents I worked with, and my chief resident at the time was an outstanding family doctor. He was a 3rd year resident out of medical school, and he was on call in the hospital and didn't want to bother me because it was 2:00 in the morning when they got the lab test results back and the patient was resistant to the antibiotic we had them on. He had just met with a drug rep that day about a new drug for tough pneumonia cases, and he thought, "Well, let's try this new medicine." What he didn't know, because he didn't look it up, was it was a penicillin derivative, and this patient was highly allergic to penicillin. So guess what? He gave her a dose, and 20 minutes later, the patient was dead. That really happened – I've had everything happen to me. This is a prime example of failure to understand the pharmacology. So finally the resident called me, at like 3am in the morning, and asked,

"Are you awake?" I said, "Well, I am now." He said, "I just killed your patient." That was exactly what he said – he was devastated. I said, "You what?!" He said, "I just gave your patient such-and-such a drug, it was a penicillin derivative, and I didn't know that. She was highly allergic to penicillin, and it was all over her chart. She died within 20 minutes and there was nothing we could do." I told him I'd be right there, and the family was there. That is an open-and-shut malpractice case – I don't care if she only had two more days to live, it doesn't get any more cut and dry than this. I went in to the family and I told them exactly what happened, and you know what they said? They said, "Did she suffer?" I said, "No, she died almost instantly." They were so grateful because she had already suffered so much, they said, "Thank you very much." Now listen – don't count on that happening. If you kill somebody, don't count on that happening to you – that could have easily resulted in a multi-million dollar lawsuit. So I went out to talk to this devastated resident, and I haven't gotten over it yet, either, because whose responsibility was that, even though the resident gave the medication, whose responsibility was that? If you have somebody in your office that you are responsible for and they do something, it is you that did it, even if you didn't directly do it. We had to go before a hospital inquiry board, and all sorts of other things that we had to do, and basically nothing happened because the patient in question was so terminal, but it could have been a very different situation.

Failure to warn of side effects. Don't tell patients everything in the PDR; no one would ever take a pill if they read the PDR. Just tell them the common things. If there is a reasonable incidence of allergies, or a reasonable incidence of nausea and vomiting, or diarrhea, etc. Then, if they have side effects, tell them what to do. Tell them that if they develop an allergic reaction or develop nausea and vomiting, give you a call because you may have to change the medication.

Table 7

Basic Considerations
Vascularity and Distribution
Problem with Avascular Tissues
Intraocular Fluids

Basic considerations – there is at least one very important point here that I want to make. If any of you have given a lecture, you need to know this: any time I lecture I try to make only five to seven key points, because if you do more than that, your audience will not remember them. It is very important in the eye care practice to think about the avascular ocular tissues. By that, those that have a very poor or no blood supply at all. One of my favorite things about teaching the optometry and medical students, especially the fourth years, because they think they're hotshots, I love to ask them a question anytime we were doing anything with the cornea. I'd say, "OK, time for an anatomy review. Tell me the two arteries that supply the cornea." The cornea doesn't have any arteries – it's avascular. The students would look at me, and you can tell the wheels are turning and I'd tell them, "Come on! Come on!" There are no arteries that supply the cornea. The sclera is poorly supplied, and the crystalline lens has no arteries. The only time you have a vascular cornea is from neovascularization due to some injury or inflammation. So anyway, with relatively avascular tissues, are we going to get any medication to that tissue by having the patient swallow a pill or giving them an IV? Under normal conditions, avascular tissues get a zero-level distribution of systemic medication. That's why we treat it topically – systemic administration will not get any medication into the cornea but topical will. How do you treat a Herpes Simplex of the cornea? How do you treat a corneal bacterial ulcer from a contact lens? We use topical

medications. One of the most wonderful things about the eye is that almost everything that we do can be treated topically. But, when we need a systemic medication for a specific indication, they need it.

Barriers: this is another important concept. Why, if you have no intra-ocular infection, we can give all the systemic antibiotics we want and still have an intra-ocular distribution level of zero. And yet, if you have an intra-ocular infection or inflammation, you can use a systemic medication. Why is that? Because, remember in inflammation, the tissue becomes red, hot, swollen and it hurts. The capillaries and endothelium open up and the blood vessels dilate and therefore, molecules can get in. So, when we have an intra-ocular infection, there is inflammation which will allow us to get the systemic medication to enter the eye. In meningitis, if someone has no bacterial meningitis, we can give them a shot of whatever medication, and the level of medication in the spinal fluid will be zero. But, if you have inflamed meninges secondary to a bacterial meningitis, the capillaries will open up and dilate, the endothelial cells open up, the medicine can get into the cerebrospinal fluid. Once that meningitis resolves, everything will be back to normal and you can stop that antibiotic because it's no longer doing any good.

Table 8

Factors to Improve Intraocular Penetration
High Lipid Solubility
Low Molecular Weight
Low Plasma Protein Binding Affinity
Higher Blood Concentrations
The Presence of Inflammation

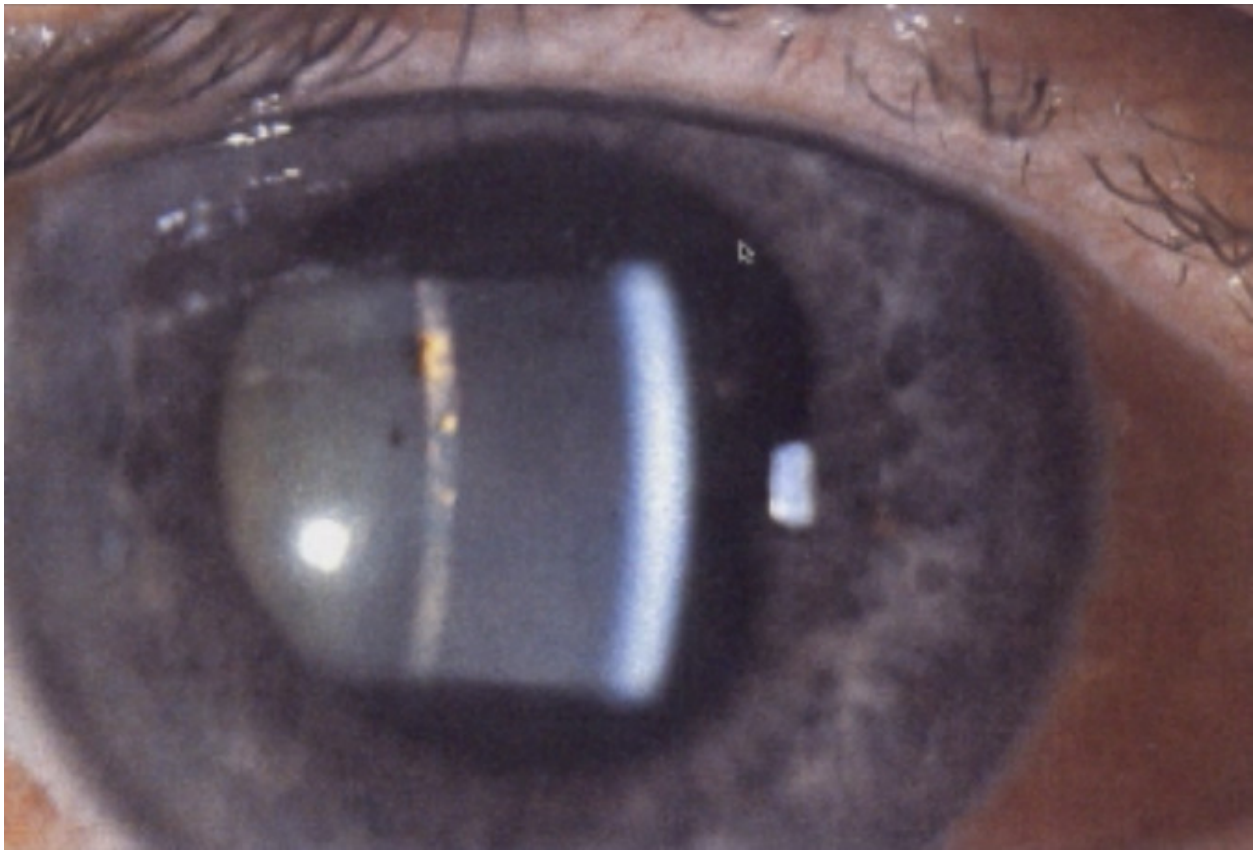


Figure 2: A patient with cells and flare, indicating intra-ocular inflammation.

I'm personally not too interested in lipid solubility and molecular weight, and all of the factors listed in Table 8. Those are just general principles of a medication, and that is why they come up with the rules of what is a good medication for certain things, and you will get more of that. Obviously, we've talked about if a patient is pregnant or breastfeeding; if a patient is diabetic; if they have heart, liver or kidney disease, we worry more about them. That's why if we see someone with cells and flare (Fig 2), you know that you have intra-ocular inflammation, and medicines will cross into the eye. But again, with most of the iritises that we see, how do we treat them? We get very good levels topically.

Table 9

Prescription Writing
Demographic/Identification
Inscription
Subscription
Signatura

Prescription writing I'm going to cover in my later lecture in this series on judicious prescribing, but there are a couple of things that I want to give you a head's up on now, generally, and then we will get very specific later. There are four components to a prescription, listed in Table 9. The demographic is the patient's name and identifying information that you want on the prescription. The inscription is the name of the drug that we are prescribing. I always try to write generic if I can. The concentration and dosage form are also included here – is it a solution, a tablet form, etc. The subscription is how much the pharmacist is to give the patient, or the quantity to be dispensed: 21 tablets, 250 cc's, depending on the medicine. The signatura is not your signature – it is the instructions. Take 1 tablet every 6 hours, take 1 tablet each morning with food, avoid dairy products, etc. They are specific, and I was always guilty of writing too much in the signatura. I didn't think it was too much, but the pharmacist did because they would have to tape things onto the little pill bottle because I was very specific. Why? You don't want any confusion over how to take your medication, so give specific instructions. It is not necessary to do this in Latin – a lot of people still use the Latin when they're writing, but good old English is just fine. You want the pharmacist to understand what you want, that's the key here.

Systemic Antibiotics and Antivirals

Now, what I'd like to do is shift from some of those general principles and take some of them and go into some specific medications. We will now look at Indications for Systemic Antibiotic Administration. Why in optometry would there be things that we would need to use a systemic medication for? With a deep tissue infection, how deep does a topical antibiotic go? It doesn't go very deep – just down to essentially the basement membrane, meaning that topicals only treat superficially. If you have a conjunctivitis, that's all we need – we only need to treat down to the basement membrane to get rid of it. But if we have a deep tissue infection, you can't treat that with a topical. If we have a patient with a staphylococcal infection of a meibomian gland, you can rub all the antibiotic you want on the outside of the lid, it isn't going to get into that meibomian gland. If your patient has an infection in deep tissue, such as a cellulitis, where the bacteria is below the basement membrane, you have to use a systemic medication.

Intra-ocular infections also need systemic medications, which, as we covered above, are able to enter the eye when inflammation reduces the integrity of the retinal barrier and allows those systemic medications to permeate the tissue.

Table 10

Indications for Systemic Antibiotics
Deep Tissue Infection
Intraocular Infection
Corneal Perforation/Orbital Fracture
Intraorbital Infection
Sinus Infections
Ocular Sexually Transmitted Diseases

Corneal perforations cause inflammation, and there are very few sterile foreign bodies that would penetrate the cornea. A thorn from a rosebush, or a piece of metal from a muffler, or something else, will be prophylactically treated so that if there is inflammation, the antibiotic will quickly enter the eye.

Prophylaxis for an orbital fracture. You get a blowout fracture of the orbit, and you get that inferior rectus and ocular tissue down in the sinus, and those sinuses are not sterile. Therefore, you run the risk of getting an orbital infection, so you use a prophylactic antibiotic.

With ocular sexually transmitted disease, we are mainly talking about chlamydia here in optometric practice. Occasionally an optometrist will see a patient with gonococcus in the eye; we had a lot of that in Oklahoma. But again, the sexually transmitted diseases that are also causing an infection in the eye, you have to use a systemic antibiotic because it's more than just in the eye. We will talk about that more in a little bit.

In systemic anti-viral infections, the thing that we would see the most is acute Herpes Zoster. It happens. By the way, they think that in the future we will see less Zoster patients. Why? Because now we have a Chicken Pox vaccine. If you haven't had your Zostavax and you're around age 60 or so, I highly recommend it, because almost everybody in that age group has had chicken pox, so you have the virus living in the ganglion. Get the Zostavax vaccine and it doesn't absolutely prevent Herpes Zoster, though it does prevent it in a large number of people. But, if you do get it, you'll get a milder case, and you'll have less of a chance of getting a post-herpetic neuralgia. Thus, I highly recommend it. I got it, and if it wasn't good, I wouldn't have gotten it.

Recurrent Herpes Simplex. How do we treat that? Topically. But if a patient is getting recurrent herpes, remember that the virus is not living in the cornea. It's only living in the cornea when you have an active infection. It's residing elsewhere in the body in the dorsal root ganglion, etc. and there's evidence that by taking some prophylactic antivirals, like at bedtime, for several weeks can suppress that virus and you are less likely to get the recurrent herpes. I've actually put people on the antivirals for a long period of time – they are very safe, and I'll tell you more about that in a moment. I have recurrent Herpes Simplex – do any of you get cold sores? I do. I haven't had a cold sore in years, because when you're getting one they will start tingling and you'll go, "Oh, man! I'm getting a cold sore!" Then I take the antivirals systemically, not topically, for two days and guess what? I don't break out – it suppresses the virus. A

lot of people will take Lysine, which is a standard treatment. Personally, I've tried Lysine and other things, and apparently I have a resistant herpes, because the next thing I know I have a huge painful lip, and I don't need that. I take the Zovirax (acyclovir).

Anyway, we don't see chicken pox anymore. Why don't we see chicken pox? Yes, there are some outbreaks because of people not getting vaccinated – go vaccinate your child.

There are several myths about the use of systemic antibiotics. For example: If you use a systemic, you get more medication in the cornea; or if you use a systemic medication, you get more in the anterior chamber. If you use a systemic medication, you don't need a topical. None of that is true.

Tips for avoiding ADR's (adverse drug reactions): Always take a good history. Always! If a patient has any allergies, you know those little red stickers that you have that say 'Allergies'? Put them on the chart. All allergies should be listed. By the way, when you do that, you're going to list things that aren't really allergies, but that's OK, because that probably means the patient had an adverse drug reaction of some kind, and they just call it an allergy. I've had a lot of people tell me they are allergic to codeine. With an allergy you get hives and itching, all of that Type 1 reaction. I ask the patient what happens when they take codeine, and they say, "It makes me nauseated!" That's not an allergy – that's the effect on the medulla, the nausea center in the brainstem. It's not an allergy, it's an ADR. But if the patient says they have it, list it and don't use the medication – that's the safest thing to do.

General concepts and principles:

- The dosage may vary. If you don't remember it, look it up.
- Side effects – there is no such thing as a medication without side effects. Know the common ones – you don't need to memorize the PDR, just know the common side effects.
- Know the mechanism of action (MOA)! This is critically important to know the MOA. In talking about antibiotics, we basically talk about is a medication bacteriocidal or is it bacteriostatic? You can use an antibiotic that a bacteria is sensitive to until the person is a walking crystal of that antibiotic, and it will not cure the infection if the patient does not have an immune system. Everything we use has to be a supplement to our own immune system. Otherwise, why would an AIDS patient die? We have things that will treat the infection, and they die anyway. Back in the late 80's and early 90's, I had a lot of AIDS patients in my practice, and I had patients die when they were sensitive to the medication we used but had no immune system to work with the medication. But, the best medication to get rid of any bacteria is bacteriocidal. What does the suffix –cidal mean? It means 'death'. It kills the bacteria. Bacteriostatic means it doesn't kill the bacteria, but keeps it from reproducing, effectively holding it in limbo while your immune system gets rid of it. Both require an immune system of some level. Obviously, the bacteriostatic medications require a higher level of immune system function than the bacteriocidal.

    - I have a disclaimer to this: Note: I will shoot you if you bring me into a law suit over how you use a medication just because I gave you this lecture. What I am telling you now is built on personal experience, personal research and stuff that I do. You have to develop your own armory of medicines that you will use, and have your own knowledge of medicines that you will use, and I cannot do that for you.
- I consider a patient an 'adult' by the time they are finished with puberty, because by that time, their liver, kidneys and other organs are basically mature. In pre-puberty, I treat them as a child, and dosed them accordingly. Obviously, the same with the elderly – especially the advanced elderly. With elderly patients, remember that we worry especially about liver and kidney function.

Penicillins are bacteriocidal. Bacteria are surrounded by a very tough exterior capsule, if you will, and the penicillin weakens that. Bacteria are incredibly hyperosmolar, so they need to have a very tight membrane to hold themselves together. Weaken that membrane, and they explode. You can actually look up on the internet and get pictures of bacteria exploding. That is '-cidal' – they die. That's what penicillin does – it inhibits the bacterial cell wall.

There are two unfortunate things about penicillin. It's important for you to remember these. Plain penicillin has a lot of bacterial resistance by producing an enzyme that deactivates it, we call it penicillin-ase or beta-lactamase, so the penicillin is inhibited and does not destroy the cell wall. So we have resistance to plain penicillin. What else are we worried about with plan penicillin? Allergies. That is a major downside to penicillin – it has an incredibly high incidence of allergies.

Now, the good news is there are some things that they can do to penicillin to inhibit resistance, but any penicillin derivative will cause an allergic reaction. We cannot get rid of the allergies. Nobody knows what the true incidence of penicillin allergy is, that's why they say between 1 and 10%. Nobody knows. More good news, though, is that only 0.5% of penicillin allergies would go into full-blown anaphylactic shock. What's an anaphylactic reaction? That's life-threatening, where the patient goes into shock, suffers respiratory failure, and dies. Most patients with a penicillin allergy will be very uncomfortable, but they will not die. People who have anaphylaxis have an inadequate amount of epinephrine, and you have to shove it in their bodies. The first time I had to use epinephrine for a patient with anaphylaxis, I was watching a college football game on a Saturday afternoon and was on-call for our medical practice. A patient of mine called, and he said, "You may remember that my son is highly allergic to bees, and he just got stung." I was watching football. I was a mile or a mile and a half from the office. I asked him, "Are you closer to my office or closer to an emergency room?" I was hoping they were closer to an emergency room, but he said, "We are much, much closer to your office." I told him, "Don't get killed in a car wreck, but as expediently as you can, you get to my office, and I bet I'll beat you there." I did beat them there. I got the kit, and was ready for this kid when he came in. He was wheezing very badly. The amazing thing with anaphylaxis is that you get incredible smooth muscle spasm in the respiratory tree, so your bronchioles just go to nothing. And, the respiratory mucosa swells. You can get air in easier than you can get air out. When you hear that, and someone is allergic, get the epinephrine, because

they need it. I gave this kid a shot, and this was the first time I'd treated in the office. (I'd treated it in the emergency room when I was an intern and a resident, but I was a new private-practice practitioner.) It was incredible – within a minute or so, the patient is already feeling better. Back to penicillin – it has a high incidence of allergies, but a low incidence of anaphylaxis. Patients will itch and get hives, but anaphylaxis is much rarer. If the patient itches, has hives, their eyelids swell, they get the bronchiospasm, all the capillaries of their bodies are dilating so their blood pressure goes to nothing, that is anaphylactic shock.

Here's the wonderful news: we don't need very much plain old penicillin because we have the cephalosporins. The cephalosporins work like penicillin, and they resemble penicillin, but there is a low incidence of allergies. I've used cephalosporins for 40 years, and I have personally never had a patient who is allergic to penicillin be allergic to cephalosporins, though I have had friends who have. That is just my personal experience. There is some cross-allergies, but it's a very low incidence. The cephalosporins also resist penicillin-ase, so we will have less bacterial resistance. Thus, when I have someone with a meibomian gland that is infected, or a preseptal cellulitis, or we have an intra-ocular bacterial infection due to a blow-out fracture, I tend to use a cephalosporin. We will cover a couple of those in this talk. Because, again, if 1% of the population is allergic to penicillin, only 1% of that population will be allergic to cephalosporins. Again, I've never seen it in my personal practice. Cephalosporins are a wonderful group of drugs.

We also use a lot of fluoroquinolones, topically, in optometric practice. They also use them systemically. I, to this point, have never seen an ocular indication for an oral fluoroquinolone – only topically. Fluoroquinolones have some bad side effects. Have you heard of tendon rupture, and things like that, in patients who use fluoroquinolones? Ruptured Achilles tendons, etc. I have a sister who was on a fluoroquinolone for a bad infection in her intestine, and she ruptured her Achilles tendon. But the good news is that we don't use them. Please remember that we don't really use fluoroquinolones under age 18. It's important to remember that there are some age limitations on some of these antibiotics, and unless they've changed that recently, we just don't use a fluoroquinolone on children.

We do use macrolide antibiotics. They have taken some antihistamines off of the market because of interaction with macrolide antibiotics can lead to some deadly heart arrhythmias. There are several kinds – some are bacteriocidal and some are bacteriostatic. That property depends on how much is given – you can give a bacteriostatic dose or if you give a higher dose it might be bacteriocidal. They work kind of in a weird way. But we do use them and we will cover some of them. Anymore, mainly we use the derivatives, or the 2nd and 3rd generation macrolides. Very rarely do we use plain old erythromycin anymore. What's topical erythromycin? Mainly we use it anymore on newborns prophylactically against sexually transmitted diseases acquired from the birth canal.

Tetracyclines: with tetracyclines there are a couple of things I want you to remember. Remember that tetracyclines are bacteriostatic. They work to inhibit protein synthesis on ribosomes and stuff like that.

Plain tetracyclines you cannot use until a person is full-grown. Until they have all of their teeth and their long bones are grown, it will stain during bone growth. Once in awhile you will see someone who had tetracyclines as a child, and their teeth are silver grey. They are almost metallic grey. That is permanent staining from tetracyclines. Thus, don't use it in a pregnant patient, as it will cross the placenta and cause in-utero bone staining. You do not use it until a child is completely grown with all of their teeth. Again, we have some better medicines, so I don't use tetracyclines that much. Remember that these are contra-indicated in pregnancy. The second thing to remember with plain tetracycline is that if you take it with food, you get no absorption. You must avoid dairy products; it tends to get bound with any kind of a dairy product, stays in the gut and thus you get no absorption. There is a form of tetracycline that I will cover in just a moment called Vibramycin that doesn't do that.

Systemic antivirals are extremely safe. I've read that the most common side effect of an antiviral, like for systemic herpes, like when my lips are breaking out, or if you're having vesicles on the eyelid, is a headache. But I'm telling you – I get a headache just with the virus, so I'm not sure if it's a side effect of the antiviral, or if it's an effect of the infection itself. But the medications are very safe.

For the next few paragraphs, remember what I told you: if you haven't used it in awhile, look it up. If it's the first time you've used it, look it up. I don't care how much you know, you look it up. I'm going to give some general things here. Very general.

Antibiotics: the first thing, in that whole cephalosporin family, is cefaclor (Ceclor). It's in that same category as cephalexin (Keflex), but they all have a slightly different molecular structure. What's really neat about Ceclor is that it's really great for skin and appendages, and it's wonderful for children with preseptal cellulitis or a cellulitis in and around the eye because even with the Haemophilus flu immunizations they give, it doesn't protect you against all H-flu. It only protects against a couple of strains that are notorious for causing meningitis. But in children, I always worry that if they have a cellulitis on their face, it's caused by H-flu. And Ceclor is a wonderful drug for H-flu. Therefore I tend to use it in children. I do not use it in adults, only children.

Figure 3: Two cases of severe blepharitis. Consider initiating treatment with a 7-day course of systemic oral antibiotic in addition to standard lid hygiene.

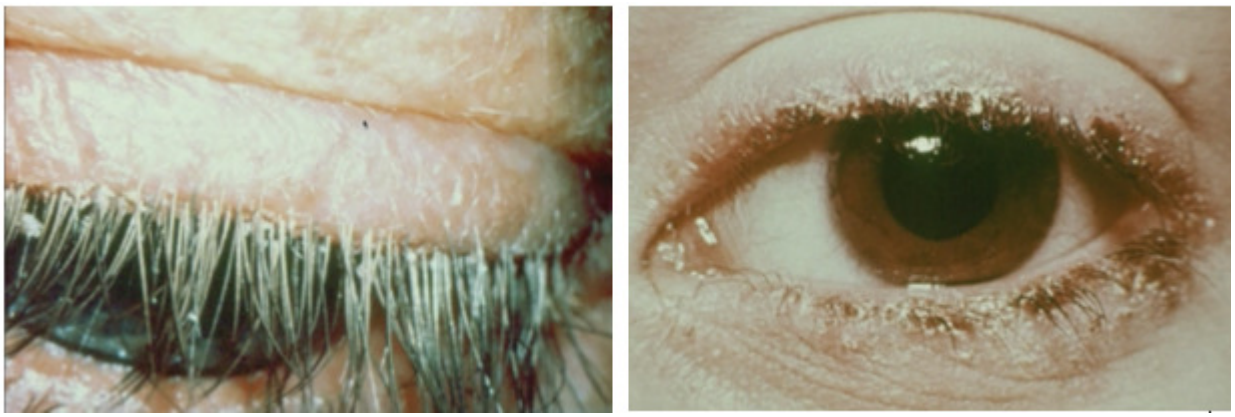


Figure 4: Hordeolum with edema spreading to the lid.

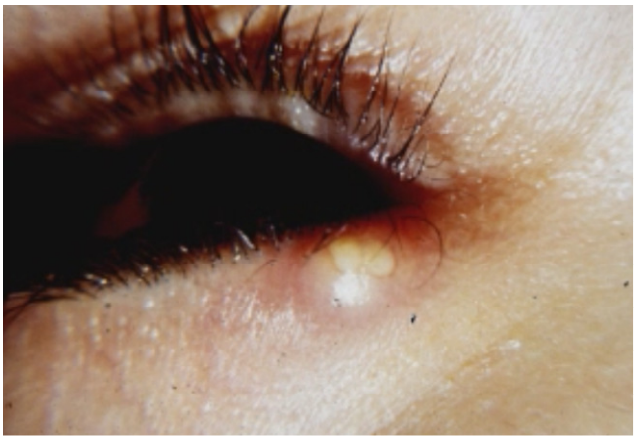


Figure 3 is a blepharitis case I want to briefly go over. How do we treat marginal blepharitis? We treat it with lid scrubs, topical antibiotics, and this and that. If you have a resistant case, and you see a lot of lid edema and erythema, spreading up the lid, very often that bacteria is down in the hair follicles and topicals can't get to it because it's already down into the subcutaneous tissue. Use a systemic antibiotic to kick it off with. Optometrists call me often, saying, "I've got this problem, it looks infected. I've been using lid scrubs." I recommend hitting the patient with 7 days' of an anti-staphylococcic antibiotic orally, and always, we get there. When you start seeing a lot of lid edema and inflammation spreading away from the lids, it doesn't hurt to kick-start the battle with an oral antibiotic, and then keep doing the other things we would normally do.

If you have somebody with a hordeolum (Fig 4), sometimes you will see the edema spread out into the lid. You know we do epilation, and you've got to put the patient on a topical. Don't be afraid, if it's severe, to hit the patient with a systemic antibiotic for a few days.

Figure 5 is a dacryocystitis. This is so bad that the inflammation is causing an ulcer on the outside. You can rub antibiotics on this until we go blind and we will get nothing down into that tissue. This patient has to have a systemic medication. Now in the old days when I first got out of medical school, internship and residency, I would put a patient like this in the hospital. Why? Because we didn't have the antibiotics that we have today! Back then, I would put these patients on IV antibiotics. Anymore, you put them on systemics and watch them to see if they get worse. Obviously, you want to take a culture, you would want to see the results of that culture, if it's staph, etc.

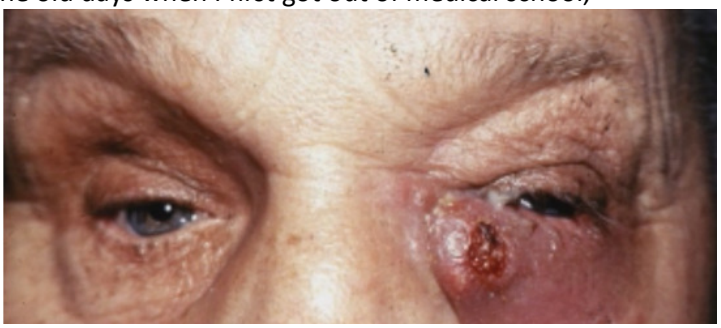


Figure 5: Severe dacryocystitis with superficial ulceration

Also consider systemic antibiotics for a blow-out fracture of the orbit, severe ocular trauma such as would result in a hyphema. Figure 6 is a blow-out fracture, with the inferior rectus down below the orbit. We use systemic antibiotics for this.

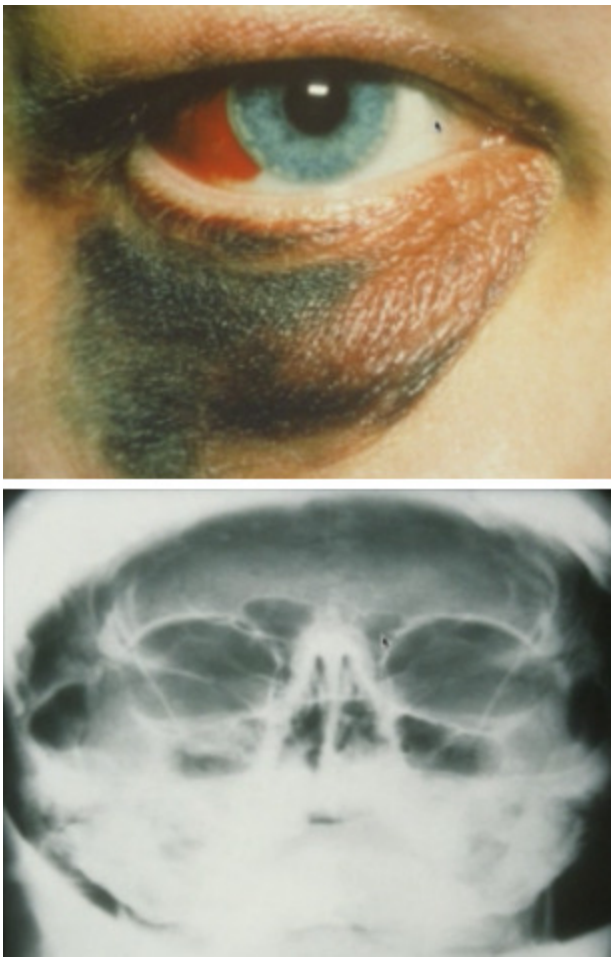


Figure 6: Two examples of an orbital blow-out fracture

Somebody with a cold conjunctivitis, we just use topical, right? We don't use systemics in that case.

Did you know that the eye is connected to the middle ear and your lungs? We did a research study back in the late 80's. We looked at children who came in with a simple viral conjunctivitis and about 5-10% of them developed an otitis media. Isn't that something? Why? Did you know that there's a little hole in your eyelid that drains into your nose? From your nose, did you know that goes all the way to the back of your throat? And did you know that at the back of your throat, there's a little tube that goes into the middle ear? So you are draining bad stuff from the eye to the back of your throat, and you cough, and children have a straighter eustachian tube, and cough that stuff right up into their middle ear, and so they get an ear infection.

Now let's get back into some specifics on our systemic medications. Cefaclor (Ceclor) in an adult the dosage is 250-500 mg. (See Table 11) I just talked about this above. If an adult has a severe infection, I tend to use 500mg. If it's an early or mild infection, I tend to use 250mg. It's a judgment thing on how severe the infection is. Ceclor is penicillinase resistant.

Table 11: Cephalosporin antibiotics

Cefaclor	Keflex	Duricef
Bacteriocidal	Bacteriocidal	Bacteriocidal
Penicillinase Resistant	Penicillinase Resistant	Penicillinase Resistant
250-500 mg per Dose	250-500 mg per Dose	500-1000 mg per Dose
TID	QID	QD (or BID)
Gram + and H. Flu	Gram +	Gram +
Skin and Appendages	Skin and Appendages	Skin and Appendages

Did you know that the more often a person has to take a medicine, the less compliant they are? The best way to take a medicine is to not have to take any – then you are, by default, very compliant. If you do have to take a medicine, if you only have to take it once a day, you are going to be much more compliant than if you have to take it every 6 hours. That's because we get busy – everybody is busy. The good news on this medication is it's only three times a day (TID). This medication, as mentioned above, is also good for H-flu. Overall, a great medicine.

Keflex came out in the late 60's and it was a miracle drug when I was in medical school. All of a sudden we had this drug, and it has stood the test of time. It is a really good medicine. It is a cephalosporin, penicillinase resistant, and again the dose is 250-500 mg per Dose, but this time you have to take it four times per day (QID). The more often you have to take a medicine, the less compliant your patient will be.

I have a favorite medication that works just like Keflex, but its dosage is only once or twice a day. It's also a cephalosporin, and it is called Duricef. This has been out for a few years now, and it has turned out to be my very favorite cephalosporin for adults. (Ceclor is my very favorite cephalosporin for children.) It's bacteriocidal and resists penicillinase, and you can use it once a day. You can give the patient 1 1000mg dose of Duricef, and that's the equivalent of 250mg Keflex QID. This is a long-acting cephalosporin. If your patient has a bad infection, I would use 500mg BID. Why? Because I think you get a little steadier level, even in a long-acting drug, if you split the dose. If your patient has a raging infection, I would use it twice a day just to get a more dependable blood level. It probably doesn't do any good, but it makes me feel better.

Table 12: Penicillins

Dicloxacillin	Augmentin	Amoxacillin
Bacteriocidal	Bacteriocidal	Bacteriocidal
Penicillinase Resistant		
Penicillin Allergy the Same	Penicillin Allergy the Same	Penicillin Allergy the Same
250-500 mg per Dose	250-500 mg per Dose	250-500 mg per Dose
QID	TID	TID
Gram + and H. Flu	Excellent for H. Flu	Excellent for H. Flu
Skin and Appendages	Especially Useful in Children	Especially Useful in Children
Inexpensive	Expensive	Expensive

Dicloxacillin (Table 12) is nothing more than penicillinase-resistant penicillin. It works just like Penicillin, except it's penicillinase resistant. The pharmaceutical companies have done something to the molecule so that the penicillinase doesn't break it down. But, if you are allergic to penicillin, believe me – you are allergic to dicloxacillin. And you need to take it at least QID. It's very inexpensive, and I've used dicloxacillin in the optometry clinic in patients who have no insurance and we wanted something very cheap, and the patient knew for sure that they were not allergic to penicillin. This medication is dirt-cheap – it ought to be free! But again, it works great for skin and appendages, which is what we would use it for.

Augmentin and Amoxacillin are penicillins. You have the same allergic reactions, and they are more expensive. What I would like you to remember is that there are two medications we tend to use in children: Celcor and Amoxacillin. Those are the two we tend to use in children because they hit H. flu hard. They are very good for H. flu. I've used a lot of amoxacillin – it is easy to administer, it comes in a nice liquid form, tastes good, and the children will swallow it. But, it comes with the allergy to penicillin.

Plain old Erythromycin we don't use very much anymore. It is a first generation. Instead, we use an advanced generation of erythromycin called Azithromycin. Also known as a Z-pak. It is a very good medication, and tends to be bacteriocidal because it is so effective, as opposed to plain old erythromycin, which is bacteriostatic. Here is what I want you to remember, and it's very important because it has a lot of good indications for something we don't see very often, but it's very important. That is it's wonderful for chlamydia. If you see a chlamydial conjunctivitis, the wonderful thing about Azithromycin is that, remember if the patient has chlamydial conjunctivitis, that is considered to be a sexually-transmitted disease, you can treat it with a single dose, one time. You take 1000 or 1250mg dose one time, and you have to take it at least 1 hour before eating or 2 hours after eating, because it's not absorbed well if taken with food. A single dose will cure 95-98% of chlamydial infections, and I'd like you to remember that.

Table 13: Macrolide Antibiotics

Erythromycin	Azithromycin
Bacteriostatic	Bacteriocidal
250 mg per Dose	500 mg 1st Day AND
QID	250 mg x 4 more days
Gram + and Gram -	Good for Most Staph and Strep
Chlamydia	Chlamydia: 1000 or 1250 mg as a Single Dose!
High Rate of Staph Resistance	Fancy Erythromycin
Take on an empty stomach	

Plain old tetracycline I've already mentioned. We don't use it until the patient's teeth are completely full-grown, but we now have an exception. Wisdom teeth are the exception. (But they are not usually a cosmetic concern, anyway.) I'm going to ask my children – both of my kids are dentists, and I wanted an optometrist so badly… I'm going to ask them if they've ever seen a patient with pearly white teeth but grey wisdom teeth from tetracycline. I love to ask my kids questions like that. Tetracycline is good for acne rosacea and all this type of stuff, because it has anti-inflammatory action. They've discovered that it almost works like a mild steroid deep within the tissues. But the main thing is that we don't use it until the teeth are full-grown. It is bacteriostatic. But it is concentrated in oil-producing glands, which we have a lot of around the eye, and therefore it is still a good medication.

Table 14: Tetracycline Antimicrobials

Tetracycline	Doxycycline
Bacteriostatic	Bacteriostatic
250 mg per Dose	200 mg 1st Day, 100 mg QD
QID	BID Dosage 1st Day then QD
Avoid Dairy Products	No Need to Avoid Dairy
Concentrated in Oil Glands	Take With Food!!
Good for Chlamydia/Skin	

I tend to use Vibramycin (doxycycline). It has the same general uses as tetracycline, except that it's not bound in the gut with food, so you can take it with food. As a matter of fact, with doxycycline, you don't have to avoid dairy products and can take it with food. In fact, if you don't take it with food, it can cause nausea. I've had more patients puke it up on an empty stomach. It must be very irritating to the gastric lining or something. With food, it tends not to be nauseating.

Chicken pox we don't see anymore, but it is still, the last I read on it, is still the most contagious disease known to mankind. In other words, if you haven't had chicken pox, and you get exposed to chicken pox, you are more likely to get it than any other disease you would be randomly exposed to – it is very contagious. It's considered mostly a benign disease, but the virus lives forever within your body once you get it. The virus migrates back to the dorsal root ganglion, and then what happens later in life? Varicella Zoster virus can cause Shingles. That's the problem with it. Now we have immunizations, but we are still going to see some of our patients who have been around long enough that they didn't have the vaccine will have Herpes Zoster. Why does it love the ophthalmic division of the 5th cranial nerve? I have no idea. I've seen shingles break out on the leg, everywhere, but over 50% of the shingles cases I've seen in my career have been on the ophthalmic division of the 5th cranial nerve. It loves that nerve for some reason. Remember, the more widespread the vesicles are, the more likely the patient is to have the ocular symptoms. Systemic antivirals are very safe. We use them for Herpes Zoster, genital Herpes. Remember that there are three kinds of Herpes: Herpes Simplex, which we see on the lip, nose, eye, and cornea; the genital Herpes (Herpes Type 2) is sexually spread; and the 3rd category is Varicella Zoster, which is Chicken Pox and Shingles. They each require a different medication dose. Herpes Simplex is the easiest to treat. The hardest to treat, requiring the highest dose, is Herpes Zoster. Again, I have never had a patient with what I would consider side effects of that medication. It's so safe I think it ought to be over the counter. (OTC)

The mechanism of action (MOA) for antivirals is that it inhibits viral replication. Side effects: mild, headaches, some nausea but nothing serious. I'm convinced that the mild headache probably goes along with the virus itself rather than the medication, but that is just my opinion.

Now pain relief we will get into in detail in Judicious Prescribing, but I have just a couple of head's-up tips. Don't forget aspirin – it's a good drug. It's a good prostaglandin inhibitor. Don't forget what we call Tylenol (acetaminophen). We will get into specific MOA's right after lunch. Don't forget that non-steroidals, in the eye care business, we tend to tell patients to go buy ibuprofen and take it as directed. Pshaw. They may as well take a glass of water; the OTC dosages are totally an inadequate amount. In a standard adult, I use either 600 or 800 mg or 800 mg <u>per dose</u>, QID. You can write that over all of the non-steroidals like Motrin or Ibuprofen. Ibuprofen is what I use, and it comes in several forms OTC. The prescription form of Ibuprofen works better than the OTC form. Why is that? It's formulated differently – it has a different carrier! You take an OTC form of Ibuprofen, you have to hit it with a sledgehammer and the pill will dent the sledgehammer – it is as hard as a rock. Whereas the prescription form has a different carrier – it is light as a feather; you put water on it and it will start to dissolve immediately. Thus, you get a much better effect from prescription Ibuprofen than you do OCT. It's more predictable,

more dependable, and therefore I like to use prescription Ibuprofen. OTC's dosage is only 200 mg taken 3-4 times a day. If it's a killer pain, you have to use 800 mg per dose, not per day.

Systemic steroids are very safe for short-term use. In the eyecare business, that's all we have is short-term use. We don't keep people on steroids for months at a time, like you do for Rheumatoid Arthritis. The maximum we have a patient on systemic steroids is for about 10 days. What I want you to remember on steroids is that if you use it for more than 5 days systemically, you must taper the dose over at least 5 days. Why? Because it suppresses the adrenal gland, and they can get hypocortisolism and really get into trouble with shock and stuff. If you use a systemic steroid for less than 5 days, you can stop it abruptly and the adrenal gland will kick right in. If you suppress the adrenal gland for more than 5 days, you have to taper off the dose to let it kick back in slowly. My rule is, for however many days I use the full steroid dose, I take at least that many days and slowly taper the dose down to zero.

Antihistamines OTC – let me tell you something. OTC works just fine – there is no need to write a prescription unless the patient is on an insurance plan that would pay for it and save the patient money. But you can get anything, like Zyrtec, OTC. For those, I would just recommend OTC antihistamines.

Corresponding Author:
Lesley L. Walls, O.D., M.D.

Course provided courtesy of:
Pacific University College of Optometry
2043 College Way, UC Box A134
Forest Grove, OR 97116-1797

Address questions about Pacific's Web CE to:
James Kundart, OD MEd FAAO FCOVD-A
Kundart@pacificu.edu