

Audiology and ophthalmology: A comparative perspective on diagnostics and patient care

BY ROSALYN PAINTER, CHRIS GORDON AND ANTHONY VUKIC

I'm here with Chris Gordon and Anthony Vukic from Gloucestershire Hospitals NHS Foundation Trust to find out how two professions that may appear unrelated on the surface actually have a lot in common. Some of this article might surprise you.



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Would you both take a moment to introduce yourselves before we get into the nitty-gritty?

Chris Gordon (CG): After qualifying as an audiologist in 1989, I worked in various roles both within and outside of the NHS, with an interest in training. My area of special interest is adult rehabilitation. I'm currently Deputy Head of Hearing Services at Gloucestershire Royal Hospital (GRH).

Anthony Vukic (AV): I'm an ophthalmic science practitioner at Gloucestershire Research and Education Group, part of Gloucestershire Hospitals NHS Trust. I lecture at the University of Gloucestershire on the Healthcare Science (Ophthalmic Imaging) BSc.

You both primarily work with adults, so let's stick to adult services for now. Is there a name for age-related reduction in vision or hearing? And what impact does this have on your service?

CG: Yes, presbycusis is age-related hearing loss. The vast majority of our referrals are age-related; we manage those patients from the time they're referred and we never really discharge them unless they move

away to a different service, or they pass away.

AV: For ophthalmology, age-related reduction in vision is called presbyopia. This tends to be something that community optometry manages, but we do have a lot of other age-related conditions we manage and treat for life, such as age-related macular degeneration or glaucoma.

Do you think [seeing patients throughout their life] might come as a surprise to healthcare professionals from different specialties?

AV: Absolutely! Sometimes when we talk to booking managers or service managers outside of our discipline, they really struggle to understand the pathways because they're so used to following the model of referral, treatment, follow-up, discharge. I'm not saying this is unique to ophthalmology, but that model doesn't always fit. If large proportions of patients stay under your care indefinitely, capacity management becomes a different story.

CG: Yes, our hearing services [at GRH] does not see assessment, support and discharge like many other outpatient services. It takes time for colleagues within the organisation to understand that we are very different from other outpatient services. Even within

the service, there are changes in how patients are supported. For example, the transfer from paediatric to adult services has to be carefully managed because the expectation of what an adult service can offer is not the same. Follow-up rates are lower when you move to the adult service as we do not have the capacity to offer the same level or frequency of support.

Can we talk about assessment of the patient?

CG: Well, the assessment starts the moment you actually meet the patient, as you are assessing functional hearing and how are they interacting with you. Are you having to raise your voice? Are they able to follow the conversation? That's already giving you an idea of what you should be expecting from a hearing perspective before you go into a test booth. This can assist you in spotting any potential non-organic hearing loss presentation. If a patient performs well during the initial conversation, but their performance isn't what you would expect when doing their test, this will need further investigation. Then we would give information about the assessment, gain consent, take a history, perform otoscopy and perform an assessment called a pure-tone audiogram. Before the pure-tone audiogram, we would examine the ears (otoscopy) to make sure



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that they are healthy and that there aren't any reasons why we couldn't continue, such as underlying infection or occluding wax, for example.

AV: What you have said resonates with me. Initially, you're checking to see whether or not they can hear you in the waiting room; we are checking to see if the patient can navigate around the room, that they're looking directly at us. Then we give them the occluder and we ask them to read the letter chart. You mentioned checking the ear for occluding wax – we might call that media opacity. With mature cataract, for instance, we can't see to the back of the eye because there's something in the way. Another sort of media opacity that we might find in eyes, like vitreous haemorrhages, are typically much more urgent. So, do you have anything like that in the outer or middle ear?

CG: When we're performing an otoscopy, we are able to observe the external ear, ear canal and tympanic membrane, which forms parts of the outer ear. In rare cases, a tumour can be behind the eardrum, something called a glomus tumour. You'll see that there is a discolouration of the tympanic membrane as the tumour sits behind the eardrum in the middle ear. You can also look into what we call the attic region, and may see a little pearlescent drop; this could be a retraction pocket. That could be an early indicator of something called a cholesteatoma, which is a ball of keratin (skin) cells that can erode into the middle ear and mastoid bone. If left unchecked, disease can actually eat through into the meninges and then cause meningitis.

Ok, so we have discussed things that get in the way, what about injury?

CG: Traumatic perforation, subtotal or total perforation and pinhole perforation. You can observe all of these and, depending on the size and position of the perforation, it may or may not affect hearing at all.

AV: We have three types of retinal detachment that I can think of. The mechanics behind each are different: exudative, tractional and rhegmatogenous.

CG: For someone with otitis media, there is fluid build-up behind the eardrum. It can't drain through the eustachian tube because it's closed. In some cases, this can become infected; the infection will build and build, so as to push the eardrum out possibly resulting in a traumatic perforation or rupture. So that could be like an exudative detachment? There is also something called divers' barotrauma, when, whilst scuba diving, you are unable to equalise the pressure fast enough – that can potentially result in a ruptured eardrum, too.

AV: Talking of pressure in ophthalmology, there is hypotony (low pressure). When the pressure in the eye drops too far, the eye is unable to support itself. If the pressure is too high, that can lead to glaucoma, which has many types but can be caused by trauma. We measure the intraocular pressure with a tonometer, if the pressure is above normal limits, and this can be an indicator of glaucoma.

CG: We do something similar; it's called tympanometry. We place a probe into the ear and then create an acoustic seal. A pneumatic pump along with a presentation tone will engage and sweep between positive and negative pressure. We record at which point the sound is transmitted through the system, this will give us information as to the condition of the middle ear. This assessment is used to identify normal middle ear function, perforation, otitis media and ossicular discontinuity.

In ophthalmology, we use dilating drops to get a better view of the retina. Are you able to dilate the ear canal for any reason?

CG: Funny you should ask that. We've been doing some work with one of our ENT consultants who has a patient with stenosed canals. The surgical options for that are quite limited, and usually not very good. So, what we've been doing is using stents (custom ear moulds) to hold the canal open. In one particular patient, the cartilage isn't as strong around their ears and the canal is collapsing, causing hearing loss. If the canals are held open by fitting stents, it can reduce hearing loss.

AV: Interestingly, we may use stents for glaucoma patients to reduce the pressure in the eye.

Let's talk about threshold testing. Chris, you mentioned the pure-tone hearing test earlier. Anthony, is there something similar in ophthalmology?

AV: Yes, there are several examinations you could argue are threshold tests. Visual acuity tests can be adapted to include contrast thresholds, but visual fields testing appears to be the closest equivalent of the pure-tone hearing test. You are testing the sensitivity of the retina, asking, "What is the minimum intensity of light a patient can register across their field of vision?" It requires a lot of compliance from the patient and a skilled operator to get the best out of this test, as patient positioning and concentration can be an issue. The difference is that visual fields testing is a measure of a patient's sensitivity to

the intensity of light rather than frequency. Examining a patient's sensitivity to light frequencies would be a test of their colour perception.

CG: We use headphones or inserts to test 250Hz up to 8KHz. The reason we look at that this narrow bandwidth is because these frequencies are most commonly associated with speech perception. The human ear generally has a frequency range of 20–20,000Hz. As audiologists, we want to make sure that you can hear conversation. Also, hearing aids are designed to work within this bandwidth so as to assist with hearing conversational speech.

You mentioned the high-frequency loss; tell us a bit more.

AV: Blue light is in the high-frequency spectrum of visible light, in the region of 450nm. There are studies that have found that prolonged exposure to blue light causes photochemical damage to the cornea, lens and retina. When it comes to sound, is it high frequencies of noise that damage the ear or is it simply the decibel?

CG: Generally, it's a combination of wear and possible noise exposure throughout your lifetime. The initial frequencies affected are 2–3KHz and higher. Due to the shape of the cochlea, the first turn, known as the basal turn, is sensitive to high frequencies. So, throughout your lifetime, all that energy will hit that first part of the cochlea before it proceeds around to the remainder. And that's why high frequency tends to get damaged first. Everyday sounds will not just be high frequencies. It's a compound process of exposure over 50 to 60 years that has caused this problem. In addition, exposure to high levels of sound, either occupational or social, could cause damage, something called noise-induced hearing loss.

Thank you, Chris and Anthony, for an illuminating conversation. You have certainly given me lots to think about. For me, the take home message is that we have very similar services, so getting to know our respective counterparts could be an invaluable source of support.

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