

**E**vidence-based practice, or EPB. Heard of it? Read about it? Do you understand it? Or apply the principles when you fit hearing aids?

Just for fun, I'm going to list 12 decisions you might make in the selection and fitting process for your next adult hearing aid patient: AGCo for output limiting, AGCo settings based on patient's pure-tone LDL, AGCi (WDRC) for speech processing, AGCi kneepoints of 30-50 dB SPL, syllabic compression for AGCi, 8 to 20 channels for WDRC compression, expansion for soft sounds, gain and output adjusted to NAL-NL1 targets for 50, 65, and 80 dB SPL inputs, probe-mic measures to verify NAL-NL1 targets, digital noise reduction, directional-microphone technology, adaptive polar plots for the directional technology.

Now, assuming that our amplification goal is to obtain patient benefit in the real world, we ask the questions: Is there evidence to support all 12 of these decisions? Most of them? Any of them? And, if so, what is the level (strength) of the evidence? That's not something we always think about, but it is something we'll be thinking about more in the future.

To help us understand EPB and how to use it in the selection and fitting of hearing aids, we've brought back a familiar Page Ten face, **Robyn Cox**, PhD. Dr. Cox, an internationally recognized researcher and writer on hearing aids and rehabilitation, is professor of audiology, and director of the Hearing Aid Research Laboratory, University of Memphis.

Robyn tells me that although she had been aware of the movement towards evidence-based healthcare for several years, she became seriously interested when she began to consider what AuD students needed to learn about hearing aid rehabilitation. She states that unlike the old master's degree model in which there was never time for clinicians-in-training to really dissect and evaluate research, the AuD program afforded the luxury of time to think—to think about what we know and what we don't know, why we don't know it, and what we can do about it. As a result, for the past few years, she has been devoting energies to learning and teaching about EPB. So, we're fortunate to have her first article on the topic on Page Ten.

If you'd like to hear more about hearing aids and EPB, join Robyn and her fellow presenters from the IHAFF next month in Wyoming at the Jackson Hole Rendezvous (inquiries to [mwm@audiology-center.org](mailto:mwm@audiology-center.org)).

**Gus Mueller**  
Page Ten Editor

## Waiting for evidence-based practice for your hearing aid fittings? It's here!

By Robyn M. Cox



Cox

**1 I'm actively involved in fitting and dispensing hearing aids, and I heard from a colleague that I should be using the principles of "evidence-based practice." What does that really mean?**

The usual answer to this question involves quoting the classic definition that evidence-based practice (EBP) is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients."<sup>1</sup> However, most of us find it hard to relate to that definition at first glance. Also, much of the literature about EBP comes from the field of medicine, so it needs a little translating to become clear and relevant to hearing

aid selection and fitting practices.

**2 I'm listening. Can you give me a quick translation?**

Sure. Basically, it's important to understand three issues about EBP.

First, "current best evidence" ideally refers to well-designed, patient-centered clinical research on the efficacy and effectiveness of rehabilitative treatments for hearing loss. This includes such matters as prescriptive fitting methods, technologic innovations, audiologic rehabilitation services, etc.

Second, we practitioners must use our clinical acumen and rapport-building skills to describe and clarify each patient's particular problems and circumstances as well as his/her personal priorities and viewpoint.

Third, in EBP, we integrate these two types of knowledge (research results and patient specifics) in the optimal way for each individual. This means extracting the research evidence that is relevant to the patient's situation and applying it prudently with consideration for what is likely to work in this unique set of circumstances.

**3 You mention "treatment efficacy" and also "treatment effectiveness." Don't they mean the same thing?**

As a matter of fact, those two terms mean different things, so I'm glad you were paying close attention. The *efficacy* of a treatment is how well it *can* work given the best possible scenario. This usually means the treatment is administered to highly motivated patients with uncomplicated problems, and the practitioners providing the treatment are extensively trained in the details of the treatment and have plenty of time to get things just right. In contrast, the *effectiveness* of a treatment is how well it *does* work in the real world where patients may not be very motivated or compliant and they often lead complicated lives. Also, in the real world, practitioners have limited time and may not understand all the fine points of the treatment.

For example, we all understand that appropriately adjusted WDRC hearing aids can make soft speech audible for our patients, and research has shown that this improves understanding for soft speech in a quiet room. This is evidence for the *efficacy* of WDRC processing. Yet, we also know that some patients do not adapt well to this amount of gain for soft sounds in everyday life, are unwilling to go through the acclimatization

process, do not receive appropriate counseling, etc., and, as a result, do not actually obtain the benefit for soft speech. In other words, WDRC amplification is not always an *effective* treatment in real life.

Treatment efficacy research is often done by the manufacturer or in clinical trials. It is obviously important, because if a treatment does not work well under ideal conditions it's time to go back to the drawing board. However, a treatment with acceptable efficacy is not necessarily effective in the real world with real patients. In the final analysis, treatment effectiveness is more important than treatment efficacy for evidence-based practice.

#### **4 How is EBP different from the way most of us practice now?**

In our traditional academic preparation, most of us learned a set of approaches for answering perplexing clinical problems. We acquired textbooks and course notes and learned how the ear works and about hearing disorders. In practice, we use this basic knowledge to evaluate possible treatments and to decide whether or not to use them. Over time, we build up observations about what seems to work for us, and we tend to continue to use those approaches. When something new comes along, we look for an in-service conducted by a recognized expert to guide us on its use.

In summary, to determine what treatment to use for a particular patient, we can call on our past experience or our knowledge of hearing disorders, check in a textbook, or ask an expert for advice. This traditional approach values expert opinion and standard approaches to care.

The EBP paradigm reflects a different mindset. It recognizes that learning good clinical skills is essential for successful practice. However, according to this paradigm, the choice of treatment for an individual should be based whenever possible on specifically relevant current data. It is not enough to argue that a treatment is useful because it seems as if it ought to be. Frequently, seemingly convincing rationales for a treatment have been found lacking.

In EBP, we give first priority to the results of original clinical research that actually measures treatment success on patients in the real world. And, unless there is evidence of real-world effective-

ness, we must accept uncertainty about the value of any treatment. The opinions of experts, textbooks, and other traditional authorities receive less weight in the EBP paradigm. A fundamental tenet of this approach is that clinicians can and should learn to evaluate the evidence from original research to answer their clinical questions and select optimal treatments for each patient.

#### **5 Could you give me some practical examples of how using EBP may influence my decisions when I fit my next pair of hearing aids?**

Well, let's see. Do you have evidence to answer any of these questions: Are ten channels of compression better than five? Are four better than two? Are low knee-points better than high? Does digital noise reduction provide patient benefit? Is automatic directional switching better than manual adjustment? Is adaptive directional technology better than a fixed polar pattern? Does adaptive feedback suppression work better than static? Is one prescriptive fitting approach better than another? Do clinical loudness measures relate to real-world situations?

I could go on and on, but you get the idea. All these issues come up pretty regularly when you fit hearing aids. Knowing the best current evidence on a topic provides justification for your recommendations.

#### **6 Okay, okay. You've got my attention! But using EBP in my practice seems overwhelming. How can a busy practitioner possibly follow those principles?**

First, realize that EBP tackles one problem and one patient at a time. There is a widely accepted five-step agenda for tackling each problem. Here are the five steps:

- (1) Ask an answerable question to define the problem.
- (2) Conduct an efficient search of the literature to locate the available evidence relevant to the question.
- (3) Evaluate the quality of the evidence.
- (4) Decide how the evidence applies to this particular patient and generate your recommendation for treatment.
- (5) Evaluate the outcome of the treatment and seek ways to improve next time.

#### **7 That doesn't sound too bad. Can you tell me a bit more about these steps?**

Absolutely. In the first step, we frame the problem as a question that has several essential components. Let's imagine a scenario to illustrate this process. The patient is a 54-year-old man who already has hearing aids that provide appropriate gain for his bilateral, sloping, cochlear hearing loss. He is experiencing problems with speech intelligibility in the work setting. His current hearing aids have first-order directional microphones, and he wants to know if he could get more help from different hearing aids.

You know that instruments with second-order directional microphones have been introduced since he purchased his current hearing aids, but you don't know how much more help he could expect from these devices. You don't want to risk making a customer unhappy by making promises that might not be fulfilled, so you decide to check the evidence. This brings us to step one: asking the question.

The question must state the type of patient and problem, the treatment (intervention) you are considering, the comparison treatment, if appropriate, and the type of data you will accept as evidence. An example of the question might be: "Will an adult patient with moderate hearing loss obtain significantly better speech intelligibility in noise with second-order directional microphones than with first-order directional microphones?"

#### **8 Why is the wording of the question so important?**

Because the question you ask determines what you do to search the literature in step two. It focuses your efforts, which saves time. Sometimes when you start looking at the evidence, you realize that the question needs further refinement and it's okay to do that. For example, in the question above, I've stated that the evidence will be data about "speech intelligibility in noise." But, when I start looking at the literature, I will soon realize that this might be either laboratory-type objective measurements (such as the Quick SIN) or self-report measurements from field trials (such as the APHAB). I could choose to refine the question to concentrate on just one of these.

## **9 So, does this mean that I am going to be spending days in some university library searching through journals?**

Not too long ago, that would have been true, but we are lucky to be living in the age of on-line databases. Step two would be impractical without them. You need a computer with Internet access and a bit of time to learn how to search. One excellent database available free is PubMed. Go to a search engine such as Google and type in “entrez pubmed” to find it. Other useful databases include the ComDisDome and CINAHL. You might have to subscribe to use these. There are others, but I have found PubMed, ComDisDome, and CINAHL to be the most useful.

For the question above, I went to PubMed and typed in the search terms “hearing aid AND directional microphone.” I limited the search to publication within the past 5 years (because second-order directional microphones are a recent innovation in hearing aids) and only references with abstracts in English. This produced 19 articles, which is too many to review in detail. To narrow the search I added the search term “AND second order.” This pulled up just one article, but it did give evidence on the topic of interest.

## **10 What else do I need to know about searching?**

You usually hope to find more than just one article on a topic. You can often get more references from other databases, although none is as convenient as PubMed. However, PubMed includes only peer-reviewed journals, and useful evidence sometimes appears in non-reviewed publications. CINAHL gives references for articles in the trade journals. ComDisDome gives references for funded research projects and dissertations. You can also hand-search reference lists of relevant articles if you have time. Ideally, you will generate a list of five or so really relevant original investigations.

## **11 Why can't I just look it up in my textbooks?**

Traditional textbooks are very useful for studying material that does not change quickly. However, because treatments for hearing loss evolve rapidly, and writing

and publishing takes a long time, textbooks usually do not include the most up-to-date evidence. In addition, a textbook author is free to promote his or her point of view. Although it is in the nature of textbooks to summarize and synthesize information, you usually do not know what rules the author used to select certain evidence and exclude other. Nor do you know if the author has critically appraised the strengths and weaknesses of the evidence used.

There is a movement toward creating evidence-based textbooks. These would be revised frequently (at least annually) and they would be constructed according to strict and explicit rules and contain extensive references. I am unaware of any such textbooks in the area of amplification.

## **12 Okay, I'll stick with primary sources. Now that I've located the evidence, what do I do next?**

You move on to step three, where you critically evaluate the evidence. Evaluation is one of the biggest challenges facing us as we work toward evidence-based practice in hearing healthcare. Most of us did not learn how to evaluate research in our academic courses. Now, this kind of information should be integrated into AuD curricula. For those of us no longer in classes, there will be opportunities for continuing education to sharpen these skills. Also, there are several excellent books. I especially recommend Greenhalgh.<sup>2</sup>

In this step, your first job is to determine the validity (truthfulness) of the evidence. This calls for an assessment of the strengths and weaknesses of the research. It is important to consider the research design, because some designs are more likely to yield valid evidence. Most people agree that to determine the effectiveness of a treatment, the randomized controlled trial (RCT) is the most bullet-proof design. However, such trials are rarely used in amplification research, mostly because they are expensive to complete. Greenhalgh provides a nice summary and evaluation of many of the common research designs.

There are several ways in which research evidence is weakened and thus its validity is questionable. Problems are often found with sampling bias, halo effect, or too few subjects, among others.

Recognizing weaknesses in research procedures is just as important as assessing strengths. That's one reason it's essential to actually *read* the account of the methodology. Several sources provide useful checklists that help you review the strengths and weaknesses of an investigation (for example, see <http://www.sign.ac.uk/>).

If you determine that the evidence is valid, ask yourself if it shows something important. Sometimes research produces a statistically significant difference between treatments, but when you look more closely you discover that the actual size of the difference is too small to matter. For example, a 0.5-dB improvement on the Hearing In Noise Test (HINT) is sometimes *statistically significant*, but would your patients ever notice this small improvement in the real world? If the difference is not pragmatically or clinically significant, it may not be worth many dollars to your patient.

## **13 I think I feel a headache coming on. What's the fourth step?**

Just stick with me for a while. It's really not as bad as you think. Suppose you decide that the evidence shows a valid and important difference between treatments. Now, ask yourself, “does this evidence apply to my patient?”

The answer to this question depends upon the similarity between your patient's situation and the situation and treatment environment of the research patients. There might be noteworthy differences between your patient and the study patients in age, health, education, gender, socio-economic conditions, or other variables. Such differences might affect the extent to which the research evidence can be applied to your patient. In the end, you must use considered judgment to decide on an appropriate recommendation for treatment based on the applicability of the available evidence.

You present your recommendation to the patient, explain why you are making it, how confident you feel about it, and what you plan to do to follow up and review the success of your decision.

## **14 Oops, you just lost me. What's that about following up and reviewing the success of my decision?**

That's the essential, but often overlooked, fifth step in EBP. You need an explicit plan for determining if your recommendation was a good one. This can be a follow-up clinic visit, a telephone call, a mailed questionnaire, a formal speech intelligibility test, or whatever is appropriate to the problem. In this step, you have the opportunity to increase your clinical proficiency and make sure that your patient's concerns have been addressed.

**15 Okay, now I see how evidence-based practice is supposed to be done. But I still have a lot of questions and concerns about actually doing it. There is so much literature out there that might contain useful evidence, and only so many available hours.**

Even though that wasn't a question, I know what you are getting at. And you're right. A typical practitioner does not have

the time to read and critique every published article in amplification. Fortunately, a method exists for addressing this problem of too much information. It is called "a systematic review of evidence."

A systematic review is conducted according to very strict rules. It evaluates and summarizes the evidence on a clearly defined topic. There are specific inclusion and exclusion criteria. The goal is to include every existing study, published or not, that meets the criteria. The evidence is rigorously assessed for validity, consistency, and generalizability. Where possible, the data are combined in a meta-analysis, which is a statistical method for combining data from similar studies. Finally, a considered judgment is made about the weight of evidence and the treatment recommendations that it supports.

When a good systematic review exists that is relevant to your EBP question, you need look no further. Of course, if you can find a systematic review of systematic reviews on your topic, you are in EBP heaven!

Other healthcare fields that have a more extensive research base have begun to develop journals that consist entirely of systematic reviews. When that sort of literature is available, many EBP experts recommend that practitioners cancel their subscriptions to primary journals and concentrate on those with systematic reviews. At this point, there are only a few systematic reviews in the amplification literature. Hopefully, we will begin to see more of them.

**16 What if there is no research about a treatment I want to try?**

Good question. The field of amplification changes quickly and research is slow and expensive. Add to that the fact that patients often push us to provide the most up-to-date technology, and you have a situation where we may find ourselves operating ahead of the curve, evidence-wise.

When there is no evidence on the effectiveness of a treatment, EBP clinicians acknowledge uncertainty about the value of the treatment. Although this may make us feel somewhat inadequate, it is more palatable if we realize that there are levels of uncertainty. This brings me to the topic of levels of evidence and grades of recommendation. Ask me about this.

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## 17 What do I need to know about “levels” and “grades”?

It definitely helps to understand these issues when we are dealing with an imperfect world. As I already mentioned, certain research designs are viewed more favorably than others. This is because these research designs are less susceptible to errors and bias and thus tend to give more “truthful” results. Certain other research designs may be useful for addressing particular questions, but are inherently more susceptible to errors and bias. Research approaches that are more likely to give accurate results are considered to produce a higher level of evidence for or against the treatment under investigation.

Several hierarchies of evidence have been proposed. In these hierarchies, it is assumed that each type of design is executed without serious flaws. They may differ slightly depending on the nature of research in the field being considered. My favorite for our field (slightly adapted from several sources) is shown in Table 1.

**Table 1.** Levels of evidence.

1	Systematic reviews and meta-analyses of randomized controlled trials
2	Randomized controlled trials
3	Non-randomized intervention studies
4	Descriptive studies (cross-sectional surveys, cohort studies, case-control designs)
5	Case studies
6	Expert opinion

The most convincing evidence (i.e., level 1) is derived from a careful compilation (systematic review or meta-analysis) of several randomized controlled trials that studied the treatment. The least compelling evidence is derived from expert opinion (unsupported by patient-centered data).

If you have level 1 evidence for your treatment recommendation, you can have a high degree of confidence that your recommendation is the best one. If your evidence comes from, say, level 3 studies, your degree of confidence about the recommendation is lower. This degree of confidence is called the *grade* of the recommendation. Table 2 shows a reasonable approach to grades of recommendation for research in amplification.

## 18 That’s all very interesting, but how do I use these levels and grades?

When you are formulating a treatment recommendation for a particular patient, ask yourself what level of evidence (from Table 1) this recommendation is based on. Then you can mentally assign the corresponding grade to your recommendation from Table 2. The higher the grade, the more confidence you can have that

**Table 2.** Grades of recommendation.

A	Consistent level 1 or 2 studies
B	Consistent level 3 or 4 studies or extrapolations* from level 1 or 2 studies
C	Level 5 studies or extrapolations from level 3 or 4 studies
D	Level 6 evidence or troublingly inconsistent or inconclusive studies of any level

\* “Extrapolations” occur when data are used in a situation that has potentially clinically important differences from the original study situation.

your recommendation will be effective. If you do not have a high level of evidence to support your recommendation, you can still make the recommendation, but realize and acknowledge that the grade is low. Your corresponding degree of confidence in the effectiveness of the recommendation is low. It is an accepted tenet of EBP that you should strive for the highest grade of recommendation that is available for each patient and that this will result in improved patient outcomes.

## 19 How can we make EBP a widespread reality in hearing healthcare?

First, to avoid frustration and feelings of futility, it is important to set modest goals and accept incremental progress. That said, there are several substantial steps we can take in the right direction.

❖ We need to offer CEU opportunities for current practitioners to help them gain EBP skills, especially in critically reviewing research.

❖ We need to make sure practitioners in training are prepared in their academic classes to appreciate and use the principles of EBP.

❖ We need many more systematic reviews of treatments. These should be published and made readily accessible to

practitioners. Producing systematic reviews is the job of individuals who are well versed in research principles as well as knowledgeable about clinical practice. Also, journal editors can play a role in facilitating publication of these types of articles. Online systematic reviews would be especially useful.

❖ Many of us who publish original research could do a better job of making sure that the essential features of a study can be determined efficiently via an online search. This means careful attention to key word indexing so that articles do not get overlooked. Also, the structured abstract used by some journals is very helpful in the initial review to determine if an article contains the type of evidence we are looking for. At the least, the abstract should include a clear statement of the question, the research design, types and numbers of subjects, and statistical results. Where appropriate, effect sizes should be described.

❖ As a field, we should insist on higher levels of evidence to support amplification recommendations. Providing this evidence is the job of researchers. There needs to be a financial commitment to support patient-centered research by those who have an interest in improving hearing healthcare outcomes.

## 20 How can I find out more about EBP?

There are numerous excellent web sites with very helpful tutorial information. Go to Google or another search engine and type in “evidence based practice” in the search field. You will get lots of choices.

Also, there are several good books. Earlier, I recommended Greenhalgh<sup>2</sup> for a very readable approach to critical appraisal. In addition, I recommend Sackett et al. for a readable scholarly approach to the whole EBP process.<sup>3</sup> Just remember that all this information is presented from the point of view of the practice of medicine, so you will need to mentally change some words and scenarios to make it apply to your practice. (HJ)

### REFERENCES

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