Some orthodontists are puzzled by the current call for evidence-based orthodontics. This term is, of course, the latest buzzword. Still, conscientious orthodontists are uncertain about just what evidence-based orthodontics is and how we are supposed to respond.

Evidence is something that furnishes proof and it comes in many shapes and forms. Courtroom evidence includes all manners of issues from circumstantial evidence to almost perfect DNA evidence. Given this spectrum of definitions, what kind of evidence do we need to have for the treatment of orthodontic patients?

One bastion of orthodontic evidence is our published literature. Does this mean that the printed word is gospel? Hardly. Some journals and textbooks are notorious for opinions presented as facts. Someone once said that it takes an average of 17 years to get published erroneous information out of the literature.

Some will use the tools of science in trying to describe the imperfect science of orthodontics. The physical sciences are the most nearly perfect sciences and have advanced to levels of evidence that are well established and reproducible—they are, at least the nearest thing we have to fundamental truths. Still, they are not perfect. In the last century the field of physics was thought to be almost a perfect science—that was until atomic physics came into focus, and opened a whole new world.

By this definition the field of social sciences are the least developed of the sciences. They require great interpretation of the data they produce. Perhaps the greatest need of civilization is for progress in social sciences that allows us to be able to live together before the physical sciences create too powerful ways for us to settle our differences.

Somewhere in the middle lie the biological sciences. Not as perfect as the physical sciences, but more data based and reproducible than the social sciences.

Orthodontics, as a biological science, uses many forms of evidence. The least reliable evidence is designed primarily to sell a product or an emotionally committed vested interest. This level of evidence is commonly characterized by testimonials. This is the least useful evidence and can even be harmful when it distorts the truth and creates unreal expectations.

The next level of evidence is in case reports and we recognize full well the imperfect, empirical form of this evidence. Still, empirical evidence can have special value. While case reports do not tell you what to expect for any given patient, they do tell you what is possible, usually under some partially known set of conditions. They are valuable to tell us of our limits and our horizons, but no single case report should be permitted to govern treatment for ostensibly similar clinical situations. It is information to help us know the possible, but not a guideline for action. Clinical experiences can influence specific clinical care only when all the underlying facts are known. Using single case reports as a basis for individual patient treatment plans for other patients is like playing roulette. You know your choice can win, but the odds are usually not on your side.

This leaves investigative or research reports. Does this mean that we should trust the evidence that comes from research? Yes, but not blindly and without thought. It does mean that the scientific merit of the evidence presented is conditional and no single study will probably do anything but add a brick in the wall of knowledge. The nature of the null hypothesis is such that you are only able to support it when there is no relationship between X and Y. The only alternative is to fail to support the null hypothesis and that is also inconclusive.

The bulk of our published evidence is basic or applied experimental data. I distinguish basic research as research undertaken with no application in mind and applied research as research undertaken with an application in mind. Clinical research simply means that patients are involved and it can be either basic or applied.

Most orthodontists are rather pragmatic and look for evidence to use now, but they have the greatest respect and admiration for basic research. Basic research is undertaken at a very fundamental level without a specific application in mind, but it has the potential to have a monumental impact on science and our lives. To create a transistor is to eliminate the vacuum tube and make possible an explosion in the entire electronic world. To study genes is to begin an entry into the future of how we will manipulate a wide spectrum of our lives. This issue comes down to a willingness to commit resources to long-term and abstract goals as opposed to short-term immediate applications and payoffs.

Evidence-based orthodontics is based on applied or basic research and/or is based on clinical or non-clinical research. It is using rational behavior and education to evaluate the ambiguities present in all research. It is orthodontic care using the best information available, but understanding that the goal of making clinical practice a perfect science does not insure perfection. Evidence-based orthodontics means to be familiar with the best information and data available, aware of its limitations and judiciously use it in patient care. It is critical to know what information is available, but it is equally critical to know the limitations of this information. A patient’s trust deserves no less.