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Principles of Evidence-Based Orthopedics

Simrit Bains¹, Mohit Bhandari¹, and Paul Tornetta III²

¹McMaster University, Hamilton, ON, Canada

²Boston University Medical Center, Boston, MA, USA

Introduction

The traditional approach to solving clinical problems involves a great emphasis on professional authority, with the approach being dictated almost exclusively by the experience and rationale of the clinician.¹ This approach was dictated largely by the opinions of practitioners, which is problematic because there are a wide variety of opinions and it is reasonable to suggest that not all of these opinions can be correct. Evidence-based orthopedics is a contrast to this paradigm and has arisen from a need of effectively solving clinical problems.¹ Evidence-based orthopedics is part of a broader movement known as evidence-based medicine, a term first used at McMaster University during an informal residency training program. Since that time, evidence-based medicine has entered the vocabulary of every medical field and has steadily gained prominence.² Although orthopedic surgeons have been generally slow to adopt this new approach, it is becoming increasingly accepted as a positive alternative in patient care.³ Evidence-based orthopedics does not accept the traditional paradigm as being adequate to address clinical problems, especially when considering the large quantity of valuable information available to clinicians to help them in their problem-solving process. Less emphasis is placed on the clinician's own professional authority.¹ His or her experiences, beliefs, and observations alone are not enough to make satisfactory decisions with respect to patient care. Evidence-based orthopedics promotes the need to evaluate the evidence available in the medical literature from published research and integrate it into clinical practice. As such, critical appraisal of studies is of paramount importance.³

The importance of evidence-based orthopedics

To fully appreciate the principles of evidence-based orthopedics, it is helpful to have an understanding of the importance and value of this approach. The ultimate goal of a clinician is to provide the best clinical care for his or her patient.⁴ To that end, the clinician's own experiences and training are important assets. However, there is a wealth of information available in the literature that can assist the clinician in numerous ways, from assessing the efficacy of a certain treatment to recommending lifestyle changes that may help prevent illness.⁵ As such, it is important for the clinician to evaluate and incorporate this evidence into his or her own reasoning and judgment when considering the best approach to patient care. A failure to consider such evidence while adopting a clinical approach may result in patients being denied the best possible care.⁴ There is a greater risk of applying an inappropriate treatment or not applying an appropriate treatment.

Top four questions

1. What are the most important principles of evidence-based orthopedics?
2. How do you apply these principles to a clinical approach?
3. What is an example of applying these principles to a clinical approach?
4. What are some common misconceptions about evidence-based orthopedics?

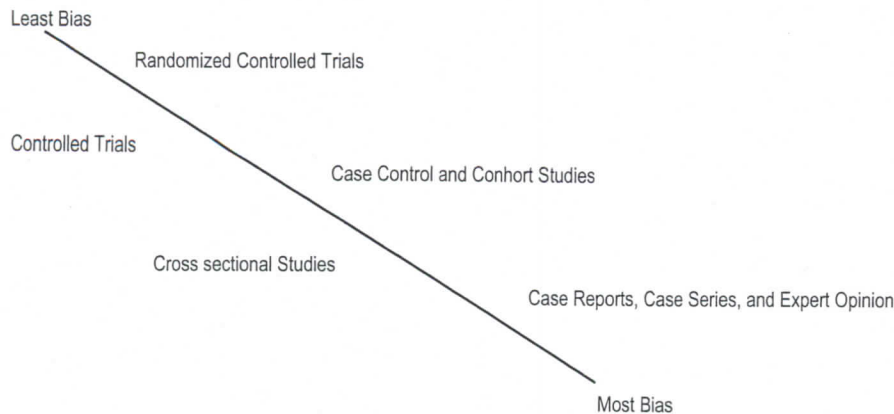


Figure 1.1 A general hierarchy of evidence, with the least bias present at the top of the hierarchy.¹

Question 1: What are the most important principles of evidence-based orthopedics?

Patient values

This principle is fundamental to any clinician. The key goal of good clinical practice is to deliver the highest quality care to patients, and this can only be done if there is a thorough understanding of the patient and his or her problem.¹ This includes knowledge of the patient's values, demographics, and circumstances. Consideration of the patient's desires based on their values or preferences is paramount in evidence-based orthopedics and it must be considered an important factor when a clinician decides which course to pursue in order to treat the patient.³ Evidence-based orthopedics therefore stresses patient involvement and understanding. This is positive for ethical reasons and also for improving patient satisfaction and care.

The need for evidence

Once the clinician has a thorough understanding of the problem, he or she can begin to seek evidence to supplement their judgment. The intuition, experience, and rationale of a trained clinician are all immensely valuable and essential to delivering high-quality care. However, evidence-based orthopedics seeks to supplement the skills and judgment of the clinician with the relevant information that has been gathered about the particular problem.⁶ Such evidence can assist a clinician with comparing the efficacy of different types of surgery, an operative vs. a nonoperative approach, and more. This is especially true now because of the sheer quantity of easily accessible evidence available to clinicians.⁵

The evidence is unequal

The large quantity of available data is of benefit to clinicians looking for the best clinical approach, but it is easy to be inundated with such large amounts of information.⁷

Integrating questionable evidence into a clinical approach may cause more harm than benefit to the patient.³ Therefore, evidence-based orthopedics is specific in its emphasis on evidence published in the literature and careful assessment of this evidence.⁷ Clinicians must therefore be adept at understanding study design and critically appraising the literature.⁵ The various study designs are typically represented in a hierarchy of evidence (Figure 1.1), where they are ranked according to the validity of their results. Expert opinion is at the bottom, being the most susceptible to bias and producing the most questionable evidence.⁸ At the top of the hierarchy are randomized controlled trials and meta-analyses, which are the least vulnerable to bias. Randomization is an important feature of a study because of the random allocation of patients to treatment and control groups, which balances known and unknown prognostic factors between the two groups.⁹ However, the clinician must still determine if the study is methodologically sound. A poorly designed randomized trial, for example, would no longer qualify as producing evidence of high validity.⁵

Integrating evidence and clinical expertise

The clinician must appropriately apply the relevant evaluated evidence to the clinical problem. This must be done with the full context of the situation taken into consideration, which is dependent upon the clinician's expertise and experience.³ He or she must consider the evidence in light of the patient's characteristics: values, preferences, demographics, medical history and more. The clinician also knows the specific details of a patient's condition and medical problem, which may differ slightly but importantly from what is discussed in the literature. It is therefore up to the clinician to use his or her best judgment and skill, in consultation with the patient, to pursue the best possible course of action. In other words, that which is indicated by the evidence as the best course of action will not always dictate the clinical approach.⁷

Question 2: How do you apply these principles to a clinical approach?

The evidence cycle

With the key principles of evidence-based orthopedics having been presented, a general clinical approach that employs these principles can be shown. This approach is called the *evidence cycle*.⁴

1. *Assess*: The first step for the clinician is to thoroughly understand the patient and his or her problem.
2. *Ask*: With the patient's problem in mind, the clinician must next formulate a research question that seeks a solution to the problem and lays the foundation for a search of the literature.
3. *Acquire*: This step involves obtaining evidence from databases.
4. *Appraise*: Next, the clinician must critically appraise the evidence. It must be determined where the study fits on the hierarchy of evidence, whether the methodology is sound, relevance of the results, and so on.
5. *Apply*: The evidence that the clinician has obtained and evaluated must now be applied to the patient, but only with the full context of the situation in mind. The patient's values and the circumstances of the problem must be considered when applying the evidence.

Question 3: What is an example of applying these principles to a clinical approach?

Case scenario

A patient presents in clinic with a vertebral fracture. He is compromised with respect to daily function and also experiences a high degree of pain from this fracture. The goal here is to relieve the patient's pain, allow him to at least partially return to his daily activities and heal the fracture. A typical procedure for a case like this is vertebroplasty, a stabilizing surgery that involves injection of a "cement" substance into the spine. It is widely believed that this surgery helps to heal such fractures, reduces pain, and improves daily functioning of the patient.¹⁰ However, the patient asks you if this surgery is absolutely necessary as it is a procedure that he is uncomfortable with. With knowledge of the patient and their condition established, you can now begin to search the literature with a specific question in mind: What is the evidence for the efficacy of vertebroplasty?

Vertebroplasty is a common procedure and therefore numerous studies have been published about this type of surgery. Many of the studies show dramatic positive effects of this surgery on patients. Healing was found to be accelerated, pain reduced, and daily function improved—all goals of the clinician. However, when it comes time to evaluate the evidence you have obtained, you notice significant flaws in these studies. Not only do they lack ran-

domization, but there is also no comparison to a placebo control group.¹¹ These studies rank quite low on the hierarchy of evidence.⁸

On the other hand, a randomized controlled trial from the Mayo Clinic compared two groups of compression fracture patients.¹⁰ One group had the vertebroplasty performed while the control group had a placebo surgery performed. The result was a lack of significant difference between the vertebroplasty and the placebo surgery with respect to pain relief and returning the patient to daily function.¹⁰ Another randomized trial from Australia reached the same conclusions.¹¹ The studies are methodologically sound, the results are highly relevant, and, as a randomized trial, it ranks high on the hierarchy of evidence. The evidence generated by this study is therefore of high validity.

At this point you can return to your patient and inform him with a high degree of confidence that if he is uncomfortable with the surgery, he may choose to forego it without risking detrimental effects to his recovery.

Question 4: What are some common misconceptions about evidence-based orthopedics?

There are many common misconceptions regarding evidence-based orthopedics.

Evidence-based orthopedics replaces the judgment of the clinician

As previously mentioned, the judgment of the clinician that arises from professional training and experience is highly valuable in clinical practice and is irreplaceable. Evidence-based orthopedics seeks to supplement rather than replace the authority of the clinician by expanding the tools he or she uses to achieve the best possible care for their patients.⁶

Only randomized controlled trials are acceptable evidence

Although randomized controlled trials may be of the highest quality, evidence-based orthopedics does not suggest that they are to be used as the exclusive source of information.⁷ Due to ethical and technical considerations, randomized controlled trials are not always a feasible way to generate the desired information, so the clinician must turn to the information provided from other studies.⁸ Alternatively, a randomized controlled trial available on the issue of interest may have serious design flaws that bring the validity of the evidence into question. To approach clinical problems with the most effectiveness and to improve patient outcomes, it is important to consider all types of evidence and apply it if appropriate.⁵

The clinician is bound to a certain course of action by the evidence

The evidence is to serve as a guide, not as a dictate. It is up to the clinician to use the evidence as he or she believes appropriate given the circumstances of the situation.³

Conclusion

A vast amount of information is available to clinicians to use in an effort to improve patient care. The paradigm of evidence-based orthopedics stresses the importance of using this evidence to achieve the best possible outcome for patients, but only by critically appraising the evidence and integrating it with the clinician's own judgment and knowledge of the specific circumstances of the patient's case. It is a practice growing in popularity but also continues to be hampered by misconceptions, so being familiar with the principles of evidence-based orthopedics is important to any clinician seeking to get the most out of this alternative approach to patient care.

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