Editorial

Understanding Evidence-Based Arthroscopy

In January 2001, *Arthroscopy: The Journal of Arthroscopic and Related Surgery* made it a requirement that authors describe a "Type of Study" in scientific articles. This initiative helped readers to better comprehend study methods and helped researchers to identify if a study was of the type for which they were searching.

In January 2003, *The Journal of Bone and Joint Surgery: American Volume* published "Introducing Levels of Evidence to *The Journal*."[1] Levels of evidence "place a clinical research study into context for the reader" such that "(h)igher levels of evidence should be more convincing to surgeons attempting to resolve clinical dilemmas."[1,2]

The Editors of *Arthroscopy* have followed evidence-based medicine initiatives with vested interest. In this issue, *Arthroscopy* will introduce, as a requirement for publication, that authors use the published methods of *The Journal of Bone and Joint Surgery* Editors Wright, Swiontkowski, and Heckman[1] to describe in clinical articles a Level of Evidence. In addition, we request that authors of basic science and in vitro investigations specifically describe the Clinical Relevance of their research in the Abstract and Discussion sections of their reports. May it be said *vis-à-vis The Journal of Bone and Joint Surgery:* imitation is the sincerest form of flattery.

Wright et al.[1] assert: "Levels of evidence are hierarchical rating systems for classifying study quality." However, they further clarify that "levels of evidence provide only a rough guide to study quality." The Editors of *Arthroscopy* wish to further call attention to this caveat: the quality of evidence is but one measure of the quality of a manuscript.

Arthroscopy emphasizes, as a requirement for publication, the scientific merit of a technically sound experimental design that results in conclusions justified by valid data. In addition, *Arthroscopy* takes pride in its emphasis on clinically useful original material. Introduction of new ideas or techniques may start with level V studies: expert opinion. The Editors of *Arthroscopy* highlight that levels of evidence help readers, writers, reviewers, and editors to identify and better comprehend the type of study, rather than the quality of that study *per se*. "(A)n answer to a clinical question must be based on a composite assessment of all evidence of all types."[1]

As an alternative to the concept that levels of evidence represent a hierarchy of quality, levels of evidence may simply describe a continuum suggested by the scientific method whereby a hypothesis is tested to answer a question. Consider, as an example of an original idea introduced in *Arthroscopy*, endoscopic carpal tunnel release.[3] Expert opinion (level V) allows an author to share a new idea or technique, or a unique case, with the scientific community. Because reports of results obtained after less than 2 years of follow-up are rarely accepted as scientific articles by *Arthroscopy*, to discourage level V studies would be inconsistent with the scope of the journal and could delay global communication of evidence-based arthroscopy, which could undermine scientific cooperation in its broadest sense.

An original idea or technique must be tested. To continue with the example, it is appropriate that an author who describes a new technique follow, over time, the clinical outcomes resulting from application of this technique. Reports of the results of these outcomes[4-6] could be valuable level IV studies, case series (with no, or an historical, control group).

Eventually, other surgeons will consider the new technique. Initially, surgeons might try the technique in some cases while continuing to rely on a historical standard (for example, open carpal tunnel release) in other cases. Should these surgeons review and report the outcome of their (endoscopic and open) cases, a level III study (retrospective cohort study, the study was initiated after treatment was performed) could result.[7]

Other investigators might prospectively evaluate the new technique (the study is initiated before treatment is performed). Should the new technique be prospec-

doi:10.1016/j.arthro.2003.11.024

Levels of Evidence for Primary Research Question

	Types of Studies			
	Therapeutic Studies– Investigating the Results of Treatment	Prognostic Studies– Investigating the Outcome of Disease	Diagnostic Studies– Investigating a Diagnostic Test	Economic and Decision Analyses– Developing an Economic or Decision Model
Level I	1. Randomized controlled trial a. Significant difference b. No significant difference but narrow confidence intervals 2. Systematic review[2] of Level-I randomized controlled trials (studies were homogeneous)	1. Prospective study[1] 2. Systematic review[2] of Level-I studies	1. Testing of previously developed diagnostic criteria in series of consecutive patients (with universally applied reference "gold" standard) 2. Systematic review[2] of Level-I studies	1. Clinically sensible costs and alternatives; values obtained from many studies; multiway sensitivity analyses 2. Systematic review[2] of Level-I studies
Level II	1. Prospective cohort study[3] 2. Poor-quality randomized controlled trial (e.g., <80% follow-up) 3. Systematic review[2] a. Level-II studies b. Nonhomogeneous Level-I studies	1. Retrospective study[4] 2. Study of untreated controls from a previous randomized controlled trial 3. Systematic review[2] of Level-II studies	1. Development of diagnostic criteria on basis of consecutive patients (with universally applied reference "gold" standard) 2. Systematic review[2] of Level-I-II studies	1. Clinically sensible costs and alternatives; values obtained from limited studies; multiway sensitivity analyses 2. Systematic review[2] of Level-II studies
Level III	1. Case-control study[5] 2. Restrospective cohort study[4] 3. Systematic review[2] of Level-III studies		1. Study of nonconsecutive patients (no consistently applied reference "gold" standard) 2. Systematic review[2] of Level-III studies	1. Limited alternatives and costs; poor estimates 2. Systematic review[2] of Level-III studies
Level IV	Case series (no, or historical, control group)	Case series	1. Case-control study 2. Poor reference standard	No sensitivity analyses
Level V	Expert opinion	Expert opinion	Expert opinion	Expert opinion

1. All patients were enrolled at the same point in their disease course (inception cohort) with ≥80% follow-up of enrolled patients.
2. A study of results from two or more previous studies.
3. Patients were compared with a control group of patients treated at the same time and institution.
4. The study was initiated after treatment was performed.
5. Patients with a particular outcome ("cases" with, for example, a failed total arthroplasty) were compared with those who did not have the outcome ("controls" with, for example, a total hip arthroplasty that did not fail).

tively compared with alternative treatment methods,[8] the evidence will be level II (prospective cohort study, patients were compared with a control group of patients treated at the same time and institution).

Surgeons performing level II or III studies might allow patients to consider the risks and benefits of treatment alternatives and allow patients to choose the technique with which they are treated. Alternatively, surgeons might selectively use various inclusion or exclusion criteria to determine that some patients be treated with one method while other patients be treated with some other method. Various reasons might cause surgeons to selectively treat patients using alternative techniques, especially if one of the techniques is new; surgeon-investigators might be understandably reluctant to randomly assign patients to an unproven treatment group. However, a disadvantage of such cohort studies is that bias may systematically be introduced, which could increase the tendency toward erroneous results.[9] Surgeon selection of the treatment for each patient, for example, may result in susceptibility bias (patients in different subgroups have different prognoses).

In a level I study (randomized controlled trial),[10] investigators minimize bias by assigning subjects to treatment groups in a random manner. The process of randomization controls for both known and unknown factors between 2 comparison groups and thus eliminates systematic introduction of study bias.[11-13] When appropriate and feasible, a level I study may produce clinical evidence with the lowest tendency toward erroneous results.

The example is to illustrate that scientific investigation of innovations that may (or may not) result in improved outcomes for patients demands a continuum of levels of evidence. As an alternative to viewing levels of evidence as a hierarchy of quality, levels of evidence may be viewed as a ladder that we climb to reach the answer to a question. In clinical arthroscopy and related surgery, our study subjects are patients; thus, the ladder must be climbed with appropriate caution.

Clinical decision making requires assessment and understanding of the level of evidence of a compendium of individual studies. The quality of the evidence is vital to getting to the truth. The quality of the evidence is not a determinant of the quality of an idea and is but one measure of the quality of a manuscript. The Editors of *Arthroscopy* hope that introducing levels of evidence will help readers, writers, reviewers, and editors to better understand evidence-based arthroscopy.

JAMES H. LUBOWITZ, M.D.
Associate Editor

REFERENCES

1. Wright JG, Swiontkowski MF, Heckman JD. Editorial: Introducing levels of evidence to the journal. *J Bone Joint Surg Am* 2003;85:1-3.
2. Hurwitz SR, Slawson D, Shaughnessy A. Orthopaedic information mastery: Applying evidence-based information tools to improve patient outcomes while saving orthopaedists' time. *J Bone Joint Surg Am* 2000;82:888-894.
3. Chow JC. Endoscopic release of the carpal ligament: A new technique for carpal tunnel syndrome. *Arthroscopy* 1989;5:19-24.
4. Chow JC. Endoscopic release of the carpal ligament for carpal tunnel syndrome: 22-month clinical result. *Arthroscopy* 1990; 6:288-296.
5. Chow JC. Endoscopic release of the carpal ligament for carpal tunnel syndrome: Four years of clinical results. *Arthroscopy* 1993;9:301-314.
6. Chow JC. Endoscopic release of the carpal ligament for carpal tunnel syndrome: Long-term results using the Chow technique. *Arthroscopy* 1999;15:417-421.
7. Bande S, De Smet L, Fabry G. The results of carpal tunnel release: Open versus endoscopic technique. *J Hand Surg [Br]* 1994;19:14-17.
8. Ablove RH, Peimer CA, Diao E, Oliverio R, Kuhn JP. Morphologic changes following endoscopic and two-portal subcutaneous carpal tunnel release. *J Hand Surg [Am]* 1994;19:821-826.
9. Szklo M, Nieto FJ. *Epidemiology: Beyond the basics.* Gaithersburg, MD, Aspen, 2000.
10. Brown RA, Gelberman RH, Seller JG III, et al. Carpal tunnel release: A prospective, randomized assessment of open and endoscopic methods. *J Bone Joint Surg Am* 1993;75:1265-1275.
11. Brighton B, Bhandari M, Tornetta P, Felson DT. Hierarchy of evidence: From case reports to randomized controlled trials. *Clin Orthop* 2003;413:19-24.
12. Guyatt GH, Rennie D. *User's guides to the medical literature: A manual for evidence-based clinical practice.* Chicago: American Medical Association, 2001.
13. Sackett DL, Haynes RB, Guyatt GH, Tugwell P: *Clinical epidemiology: A basic science for clinical medicine.* Boston: Little-Brown, 1991.