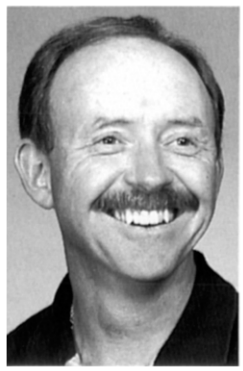
THIRTEENTH NATHALIE BARR LECTURE

Clinical Reasoning:
The Passion of Practice



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I would like to take a moment to dedicate this lecture to a person who at one time or another has touched many of our lives personally and professionally. Personally, she has had a profound effect on me as a clinician, an educator, and most importantly a person. She has always freely shared her knowledge and personal experience in order to make the practice of hand therapy more enjoyable, rewarding, and scientific. Her selflessness has certainly helped smooth the sometimes rough road of life. All of us would have had the privilege of listening to this magnificent person delivering this lecture last year. I know she would have had the same impact on you through her lecture that she has had on the lives of so many of us within this society. Therefore, I dedicate this lecture to Anne Callahan and can only hope that it will come close to the high standards that Anne exemplifies.

It is truly an honor to deliver this lecture. Remembering my first application to the Society in 1981, never in my wildest dreams did I ever consider receiving this honor. As some of you might recall, becoming a member was a stringent process, requiring logging patients for a six-month period, presenting three case studies in detail, obtaining letters of recommendation, and securing a sponsorship. My sponsor was Evelyn Mackin. No reflection on Evelyn, but I was not accepted for membership in 1981. As my wife, Beth, will tell you, though, saying no to me is like trying to stop the sun shining on a cloudless day. Undaunted, I reapplied in 1982 with Evelyn's help and was accepted as an Associate Member. Realizing that I wanted to be an Active Member, I applied a third time, completing the same process, and in 1983 was accepted as an Active Member.

I tell you this story to share with you what Evelyn taught me: We are limited only by our dreams, and their reality is limited only by our efforts. Attending these annual meetings and other ASHT continuing-education conferences, I sit in awe as I listen to many of you in this very audience talk about all aspects of hand therapy. Thinking about the content of this lecture, I called on a few of my friends and past Nathalie Barr lecturers for some advice. I called Ros Evans on the phone and said, "Ros, I don't know how I'm ever going to top what you did." She said in reply, as only Ros can, "Honey, you don't have to top what I did. Just be yourself." So I said to myself, "Mark, be yourself." I then called one of my mentors, Ken Flowers, posing another question. "Ken, how am I ever going to come before this audience and deliver an inspiring lecture that will have a long-lasting meaning?" Ken, in all his infinite wisdom, replied, "Just have fun, baby!" Putting these two comments together —"Be yourself" and "Have fun"— made me reflect on all the people, too numerous to mention by name, in this association and the many times I have listened to their presentations at annual meetings, instructional courses, and tracks. I posed a question to myself: "What is the one common denominator I admired and aspired to reach?" If I could determine the one thing common among all these therapists, it would probably be the one thing that links us all together. I meandered through this thought process and examined myself: The one thing I admired most was their passion. They were passionate about hand therapy, and they were passionate about life. I admired this the most because I aspire to be passionate in everything I do. I hope that if my family, friends, or colleagues were asked to de-

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scribe me they would say I was a passionate person. Of course, my wife may question how passionate I am but, nonetheless, I hope that that's how I am regarded.

I posed a simple question to my colleagues. "What is it that you are passionate about within the profession of hand therapy?" I ask each of you today to answer this same question. Before I share my passion with you, I would like to share a sample of the responses I received, so all of you can get a feeling of how varied the replies are despite the common message that seems to come through:

"Communicating the truth to students and helping them search for the truth through scholarly activity."—Neal Pratt, PhD, PT

"Being a part of the process of getting our professional advances into written format."—Anne Callahan, OTR, CHT

"Using the creative process to find the unique solution that gives the hand what it truly needs, even if that solution flies in the face of convention."—Karen Schultz Johnson, OTR, CHT

"The therapist's responsibility for the translation of clinical observation to clinical practice via study into basic science."—Roslyn Evans, OTR, CHT

"My hands on a patient's hands making a difference."—Judy Colditz, OTR, CHT

"It's the teaching, a no brainer."—Ken Flowers, PT, CHT

"Providing my patients with all the tools they need to get better."—Chris Reynolds, PT, MS, CHT

"Problem solving and finding solutions to difficult situations."—Mary Kasch, OTR, CHT

"Empowering my patients with the knowledge necessary to succeed in the rehabilitation process."—Elaine La Croix, OTR, MHS, CHT

"Finding ways to thrive in rather than survive in a managed care environment."—James King, OTR, CHT

Having shared these passions with you, I would like to spend the remainder of my time sharing my passion, which is "clinical reasoning." When I first started talking about this a few years ago, I displayed a slide that said "The Future Patient" (Figure 1). In preparing this lecture, I realized "the future is now." This is the present, no longer the future, patient. These are the obstacles; these are the problems many of us face every day, right now in the practice of our profession. As therapists we face obscure diagnoses; I have kept track of some of the more obscure ones that I have gotten just within the last three months—diagnoses of

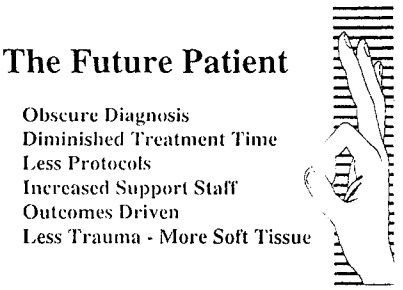

FIGURE 1. Characteristics of former "future" patients—now "present" patients—many therapists are treating.

"disability," "functional problems," "Tendinitis (where?)," and "repetitive strain injury," just to mention a few. As clinicians we must be prepared to clinically reason for ourselves, determine a therapy diagnosis, and play an active role in the patient's care. We all face the obstacle of diminished treatment time. We will have to rely much more on assistance to deliver our care. It will be even more crucial that we become critical of our clinical reasoning processes and formulate a treatment plan that is specific, that directly relates to and addresses the patient's problem. There are no protocols as yet to follow. We all remember when our practice was 80% trauma, permitting a logical thought process and allowing delivery of excellent care. In this day of obscure diagnoses and limited resources, it is more difficult and time consuming to develop these protocols. Research to support them is either lagging behind or nonexistent. The protocols will come only after we are able to classify each of these patients with obscure diagnoses. The practice of therapy is becoming more and more outcome driven, with greater level of accountability to patient's referral sources and payers. Finally, clinical reasoning becomes more crucial as occupational and physical therapists gain direct access. In 28 states, patients have direct access to physical therapists without going through a physician. This certainly puts greater responsibility on us as practicing clinicians to understand, become familiar with, and master the process of clinical reasoning.

Traditionally, evaluation means taking a history and measuring impairments such as range of motion, strength, and sensation. We must utilize additional evaluative components in assessing our patients who present with obscure or complex diagnoses or pain problems. In conjunction with traditional methods, we have to apply orthopedic soft-tissue tensioning to differentially diagnose contractile versus noncontractile and neural versus non-neural symptoms and conditions. We must consider the functional status of our patient. This has become crucial. In fact, the impairment measures we obtain correlate poorly with functional levels reported by our patients. We have to consider the appropriate use of neural tension testing, and the neural and non-neural origin of pain. What role do posture, socioeconomics, and psychology play in this evaluative process?

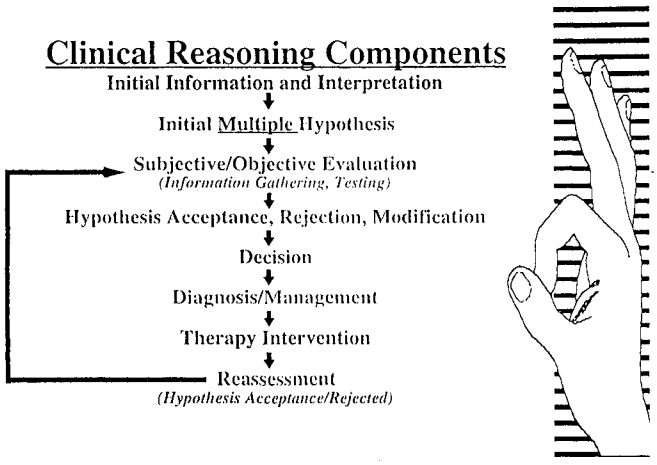

FIGURE 2. Components of clinical reasoning. (Adapted from Jones.[1])

Jones[1] describes clinical reasoning as a cognitive process that is used to evaluate and identify factors amenable to therapy and to manage a patient's problem. Factors that influence this clinical reasoning process are knowledge, cognitive skills, and meta-cognitive skills. Attaining knowledge is the reason that we attend conferences such as this. We use our knowledge to build a basis of reasonable facts to be assimilated in a logical sequence that begins to make some sense of the data that are presented. Cognitive skills represent the process used to analyze and synthesize the data that are collected.

Finally, meta-cognitive skills involve understanding how each of us personally analyzes the data as presented. This process is unique to each of us, as we utilize different methods to arrive at the same conclusion. A mentor once said to me that there is no such thing as a gut instinct. That theoretic gut instinct represents a level of cognitive reasoning based on experience, and knowledge that leads to the conclusion. The components of clinical reasoning are depicted in Figure 2. Initial information is gathered, and initial interpretations are made from the data in the form of multiple hypotheses. After making these hypotheses, we collect subjective and objective data from the patient, which require us to either accept, reject, or modify our initial hypotheses. This results in a decision process that leads to making a diagnosis and management plan. Therapy intervention is implemented, with reassessment based on a predetermined set of criteria to critically re-evaluate the hypotheses and the effect of treatment.

Hughes[2] likened the sequence of scientific method to therapy evaluation (Figure 3). We are all aware of the components of the scientific method. The initial problem statement is synonymous with the medical diagnosis or the patient's chief complaint. The problem statement leads to hypothesis formulation. For the therapist, evaluation confirms the hypothesis and occurs as a result of the history obtained from the patient. Experimental design equates with impairment measurement, special tests, and other forms of data collection to confirm the hypothesis. This finally leads to interpretation of the data and results in the therapy diagnosis. This diagnosis forces us to draw a conclusion and develop a treatment plan for the patient.

A model proposed by Echternach and Rothstein[3] is what they call "Hypotheses-Oriented Algorithms for the Clinician," or HOAC for short. These authors have proposed an algorithm to be used by clinicians to work through the clinical reasoning process. Data are initially collected through the history, chart review, and subjective information. A problem statement is generated, and goals are established. These goals are in the patient's terms and are tentative, functional, measurable, and attainable within a reasonable time. Examination results in the collection of data and determines a list of hypotheses pertaining to the etiology of the patient's problem. Each hypothesis should be a testable idea. This is the appropriate place to ask, "Are the goals that have been established reasonable?" If not, they should be re-examined and restated, based on the examination. The important concept is that the goals are in the patient's terms, not the clinician's. Establishing them before the evaluation eliminates clinician bias.

The next step in the HOAC model is a re-evaluation. This re-evaluation should have a stated time frame. This frame may be as frequently as before and after each treatment, or periodically. There should be specific test criteria used to either support or refute the initial therapy hypotheses. Once these have been developed, a strategy and the tactics necessary to attack the problems are implemented. Strategy refers to the overall approach and is usually general in nature. Examples of strategy are reducing inflammation, restoring range of motion, or improving the score on the wrist outcome.[4] The strategy is achieved by following a specific set of tactics, or treatment techniques. Specific modalities, therapeutic exercises (such as active, passive, or resistive exercises), and splinting techniques

Scientific Method	PT Evaluation
1. Problem Statement	Medical Dx or CC
2. Hypothesis Formulation	Take History
3. Experiment Design	Evaluation to Confirm Hypothesis
4. Make Observation	Record Objective Measures
5. Interpret Data	PT Diagnosis
6. Draw Conclusions	Treatment Plan Development

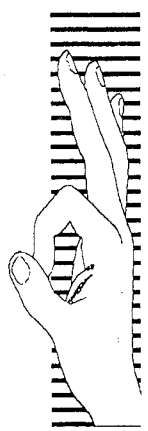

FIGURE 3. Comparison of the scientific method and physical therapy evaluation. Dx indicates diagnosis, CC, chief complaint. (Adapted from Hughes.[2])

(such as dynamic, static, and serial progressive) are examples of tactics.

The next step requires implementation and performing the treatment. This stage may involve the hand therapist, supportive personnel such as a physical therapist assistant or occupational therapy assistant, the patient, and family members. Finally, reassessment critically evaluates the success or failure to attain the goals. This confirms whether the treatment, the strategy, and the tactics were appropriate.

Keep in mind that this process is affected by the reliability and validity of the information obtained. The therapist must be critical of the data throughout its evaluation, instrumentation, and collection. Lack of reliability and validity could lead to errors in the clinical reasoning process. These errors could include failure to consider plausible hypotheses, errors in data collection, and aspects of confirmation bias. This strikes home for me especially in performing an evaluation designed to determine a diagnosis of inclusion and not of exclusion. For example, a patient comes in with a diagnosis of carpal tunnel syndrome. As a therapist, do you do what is necessary to confirm that diagnosis or accept it without question? Do you consider that other hypotheses may be applicable, such as cervical radiculopathy, brachioplexopathy, or pronator syndrome, to mention just a few? There are errors in judgment regarding how the data may be associated. Are the data related to confirm the hypotheses?[7] Perhaps there are other factors (confounding variables) we neglected to consider, which would contribute to this association. The therapist must always be mindful that association does not equal causality.

Jones[1] also refers to confusion between deductive and inductive logic. Deductive reasoning leads to a logical conclusion that is faulty because other factors (tests, measures) were not considered or not included in the data collected. Inductive reasoning goes beyond the information given, making a generalization based on specifics. Perhaps the most common area of error in clinical reasoning is an over-reliance on clinical patterns. As clinicians we tend to become rigid. This rigidity can lead to confirmation bias. The evaluation confirms a diagnosis of inclusion rather than exclusion.

As we reason clinically, it is important for us to consider the categories of hypothesis proposed by Jones. These categories are the source of the patient's symptoms or dysfunction, contributing factors, and precautions and contraindications to treatment and evaluation. At times it may be inappropriate to carry out a full evaluation, because of the patient's level of tissue irritability or the structures involved. Just as the lack of an evaluation may be an error, over-performance of one may lead to exacerbation of signs and symptoms. The remaining two categories of hypotheses formation center on management issues of strategy, tactics, and prognosis. It is our responsibility as clinicians to predict the likelihood that therapy intervention will make a difference for the patient. We must also

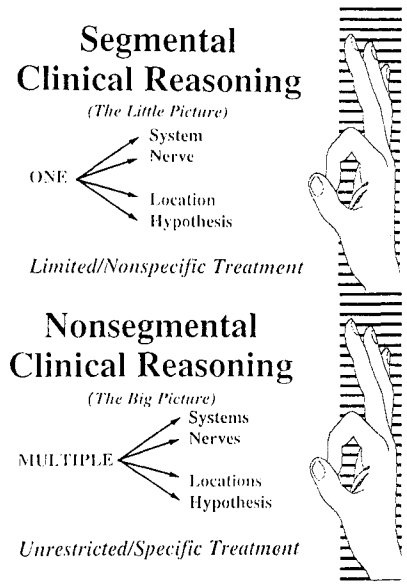

FIGURE 4. Comparison of segmental and nonsegmental clinical reasoning.

predict the scope of service required to achieve changes in the patient's functional level.

To those who are unfamiliar with this process I have tried to simplify it in my own terms. To help me through this process I conceptualize appropriate clinical reasoning as either segmental and nonsegmental (Figure 4). As a result of treating many patients, we all have a tendency to be segmental clinical researchers. We have seen these patients' problems, compartmentalizing them into one system, one nerve, one set of tissues, or one location. We therefore developed one hypothesis. As you may recall, this leads to errors in clinical reasoning. This leads to the creation of a limited, nonspecific treatment approach. For example, in a patient with radial wrist pain, the segmental clinical reasoner would think of only one problem or hypothesis, such as carpometacarpal arthritis, and would not consider other possibilities. Therefore, treatment would be nonspecific and the therapist would be practicing on a basis of probability rather than sound clinical judgment. In contrast, in nonsegmental clinical reasoning the therapist considers multiple symptoms, multiple tissues, multiple nerves, multiple locations, and multiple hypotheses, as listed in Figure 5. This leads to an unrestricted and specific treatment approach after identification of specific problems or hypotheses. This naturally leads to specific strategies and tactics and ultimately to more appropriate care.

Nonsegmental clinical reasoning is composed of multiple components as the therapist evaluates each patient. It involves the traditional methods of evaluation we are all accustomed to, but it also requires us to consider and use nontraditional or unfamiliar evaluative approaches. We need to determine whether a patient's problem is a neural or non-neural disguise. Is the patient's pain or dysfunction related to the nervous system, to other pe-

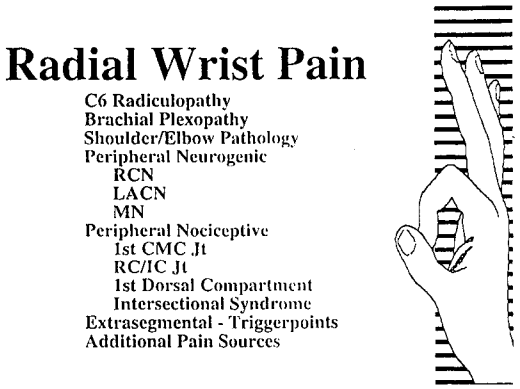

FIGURE 5. Potential sources of radial wrist pain that the therapist should consider. RCN indicates radial cutaneous nerve; LACN, lateral antibrachial cutaneous nerve; MN, median nerve; CMC, carpometacarpal; RC/IC, radiocarpal/intercarpal.

ripheral target tissues, or both? Remember, quite often this disguise can be referred pain from visceral organs into the extremity or referred pain from peripheral target tissues throughout the extremity. Quite often things don't appear as they are. As clinicians we should consider the level of irritability. This is crucial in determining precautions and contraindications for evaluation. We need to consider whether the motion barrier, or muscle guarding, we observe during our evaluation is the result of a phasic muscle response or contracture. If the barrier is the result of phasic muscle response and has been present for a long time, then adaptive shortening of all the tissues will occur, including the nervous system. Nonsegmental clinical reasoning considers the presence of double or multiple crush situations, which may also include inflammatory migration between neural and non-neural tissues, neural inflammation, and the presence of neuropeptides such as substance P, calcetone gene-related peptides, and vasoactive intestinal peptides. Migration of non-neural inflammatory agents can cause a neural response and the development of a neural inflammatory response via chemicals such as prostaglandins, bradykinins, histamines, and leuko-
trienes resulting from connective tissue breakdown.

Nonsegmental clinical reasoning allows the therapist to clinically classify pain, as proposed by Gifford and Butler,[5] into peripheral nociceptive, peripheral neurogenic, central nervous system, autonomic nervous system, and affective/motivational. All of these are related to specific clinical patterns of pain behavior, impairments, and functional deficits. However, caution should be exercised, as errors in clinical reasoning can occur if the clinician becomes too rigid and depends too heavily on these clinical patterns. Often our patients have a mixture of these components. The two most commonly encountered are peripheral nociceptive and peripheral neurogenic pain. Peripheral nociceptive pain results from an injury to local target tissues, is usually mechanical in nature, and presents with local dysfunction. The patient with proximal interphalangeal collateral ligament injury is one such example.

Peripheral neurogenic pain results from injury to neural tissue. Common diagnoses often associated with it are cubital tunnel, carpal tunnel, and Guyon's canal syndrome. Neural tissues may also be mechanically sensitive to tension or compression. A physiologic response of paresthesia and sensory changes may accompany the pain as a result of the internal environment of the nerve being compromised. These patients often present with a predictable pattern of pain, which follows a dermatomal or peripheral nerve distribution and therefore makes more sense to the clinician. In contrast, the three remaining pain mediators—central nervous system, autonomic nervous system, and affective motivational—are harder to confirm and treat. An example of autonomic nervous system pain occurs in a complex regional pain syndrome,[6] such as reflex sympathy dystrophy, or causalgia, which presents with vasomotor changes, allodynia, or sudomotor changes. Central nervous system pain may be from central sensitization of the dorsal horn via chemicals such as neuropeptides and should not be confused with "central" or thalamic pain. Clinically, these patients often present with summation or latency of their pain. Small non-nociceptive inputs summate to eventually provoke the patient's pain or cause a delayed response, latency. The reported pain is often disproportionate to the objective findings. Sensitization also leads to the phenomenon of "wind-up," in which small, brief amounts of input into the nervous system do not provoke pain, but continued input eventually does. All of us have cared for such patients in the clinic. They are able to perform 10, 20, 30, or even 40 repetitions of a specific exercise without any pain, but on return to a repetitive workplace motion their pain returns. Finally, we must not forget the affective or motivational component of pain. We all have experiences that play a part in how we perceive pain and how it affects our lives. Patients with strong affective or motivational components may present with minimal objective findings, and secondary gains may contribute to their pain behavior. Nonetheless, the pain is real to them.

In addition to the subjective gathering of data, the use of a clinical model to objectively evaluate a patient is often incorporated. Although there are many (Figure 6), I will use the Cyriax model[7] as an

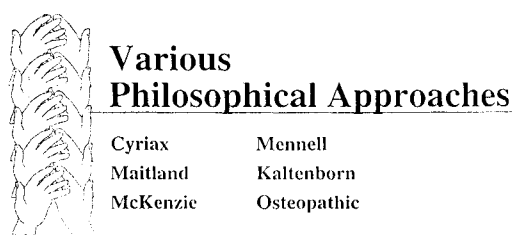

FIGURE 6. Various clinical evaluation models.

example of evaluating pain of mechanical origin. Currently, our only clinical tools are the patient's history and subjective complaints and our ability to mechanically stimulate sensitive tissues. Remember that normal stress to abnormal tissues and abnormal stress to normal tissues can elicit pain. This model and others require the generation of hypotheses and prognostication and the incorporation of all aspects of clinical reasoning. In order to correlate the subjective process with this objective process, the therapist must always focus on what provokes or relieves the patient's symptoms. Therapists constantly refer to a "positive" test, when in fact the specificity and sensitivity of a particular test is directly affected by the patient's subjective response. Does the test or impairment measure relate to or provoke the patient's complaint? For example, in performing a thoracic outlet screening test the patient's pulse may be obliterated. Do we assume that the patient has thoracic outlet syndrome even if the test did not provoke their symptoms? Therefore, this is only an incidental finding.

An additional consideration is the state of the tissues, or their level of irritability. Is pain present at rest, is it easily provoked, or is it referred away from the area? How is the pain related to motion? Responses to these questions have evaluation and treatment implications. According to Cyriax, pain before resistance indicates that passive tensioning of the tissue may be contraindicated. Pain synchronous with the end-range of motion may permit gentle stretching, and pain present beyond the available end-range of motion indicates that progressive splinting or exercise may be appropriate. The more pain there is at rest, the greater the distant referral or ease of provocation indicates increasing levels of irritability, requiring greater caution evaluating and treating the patient.

The obtaining of objective data is often referred to as impairment measures. The Cyriax model uses selective tissue tensioning by compressing or tensioning specific tissues to provoke the patient's complaints. The model's specific components are active, passive, and resistive movement testing, neurologic examination including neurodynamic testing, and palpation. Inspection reveals many clues about the irritability and extent of tissue involvement. Active motion testing examines the patient's willingness to move. The therapist must take care to standardize the method of testing active motion, so that it is repeatable from one treatment session to another. Passive motion testing attempts to examine noncontractile tissues specifically (Figure 7). We are accustomed to examining and differentiating intrinsic and extrinsic tightness in the hand. This concept of differentiation can be expanded to include the entire upper extremity. Contractile components can be examined by means of tension or compression through the use of isometric resistance. Theoretically, positioning noncontractile components in slack should help isolate contractile from noncontractile sources of pathology. In addition to identifying a specific tissue, isometric resistance provides information regarding the strength

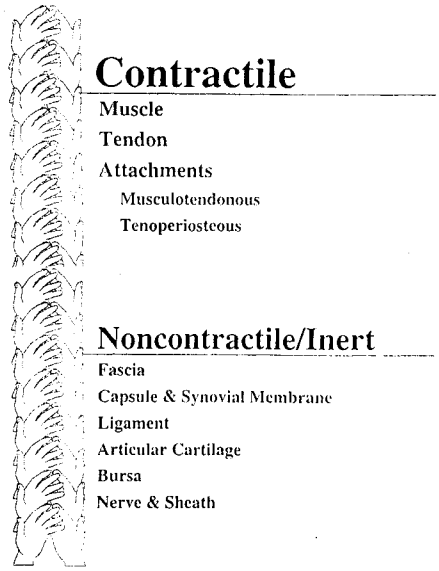

FIGURE 7. Contractile and noncontractile components of selective tissue tensioning evaluation.

of the musculotendinous unit and its relationship to pain. Neurodynamic testing assists in differentiating the role the nervous system plays in the patient's pain or dysfunction.[8] The therapist must always be mindful that neural system dysfunction can create restrictions in motion and aberrant movement patterns. The final way to mechanically simulate tissue is by palpation.

Whether through use of the Cyriax model or other models, alone or in combination, sound clinical reasoning is the foundation for hypothesis (diagnosis) generation. Without it, our profession as we know it will cease to exist. Clinical reasoning gives us autonomy and allows us to use our minds and the knowledge we have strived to obtain. Most important, the beneficiaries of our clinical reasoning will be our patients in the quality of care they receive. Embrace it and celebrate my passion with me.

In sharing my passion of practice, clinical reasoning, I hope I have helped you to see your patients in a different light. Some patients' problems may continue to be straightforward; others will require a higher level of reasoning. The status quo will no longer suffice. Do not necessarily accept what has been placed on a piece of paper or referral. Challenge yourself to continually question and hypothesize about the problems and the sources of your patients' symptoms. More important, I have tried to inspire each of you to look within and discover your own passion for the practice of hand therapy. Nurture this passion and utilize it to help you grow within your profession as a clinician and a person. By recognizing your own passion, I hope you will also see the passion in others with whom you interact every day, be they physicians, therapists, or patients. We all can derive energy from our passion, which will assist us in dealing with the tumultuous health care system that we must ne-

gotiate each and every day.

Finally, it would not be appropriate if I did not thank some special people in my life. I thank my partners in business and in friendship, Bill, Elaine, and Doug, for sharing their passion for the last 15 years. It has been a great source of energy. I thank Jane Fedorczyk for nominating me for this lectureship. Never in my wildest dreams did I think I would ever be deserving of such an honor. Thank you to good friends like Rich and Paula, who have made the trip enjoyable. And, finally, I thank my family for their sacrifice—my sons, Michael and Patrick, and my life partner, Beth, who share with me each and every day their passion for life, love, and laughter. My success could not have occurred without them.

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