

## Psychologic evaluation for patients undergoing neuroaugmentative procedures

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In his foreword to White and Sweet's book, *Pain and the Neurosurgeon: A 40-Year Experience* [1], the renowned Wilder Penfield commented:

...and there is always another problem to be solved—a psychological one. Is the patient receiving compensation in some form? Is he really being paid to complain? Does she use her symptoms to attract sympathy and admiration, or to escape the day's work that a wizened mother should give to the service of others? Here the doctor must hurry across the quicksands of decision between the “functional” and the “organic.” It is so easy to make an error here! The human brain has an amazing capacity to inhibit or even to block the incoming streams of sensation, particularly those of pain. There is also another cerebral mechanism that is capable of magnifying the stream and the focus of attention on selected portions of it. Christian Science makes skillful use of these basic principles of neurophysiology, and it is well for medical science to recognize and make use of them (page VIII).

In their introduction, White and Sweet [1] noted, “. . . in all obscure neuralgias or when there is a question of overlying emotional instability or depression, it is of the greatest importance for the surgeon to have the advice of a competent psychiatrist (psychologist). Depression alone may stimulate or aggravate painful states and prevent their clearing up after sensory denervation. So may the conscious or subconscious desire for attention or financial gain” (page 6).

These quotes give testimony to the long history of concern over the role of psychologic variables

and their assessment in neurosurgery, particularly for pain. This is no less true in contemporary spine surgery for pain. Although the potential impact of psychologic variables is well recognized, a definitive approach to their assessment remains elusive. This should perhaps be expected. In the same fashion as diagnostic methodologies for investigating structural abnormalities have advanced (ie, high-resolution imaging studies), so, too, has the development of psychologic testing/evaluation.

Nevertheless, it is important to remember that just because we can “see” more does not necessarily mean the picture is clearer. Sometimes the facts obscure the truth. It still remains the task of the clinician to put the pieces of the puzzle (ie, pain, pathophysiology, psychology), together. It is clear that physical pathology is not always associated with pain [2]. Although imaging studies correlate well with intraoperative findings, and to some degree with improvement in activities of daily living, psychologic factors seem more relevant to return to work and overall outcomes [3].

A recent (October 2002) meeting of some 16 experienced clinicians and implanters from the United States and Europe was convened to address two questions. First, why is it that every patient having a preimplant trial of spinal cord stimulation (SCS) therapy does not get 100% relief of pain? Second, why is it that only about 50% of implanted patients report 50% or more pain relief in long-term outcome studies? Implant technique, physiologic adaptation, changing “disease state,” increased activity level, and hardware/mechanical failure/shortcomings were each mentioned. Patient selection, particularly psychosocial factors,

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however, were rated as having the single greatest contribution.

The need for an appropriate psychologic evaluation in the context of neuroaugmentative therapy wherein reduction in pain and improvement in functioning are primary goals is based on several assumptions, some of which have been demonstrated and accepted by the pain community at large. First, pain is a multidimensional and multifactorial problem. Second, psychologic and behavioral factors can play a significant role in the patient's perception/experience of pain. Third, the impact of such psychologic factors can vary between patients and within a patient across time. Fourth, the physiologic and neurophysiologic characteristics of the peripheral and central nervous systems can change over time (ie, plasticity). Fifth, although obviously necessary, a positive response to temporary trialing is not sufficient to forecast a positive long-term outcome. Sixth, although generally "reversible" and often non-destructive, at least when compared with more traditional spine surgery, neuroaugmentative techniques should not be performed with impunity. Seventh, improvement in patient selection and long-term outcomes is likely to require more than simply improving the technology and implant techniques.

#### **Spinal cord stimulation/drug administration system outcomes: role of psychosocial variables**

The efficacy of implantable technology, particularly SCS therapy, has been noted to diminish with time. Kumar et al [4] reported only 59% of patients undergoing implantation after a successful trial to demonstrate greater than 50% pain relief after some 66 months of treatment. Burchiel et al [5] noted that only 55% of patients continued to evidence this level of relief. In a review of 29 studies by Turner et al [6], 55% of patients were noted to obtain long-term benefit of greater than or equal to 50% of pain. May et al [7] noted 100% of patients reporting 50% or greater relief of pain at 16.4 months after implantation but only 59% at 58 months after implantation.

This apparent "loss of effect" has also been observed, albeit to a lesser degree, with implantable drug administration systems (DASs). One study included patients with neuropathic, nociceptive, or combined pain etiologies [8]. The diagnoses included postradiation therapy, post-herpetic neuralgia, degenerative joint disease, "failed back surgery syndrome," ischemic vascu-

lar disease, complex regional pain syndrome (CRPS), angina, and phantom limb pain. In each case, it appeared that all or the vast majority of patients successfully completed a preimplant trial.

Nitescu et al [9] noted "failure" in some 37% of patients treated with infusion of opioid and bupivacaine over the long term. Interestingly, these authors identified factors like disharmonious marriages as significant in the decision to discontinue therapy. Indeed, Doleys and his colleagues [10,11] have shown that the perception of "success" may in fact differ between the patient and spouse. Spouses tend to perceive less benefit than patients on the whole. There also seemed to be a significant difference in estimated benefit comparing ratings of clinic staff with those of the patient.

There may be many reasons for this loss of effect in SCS and DAS therapy. Sharan et al [12] have indicated the potential advantage of a broader range of electrode arrays and programming in an effort to sustain the effect of SCS. Follett and Doleys [13] have reviewed the different preimplant trial methodologies for DAS, suggesting some to produce a more favorable outcome than others. One cannot, however, overlook the impact of psychosocial variables.

There have been a variety of attempts to identify the relevant psychologic or psychosocial variables related to positive or negative outcomes in neuromodulation. Doleys et al [14] reviewed the literature up to 1997 and concluded, "...to date, no definitive, reproducible studies from more than one center have verified any specific, statistically significant psychological factors, as measured by established psychological tests to predict the outcome from SCS therapy" (page 202). Indeed, North et al [15] stated, "...psychological testing is of modest value and explains little of the observed variance in outcome." (page 301).

Despite these inconclusive findings, it is generally agreed that psychologic issues can play a significant role. It is highly unlikely that any clinician experienced in neuromodulation would be inclined to consider implanting a schizophrenic patient with evidence of psychotic features, a known and active drug abuser, a patient with extreme hysteria, or a patient with profound uncontrolled depression, despite the presence of a pain pattern and pathophysiology that have proven amenable to neuromodulation.

Perhaps psychosocial issues should be construed as the third leg of a three-legged stool: pain pattern, pain pathology, and psychologic status

each constitute one leg supporting the stool. It may be a balance of these three that produces the most sustained effect. In this regard, there has been little or no systematic study as to the contribution of other therapies to preserving the effect found during a trial. For example, does the inclusion of antidepressants, anticonvulsants, muscle relaxers, cognitive behavioral therapy, or physical rehabilitation therapy contribute to sustained benefit? Perhaps neuromodulation should be perceived, at least in the setting of pain, to be a means to an end rather than an end in and of itself. In other words, neuromodulation therapy should serve the function of reducing pain, allowing the patient to participate more effectively and gain benefit from other therapies. Certainly, this is the case in other disease processes, such as diabetes, wherein insulin is provided as a baseline treatment but patients are exhorted regarding their responsibility.

There may be instances where the patient is not “prepared” for a particular therapy. One theory of change model [16] indicates the existence of various stages, such as precontemplation, contemplation, and action. The clinician naturally assumes that any patient experiencing moderate to severe pain is motivated to undergo procedures to modulate that pain. This may be true to varying degrees depending on the patient’s expectations and perception of potential benefit. The highly susceptible patient may be all too willing to submit to a procedure extolled for its efficacy, particularly in the presence of a reassuring and supremely confident implanter, only to regret the decision later.

In some instances, as noted in a recent article in the *American Pain Society Bulletin* [17], improvement of pain may open “Pandora’s box,” leading to the emergence of otherwise overlooked psychosocial issues. In this particular instance, two cancer patients experienced significant improvement in pain and cognitive functioning after the introduction of intraspinal therapy. Both were found later to suffer increased marital discord, conflict, and depression as a result of the emergence of issues thought to be secondary to that of pain relief.

Attempts to “predict” long-term outcome based solely on physiologic factors, let alone purely psychosocial factors, would seem foolhardy. The relative influence of such variables may change over time. For example, a patient may pursue neuromodulation therapy in an effort to improve pain and quality of life only to have

a “change of heart” if this results in demands to engage in nonreinforcing activities, such as return to work or household chores. To believe that such is not the case or that anticipation of such issues is not the purview of the implanting physician is both naive and short sighted.

At any given point in time, depression, anxiety, hysteria, elevations on various scales of the Minnesota Multiphasic Personality Inventory (MMPI) [18], specific response patterns to the McGill Pain Questionnaire [19] or responses to other tests, such as the Beck Depression Inventory [20] or State/Trait Anxiety [21] scales, have been found to correlate, occasionally to a statistically significant degree, with outcome. It is unlikely that attempts to predict long-term outcome from scores on various psychologic tests will be satisfying. In the same way that plasticity in the central nervous system may alter the intensity of nociception, so, too, is there likely to be “plasticity” in the psychologic makeup and responsivity of the individual with pain. Flor et al [22], for example, used operant conditioning reinforcement procedures to demonstrate how providing a positive consequence for patients, increasing their verbal assessment of the severity of a stable painful stimulus, can alter the intensity of that painful stimulus in a fashion that is resistant to the process of extinction. This effect was found to be particularly robust in subjects with chronic back pain. The study also demonstrated observable alterations in cortical activity in response to the provocative stimulus even though the intensity of the stimulus remained unchanged. Studies of this type begin to explain the neurobiologic basis that may underlie the effects of such conditioning methods [23]. It is indeed a much greater effect than merely altering some observable behavioral response.

The mechanisms by which psychologic issues can influence the patient’s perception and behavior include (1) behavioral/environmental, (2) cognitive/affective, and (3) neurochemical/physiologic [24]. In the behavioral/environmental mechanism, the patient may be undergoing significant reinforcement for certain pain behaviors. Attention from family members or avoidance of undesirable activities is an example of such reinforcement. The patient’s pain behavior is not likely to change simply in the presence of pain reduction. Indeed, the patient may not experience or report reduction in pain if it is thought that to do so will be associated with a reduction in current desirable consequences.

Patients' confidence in their ability to cope, their expectations, and their beliefs are part of the cognitive/affective mechanism. Depressed patients may have a fatalistic and pessimistic view. Their anticipation of ultimate failure based on previous experience may eventually overwhelm the effects of a positive trial period.

Research has shown alterations in serotonin and substance P and changes in the hypothalamic-adrenal-pituitary axis in response to psychologic stresses [25]. These alterations in neurochemical/physiologic functioning can be fairly profound and permanent. It becomes important to appreciate that psychosocial variables do not merely influence the patient's "state of mind." Those clinicians believing such do a disservice to the seriously afflicted patient by assuming that this state of mind can be altered at any point the patient chooses and that its persistence is therefore an indication of an unmotivated patient. This extraordinarily naive and pedestrian philosophy often distinguishes the "technician" from the true pain clinician.

### **Psychologic evaluation: who and how**

"Psychologic evaluations" are sometimes performed by different levels of professionals. In some instances, a master's level health care practitioner, such as a psychologist or social worker, may be called on to evaluate the patient. More commonly, and preferably, a doctoral level psychologist with clinical experience can be used. In some instances, psychiatrists are called on to perform this function. The level of training, clinical experience, and general philosophy regarding psychologic issues and pain are likely to vary vastly. Some practitioners, regardless of their level of education (ie, master's, PhD, MD), lack sufficient educational and clinical background/experience in the area of pain and related psychologic issues to render a meaningful assessment. The ability to administer and interpret appropriate psychologic tests should be a consideration. The experienced patient, as we have all encountered, can be manipulative if not misleading.

Assessments relying solely on an interview could be incomplete if not inadequate. The use of psychologic tests, such as the MMPI-II, provides a mechanism by which dissimulation, including "fake bad" and "fake good" profiles, can be detected. Therefore, whenever possible, it is recommended that when selecting an evaluator, a doctoral level clinician with training and ex-

perience in assessing and treating patients with pain as well as possessing, at minimum, a passing familiarity with neuroaugmentative therapies should be given favor.

The purpose and goals of the psychologic assessment can vary widely. In the opinion of the author, it should not be undertaken with a "go/no go" mentality [26]. The notion of "clearing" the patient for implant technology is misleading. This approach betrays our knowledge of the plasticity of the nervous system that we are attempting to modulate and the changing impact that various psychologic variables may have depending on a patient's coping style and general resources. Efforts should be made to provide a sufficiently adequate description of the patient, addressing several factors so as to allow the implanter and those who will be involved in the long-term care of the patient to determine the individual's desirability. The general areas to be assessed during the psychologic evaluation include the following:

- Any untreated or undertreated major affective disorder
- Axis II (personality/character) disorder: effects of such disorder on the perception of pain, compliance, and cooperation, for example
- Any untreated or undertreated alcohol or drug problems, present or past
- Expectations/attributions regarding pain and proposed therapy
- Nonphysical factors: their contribution to the patient's pain perception and behavior
- Type and degree of social support

Some practices have the support structure to provide therapy for ongoing psychologic issues, such as depression, although others do not. It is a serious mistake to assume that the absence of obvious psychologic dysfunction correlates with a positive outcome [27]. It seems that consistency across multiple sources of information, including clinical interview, behavioral observations, objective psychologic testing, medical data, staff, and significant others, is the most critical factor. This is no different than examining the consistency across the physical examination, patient's complaint, and radiologic studies in determining appropriateness for surgery.

The ability to perform an appropriate psychologic assessment may be hampered by financial resources and insurance coverage. It is up to the individual implanter as to what importance is placed on this assessment and how

strongly the insurance carrier or patient is urged to assume financial responsibility. Most mental health practitioners are willing to make some accommodations for obvious hardship cases.

The implanter is encouraged to engage in a dialogue with the psychologic evaluator. Often, the implanter has an extended treatment history with the patient and can impart information or shed light on interview and test data that could otherwise lead to an inappropriate or unfavorable impression. The ability and willingness of the psychologic evaluator to interact with the patient during the trial and after implantation will add to his/her experience and undoubtedly influence the decision-making process. There is likely to be a “learning curve” regarding psychologic evaluations in much the same way as there is for developing proper implanting technique.

Expectations and education are important variables related to outcome. These can be addressed during the psychologic evaluation/assessment. The use of literature (evidence)-based projections rather than the biases of individual practitioners is encouraged. Educational material, including manufacturer pamphlets and videotapes, can aid in the education process. Previous work has shown the tendency for significant others to perceive outcomes as less satisfactory than patients [10,11]. For this reason, their involvement in the evaluation and trialing process should be emphasized.

The role of psychologic assessment and neuroaugmentative therapy is somewhat different than that in traditional spine therapy. In general, a primary goal for neuroaugmentative therapies is reduction in pain. To date, there is little reason to believe that these therapies substantially alter the underlying offending pathophysiologic abnormalities. Spine surgery, such as decompressive procedures, may be necessary to alter ongoing damage to neural structures, with a hope of associated pain relief. For this reason, issues, psychologic or otherwise, that influence the patient’s experience of pain become of paramount importance. Furthermore, neuroaugmentative therapies involve the implantation of devices that require ongoing monitoring, a fairly strong likelihood of some type of revision, or ultimate replacement in the case of battery-driven devices. In addition, some therapies, such as SCS, require the acceptance of a hopefully comfortable paresthesia by the patient. Such is not the case with typical spine surgery. A relative advantage, although sometimes a “double-edged sword,” of

neuroaugmentative therapies is their reversibility. Unfortunately, this feature is sometimes used as the primary or, worse, the sole rationale for going to trial. In other words, patients are selected on the basis that they have failed all other therapies rather than on the basis of the identification of positive prognostic factors.

In 1996, Nelson and Novy identified a number of relative and absolute contraindications for implantation technology [28]. It should be noted that these are based on conjecture and have not been clinically or experimentally validated. In all probability, many of the factors that they put forth, such as neuropsychologic abnormalities, untreated significant addiction, and psychiatric disorders with delusional/hallucinatory components, would prove accurate. Alternatively, Doleys [29] listed a number of factors whose presence was believed to be associated with increased likelihood of long-term outcomes:

1. Generally stable psychologically
2. Cautious
3. Effectively defensive
4. Moderate levels of self-confidence and self-efficacy
5. Realistic concern regarding “illness” and proposed therapy
6. Mild depression appropriate to the situation
7. Generally optimistic regarding outcome
8. Ability to cope with flare-ups, complications, and side effects appropriately
9. Appropriately educated regarding procedure and device
10. Supportive and educated family/support person
11. History of compliance and cooperativeness with previous treatment
12. Behavior and complaints consistent with identifiable pathology
13. Behavioral/psychologic evaluation consistent with patient’s complaints and reported psychosocial status
14. Comprehends instruction(s) and other information
15. Patient/significant other has appropriate expectation(s)
16. Patient able/willing to “tolerate” electric stimulation/paresthesia with SCS and medication adjustments with DAS

These also require empiric validation; however, each has been cited at some point in the surgical or neuromodulation literature. In this regard, establishing appropriate goals and expectations

becomes important. Indeed, Anderson et al [30] demonstrated how differently patients may prioritize the more typical goals of pain relief, improved functioning, return to work, standing tolerance, and improved sleep, for example. Perhaps our tendency to impose our therapeutic goals on the patient and family may account for some of the discrepancy between relief during the trial and long-term outcomes.

It would be a mistake to use a positive trial as the sole or best indicator to proceed to implantation. Some patients are more prone to a placebo response. Kemler et al [31] noted improvement in pain ratings after patients were informed they had been assigned to the SCS plus physical therapy versus physical therapy alone treatment in a randomized study. This improvement was statistically significant and was noted to occur before undertaking the trial. Other patients are more prone to misrepresent the benefits of the trial, believing that once the “permanent” system is in place, benefits will improve. Others find the presence of an implantable device helpful in establishing the authenticity of their problems and in securing compensation/disability. Nitescu et al [9] identified several psychosocial factors to explain the

failure of nearly a third of patients to complete an intrathecal trial to obtain long-term benefits. For this reason, the appropriately trained and experienced psychologist may be a valuable asset not only regarding pretrial assessment but in evaluating the patient’s response during the trial and assisting in developing postimplant management strategies and adjunctive therapies. In this context, the “assessment or evaluation” may require more than one session (Table 1). Williams [32] put forth the protocol in which patients would be seen for several visits before proceeding to trialing. Compliance with the protocol was considered an important feature of the evaluation process.

### Psychologic evaluation: what factors

The five most commonly evaluated psychologic factors seem to be psychiatric disorders, depression, substance abuse, secondary gain, and motivation [33]. The presence of any severe psychiatric disorder, including major depression with or without psychotic features, is likely to compromise the patient’s experience of pain. In particular, there could be enhancement of the “unpleasant” or affective component of pain that

Table 1  
Use of psychological evaluation and treatment

Pretrial selection	Trial	Postimplant
Psychologic testing eg, MMPI, MPI, Oswestry, McGill	Variables to monitor Pain, function, medication	Adjunctive therapy Cognitive-behavioral
Psychologic variables (eg, depression, anxiety, reinforcement contingencies, social support)	intake, psychologic, perception affect, somatic	(individual, group), rehabilitation
Role of variables in pain perception management (eg, cooperation, compliance)	cognitive, for example	Outcome measures When, what, failure versus success
Patient/significant other education	Measurements NRS, VAS, McGill, Beck, Oswestry, MPI, for example	Guidelines for “adjustments” Patient management
Pretrial treatment	Adjunctive treatment Relaxation, individual, medication	Flare-ups, decreased effect, “side effects,” “troubleshooting”
One or one, group	Implant versus no implant	(eg, family, behavioral, person variables, contingency change)
Attribution/expectations	Withdraw catheter/lead, immediate implant, delayed implant	
Trial structure		
Prolonged, medication adjustment (monitored)		
Accept/reject/accept with reservation		
Outcomes Expectations, management issues, baseline measures		

This table presents the various times during the pretrial selection, preimplant trial, and postimplant management that various behavioral psychologic issues, assessments, and therapies can be used.

*Abbreviations:* MMPI, Minnesota Multiphasic Personality Inventory; MPI, Multidimensional Pain Inventory; Oswestry, Oswestry Low back Disability Questionnaire; McGill, McGill Pain Questionnaire; NRS, Numerical Rating Scale; VAS, Visual Analogue Scale, Beck.

would vary considerably with the nature of the psychiatric illness and not be effectively managed by implant technology. Included in this category would be the axis II or personality disorders. There are 10 such disorders, which have been grouped into three clusters [34]. The odd or eccentric cluster includes schizotypal, schizoid, and personality disorder. Cluster B includes the dramatic, emotional, and erratic groups, such as histrionic, borderline, narcissistic, and antisocial personalities. The anxious or fearful group incorporates the avoidant, dependent, and obsessive-compulsive personality disorders. In some cases, the presence of a personality disorder influences the patient's perception of pain. In other cases, it introduces significant problems regarding long-term management.

Depression is commonly evaluated. Key features include severity of the depression pre-existing or secondary to pain and how adequately it is being treated. In many cases, "reactive depression" improves, as does pain relief and functioning. In other instances, the magnitude of depression may overwhelm long-term effects of implanted technology. Such patients are likely to have a temporary sense of hopefulness and are therefore prone to a "false-positive" trial.

Substance abuse or addiction issues are found in as many as 19% of chronic pain patients [35]. One must determine whether the addiction is current and ongoing or remote. Patients who have accepted their addiction, submitted to rehabilitation, and remain actively involved in recovery programs may, in fact, be suitable for implantation technology.

Secondary gain issues have maintained a position of prominence. All too often, however, one assumes that the presence of any litigation or worker's compensation claim automatically implies the influence of secondary gain. Doleys et al [10] have shown the absence of any statistically significant differences in 10 of 11 variables in patients with an implanted DAS when comparing those whose injury and treatment was covered under worker's compensation versus with those whose injury and treatment was not covered. The issue may be proximity to settlement.

Motivation is sometimes hard to evaluate. It can be falsely manifested by "I'll try anything" or "anything you say, doc." This apparent willingness to "submit" to treatment may mask a dependent personality style that is willing to assign responsibility for therapeutic outcome to the technology and implant. These patients, having

failed multiple treatments, seem willing to undergo any available intervention. They are, unfortunately, selected as candidates not because they display characteristics associated with a positive outcome but because they have failed all other interventions.

Doleys and Olson [36] outlined a number of patient beliefs that may be associated with positive and negative outcomes (Table 2). This was also extended to examining the beliefs held by professionals (eg, anesthesiologists) as well (Table 3). It is important for practitioners to appreciate their own approach to the problem at hand and the many ways in which they may reveal their own attitudes. A more vulnerable and psychologically fragile patient is susceptible to even subtle forms of influence and more than willing to relinquish responsibility for successful pain therapy to the practitioner.

The most commonly used assessment tools are the clinical interview, MMPI, Beck Depression Inventory, Oswestry Low Back Disability Questionnaire, and McGill Pain Questionnaire. The interview should be quite focused and detailed. Using questionnaires can be helpful but is no substitute for face-to-face interaction with the patient and significant others. The MMPI is a well-recognized psychologic test and has recently undergone extensive research in a pain population [18]. It has the advantage of three validity scales that can help to determine the possibility that a patient is attempting to misrepresent his/her

Table 2  
Patient's beliefs

Associated with positive outcome's	Associated with negative outcomes
Pain is multifactorial/multidimensional	Pain is a purely physical phenomenon
Attitudes and behaviors can affect treatment outcomes	Psychosocial factors play little role in pain and treatment outcomes
Coping skills (eg, relaxation, distraction, goal setting) can be helpful	Chronic pain means loss of a productive life
An active participant in therapeutic decision	Pain can only be relieved if medical cause (eg, arthritis, scar tissue) is eliminated
Support systems that reinforce positive behavioral change are useful	Medical technology holds the solution
Proper expectations influence outcomes	

*Adapted from Doleys et al, Olson K. 1997.*

Table 3  
Physician beliefs

Associated with positive outcome	Associated with negative outcome
Pain is multidimensional/multifactorial	“Pain generators” are sensory/physical phenomena
Treatment of psychosocial factors can be as effective as “medical” treatment	Failure of intervention is usually patient’s “fault” (ie, poorly motivated)
The patient’s concept of pain can profoundly affect treatment outcome	Long-term management is someone else’s responsibility
Patients are capable of change	“Trial” outcome is a primary predictor of success
Treatment is long-term process	The more reversible or “nondestructive” a procedure is the greater is the flexibility in patient selection
The clinician’s role is facilitative as much as prescriptive	Relief of subjective pain underlies all other areas of concern (eg, psychologic well-being, increased function, general quality of life)

*Adapted from Doleys all, Olson K. 1997.*

condition. The Beck Depression Inventory [20] is a well-recognized, easily administered, validated measure of depression. The Oswestry Low Back Disability Questionnaire [37] is highly correlated with functional capacity evaluations and provides a repeatable measure that can assess change in function. The McGill Pain Questionnaire [19] can be of significant benefit in determining the degree to which patients are identifying sensory versus nonsensory components to their pain.

There are a number of strategies that can be implemented to minimize the potentially negative impact of coexisting psychologic problems [38]. Attempts can be made to reduce stressful environmental factors, such as marital conflict, litigation, or job stresses. Involving family members in an effort to establish a support network can be helpful. The patient should be given realistic estimates of potential benefits and risks. Plans should be instituted for the patient’s agreement and awareness for management of psychologic problems during and after trialing or implantation. In determining the patient’s compliance, for example, with psychologic therapy, psychotropic medications could be made

a contingency for trialing or implant. Where possible, the potentially offending psychologic issues should be resolved before implantation.

## Summary

Neuroaugmentative and neuromodulation therapy continues to expand. New applications are being found for existing technology, such as the use of SCS therapy in the treatment of head pain. The potential impact of existing therapies is enhanced by new discoveries as exemplified by the availability and demonstrated efficacy of different pharmacologic agents and combinations of agents in intrathecal therapy [39]. Increased attention is being paid to cortical stimulation, including motor cortex stimulation and deep brain stimulation. We must, however, not let our fascination for gadgets betray sound sense.

The role of psychosocial factors in the outcome of more “objective” and measurable problems, such as spasticity and tremor versus pain, remains an open area of investigation. Although psychologic issues may not be as prevalent in the amelioration of such problems, they may influence the patient’s overall level of satisfaction with the therapy and improvement in quality of life.

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