

Ethics

Pain Assessment: Subjectivity, Objectivity, and the Use of Neurotechnology

Part One: Practical and Ethical Issues

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The pain clinician is confronted with the formidable task of objectifying the subjective phenomenon of pain so as to determine the right treatments for both the pain syndrome and the patient in whom the pathology is expressed. However, the experience of pain — and its expression — remains enigmatic. Can currently available evaluative tools, questionnaires, and scales actually provide adequately objective information about the experiential dimensions of pain? Can, or will, current and future iterations of biotechnology — whether used singularly or in combination (with other technologies as well as observational-behavioral methods) — afford objective validation of pain? And what of the clinical, ethical, legal and social issues that arise in and from the use — and potential misuse — of these approaches? Subsequent trajectories of clinical care depend upon the findings gained through the use of these techniques and their inappropriate employment — or misinterpretation of the results they provide — can lead to misdiagnoses and incorrect treatment.

This essay is the first of a two-part series that explicates how the intellectual tasks of knowing about pain and the assessment of its experience and expression in the pain patient are constituent to the moral responsibility of pain medicine. Herein, we discuss the problem of pain and its expression, and those methods, techniques, and technologies available to bridge the gap between subjective experience and objective evaluation. We address how these assessment approaches are fundamental to apprehend both pain as an objective, neurological event, and its impact upon the subjective experience, existence, and expectations of the person in pain. In this way, we argue that the right use of technology — together with inter-subjectivity, compassion, and insight — can sustain the good of pain care as both a therapeutic and moral enterprise.

Key words: pain, assessment, neurotechnology, biotechnology, neuroethics, medicine

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INTRODUCTION: THE PROBLEM(S) OF PAIN — AND PAIN ASSESSMENT

The pain clinician is confronted with the formidable task of objectifying the subjective phenomenon of pain so as to determine the right treatments for both the pain syndrome and the patient in whom the pathology is expressed. However, the experience of pain

— and its expression — remains enigmatic, as they are both deeply embedded within the first-person reality of the patient. How then, can the physician approach this task? Is patient history and physical assessment sufficient? Is a more detailed narrative required to gain insight to the personal nature of pain-as-illness? Can currently available evaluative tools, such as magnitude-estimation and analog scores, various question-

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naires, and assessment batteries — even if quantified — actually provide adequately objective information about the experiential dimensions of pain? Can, or will, current and future iterations of neuro- and infrared imaging, encephalography, and various genetic and phenotypic biomarkers, whether used singularly or in combination (with other technologies as well as observational-behavioral methods) afford objective validation of pain?

And what of the clinical, ethical, legal, and social issues that arise in and from the use — and potential misuse — of these approaches? To be sure, many of these approaches are new, and as such, their validity and value in clinical practice remain incipient. Yet, the subsequent trajectories of clinical care depend upon the findings gained through the use of these techniques, and their inappropriate employment — or misinterpretation of the results they provide — can lead to mis-diagnoses and incorrect treatment. Moreover, while the principal use of any and all methods to objectify pain is toward facilitating accurate diagnosis and initiating and maximizing the good of treatment in the patient's best interest, there is an implicit — if not equal — agenda to employ such techniques and technologies to discern veracity and validity of pain reports, and thus, by extension, "gate keep" potential access to subsequent forms of care. How does this affect disclosure, consent, and the relative autonomy of both patient and clinician? How can — and should — patients be informed about such practices so as to meaningfully provide consent?

This essay is the first of a two-part series that explicates how the intellectual tasks of knowing about pain and the assessment of its experience and expression in the pain patient are constituent to the moral responsibility of pain medicine. Herein, we address the problem of pain and its expression, and those methods, techniques, and technologies available to bridge the gap between subjective experience and objective evaluation. We address how right and good use of these approaches is fundamental to the goal of meeting the unique challenge of clinical pain assessment while keeping the ethical integrity and value of the clinical encounter well in view.

THE HERMENEUTIC NATURE OF THE CLINICAL ENCOUNTER

We have claimed that "...knowledge of pain is limited by problems of understanding and explanation: what is subjectively understood cannot be directly explained, and what can be explained does not reflect

that which is subjectively understood" (1). Empirical knowledge of etiology and treatment is fruitless without knowledge of the patient's subjective existence as a person in pain. Elaine Scarry has claimed that pain "defies language"(2); yet, the person in pain cries out to be understood (3). Medicine attempts to resolve this paradox via the inter-subjective structure of the clinical encounter, and thus can be considered to be a hermeneutic endeavor (4). Within this hermeneutic framework, the physician uses interpretive skill to synthesize the clues gathered in the clinical meeting into a more meaningful picture of the patient's experience of pain. As this domain deepens and expands to foster appreciation for the ways in which pain-as-pathology affects the patient-as-person, the pain practitioner's abilities and efforts (to both understand pain and make prudent clinical decisions as relate to therapeutics) will likely become increasingly adept.

At the juncture of the clinical encounter, the life-worlds of patient and physician are united by a common goal of healing. The responsibility each party assumes in order to achieve this goal lays the foundation for an ethics of pain medicine. The core ethical issues of the clinical encounter in pain medicine can be posed by two fundamental questions: 1) Is the pain physician fulfilling the telos of pain medicine by providing effective and beneficial treatment of pain? 2) Is the pain physician upholding the values inherent to the profession of pain medicine (4)? To affirmatively answer these ethical questions requires not only knowledge of pain writ large, but knowledge of pain as it is manifested in the individual (5). Therefore, as a first step toward right and good treatment, the primary goal of pain medicine is to make the subjective experience of pain objectively accessible, assessable, and appreciable.

THE CHALLENGES OF COMMUNICATING PAIN

Although one can point to a part of the body where pain seems to originate, neither patient nor physician can point to the pain itself. As Ludwig Wittgenstein has argued, even if one could focus attention inwardly to apprehend pain as it is felt, language often fails to adequately describe introspective, private sensations (6). Despite these difficulties, there are ways of communicating pain. One can use metaphor, as well as pain behaviors to provide visual cues that signal pain to others. However, pain behavior can be faked or repressed, visual cues such as bloodshed or tissue damage do not correlate to pain intensity—as anyone who has experienced a paper cut will attest—and metaphors

may not be useful across cultural borders.

Effective communication requires both someone who signals and someone who understands. To understand someone who speaks of (her own) pain, requires imagining pain that is not felt, based upon some recollection of pain that has previously been felt (7). In light of this, any understanding of another being's pain is dependent just as much on one's personal experience as it is on another's ability to express it. Valerie Hardcastle posits that "...our ways of discussing pain are beyond repair...our best strategy is simply to scrap them and start over"(8). But is such a complete epistemic and linguistic revision really necessary? Using existing language, many astute and compassionate practitioners successfully diagnose and treat patients' pain.

A counterpoint to Hardcastle's bold and rather nihilistic assertion has been put forth by Melzack and Casey, who have sought to use the linguistic tools we have at present to assess and identify the dimensions of pain (9). But, if such linguistic tools for describing pain are to some extent inadequate, then the task is to analyze the scope and nature of these informational gaps, and augment those means of assessment and evaluation until we develop new tools that more fully compensate or wholly bridge the gaps.

We posit that pain often compels expression in order to satisfy the needs for meaning and relief. Consequently, from a physician's perspective, the pain narrative can be important as both a diagnostic tool and as a form of therapy (10). In this way, Rita Charon's definition of narrative as "a story with a teller, a listener, a time course, a plot, and a point"(10) is most useful. Narrative entails more than merely simple answers to a series of questions asked by the physician; rather it can become an open-ended reflection on aspects of the patient's life that facilitate communication with the physician and participation in the clinical encounter through sharing of values, goals, needs, and first-person experience.

A physician imbued with the skills of recognizing, absorbing, interpreting, and appreciating the stories of chronic pain (as symptom and illness) cannot only recognize and understand the patient's viewpoint, but can work to bring the (patient's) experiential and (physician's) medical viewpoints into better alignment, thereby enlarging the inter-subjective and clinical space that they share. The difficulty of expressing the pain experience makes the role of the teller exceptionally challenging and sometimes taxing. The reciprocal duty of the pain physician as listener is to record the narrative, respect the value of its telling, trust that what is said has

meaning, and reflect upon and communicate whatever coherence or meaning emerges (1,10).

Pragmatic analysis of narrative will reveal that while some stories are genuine, truthful, insightful, and revealing, others are disingenuous, deliberately misleading, or beside the point (10). However, much can still be gleaned from the latter categories of narrative. Even untruthful stories reveal much about the patient, her motives, the way she sees the world, and the way she thinks. It can be disjointed, unclear, or altogether cut off by the severity of pain, and in such cases, verbal and non-verbal accounts of pain can be incongruent. Without doubt, narrative can also be influenced by, and pursuant to, secondary gain. These challenges, however, do not lessen the overall value of narrative to pain medicine, nor do they disavow the moral and therapeutic importance of actively listening to the patient's narrative as a means to acquire insight to the existential reality of "being a patient" through the nexus of explanation.

EXISTING ASSESSMENT TOOLS AND METHODS

There are myriad pain questionnaires and assessment tools available to measure causes and effects; none, however, is able to truly capture the existential essence of pain. To grasp the fullness of the pain experience, the physician must synthesize the results of these assessments into a complete picture of the patient's pain, that necessarily is more than simply the sum of its component parts. Of those self-report measures, we include generalizable assessments of pain intensity that can be quickly and easily used to gather preliminary information and gauge treatment efficacy. The most common of these are the pain scales — a bare minimum, but still reasonably valuable assessment used by almost every clinician in those situations involving pain. Drawbacks of these metrics include the uni-dimensionality of the scale, problems with acquainting patients to reliable magnitude estimation, and some lack of sensitivity to treatment effects as compared with other measures (11).

Of the assessments developed to reveal specific sensory attributes of pain, the McGill Pain Questionnaire (MPQ) was the first, and remains the most widely used. Dubuisson and Melzack have validated the diagnostic utility of the MPQ by demonstrating that different pain syndromes are consistently described in unique constellations of words (12). Other strengths of the MPQ include its expedience (particularly in the short-form) and

cross-cultural reliability. But the discriminative capacity of this tool is limited when the patient presents with high levels of anxiety or psychological disturbance (13). Therefore, although the MPQ is designed to measure affective and evaluative, as well as sensory dimensions of pain, we believe that there are more effective assessments available for these more psychologically (and socially) influenced domains.

Assessments for the affective dimension of pain can measure distress, disability, and/or overall health of the patient. Not all of these tools will be useful for the treatment of every patient, and thus, the physician must first gather enough background information from narrative and/or the patient interview to determine which assessments might be most helpful. Behavioral assessment encompasses many specific methods of scoring and coding the frequency and quality of a patient's pain behaviors over a specified observation period. Advantages of the behavioral method of pain assessment are that it is first-hand, reliable, quantitative, and overcomes any language barriers between patient and physician (14). Although indispensable in assessing the non-communicative patient, there are many possible pitfalls of the behavioral approach. Foremost among these is that the observed behavior(s) may be skewed by a patient's reaction to both observation and possible treatment(s). Additional drawbacks are 1) the inescapable element of observer bias, and 2) the fact that pain behaviors are inconsistently manifested (15).

Although we have not been able to identify any standardized tools to fully elucidate the cultural factors inherent to, and influencing the experience and/or expression of pain, Margie Rodriguez-LeSage has presented a set of questions that should be asked and appreciated in the interest of developing cultural competency relevant to the expression and experience of pain (16). Such questions include: 1) How do you identify your pain? 2) What do you think caused your pain? 3) What do you think the pain means? 4) What are the chief problems and benefits that pain has caused? 5) What do you fear most about the pain? and, 6) What treatment do you think you should receive?

DEFINING PAIN: WHAT IS SENSED AND WHAT IS "FELT"

In many ways, the linguistic challenges of communicating pain reflect the basic problem of defining pain. The International Association for the Study of Pain's definition of pain as "...an unpleasant sensory and

emotional experience associated with actual or potential tissue damage, or described in terms of such damage (17)," while standardized and valid, still does not resolve the extant controversy surrounding how pain can and/or should be made an objectively appreciable entity, given its subjective, individually variable, and often ambiguous qualities.

Pain originates as a noxious sensory signal, and the contribution of these noxious qualities is fundamental to the concept of pain qua "pain." As Nikola Grahek has stated "...the common and distinctive felt quality of pain is the essential or indispensable component of our total pain experience and why that experience is not pain experience when that component is missing" (18). Simply, without this sensation, the experience would not be "pain." Suffering without the sensation is possible and perhaps even common, yet we do not universally classify this discomfort as pain. Other types of bodily discomfort such as nausea are imbued with an aversive motivational quality and have the potential to cause suffering; however, these can be easily differentiated from pain by the nature of the sensation.

The raw sensation of pain is only pain when it provokes an emotional reaction. This component of the pain experience has been referred to by Dubuisson and Melzack as the "affective dimension" (12), and it encompasses the ways which pain changes one's relationship to the body, existence, and "being-in-the-world." Grahek speaks of the "affective-motivational aspect" (18), Rodriguez-LeSage notes the socio-cultural dimension of pain (16), Woessner includes the psychological/cognitive dimension (19) and Moskovitz holds that pain is experienced emotionally due to the "...habits, goals, desires, expectations, roles, and attachments threatened by the experience (of pain)" (20,21).

Pain changes the existential being of the patient through the intensity and discomfort of the sensation, its impact upon normal and enjoyed activities, and the meaning that the patient ascribes to the pain, i.e., the patient's evaluation of pain. While the statement, "I am in pain," may reflect the activity of a neurobiological system, it is not the neural system that "feels" and "experiences," but rather the person (22,23). So, while the physician can perform limited tests to ascertain the activity of neural systems, the subjective nature of the pain can only be apprehended through a sharing or telling of experience. It is these unique qualities of experience — and their expression — that are essential to "understanding" another's pain.

EXPRESSION AND EXPECTATION

A necessary correlate to the aversive, affective quality of pain is the behavior(s) that it inspires. Woessner (19), Hardcastle (8), Turk and Rudy (24) all address the behavioral dimension of pain, and attest that to understand pain, it is necessary to note and appreciate its behavioral expression. Roselyn Rey states that "...the manner in which pain is expressed has a direct relation to the way in which pain is actually borne, how it is felt" (25). Clearly then, understanding a patient's behavioral reaction to pain is essential to clinical assessment and diagnosis. A physician must learn the tendency of a particular patient toward stoicism or over-representation so as to correctly interpret pain behaviors and verbal ratings.

However, the way in which pain is behaviorally expressed often depends upon social, cultural, and environmental factors that interact with the nature of the internal pain experience. Different cultures have distinctly acceptable expressions of, and for, pain. In addition, cultural ideas and conceptions about pain are strongly tied to the psychological response and affect that is manifested (26). In some circumstances and/or cultures, the experience(s) of pain are not seen as disintegrative, but as unifying and intensely spiritual occurrences (27). Rodriguez-LeSage speaks to the social, cultural, spiritual, and historical dimensions of pain, highlighting the importance of language and the potential for tension as different values and interpretations of ethical principles come in conflict (16). Thus, both the meaning and manifestations of pain are mediated by the socio-cultural environment and world-view of the person in pain.

It is important to note that these dimensions are neither comprehensive nor static. Turk and Melzack explain that these components do not always co-occur in time or the same configuration in all people (28). McGuire echoes the importance of defining the dimensions of pain on a case-by-case basis (29). Indeed, each patient's pain is unique, and is affected — to differing extent — by various combinations of physical and emotional dimensions (1,30-32).

Although behavioral expressions are important to interpreting another being's pain, behaviors are by no means consistent — both in an individual, and across groups of individuals, given that socio-cultural norms provide a relative baseline for typical and/or accepted patterns of expression, which can then vary within (and even between) these parameters. There are several tools that viably depict the social and cultural factors

contributing to pain expression; for example, the West Haven-Yale Multidimensional Pain Inventory (WHYMPI), while primarily a comprehensive affective survey, includes a section on the response of the patient's significant other to pain behavior (33). Use of this section may help to illustrate any social or cultural pressures present in the home environment that mask, mitigate, and/or exacerbate pain expression. Additional insight to factors influencing a patient's response to pain can be afforded by the Pain Self-Efficacy Questionnaire, which measures the patient's confidence level relative to the extent to which pain impacts and interferes with the perceived capacity to engage in daily activities (34). Still, however, substantive gaps exist between patients' subjective experience, expression, and reports of pain, and the objective information required by physicians in order to develop and articulate cogent assessment and diagnosis from which to guide care.

A ROLE FOR TECHNOLOGY? POSSIBILITIES, PROBLEMS, AND THE NEUROETHICS OF PAIN CARE

Can biotechnology provide the means and tools to successfully — and validly — bridge this subjectivity/objectivity gap? Several neurotechnologies are already available (e.g., neuroimaging, transcranial magnetic stimulation, deep brain stimulation, nano-pharmacology, neurogenetic assessments, brain/machine interfaces, etc.) and these give rise to neuroethical concerns that require immediate consideration (35, 36). For example, while neuroimaging provides unprecedented ability to view the living brain, it is important to exercise caution about the actuality of the images, individual differences, and basic limitations of the technologies themselves (37).

Given what is known about the (structure and function of the) brain, and pain (as a process of networked neural activity, and the uniqueness of its phenomenal experience), it is unlikely that current iterations of neuroimaging technology will be able to create a wholly objective measure and/or discernment of pain (1,38,39). Obviously, similar discernment of the lack of pain (e.g., malingering) is equally problematic. But presuming that we accept neuroimaging as a reasonably valid assessment for the presence or absence of pain, how then might we treat the patient who complains of pain, but whose neuroimage fails to "depict" brain activity reflective of nociceptive processing? Conversely, how should we treat the individual whose neuroimage objectively depicts pain, but who does not subjectively feel or express it?

When considering deep brain stimulation (either in its current form, or as projected to involve implanted micro- and/or nano-devices), it is important to acknowledge the long-term viability of the implant and unintended outcomes that may occur as patterns of neural network activity are altered over time (40). Many of these same concerns apply to transcranial magnetic stimulation, and ultimately we must ask whether we are prepared to maintain responsibility for the longitudinal management of any such unforeseen consequences and effects (41).

Neurogenetics holds promise to elucidate genotypic predispositions to certain types of pain. However, it is not yet possible to manipulate the genome to mitigate these pain syndromes (42). And even if it were possible — either through genetic or some combination of other technologies — should we? What of those dispositions to pain conditions that cannot be ameliorated? If the current health care system portends any vision of the future, then we must be wary of policies and plans that discriminate against individuals who are shown by genetic testing to have a “predisposition” to an existing condition (43). Granted, a genetic predisposition does not always predict phenotypic expression, and, in the best case scenario, genetic “diagnosis” of a potential pain disorder would instigate an active program of health behaviors and preventive care. But once again, this is the ideal; in reality we must question whether such care be supported by insurance plans, or is it more likely that such diagnoses would lead to higher premiums or inability to obtain insurance?

Merging these advancements with cybertechnology would conceptually allow rapid access and retrieval of an almost unlimited amount of medical data. This would enable real-time monitoring of individual patients’ physiological composition (e.g., genotype, expression of particular phenotypes, etc.) and status (e.g., metabolic processes, biomarker expression, etc.) that could be used to maximize medical care. Trial-and-error empiricism would be minimized, and any physician would have access to a particular patient’s full medical history and records, as well as current condition, at any time, anywhere in the world.

To be sure, such “stacking” of information would increase the knowledge base that could be used to personalize treatment. But how would such information be protected? Under current Health Insurance Portability and Accounting Act (HIPAA) regulations, patient records would be fully protected to minimize disclosure (44). However, this raises concerns about unauthorized

access and (mis)use of highly detailed patient information. However, the current ranges of both technologic and human cyber-threats render it exceedingly difficult, if not impossible, to “absolutely” and/or “fully” protect electronic information. Such threats include, for example, 1) direct hacking, 2) phishing schemes, and/or 3) medical providers not following computer security protocol and exposing patient data. It is evident that electronic patient information is always at risk and cannot only be accessed, but can be compromised or co-opted.

This new type of “identity theft” could have a profound impact upon insurability, access to care, and safety. Furthermore, even if “appropriately used,” that is, not hacked or stolen, it is entirely possible that patient information gained through these (geno- nano- neuro) technological resources could be used for employment discrimination and social stigmatization. Another real concern in the area of cybersecurity is the possibility of a Denial of Service attack, in which patient data would be rendered inaccessible. While this poses an obviously catastrophic risk in the event of an emergency, it is equally problematic even during the course of regular treatment; how would we treat patients if their records became unavailable or lost/damaged entirely?

Would such possibilities and potential risks require new regulations demanding that each provider maintain air-gapped, TEMPEST-controlled dual computer systems that are backed-up on an hourly basis to ensure secure duplication of records? Moreover, if safeguards against human error (e.g., writing down passwords, ignoring shoulder surfing, incorrectly keying data, or not shutting down at the first sign of an attack) are to be instantiated, how might these “behavioral and system fortifications” affect the conduct and efficiency of pain care? Thus, while the merging of neuro- and cybertechnologies would be intended to expedite the pace and facility of care, in reality, the security safeguards necessary to maintain even minimal protection of patient information might incur untimely delays and further impede and de-personalize pain care.

TOWARD INDIVIDUAL “GOOD” IN USE

This is not to say that technology might not offer the capabilities to ford the subjectivity-objectivity gap, enhance pain diagnosis and treatment, and offer real promise for maximizing pain care. To be sure, using available technologies — and developing novel technologic tools — is both desirable and necessary, at least to some extent, if pain medicine is to keep pace with other

medical disciplines (1,45). We have previously argued, and re-iterate here, the obligation to use any extant or new technology in ways that are both procedurally right, and circumstantially appropriate (1,45,46). But heeding the cautions posed by numerous philosophers of science and technology, including Jürgen Habermas, Hans Jonas, Hans Lenk, and Herbert Marcuse, it becomes important to question both the means and ends to which any technology is ascribed or dedicated (47-50).

At face value, one could assume that given the hurtful nature of pain, its eradication would represent a viably good, moral end. However, this would also presume that we could first obtain a reliably objective measure/representation of pain, from which we could establish a (clinically and socially) relevant threshold that determines the obligation to treat. In the absence of the former, we must still rely upon some level of subjective report and valuation of pain from the patient. This being the case, is there some threshold of pain and suffering that can or should be validated in order to incur and/or justify clinical intervention? How should we determine what type and/or severity of pain should be eradicated? Can biotechnology (reliably) contribute this metric or rule? Should some pains be left untreated, or should all pain(s) be eliminated? To what level(s) might we take diagnostics and therapeutics? And in these latter regards, at what point does the treatment of pain and suffering become “excessive” and would such interventions be considered “enhancement” (39,51,52)? Then, of course, we must ask who shall receive these interventions and what criteria shall be used to justly distribute these medical services.

In the ideal, commutative justice would dictate allocation of resources and services to all who are in need, with the additional provisions that 1) greater need demands greater resources and use of services, and 2) such allocations adhere to what are known as pareto efficient properties, so that no one is deprived goods and services in favor of another (ie., complete “win-win” dynamics) (53). However, in a real market environments — such as that in which pain care (and medicine, in general) is enacted, resources and services are limited and non-pareto efficient transactions tend to predominate, such that “win-lose” situations can and often do occur (54). Thus, distributive justice — a system of resource allocation that regards 1) the total amount of goods, 2) the criteria and process by which the social institution(s) will dispense such goods, and 3) the pattern(s) that the division of goods and services will assume (55), would need to take these variables into account.

Based upon the work of Feinsein (56), we propose ethical goals that could enable a more integrative use of technology that balances humanitarian and market values in medicine, and in this way could instantiate a more inclusive, “evolved” health care paradigm. Namely, these are 1) promotion of both “customary” and “out of the box” basic and clinical science as needed for thorough evaluation of the potential utility and uses of new technologies in more personalized therapeutic settings and regimes; 2) eliminating unnecessary, inapt, or inconsequential use(s) of technology; 3) emphasis upon the obligation to use high technology as necessary and appropriate, and 4) establishing an ethics of pain care that accommodates demand-side use of both low- and high-tech diagnostic (and subsequent therapeutic) approaches.

UPHOLDING RIGHT AND GOOD PAIN CARE

Information gained from the patient — both through objective assessment and subjective report — provides a basis from which the clinician can develop a diagnostic impression, literally a “seeing into” the nature of pain, as a pathological process. Certainly, this is important to the cornerstone of the nosological method (i.e., determining “what is wrong”), but, as Edmund Pellegrino notes, such information must be further specified to the context of “this patient” (57), not only in the biomedical sense, but in appreciation for how the pathology of pain affects the life world and actions of the pain patient as a person. In this way, the concept of diagnosis as “seeing into” is not abstract, but assumes personal worth as it allows the clinician to intuit the ways in which the clinical disorder might manifest experiential effect(s) within and upon the values, goals, and identity of the patient. From this arise 2 of the most prudential activities of the clinical encounter: 1) the decision of how much information can and should be provided to the patient so as to make her meaningfully aware of the nature and possible effect(s) of the disorder, and 2) what therapeutic options are available to treat not only the disorder, but its manifest expression in this patient, given her values, goals, and expectations, and thus will be most useful to uphold her best interests (1,58,59).

These activities are not mutually exclusive; instead, we posit that together they allow for a reciprocal exchange of information between the domains of expert knowledge held by the clinician (i.e., biomedical expert knowledge), and the patient (i.e., knowledge of the first-person experience of his/her life and the effects of

pain). It is the inter-relatedness of these activities that conjoins the patient to the therapeutic and moral fabric of the clinical encounter and establishes the fiduciary of the clinical relationship (60).

This prompts the question of what, and how much, information is necessary and/or sufficient to sustain this reciprocal responsibility. Without doubt, veracity — both on the part of the patient and the clinician — is vital to sustaining trust in medical relationship, and we have addressed the basis and extent of veracity in practical, moral and medico-legal terms (1,61-63).

In the ethically ideal situation — i.e., what “ought” to be, as opposed to what actually “is” — both the physician and patient would provide accurate, complete, and truthful information to one another at all times during their clinical interactions. Within these parameters, the exchange of information would reflect the physician’s unbiased, objective, and full attention to the patient, and the patient’s thorough, “objective” (viz — non-exaggerated, accurately estimated, unimpassioned) account of her subjective level of pain and its experience. With the patient’s best interest as the focus of these interactions, both parties would then have access to both the sum of data that is required for accurate assessment, diagnosis and treatment. While physicians possess expert objective knowledge, it is the patient who maintains expert subjective knowledge of self and the effects of disease and illness upon her lived body and life world, and it is this reality that serves as the substrate for the medical relationship and clinical encounter (1). In an ethically ideal clinical relationship, open, honest, and mutually trusting communication between physician and patient is not only morally favored, but diagnostically essential.

However, as Hume (63) observed, “is” generally dominates “ought,” and when applied to the medical relationship this often results in external forces affecting the ethical tenor of physician-patient interactions. Research and practical experience both indicate that physicians and patients are equally culpable of dishonest relationships with one another: physicians, primarily through socio-cultural biases and distrust of patients perceived to have “something to gain” (e.g., litigation), and patients, by exaggerating or withholding symptoms of pain. But why would a patient who is truly in need of care misrepresent her pain? There are many potential reasons to both consciously and subconsciously over- or under-report pain. For example, patients may exaggerate pain due to depression (64) or perceived psychological stress that temporarily inflates

the patient’s sense of the pain (65). Environment plays a factor in self-reporting; patients in a clinical setting reported higher levels of pain than those in a research laboratory setting (66). Time of day has been found to be related to pain intensity ratings, as well (67). Patients may over-report pain because they are seeking attention from medical providers, family, or friends; this may be conscious and controlled or pathological. Pathologies of this nature include emotional dependence and Dependent Personality Disorder; conversion disorder, in which pain is unconsciously produced in response to a psychological conflict; somatoform disorder; and Munchausen’s Syndrome, in which patients present symptoms that are either self-inflicted or self-created. Patients may also exaggerate because they are frankly malingering, defined by the American Psychiatric Association as “the intentional production of false or grossly exaggerated physical or psychological symptoms motivated by external incentives” (68). These incentives include, but are not limited to, drug-seeking; supporting claims for insurance or litigation purposes; or avoiding work, school, or other responsibilities. Each of the aforementioned examples represents misrepresentations, “faking,” or, in the case of malingering, “lying,” but in every instance incorporates underlying pathologies and/or incentives that may not be easily diagnosed or recognized, respectively.

Patients may also under-report their level of pain. In social contexts, individuals often modify responses on questionnaires to present a more favorable image — a phenomenon known as “socially desirable responding” (69). For example, men have been shown to minimize their degree of pain when a woman is present, based upon socio-cultural expectations of stoically masculine behavior (70). Both male and female patients may uphold or reinforce a certain self-image that contraindicates pain. Patients may also be fearful of the repercussions of exhibiting pain, ranging from being disbelieved or accused of malingering, to shame, or losing the support of loved ones (71). Conversely, patients may be in denial, or in fear of what the pain might indicate, and therefore withhold accurate information in order to minimize the potential severity of a diagnosis.

By its nature, chronic pain is characterized by ongoing, often inconsistent symptoms and perceptions that can deceive both the patient and physician. Pain may be locally extreme, then radiate, then dissipate and reappear in seemingly different locations and in varying degrees of intensity. A patient may not have the knowledge, understanding, or communicative ability to

describe the variable nature of the pain, or may “carry over” sensations and related emotions from one moment of pain to the next. In this way, the patient may not be intentionally misrepresenting, but may instead be accurately reporting the “misperceptions” that chronic pain can — and often will — evoke. How should the physician construe exaggerated pain, and discern such exaggerations from “real” pain?

In this regard, physicians may be liable to misconstrue and/or misinterpret patients’ pain reports and expressions. Gender and racial stereotypes can skew diagnoses, and studies have shown that both male and female physicians may consider women and minorities to exaggerate reports of pain, and as a consequence, these groups tend to be less aggressively treated than male and/or non-minority patients (72,73). Moreover, patients with pending or potential litigation, a remarkable history, or interpersonal issues, are frequently suspected of — if not perceived as — misrepresenting their pain so as to incur secondary gain(s). In each of these situations, the “good” of the medical relationship can rapidly degrade into one of mutual mistrust and suspicion.

Given the complex and often unpredictable nature of pain, patients, and reporting pain, we posit that objective tools provided by neurotechnology, whether used alone or in combination with other assessment techniques, can help bridge gaps in both patients’ responsible reporting and physicians’ diagnostic skills so as to more veritably depict pain and thereby guide more effective treatment. To be sure, medicine is wrought with uncertainties, and such uncertainty cannot be wholly ameliorated simply through the use of neurotechnology (1,74). Nor should it be posed that technology offers such absolute certainty. As Sissela Bok has noted, physicians’ reluctance to communicate uncertainties may reflect a need to portray clinical confidence and/or avoid further denigrating a patient’s condition by incurring some form of “self-fulfilling

prophecy” arising from a grave or uncertain prognosis — such as intractable chronic pain (75,76). We agree with Bok, and believe that such reluctance may, in fact, be contrary to the moral obligation(s) intrinsic to physicians’ stewardship of knowledge. As Bok has emphasized, the determination of what and how information is both gained from — and provided to — patients requires a process of “reasoned discourse”, given that “...lies place [patients] in a position where they no longer participate in choices concerning their own health, including the choice of whether to be a “patient” in the first place” (75).

Without doubt, the processes of evaluation and reciprocal provision of information are iterative and reflect changes in the objective effects of pain and various treatments, and the subjective valuation and experience of the patient as the recipient of such care. Thus, assessment is fundamental: not as a single event that occurs to establish an initial diagnosis, but as an ongoing practice that strives to “see into” the intersection of pain as an objective, neurological event, and its impact upon the subjective experience, existence, and expectations of the person in pain. In this way, we argue that the right use of technology — together with inter-subjectivity, compassion, and insight — can sustain the good of pain care as both a therapeutic and moral enterprise.

Part Two: Objectifying pain: From ethics to policy — concerns, caveats, and considerations.

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REFERENCES

1. Giordano J. *Pain: Mind, Meaning and Medicine*. PPM Books, Glen Falls, PA, 2009.
2. Scarry E. *The Body in Pain: The Making and Unmaking of the World*. Oxford University Press, NY., 1987.
3. van Hooft S. Pain and communication. *J Med Healthcare Phil* 2003; 6:255-262.
4. Svenaeus F. *The Hermeneutics of Medicine and the Phenomenology of Health. Steps Toward a Philosophy of Medical Practice*. Kluwer, Dordrecht, 2000.
5. Giordano J. Prolegomenon: Engaging philosophy, ethics and policy in, and for pain medicine. In: Giordano J, Boswell MV (eds). *Pain Medicine: Philosophy, Ethics, and Policy*. Linton Atlantic Books, Oxon, 2009; p. 13-21.
6. Wittgenstein L. *Philosophical Investigations*. (Anscombe GEM., Trans.) Blackwell; Oxford, 1953.
7. Giordano J. Understanding pain as disease and illness: Part one. *Prac Pain Management* 2006; 6:70-73.
8. Hardcastle VG. *The Myth of Pain*. MIT Press, Cambridge, MA, 1999

9. Melzack R, Casey KL. Sensory, motivational, and central control determinants of pain. A new conceptual model. In: Kenshalo DR (ed). *The Skin Senses*. Charles C. Thomas, Springfield, 1968, p.423-443
10. Charon R. *Narrative Medicine*. Oxford University Press; New York, 2006.
11. Duncan GH, Bushnell MC, Lavigne GJ. Comparison of verbal and visual analogue scales for measuring the intensity and unpleasantness of experimental pain. *Pain* 1983; 17:45-56.
12. Dubuisson D, Melzack R. Classification of clinical pain descriptions by multiple group discriminant analysis. *Experimental Neurology* 1976; 51:480-487.
13. Melzack R. The McGill Pain Questionnaire: Major properties and scoring methods. *Pain* 1975; 1:277-299.
14. Keefe FJ, Block AR. Development of an observation method for assessing pain behavior in chronic low back pain patients. *Behav Ther* 1982; 13:363-375.
15. Chapman CR, Casey KL, Dubner R, Foley KM, Gracely RH, Reading AE. Pain measurement: An overview. *Pain* 1985; 22:1-31.
16. Rodriguez-Le Sage M. The culture of pain. In: Boswell MV, Cole BE (eds.) *Weiner's Pain Management, A Practical Guide for Clinicians* 7th Ed. CRC Press, Boca Raton, 2002, p. 49-60.
17. International Association for the Study of Pain. *Classification of Chronic Pain*. 2nd ed.; IASP Press, Seattle, 1994.
18. Grahek N. *Feeling Pain and Being in Pain*. MIT Press, Cambridge, MA, 2007.
19. Woessner JW. Overview of pain: Classification and concepts. In: Boswell MV, Cole BE (eds.) *Weiner's Pain Management, A Practical Guide for Clinicians* 7th Ed., CRC Press, Boca Raton, 2002, p.35-45.
20. Moskowitz P. A theory of suffering. *Pain Practitioner* 2006; 16:73-81.
21. Moskowitz P. Understanding maldynic pain as suffering: The phenomenology and neurobiology of the experience of pain as illness. In: Giordano J (ed). *Maldynia: Multi-disciplinary Perspectives on the Illness of Chronic Pain*. CRC/Taylor-Francis, Boca Raton, In press.
22. Bennett MR, Hacker PMS. *The Philosophical Foundations of Neuroscience*. Blackwell, Oxford, 2003.
23. Giordano J. Complementarity, brain/mind, and pain. *Forsch Komplementärmed* 2008; 15:2-6.
24. Turk DC, Rudy TE. Assessment of cognitive factors in chronic pain: A worthwhile enterprise? *J Consulting Clin Psychol* 1986; 54:760-768.
25. Rey R. *The History of Pain*. (Wallace LE, Cadden JA, Cadden SW. Trans.). Harvard University Press, Cambridge, MA, 1993.
26. Giordano J, Engebretson J, Benedikter R. Pain and culture: Considerations for meaning and context. *Cambridge Q Rev Healthcare Ethics* 2008; 7:45-59.
27. Giordano J, Kohls NB. Self, suffering and spirituality: The neuroscience of pain and spiritual experiences and practices. *Mind and Matter* 2008; 6:179-192.
28. Turk DC, Melzack R. The measurement of pain and the assessment of people experiencing pain. In: Turk DC, Melzack R. (eds.) *Handbook of Pain Assessment*, 2nd Ed. Guilford Press, NY, 2001, p. 3-14.
29. McGuire DB. Comprehensive and multidimensional assessment and measurement of pain. *J Pain Symptom Management* 1992; 7:312-319.
30. Giordano J, Schatman ME. A crisis in chronic pain care — An ethical analysis. Part one: Facts, issues, and problems. *Pain Physician* 2008; 11:54-62.
31. Giordano J. In the patient's voice. *Am. J Pain Management* 2006; 16:34-35.
32. Giordano J. Moral agency in pain medicine: Philosophy, practice and virtue. *Pain Physician* 2006; 9:41-46.
33. Kerns RD, Turk DC, Rudy TE. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). *Pain* 1985; 23:345-56.
34. Nicholas M. The pain self-efficacy questionnaire: Taking pain into account. *Eur J Pain* 2000; 11:153-163.
35. Giordano J. Neuroethics: Coming of age and facing the future. In: Giordano J, Gordijn B (eds). *Scientific and Philosophical Perspectives on Neuroethics*. Cambridge University Press, Cambridge, 2010, p.xxv-xxix.
36. Jeannotte A, Schiller K, McBride D. Neurotechnology in pain medicine — Toward best use. In: Giordano J, Boswell MV (eds). *Pain Medicine: Philosophy, Ethics and Policy*. Linton Atlantic Books, Oxon, 2009, p. 199-210.
37. Racine E, Bell E, Illes J. Can we read minds? In: Giordano J, Gordijn B. (eds.) *Scientific and Philosophical Perspectives on Neuroethics*. Cambridge University Press, Cambridge, 2010, p. 244-270.
38. Giordano J. Pain, the patient and the physician: Philosophy and virtue ethics in pain medicine In: Schatman ME (ed). *Ethical Issues in Chronic Pain Management*. Informa, NY, 2007; p.1-18.
39. Giordano J. The neuroscience of pain and the neuroethics of pain care. *Neuroethics* 2009; 2(1).
40. Giordano J, Akhouri R, McBride D. Implantable nano-neurotechnologies: Ethical, legal and social issues. *J Long-term Effects Med Implants* 2009 5:45-54.
41. Gordijn B, Buyx AM. Neural engineering: The ethical challenges ahead. In: Giordano J, Gordijn B (eds). *Scientific and Philosophical Perspectives on Neuroethics*. Cambridge University Press, Cambridge, 2010, p.283-301.
42. MacGregor AJ. The heritability of pain in humans. In: Mogil JS. (ed.) *The Genetics of Pain: Progress in Pain Research and Management*, vol 28. IASP Press, Seattle. 2004; p. 151-169.
43. Wurzman R, Jonas WB, Giordano J. Pain and depression: Potential and possibility for putative spectrum disorders. *Pain Practitioner* 2008; 17:14-20.
44. Health Insurance Portability and Accountability Act (HIPAA) of 1996 P.L. 104-191.
45. Giordano J. Neurotechnology, evidence and ethics: On stewardship and the good in research and practice. *Prac Pain Management* 2010; 10:63-69.
46. Giordano J. Techniques, technology, and tekne: On the ethical use of guidelines in the practice of interventional pain medicine. *Pain Physician* 2007; 10:1-5.
47. Habermas J. *Technik und Wissenschaft als "Ideologie."* Suhrkamp, Frankfurt am Main, 1968.
48. Jonas H. *Technik, Medizin und Ethik; Zur Praxis des Prinzips Verantwortung*. Insel, Frankfurt am Main, 1985.
49. Lenk H. *Technokratie als Ideologie. Sozialphilosophische Beiträge zu einem Politischen Dilemma*. Kohlhammer, Stuttgart, 1973.
50. Marcuse H. *One Dimensional Man: Studies in the Ideology of Advanced Industrial Society*. Beacon Press, Boston, 1964.
51. Liao SM, Savulescu J, Wasserman D. Ethics of enhancement. *J Appl Phil* 2008; 25:159-161.
52. Gini A, Rossi J, Giordano J. Considering enhancement and treatment: On the

- need to regard contingency and develop dialectic evaluation. *AJOB-Neuroscience* 2010; 1:25-27.
53. Osborne MJ, Rubenstein A. *A Course in Game Theory*. MIT Press, Cambridge, MA, 1984.
 54. Deb K. *Multi-objective Optimization Using Evolutionary Algorithms*. Wiley, West Sussex, UK, 2001.
 55. Phelps E. Distributive justice. *New Palgrave: A Dictionary of Economics, vol 1*. Palgrave-Macmillan, NY, 1987, p. 886-888..
 56. Feinstein A. Scholars, investigators, and entrepreneurs: The metamorphosis of American medicine. *Perspectives Biol Med* 2003; 46:234-253.
 57. Pellegrino ED. The healing relationship: the architectonics of clinical medicine. In: Shelp EE. (ed.) *The Clinical Encounter: The Moral Fabric of the Patient-Physician Relationship*. Reidel, Dordrecht, 1983, p.153-172.
 58. Fulford KWM, Colombo A. Ten principles of values-based practice: Professional judgement, critical realism, real people, and yes, two wrongs can make a right! *Phil Psychiatr Psychol* 2004; 11:165-173.
 59. Waters D, Sierpina V. Goal-directed health care and the chronic pain patient: A new vision of the healing encounter. *Pain Physician* 2006; 9:353-360.
 60. Giordano J, Hutchison P, Benedikter R. Regrounding medicine amidst a technological imperative and Post-Modern mindset. *Int J Polit Cult Soc* 2010; 10(10).
 61. Pellegrino ED, Thomasma DC. *The Virtues in Medical Practice*. Oxford University Press, New York, 1993.
 62. English D. Moral obligations of patients: A clinical view. *J Med Phil* 2005; 30:139-152.
 63. Hume D. *A Treatise on Human Nature*. John Noon, London, 1739.
 64. Manchikanti L, Giordano J, Fellows B, Manchukonda R, Pampati V. Role of psychological factors as predictors of opioid abuse and illicit drug use in chronic pain patients. *J Opioid Management* 2007; 3:89-101.
 65. Kremer EF, Atkinson JG, Kremer AM. The language of pain: Affective descriptors of pain are a better predictor of psychological disturbances than pattern of sensory and affective descriptors. *Pain* 1983; 16:185-192.
 66. Clark WC, Ferrer-Brechner T, Janal MN, Carrol JD, Yang J. The dimensions of pain: A multidimensional scaling comparison of cancer patients and healthy volunteers. *Pain* 1989; 37:23-32.
 67. Turk D. Assessment of pain: The elusiveness of latent constructs. In: Chapman CR, Loeser R (eds). *Issues in Pain Measurement*. Raven Press, New York: 1989.
 68. American Psychiatric Association. *Diagnostic and Statistical Manual, IVth Ed., Text Revised*. APA Press, Washington, DC, 2004.
 69. van de Mortel TF. Faking it: social desirability response bias in self-report research. *Aus J Adv Nurs* 2008; 25:40-48.
 70. Chin ML, Rosenquist R. Sex, gender and pain: "Men are from Mars, Women are from Venus..." *Anesth Analgesia* 2008; 107:4-5.
 71. Strong J, Unruh AM, Wright A, Baxter GD. *Pain: A Textbook for Therapists*. Churchill-Livingstone, Brisbane, Australia, 2002.
 72. Heston TF, Lewis LM. Gender bias in the evaluation and management of acute non-traumatic chest pain. *Fam Prac Res J* 1992; 12:383-389.
 73. Bonham VL. Race, ethnicity, and pain treatment: Striving to understand the causes and solutions to the disparities in pain treatment. *J Law Med Ethics* 2001; 29:52.
 74. Dogra N, Giordano J, France N. Teaching medical students about uncertainty: The findings of a qualitative study focusing on cultural diversity. *BMC Medical Education* 2007; 7(8).
 75. Bok S. *Lying: Moral Choice in Public and Private Life*. Vintage Books, NY, 1989.
 76. Giordano J. Bioethics and intractable pain. *Prac Pain Management* 2005; 5:72-79.

