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Medicolegal issues and disorders of consciousness

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Abstract.
BACKGROUND: The tasks and responsibilities that come with clinician involvement in medicolegal proceedings can be daunting and particularly so in challenging areas such as provision of medicolegal opinions in cases involving disorders of consciousness (DoC).
OBJECTIVE: The aim of this narrative review was to provide education and advice to healthcare practitioners who by choice or circumstance are asked and/or required to provide medicolegal opinions in cases involving patients with DoC.
METHODS: A literature search was conducted using PubMed Central and MedlinePlus for articles dealing with clinician involvement in medicolegal cases involving persons with DoC. The information provided also integrates the authors' nearly 40 years of clinical experience, brain injury medicine practice and "trials and tribulations" associated with medicolegal involvement in such cases.
RESULTS: The literature was found to be replete with articles on brain death and withdrawal/withholding of care (which are not the focus of this review). The extant medical literature in brain injury medicine on the other hand is currently lacking in practical information for clinicians working "in the trenches" regarding the challenges and caveats of medicolegal involvement in such cases.
CONCLUSION: This review provides the reader with a big picture overview of the most pertinent medicolegal topics inherent in clinical work with patients with DOC including pertinent nomenclature, caveats regarding forensic consultation including independent medical examinations, testimony tips, discussion of life expectancy/median survival concepts, prognostication in a medicolegal context, documentation and record keeping as well as some of the specific challenges pertinent to these types of brain injury cases that are not per se relevant in less severe injuries.

Keywords: Medicolegal, legal, independent medical evaluation, brain injury, disorder of consciousness

1. Introduction

The art and science of medicolegal involvement of healthcare practitioners tends to be a topic that is inadequately covered in professional training, and all too often ignored as an inherent part of the professional challenges and obligations faced by clinicians whether physicians, psychologists, nurses, or therapists. The discussion of medicolegal or alternatively clinicolegal aspects of neurological injury and/or disease in the neurorehabilitation context is broad and well beyond the scope of this review article. Given the focus of this special issue of NeuroRehabilitation, this narrative review article will focus on disorders of consciousness (DoC) following acquired brain injury and the spectrum of altered

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states of awareness wherein patients exhibit varying degrees of responsivity and cognitive function. For many reasons, this special group of patients presents myriad medicolegal challenges in the context of nosology, assessment, treatment, prognosis, medical decision making, patient rights and legal protection as well as ethics. These issues are multifaceted and complex as well as typically more complex than commonly encountered medicolegal cases involving post-concussive disorders or persons post moderate TBI. Any clinician involved in this type of work needs to be aware of the ever-expanding literature in this area of brain injury medicine (e.g., Giacino, Ashwal, Childs, 2002; Giacino, Katz, Schiff, et al., 2018; Giacino, Katz, Schiff, 2022; Gosseries, Laureys, 2022).

It is paramount for clinicians who are considering engaging in medicolegal work to understand that they may become involved in civil as well as criminal cases and may be asked to opine on a plethora of different issues. Such work should be taken extremely seriously as opinions provided by such testimony can have a significant impact on the outcome of a medicolegal proceeding as well as a person's future (and their family's future). Regardless of the context in which one might get involved in providing such testimony, the clinician must always provide evidence-based opinions that meet current scientific consensus and are provided in an impartial manner without advocacy for any of the parties involved. Providing such services comes with a number of ethical responsibilities such as consent, understanding issues of confidentiality and where that may be waived versus not, principles of honesty and integrity, and avoiding biases. Experts should also readily acknowledge any limitations of the scientific foundations of their testimony when they exist, and only provide opinions that can be stated with a degree of medical probability and are within their purview of expertise based on training, knowledge and experience. Readers interested in resources pertaining to broader aspects of providing expert medicolegal services are encouraged to seek out several recent reviews on this topic (e.g., Zasler, Ameis, Martelli, et al., 2022; Zasler, Bigler, 2017).

The nature of this work is in many ways very different from providing clinical care and as a consequence practitioners need to be familiar with rules of evidence and medicolegal terminology. Aside from the need for an obsessive-compulsive approach to case review, claimant examination and report preparation, a good "expert" must be able to present themselves in a professional manner, communicate information in a clear and understandable manner to non-medical professionals, be able to handle adversarial proceedings and know how to manage conflicting interests.

2. The medicolegal clinician roles

It is critically important for clinicians to understand that they may be requested to engage in medicolegal work in a variety of different contexts and as such with potentially different responsibilities, ethical challenges and medicolegal considerations. As a consequence, clinicians should become intimately familiar with the different paradigms of involvement so that when approached in such cases they are adequately prepared to intelligently discuss these various roles and how they are comfortable being involved. If the clinician is asked to testify, they will typically need to meet certain criteria regardless of the context of their testimony including being qualified based upon their education, training, knowledge, and experience. Beyond the aforementioned factors, the testimony provided by the expert must assist the triers of the fact to understand the issues in the case and make appropriate determinations regarding same. Additionally, the testimony must be based on appropriate scientific evidence and make use of reliable interpretation of same to meet admissibility standards.

If the treating clinician is requested to provide expert testimony, then that individual is automatically in an advocacy position for the patient in question. Oftentimes, lawyers will prefer to retain a treating clinician if they are aware that the clinician can provide sound testimony and will be comfortable in a medicolegal setting. Serving in such a role can sometimes be difficult if issues related to a patient's personal matters that are otherwise protected under confidentiality/HIPAA come up in the context of testimony that may potentially compromise the physician-patient relationship. Every practitioner should remember that when there is litigation there is an "open book" to any issues that are in the medical record. Clinicians should also be aware that they may be called as a "fact" witness and not an "expert" witness. As a rule, a fact witness is paid at a much lower rate than an expert witness. The aforementioned issue should be clearly delineated upfront when the clinician is retained to avoid such a situation from occurring. Ultimately, whether the clinician is considered an "expert" or not is up to the court and the

triers of fact not the clinician nor the attorney hiring them.

When the clinician is retained to evaluate a claimant who is not their patient then this is traditionally referred to as an "independent medical evaluation" or IME. Many attorneys have expressed concern with this phraseology claiming that the opinion is not necessarily independent since the clinician was hired by a party advocating for a particular outcome. This certainly can be argued as fallacious if a clinician has a track record of providing neutral medicolegal evaluations. Alternatively, different phraseology can be used such as "medicolegal evaluation" or MLE. In this context, the clinician's role is to perform a comprehensive unbiased evaluation and provide opinions on issues germane to diagnostic impressions, causality and apportionment, presentation validity, MMI (maximal medical improvement), risks and restrictions, prognosis, current and future medical and rehabilitative needs, as well as life expectancy (Edlow, Claasen, Schiff, et al., 2021; Zasler, Ameis, Martelli, Bush, 2022). The medicolegal role is one of non-advocacy for any particular party or case outcome. As a neutral party, the clinician should only advocate for neutrality and a thorough analysis of the claims made.

There may be occasions when a clinician is called upon to provide "behind the scenes" consultative services to assist the retaining party in development of their case. In this context, the retained clinician is typically charged with reviewing files, providing case analysis, identifying relevant literature germane to case issues, assisting with development of questions for opposing experts and/or treating clinicians, recommending testing and/or evaluations that may have not been done and/or performing any other tasks deemed apropos by the retaining party in assisting them in their case preparation. When retained in this context, the clinician may be asked to opine on the strength of the case as well as identify areas of potential vulnerability/weakness in the claims being made and/or in the medical record. As a consultant, most practitioners will NOT provide deposition or trial testimony for ethical reasons including the fact that their role was as an advocate for the retaining party and not a neutral party aside from the fact that no direct claimant exam was performed.

Peer reviews are another manner in which clinicians may be engaged from a medicolegal standpoint. There are differences of opinion in regard to how such evaluation should be conducted. It is this author's recommendation that such evaluations be based on the extant record and not selected records to allow the clinician full access to relevant history. The peer review should provide an unbiased, critical case analysis for exclusive purposes of internal use. They should not be used as a proxy for a comprehensive medicolegal evaluation for many reasons including lack of claimant consent, lack of direct claimant examination, and absence of the evaluating clinician's consent to use the report in such a context. Peer reviews are helpful to adjusters, insurance companies and attorneys for purposes of overall case analysis including identifying case weaknesses and strengths, causality and apportionment, liability exposure and "economic damage control". A peer review will provide the retaining party with information on the scientific validity of the claimed medical diagnoses, appropriateness of historical and current treatment plan, prognosis, life expectancy, and work re-entry potential of the claimant, among other issues as the available records allow for such opinions to be generated.

3. Medicolegal terminology

It is essential that healthcare professionals who engage in any level of medicolegal work understand the terminology used in documentation, during deposition or in the court room. Table 1 provides brief definitions for commonly used terminology relevant to medicolegal expert witness testimony.

4. Medicolegal caveats and the bedside exam

Among the first things that should occur when a clinician is asked to serve as an expert witness and examine an individual with a DoC is to seek informed consent for the examination from the appropriate party. Informed consent should be clearly documented, and appropriate information provided to the testifying expert regarding the "point person" for providing such consent. Recent advances in application of neurotechnologies involving neuroimaging and electrophysiological techniques might necessitate obtaining informed consent from examinees who otherwise are deemed unconscious based on bedside neurobehavioral assessment. Such informed consent could certainly be relevant not only to acknowledging participation in a medicolegal evaluation but also in an examinee participating in their own decision-making (Istace, 2022). It should be noted

Table 1
Medicolegal terminology

Advanced directive	A legal document stipulating a person's preferences for medical treatment and/or end-of-life care should they become incapacitated.
Affidavit	A written document issued by an expert witness which is sworn under both and signed outlining opinions in a medicolegal matter.
Aggravation	A permanent increase in the severity of a pre-existing condition.
Apportionment	How much of the given condition is due to a particular event that is causally related to the incident in question.
Capacity	The ability of the claimant to make informed decisions regarding their medical care.
Causation	The linkage between a given event and a subsequent outcome.
Chain of custody	Legal documentation regarding how evidence is handled and transferred across individuals/places to assure maintenance of integrity/credibility.
Confidentiality	Patient clinicians legal and ethical responsibility to protect claimants/patient information and not disclose it without appropriate authorization.
Cross examination	When opposing counsel questions and expert witness with the aim of understanding as well as challenging their expert opinions, methodology and/or credibility.
Daubert standard	The United States legal standard used as a litmus test for expert witness admits ability of scientific evidence and federal court cases.
De bene esse deposition	A deposition that is and lieu of court room testimony.
Direct examination	Initial questioning by the retaining attorney in the court room of their expert witness to present the clinician's qualifications as well as medicolegal opinions.
Discovery deposition	A deposition requested by opposing counsel to assess an expert witness's opinions, presentation and credibility.
Duty of care	A legal obligation of the clinician to provide appropriate medical care emphasizing Hippocratic obligations relating to patient safety.
Exacerbation	A temporary increase in the symptoms of a pre-existing condition that is expected to return to baseline levels.
Expert witness	A professional who is deemed by the court (judge and/or triers of fact) to have specialized knowledge germane to provision of medicolegal opinions in a particular area of medicine.
Fact witness	Fact witnesses testify to specific details or observations regarding a patient or event.
Frye standard	A legal standard for expert witness testimony admits ability to remain in some jurisdictions.
Guardian ad litem	Refers to a person charged by the court to represent the interests of the injured party and a legal proceeding.
Independent (medical) examination	A medicolegal examination by a non-treating clinician to provide unbiased opinions regarding a claimant's condition as related to an injury or insult.
Informed consent	Acknowledgment by a claimant/patient regarding agreement to a procedure/intervention with both legal and ethical aspects.
Liability	Refers to in individuals or groups legal responsibility or accountability for a particular act that resulted in some adverse outcome.
Mandatory reporting	The legal responsibility to report concerns regarding suspected neglect or abuse as well as impairment that may jeopardize the claimant/patient or the community at large.
Medical maloccurrence	Refers to complications associated with the particular procedure or event that are known to occur and/or were conveyed as warnings to the claimant prior to the procedure but do not fall below the standard of care or meet medical negligence criteria.
Medical malpractice	Refers to any event where and advised her care shown to have fallen below the applicable standard of care given the healthcare practitioners specialty and their geographic locale during the time of the occurrence.
Medical negligence	Refers to provision of health/medical care that is below the excepted standard of care that is similarly trained professional would provide. Medical negligence may be grounds for a malpractice claim if it was the direct cause of harm to the claimant.
Medical probability/certainty	This refers to the statistical likelihood that the opinions expressed are provided with the degree of medical probability or in other words that they can be stated as greater than 50% likelihood. Use of the term medical certainty has never been clearly defined but suggests a higher standard of statistical probability relative to "medical probability".
Medical possibility	A phraseology that is generally considered irrelevant in the context of medicolegal testimony as it indicates the likelihood cannot be stated as greater than 50%.
Medical proxy or surrogate	A person who is legally charged with making medical decisions on behalf of another individual who is unable to do so due to compromised capacity.
Privilege	Legally protected communication between an attorney and expert witness.

(*Continued*)

Table 1
Medicolegal terminology

Standard of care	The accepted health care practices that a competent clinician would provide under similar circumstances in a particular geographic locale.
Statute of limitations	For legal time frames during which a lawsuit can be filed which may vary based upon the nature of the claim and the geographic jurisdiction.
Subpoena	A legal document typically hand-delivered which orders a healthcare practitioner to act on a specific request such as appearing in court or providing specific records which may include medical records, MLE documentation, articles that might be referenced in the context of expert witness testimony among other items.
Triers of fact	Refers to the persons who hear the evidence in a medicolegal matter and decide of the relevancy of said evidence in coming to their decisions regarding the ultimate verdict.

however that in the context of performing an MLE, experts should not order testing as that would put them into a physician-patient relationship with the examinee and muddy the waters as far as their neutrality (assuming they were not already treating clinician). Alternatively, if further testing is necessary these recommendations should be made in the report.

The examiner should make every attempt to avoid preconceived notions about what they will find on assessment and take all information into consideration to optimize avoidance of bias including diagnosis threat. These pre-evidential beliefs have been well delineated by O'Brien and colleagues relative to different biases that may impact formulation of diagnostic opinions and compromise objectivity and neutrality in the context of more objectively driven post-evidential beliefs (O'Brien, Zhang, Anderl, et al., 2023).

When an expert witness is asked to examine a claimant in a state of disordered consciousness, it is critical that they review any relevant records prior to the examination. Issues regarding causation of disordered consciousness are also relevant to assure that there are no potential reversible causes or neuromedical factors that may be inhibiting emergence and/or amplifying neurologic deficit. It is also paramount to review records with an eye to entries that provide information regarding the patient's level of awareness and responsiveness that were documented by staff, particularly by nurses and therapists. If the claimant is being cared for in a specialized facility, there should be serial documentation of specialized measures that may provide further objectification of the examinee's neurologic status as far as behavioral evidence of consciousness. Additionally, feedback from significant others should be sought through appropriate corroboratory interviews (see below).

In the context of both pre-evaluation record review as well as direct examination, the clinician should consider sensorimotor inputs and outputs and always keep their "blinders off" in regard to comorbid conditions such as spinal cord injury, sensory organ dysfunction (vision, hearing, and touch) and/or other neurological disorders such as peripheral neuropathy. In order to optimize examinee/claimant performance during such an assessment, the clinician should inquire prior to the actual evaluation as to what time of day the claimant is most responsive and assure that they are not getting any medications prior to the evaluation that may adversely affect their neurological performance (e.g., arousal, attention, etc.). Ideally, the examinee should be assessed in an upright position to optimize vestibular stimulation and arousal. These are just a few of a number of nuances and caveats in the context of optimizing conditions that allow an examinee to be primed for assessment and demonstrate to the best of their ability indicators of conscious awareness (O'Brien, Zhang, Anderl, 2023).

All parties involved in these types of cases need to remain cognizant of the fact that if there is behavioral evidence of consciousness, it can be subtle as well as inconsistent thereby necessitating careful serial as opposed to single examination opportunities. This may in part explain the historical literature indicating a very high rate of misdiagnosis of persons who are minimally conscious as being unconscious/unaware (see Schnakers in this issue).

A complete neurological assessment should be performed including careful analysis of motor responsiveness as well as multimodal communication abilities (vocalizations, verbalizations, eye movements, facial expressions, motoric gestures, and/or use of augmentative communication/assistive technological devices among other methodologies). Every effort should be made to establish what the historical best methods of communication are with the patient if there is evidence of same including use of assistive technology and potentially even brain computer interfaces. It is of utmost importance for the medicolegal examiner to perform a methodical,

comprehensive bedside examination given the subtleties of many findings associated with assessing for awareness and that given examinee. Even with the best examination, evidence of consciousness in an otherwise conscious patient may not manifest on bedside assessment due to communication and/or motor deficits. Such is the case with covert consciousness and patients with cognitive motor dissociation (CMD) where even though the patient retains capacity for volitional thought, they are unable to express said abilities through communication or motoric output (Schnakers, 2024; Young, Edlow, Bodien, 2024). It has been shown that as many as 20% of persons with a DoC may fall into the CMD diagnostic category (Schnakers, 2024).

A major component of the physical examination of the person with a DoC is the assessment of overall level of arousal, responsiveness and awareness (e.g., signs of consciousness) (Bodien, Katz, Schiff, et al., 2022; Fitzpatrick-DeSalme, Long, Patel, 2022). The clinician should observe spontaneous behaviors as well as behaviors that occur in response to normal incidental stimuli and lastly those that occur consequential to structured planned administration of stimuli. Each time the claimant is examined there should ideally be formal standardized testing performed to track the individual's overall level of awareness as well as responsiveness. All examination findings, whether positive or negative, should be documented for future reference and included with formal medicolegal reports. Standardized testing methodologies have been well-established for patients with disorders of consciousness but not per se in a medicolegal context. That being said, established "gold standard" measures such as the Coma Recovery Scale–Revised (CRS-R) should be utilized in such a context with documentation clearly tracked and saved over serial assessments. The use of careful non-standardized observations certainly plays a role in the assessment of such patients and any data collected through such observation should be considered in concert with other information supporting or contradicting the presence of conscious behaviors. Other approaches to behavioral assessment including individualized quantitative behavioral assessment (IQBA) strategies should be considered in the context of these types of evaluations when pooled data are available for quantitative analysis. The use of IQBA becomes particularly relevant when the behaviors being assessed are difficult to confirm due to inconsistency and/or ambiguity (Fitzpatrick-DeSalme, Long, Patel, et al., 2022).

Beyond the issue of assessing arousal, responsiveness and awareness, the clinician should look for any exam findings that may suggest risk factors for medical morbidity that must be taken into consideration both from a treatment recommendation standpoint as well as a prognostic perspective in terms of implications for survival time. Such factors may include the presence of skin breakdown/pressure sores, severe tonal abnormalities whether hypertonic or hypotonic, limb deformities secondary to contracture or heterotopic ossification, significant limitations in range of motion of limbs or axial structures among other factors that should be part and parcel of a thorough examination.

The examiner should also be aware of the differences in clinical presentation, examination, end of life decision and prognosis (long-term neurological versus functional outcome, median survival time, etc.) of the examinee with a DoC early after injury in comparison to the examinee months or years post-insult (Chang, Provencio, Pascual, et al., 2023; Edlow, Claasen, Schiff, et al., 2021; Estraneo, Loreto, Masotta, et al., 2018; Estraneo, Magliacano, Fiorenza, et al., 2022; Giacino, Sherer, Christoforou, et al., 2020). As importantly, the neuroetiology of the patient's DoC must be taken into consideration in terms of understanding the likely long-term clinical evolution of the condition and the potential for neurologic recovery at any point in time (Magliacano, De Bellis, Panico, et al., 2023).

Generally speaking, it is critical to not make definitive recommendations on future needs until such time as an examinee has reached so-called "maximal medical improvement" and even then, there is potential for late neurological improvement which must be recognized in the context of providing such medicolegal opinions. Ultimately, the purpose of a detailed examination is to determine in a multidimensional fashion where the examinee is in regard to their level of consciousness across the spectrum of absent versus covert versus overt cognition/awareness (Young, Edlow, Bodien, 2024). These determinations will invariably lead to numerous diagnostic impressions and there will not always be agreement between experts as to the examinee's actual neurologic state of function.

Understanding of this continuum of consciousness continues to evolve in terms of the nomenclature, assessment strategies and knowledge regarding the neural mechanisms of consciousness. Clinicians as well as those providing expert witness testimony should be familiar with current definitions within

this framework as well as their medicolegal implications. Bonin et al. (2023) developed a figure well representing the pathological states of consciousness according to the levels of recovery of cognitive and motor function encompassing current nomenclature of coma, UWS, MCS-, MCS+, MCS*, cognitive motor dissociation, locked-in syndrome (complete) (note: incomplete LIS not listed), emergence from MCS, severe disability, moderate disability and lastly full recovery (Gosseries, Laureys, 2022). Such diagnostic labels can be helpful in terms of educating the triers of fact regarding the claimant's situation neurologically, neuromedically, prognostically and has potential implications on the individual's quality of life; however, they should not be seen as absolutes in terms of defining issues such as quality of life, end-of-life decision making, median survival time, likelihood of pain and suffering among other issues (Katz, Polyak, Coughlan, et al., 2009). These diagnostic labels should not necessarily drive a dichotomous approach either clinically or medicolegally to how patients with DoCs are treated given the fact that these conditions occur along a continuous spectrum of consciousness and are not in and of themselves necessarily distinct disorders (Law, Choong, 2018). It must be acknowledged that there remain substantial debates regarding the current schema for classification of DoC on multiple fronts in addition to nosological ethical ramifications as noted by Robbins and Bernat in this issue (Robbins, Bernat, 2024). The diagnostic label used may also have significant legal, and ethical implications regarding the aggressiveness and duration of care to be provided, as well as the need to consider alterations in code status, among other issues.

Any clinician serving as an expert should also be familiar with the disparities between addressing DoC issues in adult versus pediatric patients. There are unique challenges that face any expert providing such opinions on pediatric cases as the literature is much more historically limited. A proceedings paper just published in Neurocritical Care (Boerwinkle, Schor, Slomine, et al., 2023) reviewed many of the current challenges that differentiate pediatric from adult DoC care. For example, modifications to the CRS-R (e.g., the CRS-P) were suggested relative to alterations in the functional communication and functional object use item definitions to be more salient with the patient group being addressed. Readers are referred to the aforementioned paper as a good source of current consternations, challenges and caveats germane to advances in pediatric DoC practice. A recent publication by Molteni and colleagues (2023) covering diagnosis, outcome, prognosis and treatment of pediatric DoC provides a very thorough analysis of what is currently known in these areas based upon a very thorough scoping review of the evidence-based literature. Parallel to adult literature in the CRS-R was the behavioral assessment measure most frequently endorsed for use in this population of patients. It was noted that currently used classification systems might have limitations in very young children (for example, some children and MCS might be inappropriately classified as UWS due to limited language development and sensorimotor limitations). The use of neurodiagnostics such as neuroimaging (both static and functional) and electrophysiologic assessment was found to be parallel to that recommended for adult populations. The reviewers also noted the importance of addressing sleep as well as optimization of arousal/responsiveness through appropriate assessments and environmental structuring. As far as outcomes were concerned, the scoping review found that children with shorter durations of DoC typically had a better overall functional outcome although there were rare cases of delayed emergence from UWS as well as MCS reported greater than 12 months after traumatically induced brain injury as well as greater than 6 months after non-traumatic causes of brain insult. The review also noted that the evidence-based literature supporting the use of dopamine agonists with amantadine being the drug most well studied although its pharmacotherapeutic effects are still not well defined. Zolpidem was another agent that was reported to have some documented efficacy although the yield rate was quite low. The non-pharmacologic interventional literature was noted to be even smaller and less convincing albeit focused on multisensory stimulation and regenerative treatments such as cell transplantation with additional single case studies looking at assistive technology, median nerve stimulation and "traditional medicine therapies" (Molteni, Canas, Briand, et al., 2023).

5. Limitations of MLEs in persons with DoC

There are times when clinicians who are inadequately informed regarding DoC related issues provide expert witness opinions regarding same and as a consequence may misdiagnosis the claimant, not be familiar with the most recent advances as far as assessment of consciousness (and as a result not employ appropriate assessment methodologies),

base their opinions upon a single bedside assessment without requesting serial examination and/or other neurodiagnostic testing data, and/or not take into consideration fluctuations in clinical presentation based upon time of day, level of arousal and or timing of medications being prescribed. Other factors that may influence how a claimant with a DoC may present in the context of an MLE include the location of the examination if outside the context of their normal caretakers and/or environment that must be considered when interpreting examination results. Lastly, it is quite common that physician expert witness who do not come from a neurorehabilitation background often focus solely on neuromedical issues without adequate consideration of more subtle clinical findings evidencing consciousness, functional implications of clinical assessment findings in the context of providing neurorehabilitative recommendations as well as inclusion of psychosocial implications of the condition for the claimant as well as their significant others.

The expert witness should always demand to examine the claimant in such cases in a serial fashion given the potential vacillation in neurologic presentation of individuals with disorders of consciousness. One may not be given the opportunity for such serial examinations by the "system" and in such cases, it is critical that the expert witness acknowledge the limitations of a one-time assessment. As other limiting factors exist, they should also be noted including anything that resulted in less than optimal examinee performance (i.e. having a neuromedical comorbid conditions such as hydrocephalus, being on sedating medications, having an infection at the time of exam, being seen at a time of day when the examinee is typically more fatigable, being limited as to how long one could spend with the examinee and/or being limited as to who among family or treating staff one could talk to, among other factors). Expert witnesses should discuss the limitations of single examinations with the retaining party prior to being retained so that this is addressed in a proactive fashion. Experts should also not accept specific time or conditional limitations to their examination that may compromise the quality and/or content of their work to edify a claimant's condition.

6. The role of neurodiagnostics

As we have learned more about clinical assessment of persons with disorders of consciousness, the role of neurodiagnostics has become much more important as a means of honing diagnostic impressions regarding the presence of covert consciousness as well as the likelihood of meaningful recovery and specifically emergence from DoC (Young, Edlow, Bodien, 2024). Neurodiagnostic techniques that have been studied in this application can be divided into static neuroimaging, functional neuroimaging and electrophysiological assessment/treatments. In a medicolegal context, it is always important to understand underlying DoC etiology and the consequential neuropathology. These techniques are likely to be challenged in the courtroom by defense depending upon how they are applied, the methodology used, and the specific claims being made. Any expert utilizing neurodiagnostics in a case involving a DoC, should be aware of published literature addressing some of the caveats and controversies in terms of their use in neurolitigation (Sanz, Thibaut, Edlow, et al, 2021; Shenton, Price, Levin, et al., 2018; van Velkinburgh, Herbst, Casper, 2023; Wintermark, Sanelli, Anzai, et al., 2015). Depending on the geographic locale where the expert witness is testifying there may be differences in evidence standards that must be satisfied before such testimony can be presented and admissibility may further be impacted by historical case law and that jurisdiction.

Although static imaging via techniques such as computerized tomography and magnetic resonance imaging may provide basic information on the aforementioned, research is showing that techniques such as magnetic resonance imaging with diffusion tensor imaging or DTI can better assess the integrity of cerebral white matter tracts which may help in assessment of conductivity of neural pathways and have implications for neurorecovery potential. The aforementioned neurodiagnostic tests are generally widely available although they have been shown to not necessarily be as helpful in the assessment of persons with DoC from the standpoint of covert consciousness and/or prognostic implications as other methodologies discussed below.

Functional brain imaging studies such as functional magnetic resonance imaging (fMRI) and positron emission tomography (PET) have been utilized to provide further diagnostic as well as prognostic information and persons with disorders of consciousness. fMRI can assist in identification of regional brain activity and response to specific stimuli or tasks even when the patient has no motor capacity to demonstrate behavioral responses to

environmental stimuli. In that context fMRI can assist in assessing cerebral functional conductivity and covert consciousness. Examiners should obviously be aware of the nuances of these techniques and where they might be challenged as far as the forensic applications in cases involving claimants with DoC (Elwell, 2023). PET is typically used to address metabolic activity of brain regions in the context of normal metabolic, hypometabolic or hypermetabolic activity that has been demonstrated to provide helpful information in this patient population regarding general brain function as well as data germane to prognostic opinions. Electrophysiological related assessments/interventions include electroencephalography (EEG), event related potentials (ERP's) sensory evoked potentials (SEP's) and transcranial magnetic stimulation (TMS). EEG data has been shown to be helpful in distinguishing different states of disorder consciousness as well as have ramifications for prognosis when certain patterns such as burst suppression are evidenced. ERPs can provide insight into central processing of sensory stimuli and in that context the level of a person's cognitive processing. SEPs which like ERP's measure response to sensory stimuli (including tactile, visual and auditory) can also provide information about the integrity of sensory pathways and central processing of sensory information when there are questions about the integrity of these systems (Friedman, Turk, Budson, 2023). Lastly, TMS has been shown to provide a non-invasive methodology that allows for induction of cerebral activity and the responsiveness of same allowing identification of potential sensorimotor pathways that might otherwise not be measurable through bedside clinical assessment/neurological examination. Newer brain monitoring techniques which are considered as emerging technologies such as electrocorticography (ECoG) and near infrared spectroscopy (NIRS) may yield additional information about cerebral functional integrity but are still in their relative infancy and mainly confined to research use. These newer technologies have demonstrated the ability to shed additional light on the physiologic underpinnings of consciousness recovery through identification of functional brain networks in examinees who otherwise would be deemed to be unconscious based on bedside behavioral evaluation. The challenge with these newer techniques is whether they will be admissible in the court of law based upon current standards of testimony relative to federal rules such as Daubert and Frye standards.

A caveat should be repeated here in regard to diagnostic testing and the role of the expert witness. Expert witnesses should not order tests on an individual/examinee who is not their patient as that would place them into a treating clinician role and remove the implicit neutrality of their position. An expert witness can however make recommendations for testing that may help them further hone their medicolegal opinions and subsequently submit their updated opinions once that data becomes available.

7. Medicolegal aspects of pain and suffering

The issues of pain and suffering often are seen as significant areas of potential damage claims in the context of severe brain injury cases particularly when there is controversy on a person's level of consciousness and as a consequence of awareness. There are also implied issues with informed consent and consideration of treatment options in patients who are deemed with a degree of medical probability to be able to experience pain even after intermittently and/or "incompletely" and/or suffer as a consequence of same. A particular challenge in this group of individuals is the heterogeneity of potential pain generators that may be due to CNS, peripheral nervous system, and/or somatovisceral injury. Pain must be viewed as a multidimensional concept with biological, psychological, gender and sociocultural aspects. Pain perception is driven by many different factors including cognitive, behavioral, genetic, environmental and cultural influences. Pain should be understood as defined by the International Association for the Study of Pain to be "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" (Raja, Carr, Cohen, et al., 2020). Clinicians should understand distinctions between nociceptive and neuropathic pain when providing testimony in a medicolegal case involving a patient with DoC (Zasler, Martelli, Clanton, 2022).

Suffering on the other hand refers to what is experienced by the person in pain and has its foundations is a much more complex affectively negative and threat-based response with an integral and inherent disruption of one's sense of self. Pain and suffering must be understood to be interrelated but distinct phenomena (Lacerte, Shah, 2003). Ultimately, the injured person must be the one to provide feedback

to determine whether they are suffering and the reasons for same which may be related to pain or other issues including hopelessness, isolation/loneliness, loss of, among other issues. Suffering may be situational as related to pain as well as other factors or may be ongoing and chronic. When performing medicolegal assessments on persons with DoC, the clinician should always remember that their goal is not just to relieve pain but also to alleviate suffering which requires an understanding of the person as well as their injury/illness and its consequences.

The clinician expert should perform a thorough record review to determine what evidence there is in the available documentation germane to pain and suffering issues for the particular individual being assessed. Additionally, if the individual is deemed capable of perceiving pain and suffering that appropriate decision-making regarding care has been applied as this may have implications on legal liability as well as potential negligence claims for healthcare providers if otherwise mismanaged. Treatment rendered for pain and suffering must weigh benefits and risks of same in the context of ethical principles of beneficence and non-maleficence which can be particularly complex in such situations (Bodien, Katz, Schiff, et al., 2022; Zasler, Martelli, Clanton, 2022).

Clinicians providing expert witness testimony on pain and suffering must be cognizant of the nuances of same including bedside assessment as well as treatment implications (Zasler, Formisano, Aloisi, 2022). Experts must be aware of some of the more focused measures specific to individuals with DoC, say following severe brain injury whether due to trauma or other etiologies. The Nociception Coma Scale or NCS developed by Schnakers, and colleagues was the first measure developed specifically for pain assessment in this patient population (Schnakers, Chatelle, Vanhaudenhuyse, et al., 2010). The NCS assesses for subscales (motor, verbal and visual responses as well as facial expression). This measure was subsequently revised with exclusion of the visual subscale due to its non-significant contribution to the overall measure. A more recent revision of the NCS, the Nociception Coma Scale–Revised or NCS–R published in 2012 by Chatelle and colleagues (Chatelle, C., Majerus, S., Whyte, et al., 2012) is the only pain scale endorsed in the 2018 DoC guidelines of the American Academy of Neurology and American Congress of Rehabilitation Medicine (Giacino, Katz, Schiff, et al., 2018). The NCS-R scoring ranges from 0–9 and scores appear to be related to brain pain processing and nociception. Due to the presence of the visual scale, the NCS provides higher predictive validity of emergence from UWS to MCS. A more recent developed scale called the Brain Injury Nociception Assessment Measure or BINAM was developed by Whyte and colleagues and measures the intensity of nociceptive experience in patients who are otherwise unable to communicate after severe acquired brain injury (Whyte, Poulsen, Pengsheng, et al., 2020). This measure consists of 10 items tapping both behavioral and physiologic parameters. Scores appear to correlate positively with conditions that induce pain responses but are independent of the underlying diagnosis. Further research is needed to determine the specific clinical utility of this measure and at this point in time it would not be recommended for medicolegal testimony use. There remains some debate about the methodologies used in the specific behavioral measures noted above including for example the amount of pressure applied during nociceptive stimulation. It is therefore recommended that as much as possible, objective methods such as algometry be employed to be able to apply uniform degrees of pressure on stimulation.

There are currently no consensus or evidence-based guidelines on the role of physiologic/neurophysiologic techniques including EEG and ERPs (including nociceptive evoked potentials), heart rate variability, galvanic skin response, pupillary dilatation reflex, somatosensory evoked potentials, laser evoked potentials as well as neuroimaging techniques (e.g., functional MRI and positron emission tomography) in validating conscious pain perception in persons with a DoC. Research to date has suggested that these techniques may provide useful adjutant information to assist in such determinations but interpretation remains complex (Friedman, Turk, Budson, 2023).

Given the significance of pain and suffering issues in a medicolegal context, clinicians should always include commentary on this topic in their report including treatment recommendations which may include a diverse set of recommendations spanning neuro-modulatory, pharmacologic and non-pharmacologic treatment strategies. Readers are referred elsewhere for further details on this important area of clinical management (Edlow, Claasen, Schiff, 2021; Russell, Hammond, Murtaugh, 2024; Thibaut, Schiff, Giacino, 2019; Zasler, Martelli, Clanton, 2022).

8. Record acquisition, review and relevance

It is of paramount importance to assure that one receives a complete set of post-injury/insult records to assure that an appropriate review of the extant record has occurred as part of the foundation for provision of medicolegal opinions in any case regarding a claimant with a purported DoC. Records involving medical care predating DoC onset can be crucial when there are issues regarding apportionment of impairment(s) and providing opinions about whether specific impairments may have been aggravated or exacerbated by the injury/insult in question. Additionally, comprehensive record review is an integral yet labor-intensive and time-consuming part of providing opinions in cases involving persons with DoC. Critical analysis of the extant record can assist the clinician in development of medically probable opinions regarding the etiology of the claimant's neurological condition (e.g., causality), apportionment of neurological is well as neuromedical findings, the likelihood of pain and suffering, as well as the medical probability of emergence from the examinee's current state of disordered consciousness. Clinicians providing expert witness testimony should never settle for record summaries as a substitute for the extant medical record as often times important details will be excluded that may be essential for reaching accurate opinions in a given case. Ethically, and otherwise, experts should be discouraged from testifying based only on record review and this advice is even more relevant in cases where there are questions regarding complex issues as occur with cases involving DoC.

9. The importance of corroboroatory interviews

As any clinician who has worked with this patient population for any period of time will tell you, significant others including of course family members often can elicit responses from patients with DoC that others may not be able to prompt the patient to perform. Based on this observation, the examiner should request significant others to participate in the medicolegal evaluation relative to observing interactions with these individuals as part and parcel of the overall assessment. Interviewing individuals who spend substantial time with the patient such as therapists, nurses and family members about their observations can be helpful in providing additional information about an individual's level of conscious awareness. There may be misinterpretation of observed behaviors including reflexive ones with clinicians not specifically trained in DoC assessment as well as untrained lay family members that must be considered and appreciated. In the context of obtaining information from corroboratory sources examiners can rely on behavioral questionnaires, videos of interactions as well as formal and informal documentation from aforementioned observers. It is always preferable for the examiner to observe these interactions directly and complement those observations with additional feedback regardless of its form from corroboratory sources.

10. Impact on significant others and family

In the context of providing medicolegal expert testimony in the case involving an individual with a DoC, it is crucial to also take into consideration the impact of such injuries on the family unit (Gosseries, Schnakers, Vanhaudenhuyse, et al., 2023). These types of injuries and the consequences related to same lead to a variety of adverse psychosocial, financial and family dynamics changes that are often quite challenging if not overwhelming for significant others and family members more specifically. Families will often feel obligated to provide care and lose sight of their own individuality and needs. Such expectations may in part be driven by guilt, grief and/or cultural norms among other factors. Oftentimes such desires lead to burnout as well as significant financial hardship of the individual is unable to resume employment. Caring for an individual after catastrophic brain injury can often lead to long-term stress and myriad adverse consequences as previously noted. It is also very common for the demands of care of such individuals to lead to social isolation and consequential affective difficulties including depression and anxiety as well as grief, guilt and frustration. As a consequence, any evaluator should consider these factors in the context of interviewing caretakers/family members and consider the role of counseling and supporting individuals as they attempt to cope with these major life changes. Family members also have to grapple with the uncertainty of the future as it relates to how much if any neurologic and functional recovery their loved one will achieve moving forward. As it relates to the aforementioned, family members may be asked to make difficult decisions regarding con continuation of life-sustaining treatments oftentimes early on after injury

and sooner than may be appropriate to truly establish the likely prognosis for emergence from DoC moving forward. Even when the prognosis for further improvement seen bleak, these are still difficult decisions for families to make particularly so when there may be differences of opinions among family members regarding the patient's quality of life, religious perspectives on withdrawal of care, perceptions regarding their loved one's pain and suffering among other factors that may influence openness/willingness to consider withdrawal of care versus continuation when there is no advanced directive in place. Experts should also include recommendations, as deemed relevant to the case, based on current guidelines including addressing advanced care planning which may assist in modulating some of the anxieties and stress that come with having a family member who is catastrophically injured (Giacino, Katz, Schiff, et al., 2018). Additionally, clinicians providing expert witness testimony should advocate for family support services to be included in life care plans as those might be germane to the medicolegal case (Gosseries, Schnakers, Vanhaudenhuyse, et al., 2023).

11. The medicolegal report: Content and caveats

Like any other medicolegal report, the expert witness should include basic information about the examinee, details regarding date of retention, the party retaining them, the records reviewed, records required but not provided, patient's developmental, medical, psychosocial, educational, vocational, and legal history should be delineated. Additionally, home architectural layout and discharge plan should be reviewed. Post-injury as well as preinjury medication history should be documented as well as any particular/significant adverse or positive responses to pharmacologic interventions. Adverse drug events and/or allergic reactions should be clearly documented for both current and future care. Current diet and dietary restrictions should be clearly enumerated as well as the rationale for same. The physical examination while focused on neurologic elements should be comprehensive and include appropriate inclusion of the musculoskeletal, integumentary, cardiopulmonary, gastrointestinal, and genitourinary systems. In these types of cases, the expert should also opine as to whether or not the examinee is at maximum medical improvement (MMI) although this terminology can be confusing and should not be equalized to stipulating that there is no chance whatsoever for further improvement but rather that the patient's recovery from a neurologic standpoint appears to have reached a plateau. This does not translate to the absence of the need for further care and/or rehabilitation or for that matter potential for further functional gains even if the neurologic condition were to stay static. The MMI terminology emanates from the American Medical Association's "Guidelines to Evaluation of Permanent Impairment" (GEPI) and has never been consistent across the six editions of the publication (Rondinelli, 2008). Per the GEPI, a total body impairment rating cannot be established till an examinee has reached MMI. Of note, the use of GEPI impairment ratings to serve as any type of guide for financial settlement should be frowned upon and strongly discouraged.

This author also recommends delineating a section of the report on "risks and restrictions" which addresses medically probable risks that the patient has associated with their condition and any restrictions as a consequence of their impairments (Estraneo, Briand, Noe, 2024). Diagnostic impressions would then be presented and ideally divided into those deemed apportionable and causally related to the injury from those diagnoses that were not. There are occasions when such delineation cannot be made with a degree of medical probability and/or a condition pre-existed that was made worse by the neurologic insult in question that would obviously need to be given appropriate apportionment. Lastly, the expert should opine on any and all relevant recommendations as related to the examinee's injury or illness consequences. In the context of recommendations made in a medicolegal report, the expert witness should address measures to decrease morbidity associated with the examinee's low-level neurological state including management of things like heterotopic ossification, spasticity and associated limb contracture, epilepsy, movement disorders, dysphagia and aspiration risk among other comorbid neuromedical conditions (Estraneo, Briand, Noe, 2024). Such medical morbidity risk factors may adversely impact longer term prognosis and median survival time emphasizing the need for aggressive proactive assessment and treatment of these conditions (Estraneo, Loreto, Masotta, et al., 2018; Estraneo, De Bellis, Masotta, et al., 2019; Estraneo, Magliacano, Fiorenza, et al., 2022; Ganesh, Guemon, Chalcraft, et al., 2013).

Recommendations should also be made for durable medical equipment (DME) such as wheelchairs,

hospital beds, augmentative communication, bracing (whether static or dynamic), among other equipment/devices. Recommendations may also be provided regarding neuroprotective therapies that aim to reduce CNS inflammatory cascade and prophylax against neurodegeneration. Treatments including both pharmacological and electrophysiological may be recommended to improve arousal and augment response to other neurorehabilitative interventions (Edlow, Claasen, Schiff, et al., 2021; Fan, Fan, Liao, et al., 2023).

In the context of such an evaluation, and in particular in cases involving persons with a DoC, commentary regarding issues germane to evidence of conscious awareness, neurological and functional prognostication, pain and suffering as well as life expectancy/median survival time should be provided. When the retaining party asks that the expert include opinion regarding prognosis it is very important for the clinician to qualify what prognostic information is being requested. For example, the retaining party may want prognostic information for survival time, rehospitalization rates, positive future care, pain and suffering, chance of further neurologic recovery, probability of independent living among other possibilities.

When a physician is providing expert witness services, there should also be involvement in medical endorsement of the life care plan recommendations as germane to neuromedical aspects of care moving forward. As evidenced in other articles in this special issue of NeuroRehabilitation, there are numerous neuromedical and neurorehabilitative interventions that are important for consideration in this special population of patients. Readers are referred to the aforementioned articles and other resources for more details on various other aspects of treatment (Edlow, Claasen, Schiff, et al., 2021; Thibaut, Schiff, Giacino, et al., 2019).

The determination of life expectancy as well as median survival time remains rife with debate as patients with DoC continue to be followed over longer periods of time in prospective studies (Jaccobson, 2012; Brooks, Shavelle, Strauss, et al., 2015; Faugeras, Rohaut, Valente, et al., 2018). Experts must understand basic biostatistical concepts if they are providing testimony on issues germane to survival time. For example, life expectancy is a biostatistical term referring to a population-based mean of how long individuals with the same condition (e.g., DoC) will live with a degree of probability. Median survival time on the other hand is a different biostatistical concept establishing when half the patients in a pool of patients with DoC are expected to be alive. In cases involving persons with a DoC, it should be expected that an informed attorney will insist their expert use the biostatistical parameter that best supports their case since life expectancy and median survival time are usually quite disparate in these cases. An expert should acknowledge these biostatical nuances if they are providing evenly weighted testimony. Readers are referred to other sources for more information on this important area of DoC forensic testimony (Zasler, 2005; Zasler, 2009). There has been a substantive amount of research published in the last 20 years looking at this patient population and the related neuromedical morbidity and mortality risk factors as well as survival time that all experts should be familiar with (see Estraneo in this issue).

12. Ethical issues

In the context of providing expert witness medicolegal testimony, clinicians should be aware of a number of ethical issues that may arise in this context (Martelli, Zasler, Grayson, 1999). It must be remembered that the process of litigation is often fraught with opposing legal and scientific points of views, high levels of emotion and stress as well as multidirectional polarization. If clinicians are going to put themselves in a position of providing expert witness testimony, they should ethically only testify to issues that they are appropriately trained and qualified to opine on. When testifying, clinicians should always present as professional and provide transparent unbiased opinions/testimony. Experts should avoid opining on issues that ultimately fall in the purview of the injured person and/or their family such as providing personal opinions about whether the claimant's quality of life was such that it was worth continuing aggressive efforts at sustaining life and/or at providing ongoing rehabilitation. Similarly, an expert might be asked if they would want to live if their situation was parallel to that of the patient/claimant in question . . . . an experienced expert would avoid drawing such comparisons and providing any opinion in response to such a question. Beneficence and non-maleficence refer to doing good and avoiding harm, both concepts which should be paramount in guiding one's work as an expert witness. The way one does "good" is by being thorough, advocating only for the truth and basing opinions on objective data and science as much as is possible

and much less so per se on experience. Harm can be caused multiple ways including during direct examination of the claimant due to the use of excessive force and/or inappropriate examination techniques, by providing reports that demonstrate bias based upon practices such as bolding opinions that support the examiner's position, by misinterpreting test findings and/or quoting minority opinions from the literature that are not consistent with current majority opinions from evidence-based medicine, and/or by relying on experience as opposed to evidence-based medicine to serve as a primary foundation of medicolegal opinions, among other factors. Experts in such cases must also be aware of the literature that is pertinent to bridging the gap between medicine and bioethics including issues related to how current DoC guidelines are applied and the implications of disability law (Fins, Wright, Begenstos, 2020; Giacino, Katz, Schiff, et al., 2018).

Biases as noted by O'Brien and colleagues may include anchoring, confirmation, salience and representativeness aspects in the context of how when examiner approaches the assessment of the claimant who is purportedly in a state of disordered consciousness (O'Brien, Zhang, Anderl, et al., 2023). Although it is probably impossible to negate all biases, examiners should make every effort to remain as consciously aware of any such biases they may hold and try to neutralize them as much as possible in the context of their evaluation as well as their ultimate formulation of opinions in a given case.

Conflicts of interest may arise in the context of provision of medicolegal opinions in such cases driven by various different factors including having a relationship that was ongoing with the referring IME agency, retaining lawyer or lawyer's office, pre-existing social relationship with the referring attorney, religious beliefs that may not allow the examiner to approach the case based on established consensus medical practices, cultural perspectives that may color out an expert might opine on particular matters among many other influencing factors. Confidentiality is a critical piece of the equation when providing medicolegal consultative services not only in the context of protecting the privacy of the examinee relative to personal information as related to protected health information (PHI) but also as related to the health insurance portability and accountability act (HIPAA). Practitioners providing expert witness services should be familiar with confidentiality related case law and their geographic locale and as related to different types of litigation (for example Worker's Compensation cases typically inherently wave confidentiality). Experts should keep all information regarding a case confidential even after the litigation has been resolved. In the context of maintaining confidentiality, expert witnesses should make every effort to disclose only information directly relevant to their opinions and falling within their scope of clinical training and expertise unless otherwise asked by opposing counsel. Parallel to clinical records, all medicolegal documentation should be maintained securely, and precautions taken in regard to transmittal of any confidential information whether regarding the examinee's medical history or as related to the medicolegal case. When in doubt regarding the ability to release confidential information, it is recommended that the expert witness consult with their healthcare attorney.

Informed consent is a critical ethical concept when conducting medicolegal evaluations and in the context of assessing someone with a DoC there must be an assessment of the individual's capacity to provide consent. If it is deemed that they are in such a state where this is not possible then consent from the claimant's legal representative or "surrogate decision maker" is required (Rissman, Paquette, Be, 2020). Surrogate decision makers should make every effort to respect an individual's pre-brain injury moral preferences and when the examinee is a minor then the parent(s) generally serve as the surrogate decision maker. An expert should not perform an evaluation of this nature without appropriate prior consent which should only be given after the legal representative's documentation pertaining to same is provided to the clinician and the clinician explains the evaluation being undertaken (ideally in both words and writing). The legal representative should then sign a formal consent document for the examination.

Privacy, dignity and autonomy are principles that must always be adhered to in the context of conducting a medicolegal evaluation. Specifically, the clinician should always go above and beyond in assuring the examinee's privacy and dignity by treating the individual with respect, humility and empathy. Within that conceptual framework, minimizing the examinee's discomfort should always be a priority by staying attuned to the fact that multiple parts of an examination may be uncomfortable including nociceptive stimulation, extremity range of motion assessment, and mobilization of the examinee to check skin integrity, among the more common ones.

Substituted judgment and best interests are two concepts that can be quite challenging in the medi-

colegal arena as it relates to an expert witness assessing what the examinee's prior wishes might be regarding how they would like to be treated or manage if they became severely disabled and otherwise incapacitated due to a neurologic insult or injury resulting in the DoC. In order to accomplish this, an expert would likely need to commit to understanding what legal documentation such as living will, advanced directive and/or power of attorney may have been in place preemptively to the examinee's neurologic injury or insult as well as conducting an extensive review of the historical medical records to determine what if any statements the examinee may have made about their wishes in such a scenario should such an outcome ever occur and lastly take the time to interview those who may have had discussions regarding this topic with the individual prior to their event. In the absence of such information, the issue of best interests arises which means that decisions are made based upon what is deemed to be in the best interest of the examinee considering myriad issues from a neuromedical standpoint, benefit and risks of treatment versus non-treatment, pain and suffering issues, psychosocial factors such as family support, among other factors. When this occurs, it has the potential to place the expert witness in a difficult situation. One of the major challenges in such a scenario is that any opinions provided are provided without injection of personal biases and only based on a transparent, critical analysis of the individual's current situation based upon best available evidence.

13. Conclusions

The role of clinician expert witness, whether physician or otherwise, is demanding, complex and potentially stressful and requires an expanded set of skills beyond those necessary for typical clinician practice. When serving as an expert witness in any case involving an individual with a DoC, clinicians should be aware of the myriad challenges involved in such work and in the litigation process itself. There are many additional topics worthy of exploration in the context of provision of expert witness work in cases involving persons with DoC including more detailed discussion of providing opinions regarding calculation of survival time, recommendations regarding code statue, withdrawal and withholding of care, business aspects of forensic consultation relative to clinical practice, among many other salient issues.

Those serving as expert witnesses should be cognizant of the most current evidence-based literature dealing with assessment and management of individuals with DoC and apply said principles to their expert witness work. Comprehensiveness in "data acquisition" whether through record review, interviews with corroboratory sources, viewing of available video documentation as well as methodical, ideally, serial examination of the individual complemented, as available/feasible, by neurodiagnostic testing will serve any expert well in terms of providing a solid foundation for expert opinions. In conclusion, and maybe most importantly, expert opinions should always be provided without advocacy for any party involved in the case. Positions should be conveyed with full transparency, medical probability (unless otherwise unable to do so) and acknowledgment of the foundation for each opinion provided.

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Conflict of interest

The author declares that he is the Editor-in-Chief of *NeuroRehabilitation* as well as co-chairperson of the Disorders of Consciousness Special Interest Group with the International Brain Injury Association (IBIA). The author is a practicing physician who also provides medicolegal expert services to courts, insurance companies, private parties as well as attorneys.

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