BRIGHAM HEALTH
BRIGHAM AND WOMEN'S HOSPITAL

Department of Rehabilitation Services
Physical Therapy

Standard of Care: Functional Neurologic Disorder

ICD 10 Codes:
F44.4 - Functional neurological symptom disorder with abnormal movement
F44.4 – Functional neurological symptom disorder with speech symptoms
F44.4 – Functional neurological symptom disorder with swallowing symptoms
F44.4 – Functional neurological symptom disorder with weakness or paralysis
F44.5 – Functional neurological symptom disorder with attacks or seizures
F44.6 – Functional neurological symptom disorder with anesthesia or sensory loss
F44.6 – Functional neurological symptom disorder with special sensory symptoms
F44.7 – Functional neurological symptom disorder with mixed symptoms
F44.4 - Conversion disorder with motor symptom or deficit

Case Type / Diagnosis:

Overview of Functional Neurological Disorder:
Functional Neurologic Disorder (FND), also known as Functional Movement Disorder, is an acquired neurologic dysfunction that accounts for over 16% of patients referred to neurology clinics.[1] It is characterized by abnormal motor behaviors that are inconsistent with an organic etiology.[2] While other terminology has been used to denote this diagnosis (e.g., conversion disorder or psychogenic disorder); such nomenclature implies only a psychological cause. As a result, the most accurate and current terminology is to describe the condition as one that is functional.[3-4] This disorder sits at the intersection of neurology and psychiatry and is not yet well understood on a pathophysiological level. Patients typically present with a sudden onset of symptoms that may include limb weakness, limb paralysis, gait disorder, tremor, myoclonus, dystonia, or sensory or visual disturbance. FND can be triggered by a physically traumatic or psychological event, but does not always manifest this way. Symptoms of FND differ from those of progressively degenerative movement disorders, such as Parkinson's Disease, in that they oftentimes come on rapidly and intensely with periods of spontaneous remissions.

Etiology:
The etiology of FND is not known. In the past, FND had been described as a physical manifestation of psychological distress. Now, many cognitive and neurobiological models are being considered as a cause of FND. Some researchers have proposed that FND is caused by a combination of increased emotional arousal in the amygdala at symptom onset and a "previously mapped conversion motor representation," possibly as a result of a prior physical or psychological precipitating event.[5-6] They suggest that the "previously mapped conversion motor representation" is triggered and cannot be inhibited due to abnormal functional connectivity between the limbic structures and the supplementary motor area and higher activity in the right amygdala, left anterior insula and bilateral posterior cingulate.[5] Research has shown that there are a vast array of vulnerabilities that may predispose an individual to FND. Table 1 from Fobian & Lindsey, 2019 details some possible factors that may make a person more susceptible to FND. Individuals may present with one or any combination of these characteristics.[5]

Table 1: Overview of FND Predisposing Factors

Factor	Supporting evidence
Trauma/psychiatric symptoms	History of sexual abuse or trauma Increased stress Increased anxiety and panic symptoms Increased alexithymia Comorbid dissociative disorders
Somatic symptoms	Comorbid fatigue, chronic pain, irritable bowel syndrome Parent reinforcement and concern over physical symptoms, resulting in increased symptoms Impairment in sensory gating, allowing for excessive information loading
Illness exposure	Precipitating physical event or physical trauma Personal or family history of neurological disorder Personal or family history of other health disorder Profession in a medical or paramedical field Media exposure to neurological disorder
Symptom monitoring	Impairment in habituation Increased focus on external body features Increased self-monitoring
Neurobiological evidence	Abnormal attentional focus on affected area Beliefs and expectations about illness Deficits in sense of control over actions Interregional neural network deficits in limbic system, sensorimotor areas and prefrontal cortex Functional and structural brain abnormalities

Prevalence:
FND has an incidence of 4 to 12 per 100,000 population per year in the United States. In a study including outpatients of neurology clinics, 5.4% of patients had a primary diagnosis of FND, while 30% had symptoms described as only somewhat or not at all explained by other organic disease. Overall prevalence of FND is higher in women; women make up 60-75% of the FND patient population.[7]

Symptoms:
Symptoms of FND vary widely. Patients may present with limb weakness/paralysis, gait disorder, dystonia, tremor, functional tremor, myoclonus, sensory or visual disturbances, in

addition to several other potential symptoms. Typically, these symptoms disappear with distraction and increase with attention. In addition, Psychogenic Nonepileptic Seizures (PNES) is another FND presentation. Patients presenting with this condition experience seizures without any accompanied Electromyographic (EMG) activity or Electroencephalographic (EEG) changes shown to indicate epileptic activity. If possible, video EEG tests are indicated for patients with PNES. Capturing a seizure-like episode on video EEG that is not associated with epileptiform activity is currently the gold standard for this diagnosis.[7] However, this may not be accessible to every patient. Another symptom of FND can also be Persistent Postural Perceptual Dizziness or PPPD, which is perceived unsteadiness, and/or dizziness without vertigo.

Diagnosis:

In the past, FND was typically diagnosed by identifying a precipitating trauma or stressor in combination with inorganic movement pattern. Today, positive signs are the key indicator of a phenotype-based diagnosis.[7, 8] Figure 1 from Morgante, Edwards & Espay, 2013 includes a potential algorithm for diagnosing movement disorders, while Box 1 from Espay et al, 2018 shows common positive symptoms associated with a diagnosis of FND.[7, 9]

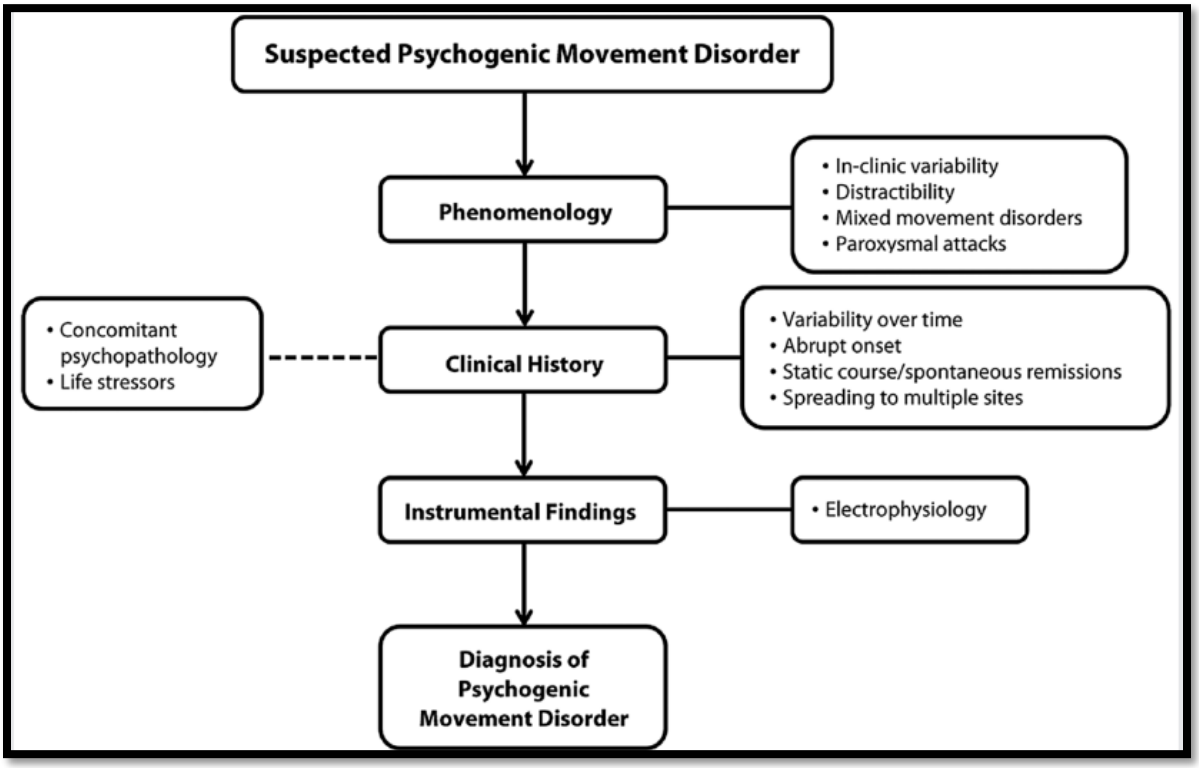

Figure 1: Proposed algorithm when diagnosing FND. Diagnosing FND is a multistep process that should integrate observed phenomenological features, the patient's clinical history, and any instrumental findings. In addition, any relevant history pertaining to the patient's psychopathology should be carefully reviewed either with the patient or in their chart (dotted line).

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Box 1: Common Clinical Features of Functional Movement Disorders

Functional Poverty of Movement (Weakness and Slowness)

General Features

Extreme slowness and fatigue

Giveway weakness

Inconsistency in performance

Leg Weakness

Hoover sign

Hip abductor sign[a]

Able to stand on toes or ankles despite weak plantarflexion or dorsiflexion on bed

Arm Weakness

Drift without pronation

Finger abduction sign[b]

Able to remove objects from bag or put on clothes inconsistent with upper limb examination

Parkinsonism

Lack of speed or amplitude decrement on repetitive tapping (sequence effect)

Variable resistance during passive manipulation (Gegenhalten)

Functional Excess of Movement

Tremor

Variability in frequency

Entrainment or full suppressibility[c]

Tonic coactivation of antagonistic muscles at tremor onset

Pause during contralateral ballistic movements

Whack-a-mole sign[d]

Myoclonus

Entrainment or full suppressibility

Variability in duration and or distribution of jerks or of their latency (if stimulus sensitive)

Predominance of axial or facial jerks

Dystonia

Fixed dystonia at onset

Variable resistance to passive manipulation

Lack of sensory trick

Lack of overflow

Face: tonic pulling of the lips or jaw to 1 side; closed eyelids resist retraction by examiner

Tics

Not fully stereotypical

Interference with speech or voluntary actions

Lack of premonitory urge

Inability to voluntarily suppress tics

Functional Axial Manifestations

Gait

Knee buckling

Dragging gait with forefoot in contact with ground

Excessive slowness or a gait similar to walking on ice

Posture

Variability of positions over time

Inconsistent, uneconomic postures

Balance

No or controlled falls despite excessive swaying when walking

Swaying and imbalance lessened with dual tasks

Speech

Effortful speech

Sudden onset of dysphonia, stuttering, or dysprosody

Foreign accent

[a] Hip abductor sign is weakness of hip abduction in a paretic leg that resolves with contralateral hip abduction against resistance in the normal leg.

[b] Finger abduction sign is weakness of fingers abduction that resolves with contralateral finger abduction against resistance.

[c] Entrainment or ceasing of tremor to externally cued rhythmic movement or an inability to copy movement.

[d] Whack-a-mole sign is the emergence or worsening of an involuntary movement in a separate body part when the initially affected body part is suppressed by someone holding it down.

Prognosis:

The consensus for treatment of FND includes a comprehensive care approach. Physical therapy (PT) is an important and beneficial part of the recovery process. The overall prognosis for FND depends on the level of impairment, time of diagnosis and length of symptom duration. The longer a person goes without an official FND diagnosis, typically the worse the prognosis. Taking unnecessary medications can also negatively affect prognosis.[5, 10] Furthermore, people who have decreased levels of health literacy have a poorer prognosis. Typically, people with FND can experience relapses; physical therapy can help to provide patients with strategies to manage and deal with these relapses.

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Indications for Treatment:
Patients with a diagnosis of FND may or may not be referred to physical therapy initially. Patients with FND are appropriate for physical therapy when there is a motor component to their disorder or they are experiencing PPPD. In addition, patients are more likely to benefit from physical therapy if they have a good understanding of their FND diagnosis and are motivated to improve. Improved buy-in to physical therapy has also been linked to better outcomes.[11]

Contraindications / Precautions for Treatment:
While working with patients with FND, physical therapists must always be aware of general contraindications for exercise such as abnormal heart rate, blood pressure, oxygen saturation levels, etc. While not a specific contraindication or precaution, it is recommended that patients receive a diagnosis of FND from a neurologist prior to beginning a course of physical therapy for optimal results.[11] If the patient has not been diagnosed with FND and the treating physical therapist suspects that a patient's impairments are due to FND, the patient should be referred to a neurologist familiar with functional disorders for further examination.
Other precautions include if a patient does not agree with the FND diagnosis, if they are focused more on other elements of their disability, such as an upcoming litigation or disability paperwork, that they are unable to fully participate in therapy, or if a patient is not buying into physical therapy.[4, 11, 12] While suspected malingering would certainly be an additional precaution for treatment, malingering has been shown to be very rare in the FND population.[6, 13, 14, 15]

Medical History/History of Present Illness:
It is essential to first review the patient's medical record, medical history and any medical questionnaires as reported on paper or in Epic. Review any recent medical imaging, tests, or operative notes. In addition, the following information should be gathered while compiling the patient's history that specifically pertains to FND:

- Initial onset and initial symptoms
- Current symptoms
    - Can include limb weakness/paralysis, gait disorder, dystonia, tremor, myoclonus, sensory disturbances, visual disturbances
- Frequency and day-to-day variance of symptoms
- If there is a pattern to symptoms, i.e. right sided vs. left sided, triggered with certain motion or action
- History of concussion or TBI
- Precipitating emotional event or stressor
- Recent illness, surgery, or hospitalization
- Level of function prior to FND symptoms/diagnosis
- What led the patient to physical therapy
- Discuss if patient has received any formal diagnosis and, if so, how it was explained to them
- If the patient has been formally given a diagnosis of FND, ascertain what is their understanding, expectations, and understanding of the diagnosis. Julie Maggio, PT at

Massachusetts General Hospital created the following set of questions to be asked to patients being evaluated with FND. Their responses can inform clinical impressions as well as guide patient education during treatment sessions.

- Patient's Understanding of Diagnosis
  - How well do you think you understand this diagnosis, rate 0 to 10? (0, not at all to 10, full understanding)
- Patient's Acceptance of Diagnosis
  - Which statement most accurately represents your current acceptance of this diagnosis?
    - I do not think the diagnosis of a FND is correct. I think there is something else wrong with me.
    - I am willing to think about FND as a diagnosis for my problems but am still not sure it is correct.
    - I think the diagnosis of FND is the correct diagnosis.
- Patient Expectations
  - To what extent do you expect to recover from this diagnosis, 0 to 10? (0, not at all to 10, full recovery)

Social History and Prior vs Current Level of Function:

- Home environment/setup
- Assistive devices or other equipment
- Family and social support systems
- Occupation
- Family role
- Community role
- Current and previous exercise routine and leisure activities
- Sleep regiment

Medications:

FND has not been shown to be effectively managed through medication.[6, 10] However, patients may be taking other medications for different diagnoses. With these medications, it is important to note:

- Name, dose, time taken
- Any possible side effects that may interfere with physical therapy

Examination:

Functional Mobility Assessment:

If possible, try to assess patient's gait and movement patterns informally (while they are in the waiting room, walking back to exam room, leaving evaluation) as well as formally in your examination. Be sure to document thoroughly and specifically on patient's functional movement impairment/presentation. In addition, if diverted attention strategies are implemented as part of the evaluation, document the change in performance with quantitative and qualitative descriptors.

- **Gait:** assess both with and, if able to do safely, without patient's assistive device
- **Stair Navigation:** if stairs are part of the patient's normal routine, assess stair navigation by recreating a similar setup to the patient's home environment. Stair navigation can be an important assessment tool, as the automatic, repetitive motion of stairs may cause symptoms to decrease.[11]
- **Transfers:** assess both with and, if able to do safely, without patient's assistive device

Hoover's Test: to assess functional leg weakness; the patient may have difficulty pushing their affected leg down (hip extension), but when they are asked to lift up their unaffected leg, strength in the affected leg returns to normal. Figure 2 from Espey et al 2018 demonstrates a positive Hoover sign when tested in the sitting position.[7]

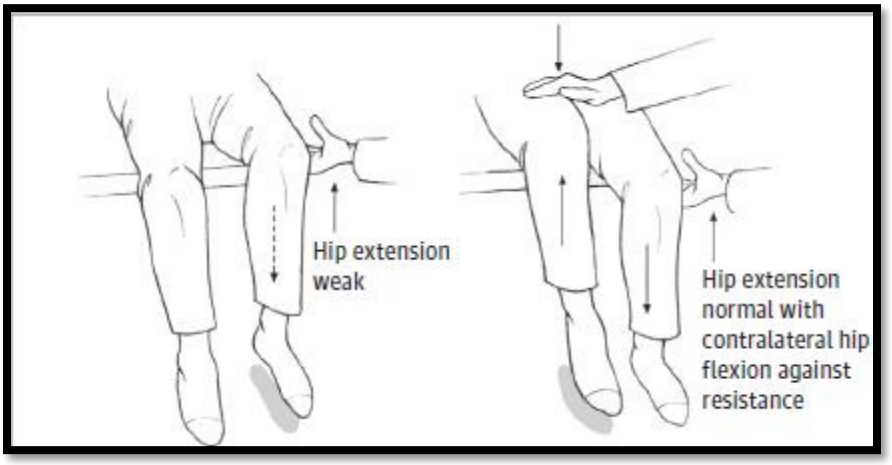

Figure 2: Hoover sign testing for functional leg weakness

Tremor entrainment test: to assess for functional tremor; this is when the shaking of a limb becomes momentarily better either when the person concentrates on mirroring a movement made by the examiner in either the affected limb or in another body part, or when they are asked to copy a rhythmical movement with their unaffected limb. The clinician can then assess if the tremor in the affected hand either 'entrains' to the rhythm of the unaffected hand, stops completely or the patient is unable to copy the simple rhythmical movement.

Pain: record location and descriptors (shooting, throbbing, sharp, dull, ache, etc.) of pain, and pain score on the Visual Analog Scale (VAS); patients with FND may or may not have pain.

Palpation: If patient has pain, palpate painful areas to assess for any tenderness or tissue sensitivity.

ROM: If range deficits exist, measure and document appropriately. Compare to opposite side/limb.

Strength: A general Manual Muscle Test (MMT) screen should be completed of both upper and lower extremities to note any inconsistencies. Test specific muscles of both left and right limbs with the functional abnormality. Note any inconsistences between patient performance on MMT and functional activities. These and other inconsistencies in physical presentation can be used to help explain to the patient that their nerves/muscle are working and intact; they just do not currently have full control over them.

Sensation/Proprioception: Changes in sensation are possible with FND. This can include loss of sensation, abnormal sensation or pain. Of note, sensory changes are often "splitting of midline" that affect half of the patient's face, trunk, or limbs. If patient presents with sensation abnormalities, assess light touch, and vibration sense. Patients with FND may also present with proprioception impairments. This can be tested by having the patient close their eyes while the PT positions a joint (big toe, ankle, knee, forearm, etc.) in space. A patient with intact proprioception will be able to correctly identify what position the joint is in (i.e. bent vs. straight).

Coordination: Patients with FND may present with coordination impairments. If indicated, a full coordination exam should include assessment of rapid alternating movements, finger to nose accuracy, finger to target accuracy, and postural stability.

Vestibular/Oculomotor Screen: Patients with FND may have oculomotor or vestibular dysfunction. An oculomotor exam may be indicated and would include an assessment of: extraocular motion (EOM), smooth pursuit, saccades, and for the presence of spontaneous and gaze evoked nystagmus with and without fixation. Other tests may include Vestibulo-ocular Reflex (VOR) testing via the Head Impulse/Thrust Test and cancellation of the VOR (VORc). Other vestibular tests may also be appropriate pending patient's presentation and symptom complaints. Please refer to the Peripheral Vestibular Hypofunction Standard of Care for further details on vestibular and oculomotor tests and measures.

Functional Outcomes: While there are no set outcome measures established in the literature to track progress for patients with FND, instruments that assess patient level of function (or perceived disability), their quality of life, their objective motor performance, and their overall function are commonly implemented. Moreover, using several outcome measures may be beneficial to more fully encompass the patient's impairments and the effect on his/her life. Given the variety of presentations seen with patients with FND, the specific outcome measures used will likely vary on an individual level. Examples of suggested outcome measures include: Short Form Health Survey - 36 (assesses patient quality of life, with both a physical and mental health component), PHQ - 15 (assesses severity of symptoms), 10 Meter Walk Test, Timed Up and Go, Five Times Sit to Stand, and the 2 Minute Walk Test.[16-17]

Differential Diagnosis: Although physical therapists do not formally diagnose patients with FND, they may be the first clinicians to recognize signs and symptoms in a patient. When that is the case, the patient should be referred to a neurologist who treats patients with FND for a full

workup. While this list is not exclusive, these are conditions that may present similarly to FND obtained from Stone et al 2013.[18]

- Higher cortical gait disturbance
- Acute parietal stroke/pathology
- Stiff person syndrome
- Tics/Tourette's
- Contractures in fixed dystonia
- Myasthenia
- Paroxysmal dyskinesia
- Parkinson's Disease
- Multiple Sclerosis

Assessment:

Problem List:

- Impaired strength/motor control
- Impaired balance/postural control
- Impaired ROM
- Impaired sensation
- Impaired gait
- Impaired functional mobility
- Impaired aerobic capacity/endurance
- Pain
- Oculomotor impairments
- Dizziness

Goals:

Create goals that are attainable and incorporate the patient's own goals. Goals should be measurable and within a specified time period. The time frame may vary depending on the patient's functional status, psychosocial factors, and extent of condition. Goals can include:

- Optimizing and normalizing gait
- Maximizing independence during functional mobility
- Focusing on specific impairments i.e. improving ROM, muscle performance, strength, coordination or endurance, etc.
- Creating a home exercise program that is attainable and feasible for the patient to perform on a regular, consistent basis
- Educating the patient on the diagnosis of FND and symptom management strategies to facilitate normalization of movement

Treatment Planning / Interventions:

Patient education:

There has been much debate with regards to treatment of FND, given the variety of presentations. In all cases, however, the most crucial underpinning of FND treatment across disciplines is assessing the patient's understanding of the diagnosis, acceptance of the diagnosis,

goals, and expectations for recovery.[4] While other health care providers may have already discussed the FND diagnosis with the patient, it is crucial to assess and optimize their health literacy on the subject by clarifying any terminology and the pathophysiology of the diagnosis. Namely, it is important to stress that, while the patient's nervous system is not currently functioning correctly, there is no structural defect or lesion.[4, 11] Table 2 provides examples compiled from Nielsen et al 2014, Nielsen 2016, Maggio & Parlman 2019 on patient-appropriate language when explaining their diagnosis.[4, 11, 17]

Table 2: Patient-Friendly Examples when Explaining FND and the Role of Physical Therapy

- "You have a functional weakness/tremor."
- "Your nervous system is not functioning properly, but it is not damaged. There is a problem in the way your brain is sending messages to your arm/leg."
- "You have a Hoover's sign – this means that when you try to push down on your leg, you are unable to do it. However, when you push your other leg up against my hand, the weak leg turns on and you can push down. This means that the "wiring" is intact, and the problem is your ability to access movements."
- "Your tremor can change when you do another movement. For instance, when you tap your fingers, your tremor subsides or goes away."
- "Functional neurological symptoms are different from other neurologic symptoms in that they can change with attention and distraction."
- "When attention is directed towards the body part or movement, usually the movement gets worse. Some people find that, the more they concentrate on suppressing the unwanted movement, the worse it becomes. This can be very frustrating."
- "Doing this unwanted movement repeatedly over time causes reinforcement of the program, and the pattern can get stuck."
- "Your symptoms fluctuate throughout the day. This is typical for FND and helps us rule in the diagnosis."
- "This is not your fault, but there are things you can do to work on this."
- "We are still not certain exactly what causes FND, in the same way that we are not certain why some people develop Multiple Sclerosis or Parkinson's. The causes are likely to be different in every case."
- "For some people, psychological factors can play a role in their symptoms. When this is the case, it is helpful to see someone in this field. This does not make your symptoms any less real, but is rather another part of your treatment."
- "Physical therapy can help you retrain your movement by changing what you do and how you do it."

Use written resources to solidify topics discussed with the patient and to allow them to further explore their diagnosis independently. This will help them to further their own understanding of their condition. For example, neurosymptoms.org, www.fndhope.org, www.fndaction.org.uk, and Overcoming Functional Neurological Symptoms: A Five Areas

Approach[19] are useful tools health care professionals can utilize to facilitate patient education and that patients should be encouraged to utilize independently.

In addition, it is crucial to reinforce a patient's normal results seen on exam as well as reiterate that there is no structural or anatomical lesion. One common tool utilized in FND literature is to describe the disorder as a "software problem" of the nervous system, as opposed to damage to the "hardware".[3, 4, 11] Furthermore, explaining to the patient how a variety of factors that can trigger FND and the importance of working with multiple health care providers across disciplines to address their symptoms will help promote the importance of interdisciplinary care and collaboration.

Finally, it is essential to frame this discussion with the explicit understanding that their diagnosis and presenting symptoms are both common and real. It is important to encourage them that physical therapy has been effective for other patients with FND in re-training the nervous system to help gain back control of their movement patterns. FND should never be described as a diagnosis of exclusion, but rather one that is comprised of specific clinical features, such as a positive Hoover's sign or tremor entrainment.[3, 6] Moreover, using language such as "functional" over vocabulary such as "conversion", "somatization" and "psychogenic" can help to reframe this condition from psychological towards one in which biopsychosocial factors have manifested into physical symptoms.[4, 20] Clinicians should emphasize that, while these symptoms are "learned movement patterns," and thus amenable to treatment, they are also outside of the patient's control.[4] For example, patients can be shown their Hoover's sign or tremor entrainment to illustrate the potential of reversing their presented symptoms or impairments.[21] By framing FND as a miscommunication between the brain and the body that manifests in tangible symptoms that have the potential of reversibility, clinicians can both acknowledge the validity and existence of these symptoms, while also instilling patient confidence in the role of rehabilitation.

Interventions most commonly used:

Given the vast variety of clinical presentations as well as the various settings where a patient can be treated and their frequency and duration guidelines, specific interventions will vary widely. However, below are several treatment strategies compiled from various literature on how to guide treatment sessions:

- **Limit "hands on" treatment** – although the majority of these patients seem to present as fall risks, it is essential to foster patient independence and increased confidence in their ability to perform certain activities. For example, when a patient is performing a transfer, avoid manually assisting them as much as possible or donning a gait belt, as the patient will likely anticipate that they will be unable to perform this activity and promote avoidance patterns.[4, 11, 17] Instead, encourage them to try on their own initially and that you have confidence that they can be successful.
    - Of note, the risk of falls in the FND population is somewhat controversial. It is a common perception that, despite presented weaknesses, tremors, or gait abnormalities, patients with FND typically will not suffer falls.[4, 11] Instead, it is thought to be more likely that these patients will either maintain their balance or

demonstrate a controlled descent pattern. With patients for whom it has been determined to be safe, it is advised to encourage patient independence and limit unnecessary assistance or restrictions. However, studies have reported that injuries can occur because of falls in this population,[22] and thus clinicians should closely examine a patient's balance during the initial examination and, more importantly, in response to tasks or exercises prescribed to a patient during treatment sessions. Based on their response, interventions can then be optimally tailored to best challenge the patient while also ensuring their safety.

- **Facilitate patient control over movement patterns** – the literature has shown that patients tend to overestimate the presence of a functional tremor, when compared to objective measurements chronicling their symptoms.[11] Instead, functional tremors are rarely continuous and typically will greatly lessen or cease completely when the patient stops attending to it. As a result, patient movement patterns should be observed in the context of other environments and activities (i.e. in the waiting room, throughout their exam, while conversing, when performing a certain cognitive or motor task, such as when answering a questionnaire or throwing a ball, etc.) and making note of how their movement patterns change. Explaining and demonstrating to the patient how their movement can normalize or minimize can aid in guiding treatments to best address their symptoms. Videotaping patients can also help reinforce these patterns with tangible evidence.[4] When treating patients who present with unwanted movement patterns or tremors, a key approach is to encourage voluntary control of the involuntary pattern. For example, instructing a patient to actively mimic their tremor and progress towards decreasing the frequency as well as consciously eliminating and ceasing the tremor for a period of time.[17] In addition, incorporating visual feedback (such as performing an exercise in front of a mirror) can instill a sense of control in the patient.[2, 4, 11]

- **Addressing maladaptive movement patterns** – physical therapists can distinguish and work to change any maladaptive behavior patterns that exacerbate patient symptoms. For example, patients may present with certain avoidance patterns or with "all or nothing" behaviors that reinforce unwanted symptoms.[11, 23] Through an ongoing discussion with patients and their family, clinicians can create activity modification strategies to instill patient independence while also avoiding any stressors that may exacerbate symptoms. Utilizing concepts such as the "mind body overload" can engage the patient in possible psychological/behavior components to their diagnosis that affect their motor symptoms and encourage the patient to find time to prioritize themselves and their own well-being.[24]

- **Redirect attention** – exploring different variables that trigger or control movement strategies can be a helpful tool. For example, some patients find that an added cognitive task can help to minimize or eliminate their symptoms, such as having a conversation, counting, reading a book, writing, or listening to music. In addition, diverting attention from abnormal movements through activities performed simultaneously with uninvolved limbs can be helpful. Examples include tapping the uninvolved lower extremity or

clapping hands together while walking, snapping fingers, twirling a stone, or moving keys in their pocket.

- **Sequential learning** – one common approach towards retraining movements is to return to the basic components of a movement task that a patient can perform without any symptoms and then slowly progress to reshaping normal patterns.[2, 11, 25] One example of this is to begin to address a functional gait disorder by initially focusing on gentle weight shifting, which can then be progressed towards unweighting each foot, and then slowly incorporate advancing each limb in a smooth and reciprocal manner.[4] This approach enables the therapist to help retrain a patient's movement without utilizing any unwanted maladaptive movement patterns. As the patient is mastering the task, clinicians should utilize motor learning principles such as repetition, appropriate feedback that encourages learning, and gradually increasing the difficulty of the task by altering the environment (open vs closed), speed, and cognitive demands.[4, 26]

- **Gradually eliminating external support** – it has been shown that muscle weakness is rarely a problem with FND, but rather the patient presents with deficits in movement control.[4] Moreover, utilizing a walking aid may trigger overdependence and could possibly result in secondary impairments such as deconditioning.[4] Physical therapists should instead encourage lower limb weight bearing to promote automatic activation of proximal musculature and facilitate patient independence. If the patient does require additional support for safety, utilizing a counter top can allow the therapist to gradually reduce the amount of external support (progressing from bilateral hand support to one finger support) as the patient performance improves. In addition, by preventing the patient from putting excessive weight through a device and instead demonstrating to them that they can successfully stand with just finger-tip support, the patient will build confidence in their capabilities.

- **Encouraging self-management** – as with any pathology addressed in the physical therapy setting, patient self-management of symptoms is essential towards instilling patient confidence and facilitating successful outcomes. Utilizing the workbook Overcoming Functional Neurological Symptoms: A Five Areas Approach or encouraging the patient to write in a journal can facilitate improved patient mindfulness and self-awareness of their condition.[19] Contents can include (but are not limited to): patient reflections on their diagnosis, maladaptive patterns and any aggravating factors to their symptoms, useful strategies employed during treatment sessions that can alleviate or manage their symptoms, prescribed exercises (and participation rates), and their goals (and the progress they have made towards these goals).[4, 27]

In addition to specific interventions to address the patient's presenting impairments, as many patients also present with a level of deconditioning due to decreased activity participation, non-specific graded exercise can address reduced exercise tolerance.[4, 11, 28] Moreover, graded exercise has been associated with improved outcomes in patients who present with chronic pain,

which is a common symptom in many patients who present with FND.[29] Clinicians should tailor intensity of exercises based on the patient's response in order to appropriately challenge the patient without exacerbating their symptoms. Table 3 lists interventions cited in different literature on specific treatment ideas when patients present with specific impairments.[4, 11]

Table 3: Intervention Techniques Targeting Specific Symptoms of FND

Symptom	Movement Strategy
Leg weakness	Early weight bearing with progressively less upper limb support, e.g. 'finger-tip' support, preventing the patient from taking weight through walking aids/supporting surfaces. Standing in a safe environment with side to side weight shift. Crawling in 4 point then 2 point kneeling Increase walking speed Treadmill walking (with or without a body weight support harness and feedback from a mirror).
Ankle weakness	Elicit ankle dorsiflexion activity by asking patient to walk backwards, with anterior/posterior weight shift while standing or by walking sliding feet along the floor. Use of electrical muscle stimulation
Upper limb weakness	Weight bear through the upper limbs, weight bearing with weight shift or crawling. Minimise habitual non-use by using the weak upper limb functionally to stabilise objects during tasks, for example stabilise paper when writing, a plate when eating. Practice tasks that are very familiar or important to the individual, that may not be associated with symptoms e.g. use of mobile phone, computer, tablet. Stimulate automatic upper limb postural response by sitting on an unstable surface such as a therapy ball, resting upper limbs on a supporting surface.
Gait disturbance	Speed up walking (in some cases this may worsen walking pattern). Slow down walking speed. Walk by sliding feet forward, keeping plantar surface of foot in contact with the ground. (i.e. like wearing skis) Progress towards normal walking in graded steps. Build up a normal gait pattern from simple achievable components that progressively approximate normal walking. For example – side to side weight shift, continue weight shift allowing feet to "automatically" advance forward small amounts, progressively increase this step length with the focus on maintaining rhythmical weight shift rather than the action of stepping. Walk carrying small weights / dumbbells in each hand. Walking backwards or sideways. Walk to a set rhythm (e.g. in time to music, counting: 1,2,1,2…). Exaggerated movement (e.g. walking with high steps). Walking up or down stairs (this is often easier that walking on flat ground).
Upper limb tremor	Make the movement "voluntary" by actively doing the tremor, change the movement to a larger amplitude and slower frequency then slow the movement to stillness. Teach the patient how to relax their muscles by actively contracting their muscles for a few seconds then relaxing. Changing habitual postures and movement relevant to symptom production. Perform a competing movement For example clapping to a rhythm or a large flowing movement of the symptomatic arm as if conducting an orchestra. Focus on another body part, for example tapping the other hand or a foot. Muscle relaxation exercises. For example progressive muscle relaxation techniques, EMG biofeedback from upper trapezius muscle or using mirror feedback.
Lower limb tremor	Side to side or anterior-posterior weight shift. When the tremor has reduced slow weight shift to stillness. Competing movements such as toe tapping. Ensure even weight distribution when standing. This can be helped by using weighing scales and or a mirror for feedback. Changing habitual postures relevant to symptom production. For example reduce forefoot weight bearing.
Fixed dystonia	Change habitual sitting and standing postures to prevent prolonged periods in end of range joint positions and promote postures with good alignment. Normalise movement patterns (e.g. sit to stand, transfers, walking) with an external or altered focus of attention (i.e. not the dystonic limb). Discourage unhelpful protective avoidance behaviours and encourage normal sensory experiences (e.g. wearing shoes and socks, weight bearing as tolerated, not having the arm in a "protected" posture. Prevent or address hypersensitivity and hypervigilance. Teach strategies to turn overactive muscles off in sitting and lying (e.g. by allowing the supporting surface to take the weight of a limb. Cushions or folded towels may be needed to bring the supporting surface up to the limb where contractures are present). The patient may need to be taught to be aware of maladaptive postures and overactive muscles in order to use strategies. Consider examination under sedation, especially if completely fixed or concerned about contractures. Consider a trial of electrical muscle stimulation or functional electrical stimulation to normalise limb posture and movement.
Functional Jerks/ Myoclonus	Movement retraining may be less useful for intermittent sudden jerky movements. Instead look for self focused attention or premonitory symptoms prior to a jerk that can be addressed with distraction or redirected attention. When present, address pain, muscle over-activity or altered patterns of movement that may precede a jerk.

Frequency & Duration:
While studies have varied in terms of frequency and duration recommendations, generally it is appropriate to see patients 1-2 times per week for a duration of 12-16 weeks.[11] However, if patients live far from the clinic, the frequency can be altered to fit their specific needs. Generally, it is beneficial to see these patients for a full hour due to the complexity of their presentation. As the patient progresses, their frequency and duration can be modified to best suit their specific needs.

Patient/Family Education:
As previously discussed, patient education is vital when treating FND. In addition, their friends' and family's knowledge and buy-in of the diagnosis can greatly affect the patient's prognosis and the benefit of therapy on their symptoms. In addition, clinicians should share key treatment principles and successful strategies employed in the clinic as well as the importance of reducing reinforcement of atypical movement patterns to encourage patient independence as much as possible.[11] Oftentimes, caregivers will assist the patient at a greater level than needed to avoid perceived risks or harm to the patient. However, this may decrease a patient's level of confidence as well as potentially affect the patient-caregiver relationship due to increased strain or caregiver burnout. While family support is essential and should always be encouraged, it is important for the patient and family members to understand that the patient needs to practice difficult and challenging tasks in order to improve. Ideally, this will ultimately lead towards increased patient independence and facilitate positive and healthy relationships between the patient and family.[30]

Interdisciplinary Collaboration/Care:

- **Neurologists -** As mentioned above, patients who first receive a clear diagnosis of FND by a physician prior to starting physical therapy are more likely to achieve optimal patient outcomes. Most often, this physician is a neurologist who has conducted a thorough neurological exam and relayed clinical findings that rule in the diagnosis to the patient. Physical therapists should communicate closely with the patient's neurologist to assess and share the patient's understanding and confidence in this diagnosis. Without a confirmed diagnosis from a neurologist and acceptance from the patient, it is very unlikely that a patient will make effective progress with physical therapy.[31]

- **Occupational Therapists (OT)** – While there is limited published literature on evidence-based assessment and treatment guidelines, it has been repeatedly indicated that occupational therapy is an integral member of the health care team when it comes to effectively treating patients who present with FND. [2, 6, 7, 13, 23, 30, 32, 43] Occupational therapists address the physical and psychological barriers inhibiting success in daily activities through engagement in functional activities.[30] More specifically, occupational therapists are trained in mental health training and facilitating patient participation in functional activities, which can aide in symptom management, coping strategies, and changing behavior patterns to improve function.[32]

  In addition, patients with FND often endorse sensory modulation dysfunction. The Sensory Integration Theory was developed by Jean Ayers in the 1970s and is defined

as an individual's ability to process sensory information both within himself or herself as well as in the external environment to adapt and interact effectively in their daily life.[33] Individuals require intact sensory modulation to respond to sensory stimuli with an appropriate behavioral response. Impaired sensory modulation can occur when sensory stimuli do not invoke a specific graded behavioral response, leading to an array of maladaptive emotional responses, poor learning, and decreased cognitive performance. For example, many individuals with FND will complain of hypersensitivity to sounds, moving targets, and crowded environments, and have limited coping strategies to combat their sensitivity.[32] Sensory-based interventions can thus aid in improving sensory processing, body awareness, and emotional regulation, as well as promoting normal movement patterns.[30] Moreover, occupational therapists can work with patients to implement specific interventions that can successfully modulate sensory information during daily activities as well as incorporate sensory tools and strategies that a patient can use when they are symptomatic or are experiencing early warning symptoms of a psychogenic nonepileptic seizure. These tools and strategies can lead to improved participation in daily activities and responsibilities and help facilitate patient control over their symptoms.

- **Speech-Language Pathologists (SLP)** – Functional Speech Disorder (FSD) is reportedly seen in up to 50% of patients diagnosed with FND.[34, 35] While clinical features can range widely, patients with FSD may present with disfluency, stuttering, foreign accent syndrome, childlike speech, and inconsistent hypernasality, all in the absence of any anatomical lesion or aphasia.[35, 36] In addition, patients diagnosed with FND may present with swallowing, language, and cognitive disorders, which also fall under the scope of SLP practice. Speech-Language Pathologists can work with patients to increase their self-awareness of their speech impairments, modify their speech output, and support carryover across various communication settings.

- **Psychiatrists/Psychologists** – When patients present with psychogenic nonepileptic seizures (PNES), it is essential that a trained neuropsychiatrist work with them to address patient control over their seizures. As mentioned above, patients with FND are generally more likely to have a psychiatric comorbidity when compared to the general population and may also benefit from specialized psychiatric treatment.[37, 38] Different approaches to treating patients with PNES have been used with good results, including Cognitive Behavioral Therapy (CBT), CBT-based self-guided help via workbooks, psychodynamic therapy, hypnosis, and eye movement desensitization and reprocessing (EMRD).[39] In a recent RCT of 66 patients with dissociative seizures, it was shown that CBT plus standard medical care (SMC) was superior to SMC alone.[40] Specific intervention approaches mentioned in the study include intervening when patients began to exhibit warning signs indicative of a future seizure, reducing certain avoidance patterns, and helping address maladaptive thoughts and behavior patterns related to patient's self-esteem, well-being, and ability to control their seizures. Of note, anti-epileptic drugs are not typically given to treat PNES, and some studies have instead observed a harmful

effect when prescribing patients with medication.[10, 39] In general, medications have a limited role for FND and their associated symptoms. The one caveat is that patients with some psychiatric disorders may benefit from medications to best manage those conditions.[41]

- **Social Work (LSW)** – Many of these patients present with complex biopsychosocial factors intertwined with their FND diagnosis. A social worker can work closely with the patient to provide counseling and ensure that they feel adequately supported. In addition, they can work closely with the patient and their family to ensure that needs are accounted for and to help the family obtain appropriate resources to optimize the patient's treatment and recovery. LSW can also be trained to perform CBT when patients present with PNES.

Re-evaluation:
A re-evaluation in the form of a progress note is required every 30 days by insurance. If patient has a change in status, a re-evaluation may be appropriate prior to 30 days. Examples of a change in status include:

- Patient has a fall which results in injury
- Patient has a significant change in functional level or symptoms
- Goals set by PT at initial evaluation are met prior to 30 days

Discharge Planning:
Commonly expected outcomes at discharge:

It can be very difficult to predict patient response to therapy and the level of function that they are expected to reach. As a result, this can make the discharge process difficult at times. It is essential to recognize that, while therapy has been shown to have a proven beneficial role in the rehabilitation of many patients with FND, these individuals can be a very challenging population to treat due to the constellation of presenting symptoms, the complex biopsychosocial interplay within the patient, and the dynamics of their support systems. Failure to progress can be due to a number of reasons.

Some factors contributing to lack of progress include decreased acknowledgement/acceptance of the diagnosis as well as decreased buy-in from the patient, chronicity of symptoms, lack of communication between specialists, decreased patient participation in their home exercise program/treatment strategies outside of the clinic, and level of social support.[12, 17, 42] While the patient may not fully return to their previous level of function at time of discharge, the goal of physical therapy is to improve the patient's self-management of symptoms and provide them with a set of strategies on how to promote normal movement patterns and optimize their ability to participate in activities at home, work, and in their community. It is also important to note that, if a patient is discharged due to lack of progress, they could still benefit from physical therapy in the future should some of the above variables change, such as greater acceptance of their diagnosis and buy-in of the role of physical therapy.[12]

As a result, discharge planning should begin at treatment onset to establish expectations and minimize confusion or frustration between the therapist and the patient. Studies have

endorsed creating "treatment contracts" on patient attendance and participation as well as inform the patient on anticipated frequency and duration of physical therapy care.[2, 4, 22]

Transfer of Care:

While the intended audience for this standard of care is physical therapists in the outpatient setting, the underlying themes regarding FND examination and treatment can be applied across the spectrum of health care settings. Each setting offers unique pros and cons when treating patients with FND, with regards to frequency and duration of care and available resources.[43-45]

When a patient is transitioning to a different health care setting, health care providers should communicate closely to facilitate a seamless transition. Documentation should be thorough when detailing the patient's history and their clinical examination, imaging, and other workups. In addition, providers should include information on patient education regarding their diagnosis and the patient response and buy-in. Finally, documentation should include a summary of their plan of care, useful resources incorporated, patient responses to different intervention approaches, health care professions involved in a patient's care team, as well as other health care professions that a patient may benefit from seeing to allow the next clinician to most effectively create a treatment plan to maximize their quality of care.

If the patient is going out of network in which documentation may not be relayed electronically, providing written documents of these different elements to the patient can help to ensure that future clinicians are fully informed.

Patient's Discharge Instructions:

As mentioned above, while the patient may not fully return to their premorbid level of function, the goal should be for patients to have created a "toolbox" of strategies on how to avoid maladaptive patterns and promote normal movement. As the patient nears discharge, they should be transitioned into the self-management phase of their treatment, which can be facilitated by decreasing the frequency of their visits.[11] At the time of discharge, provide patients with a list of written strategies and exercises to help facilitate independent management. This information should also be incorporated into the patient's medical record for other health professionals to access to illustrate the patient's progress made in physical therapy and their status at discharge. As setbacks or relapses can be common with FND, patients should be advised on the importance of frequent participation in their exercise program and how they can best utilize their exercise toolbox when they are experiencing a symptom exacerbation.

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