Tremor: an update
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Consensus Statement on the Classification of Tremors, From the Task Force on Tremor of the International Parkinson and Movement Disorder Society

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MDJ- 2018
The definition of tremor has not changed

- An involuntary, rhythmic, oscillatory movement of a body part
- Problem: the only perfectly rhythmic tremor is primary orthostatic tremor

How rhythmic must an oscillation be?
Tremor: - 4 aspects to pay attention to

• Phenomenologically (when does it appear?)
  – *Rest*: occurs when affected body part is at rest
  – *Postural*: occurs when arms are outstretched
  – *Kinetic*: occurs during movement of body part
    (intention tremor: exacerbation of kinetic tremor
     towards the end of a goal directed movement)
  – *Task or position specific*: on certain tasks e.g. writing, orthostatic- on standing
Tremor - 2\textsuperscript{nd} aspect

Anatomic distribution (which body parts are predominantly affected):

- Limb- arms / legs; unilateral or bilateral; symmetric or asymmetric
- Head
- Tongue
- Trunk
3rd Aspect: Pay attention particularly for any associated features particularly look for these 4 associated signs if present

• Dystonia
• Cerebellar
• Parkinsonism- look for bradykinesia
• Reflexes- & sensory
4th aspect

- By history:
- Tremorogenic drugs
- Family history
- Alcohol response
Why do we pay attention to when the tremor occurs

Resting tremor:
- Parkinson’s disease and other parkinsonian disorders, dystonic tremor, one component of rubral tremor, severe ET

Postural:
- Essential tremor, Physiological
- PD, Dystonic tremor etc.

Kinetic:
- Cerebellar disorders
Why do we pay attention to the associated features

• The concept of “Isolated” versus “Combined” tremor
Axis 1: clinical features

- **historical features**
  - age at onset
  - temporal onset and evolution
  - past medical history
  - family history
  - alcohol and drug sensitivity

- **tremor characteristics**
  - body distribution
  - activation conditions
  - tremor frequency

- **associated signs**
  - signs of systemic illness
  - neurologic signs
  - soft signs

- **additional laboratory tests**
  - electrophysiological tests
  - structural imaging
  - receptor imaging
  - serum and tissue biomarkers
## IPMDS Task Force on Tremor Consensus Statement

### Table 1. Tests that are useful for delineating Axis 1 syndromes (1, 2, and 3) and for elucidating Axis 2 etiologies (2, 3, and 4)

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Electrophysiological tests</td>
<td>Surface EMG to document the presence of tremor, measure tremor frequency, and evaluate EMG burst morphology and rhythmicity (e.g., to identify myoclonus and asterixis)</td>
</tr>
<tr>
<td></td>
<td>Fourier analysis of accelerometric and EMG recordings with and without loading the hand with a weight to identify mechanical-reflex and central neurogenic tremors</td>
</tr>
<tr>
<td></td>
<td>Fourier and coherence analysis of EMG recordings from multiple limbs to diagnose primary orthostatic tremor</td>
</tr>
<tr>
<td>2. Structural imaging</td>
<td>MRI, CT for detection of lesions, metabolic disorders, etc.</td>
</tr>
<tr>
<td>3. Receptor imaging</td>
<td>Dopamine and serotonin transporter imaging for disturbances or deficiency syndromes</td>
</tr>
<tr>
<td>4. Serum and tissue markers</td>
<td>Metabolic blood tests, tests for infections, genetic tests, etc.</td>
</tr>
</tbody>
</table>
(b) **Axis 2: etiology**

- Acquired
- Genetically defined
- Idiopathic
  - Familial
  - Sporadic

**FIG. 1.** (A) Axis 1 classification of tremor is based on clinical features from the patient’s medical history and physical examination. Additional tests are sometimes useful. (B) Axis 2 classification is etiology. A syndrome in Axis 1 may have multiple etiologies, and a particular etiology may produce multiple syndromes.
**TABLE 2. Etiological causes of tremor (selection)**

<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurodegenerative disease</td>
<td>PD, Multiple system atrophy, Corticobasal degeneration, PSP, Genetic disorders: genes causing predominantly parkinsonism, Genes causing frontotemporal dementia with parkinsonism, Genes causing predominantly dystonia, Neuroferritinopathy, Spinocerebellar ataxies, Genes causing Fahr’s disease, Genes causing peripheral neuropathies that produce tremor, Wilson’s disease, X-linked dystonia parkinsonism/Lubag, Lesch-Nyhan’s syndrome, Fragile X-associated tremor/ataxia syndrome, Spinal muscular atrophy</td>
</tr>
<tr>
<td>Chromosomal aneuploidy</td>
<td>XXY, XXY (Klinefelter’s syndrome), and XYYY syndromes</td>
</tr>
<tr>
<td>Mitochondrial genetic disorders</td>
<td>Leigh’s syndrome, Mitochondrial polymerase gamma mutations</td>
</tr>
<tr>
<td>Infectious and other inflammatory diseases</td>
<td>Demyelinating diseases such as multiple sclerosis, Encephalitis lethargica, subacute sclerosing panencephalitis, HIV, Tuberculosis, syphilis, measles, typhus, neuroborreliosis, Bacterial or viral encephalitis, Antineuronal antibody disease</td>
</tr>
<tr>
<td>Endocrine and metabolic disorders</td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td></td>
</tr>
<tr>
<td>○ Nephrotic or liver failure</td>
<td></td>
</tr>
<tr>
<td>○ Hyperthyroidism</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neuropathies and spinal muscular atrophies</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Kennedy’s syndrome</td>
</tr>
<tr>
<td>○ Guillain-Barre’s syndrome</td>
</tr>
<tr>
<td>○ Gammopathy-induced neuropathies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Toxins</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Mercury</td>
</tr>
<tr>
<td>○ Lead</td>
</tr>
<tr>
<td>○ Manganese</td>
</tr>
<tr>
<td>○ Arsenic</td>
</tr>
<tr>
<td>○ Cyanide, DDT, CO</td>
</tr>
<tr>
<td>○ Napthalene</td>
</tr>
<tr>
<td>○ Toluene</td>
</tr>
<tr>
<td>○ Lindane</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Anticonvulsants: valproate, carbamazepine, phenytoin</td>
</tr>
<tr>
<td>○ Tetrabenazine, antidepressants, sympathomimetics, bronchodilators, beta-2 agonists</td>
</tr>
<tr>
<td>○ Lithium</td>
</tr>
<tr>
<td>○ Neuroleptics, metoclopramide</td>
</tr>
<tr>
<td>○ Amiodarone</td>
</tr>
<tr>
<td>○ Thyroid hormone replacement</td>
</tr>
<tr>
<td>○ Anticancer drugs: vincristine, cisplatin, paclitaxel, doxorubicin, cytosine arabinoside, ifosfamide, tacrolimus, 5-fluorouracil, methotrexate</td>
</tr>
<tr>
<td>○ Drug and alcohol withdrawal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Brain neoplasms</td>
</tr>
<tr>
<td>○ Brain injury: head trauma, brain surgery, and electrical injury</td>
</tr>
<tr>
<td>○ Vascular: Ischemia, hemorrhage, and arteriovenous malformations</td>
</tr>
<tr>
<td>○ Anxiety and stress</td>
</tr>
<tr>
<td>○ Fatigue</td>
</tr>
<tr>
<td>○ Cooling</td>
</tr>
<tr>
<td>○ Trauma of peripheral tissues</td>
</tr>
<tr>
<td>○ HIV, human immunodeficiency virus.</td>
</tr>
</tbody>
</table>
The concept of “isolated” and “combined” tremor

In addition to characterizing tremor, the physical exam is devoted to the identification of associated or concomitant signs that may aid in clinical diagnosis. We propose two broad categories of tremor in Axis 1: isolates tremor in which tremor is the only abnormal sign and combined tremor in which other abnormal signs are present. Combined tremor may occur with other neurological signs (e.g., dystonic postures, rigidity, bradykinesia, or myoclonus) or with relevant systemic signs (e.g., Kayser-Fleischer ring, hepatosplenomegaly, or exophthalmos).
Examples of Axis 1 classification

**Isolated tremor syndromes**
- Essential tremor
- Task-specific tremor
- Primary orthostatic tremor

**Combined tremor syndromes**
- Dystonic tremor
- Rest tremor
- Bradykinesia
- Rigidity
- Tremor with ataxia
FIG. 3. Axis 1 tremor syndromes. Tremor syndromes are listed in this figure according to the predominant presenting symptoms.
Essential tremor
1) isolated tremor syndrome of bilateral upper
term action tremor
2) at least 3 years' duration
3) with or without tremor in other locations (e.g.,
head, voice, or lower limbs)
4) absence of other neurological signs, such as
dystonia, ataxia, or parkinsonism.

It is important to emphasize that the definition of
ET in Axis 1 allows for the existence of multiple etio-
logies for this common syndrome. Patients frequently
have a family history, and small doses of alcohol may
improve the tremor. However, these clinical features
are not consistent enough to be included in the defini-
tion of ET. It was discussed to include onset of tremor
in the upper limbs as a further criterion, but there are
no convincing data that support this criterion. Some
studies have included patients with neurological signs
of uncertain relationship to tremor (i.e., “soft neuro-
logical signs”), such as mild memory impairment,
impaired tandem gait, and subtle body posturing that
could be dystonic. There is no consensus on which of
these additional signs are acceptable within the defini-
tion of ET.

Essential tremor plus: Tremor with the charac-
teristics of ET and additional neurological signs of
uncertain significance such as impaired tandem
gait, questionable dystonic posturing, memory
impairment, or other mild neurological signs of
unknown significance that do not suffice to make
an additional syndrome classification or diagnosis.
ET with tremor at rest should be classified here.

The ET plus syndrome does not include other clearly
defined syndromes like dystonic tremor and task-
specific tremor.

Exclusion criteria for ET and ET plus
- Isolated focal tremors (voice, head)
- Orthostatic tremor with a frequency >12 Hz
- Task- and position-specific tremors
- Sudden onset and step-wise deterioration
ET is a syndrome with multiple etiologies.

• There is genetic heterogeneity.

• Many cases appear to be sporadic.

• It is an early phenotype of hereditary dystonia (eg, ANO3), hereditary ataxia (eg, SCA12), and Parkinson disease.

Deuschl et al. *Mov Disord* 2015; 30: 1327-34
Stamelou et al. *Mov Disord* 2014; 29: 928-934
ET plus “soft signs”

1. Rest tremor or questionable rest tremor
2. Impaired tandem gait
3. Questionable dystonic posturing of the hands, head, etc.
4. Memory impairment
5. Mild sensory neuropathy
6. Markedly asymmetric upper limb tremor
7. Jerky tremor

Strongly discouraged.
Tremor Investigation Group (TRIG) 1990

Validity of subtle (soft) signs of dystonia?

Courtesy Roger Elble
ET plus is more common than ET?

Cohort of patients with lower limb tremor

<table>
<thead>
<tr>
<th>Previous tremor diagnosis</th>
<th>n</th>
<th>New tremor classification</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential tremor</td>
<td>133</td>
<td>Essential tremor</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Essential tremor-plus</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indeterminate tremor</td>
<td>3</td>
</tr>
<tr>
<td>Drug-induced parkinsonian with antecedent essential tremor</td>
<td>5</td>
<td>Drug-induced parkinsonian with antecedent essential tremor</td>
<td>5</td>
</tr>
<tr>
<td>Parkinsonian tremor</td>
<td>30</td>
<td>Classic parkinsonian tremor</td>
<td>30</td>
</tr>
<tr>
<td>Parkinsonian tremor with antecedent essential tremor</td>
<td>10</td>
<td>Classic parkinsonian tremor with antecedent essential tremor</td>
<td>10</td>
</tr>
<tr>
<td>Dystonic tremor</td>
<td>58</td>
<td>Dystonic tremor</td>
<td>58</td>
</tr>
<tr>
<td>Tremor associated with dystonia</td>
<td>6</td>
<td>Tremor associated with dystonia</td>
<td>6</td>
</tr>
<tr>
<td>Psychogenic tremor</td>
<td>7</td>
<td>Functional tremor</td>
<td>7</td>
</tr>
<tr>
<td>Cerebellar tremor</td>
<td>13</td>
<td>Intention tremor</td>
<td>13</td>
</tr>
<tr>
<td>Holmes tremor</td>
<td>4</td>
<td>Holmes tremor</td>
<td>4</td>
</tr>
</tbody>
</table>

Rajalingam et al. *Parkinsonism Relat Disord* 2018; 56: 109-110
A 69 year old man with a 10 year history of worsening tremor – possible family history in mother late in her life – mild benefit with alcohol
Clinical example

Indeterminate tremor
- Isolated bilateral upper extremity tremor for 1 yr.
- Strong Fam. Hx

ET
- Action tremor in the head, voice and upper limbs

ET plus
- Increased tremor
- Strained voice
- Slight head tilt

Antecedent ET

Dystonic tremor
- Increased tremor
- Strained voice
- Cervical dystonia

Idiopathic Familial

Idiopathic Familial

Idiopathic Familial

ANO3 mutation

ANO3 dystonia

Stamelou et al. Mov Disord 2014; 29: 928-934.

Axis 1 classifications may change.
FIG. 3. Axis 1 tremor syndromes. Tremor syndromes are listed in this figure according to the predominant presenting symptoms.
Isolated Focal Tremors

Several syndromes of focal tremors other than hand tremor are well described. There is ongoing debate whether these tremors are similar in pathophysiology to ET\textsuperscript{2} or dystonia.\textsuperscript{5,48}

Isolated voice tremor is a visible and/or audible tremor of the vocal apparatus.

Isolated head tremor is a shaking of the head in yes-yes, no-no, or variable directions.

Head tremor is common in the context of ET. It is also a common manifestation of tremulous dystonia.\textsuperscript{48} The relationship between isolated head tremor and focal tremulous cervical dystonia is a topic of ongoing controversy.

There are other rare focal tremors that may occur in the absence of other neurological signs, such as hereditary geniospasm,\textsuperscript{50} isolated jaw tremor, isolated tongue tremor, rabbit syndrome, and tremor during smiling.\textsuperscript{51,52}
Other Axis 1 Isolated Tremor Syndromes

*Isolated segmental postural or kinetic tremor syndromes* commonly involve the upper limbs, but also may involve the head, voice, tongue, and face.

Many patients with this syndrome ultimately fulfill the criteria for ET. Some patients later develop focal or segmental dystonia that is idiopathic or attributed to genetic abnormalities such as anocutatin 3 (ANO3). Age of onset and family history may help to identify these cases. Other patients suffer from enhanced physiological tremor.
*Isolated rest tremor syndromes* most commonly occur in an upper or lower limb or as a hemitremor, but may occur elsewhere (e.g., lips, jaw, or tongue). It is crucial to determine, using Axis 1 characteristics, whether the rest tremor is isolated or combined with other clinical features.
FIG. 3. Axis 1 tremor syndromes. Tremor syndromes are listed in this figure according to the predominant presenting symptoms.
Orthostatic tremor - may be difficult to visualise as very fast – but you could listen to it!
Rubral tremor
FIG. 3. Axon 1 tremor syndromes. Tremor syndromes are listed in this figure according to the predominant presenting symptoms.
A word on treatment aspects
ABSTRACT: **Background:** Essential tremor is one of the most prevalent movement disorders. Many treatments for essential tremor have been reported in clinical practice, but it is uncertain which options have the most robust evidence. The International Parkinson and Movement Disorder Society commissioned a task force on tremor to review clinical studies of treatments for essential tremor.

**Objectives:** To conduct an evidence-based review of current pharmacological and surgical treatments for essential tremor, using standardized criteria defined a priori by the International Parkinson and Movement Disorder Society.

**Methods:** We followed the recommendations of the International Parkinson and Movement Disorder Society Evidence Based Medicine Committee.

**Results:** Sixty-four studies of pharmacological and surgical interventions were included in the review. Propranolol and primidone were classified as *clinically useful*, similar to Topiramate, but only for doses higher than 200 mg/day. Alprazolam and botulinum toxin type A were classified as *possibly useful*. Unilateral Ventralex intermedius thalamic DBS, radiofrequency thalamotomy, and MRI-guided focused ultrasound thalamotomy were considered *possibly useful*. All the above recommendations were made for limb tremor in essential tremor. There was insufficient evidence for voice and head tremor as well as for the remaining interventions.

**Conclusion:** Propranolol, primidone, and topiramate (>200 mg/day) are the pharmacological interventions in which the data reviewed robustly supported efficacy. Their safety profile and patient preference may guide the prioritization of these interventions in clinical practice. MRI-guided focused ultrasound thalamotomy was, for the first time, assessed and was considered to be *possibly useful*. There is a need to improve study design in essential tremor and overcome the limitation of small sample sizes, cross-over studies, short-term follow-up studies, and use of nonvalidated clinical scales. © 2019 International Parkinson and Movement Disorder Society
Management of Essential tremor syndromes

Drugs:
- Propranolol
- Primidone
- Topiramate

Botulinum toxin injections:
- VIM DBS
- Thalamic lesioning
- Focussed ultrasound

Functional neurosurgery:
<table>
<thead>
<tr>
<th>Treatment</th>
<th>Level of evidence</th>
<th>Dosing</th>
<th>Efficacy</th>
<th>Side effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primidone</td>
<td>Efficacious</td>
<td>Start with 25 mg/12.5 mg once a day and increase to 50–100 mg thrice a day. Daily dosage range 25–750 mg/day in two or three divided doses.</td>
<td>Improves hand tremors. Reduces tremor amplitude by 50%.</td>
<td>Sedation, cognitive side effects, depression. The first dose effect of nausea, dizziness, malaise, sedation and confusion can be seen in some patients. Start with low dose to overcome initial side effects of cognitive problems and dizziness.</td>
</tr>
<tr>
<td>Topiramate</td>
<td>Efficacious (only for doses more than 200 mg/day).</td>
<td>Start with 25 mg twice a day, maintenance dose of 50–325 mg/day. However, efficacious in higher doses.</td>
<td>Improves clinical rating scale scores for hand tremors. Can be used as a second-line drug.</td>
<td>Patients allergic to sulfa drugs, history of renal stones and angle closure glaucoma need to be cautious. Causes weight loss, paraesthesias.</td>
</tr>
<tr>
<td>Alprazolam</td>
<td>Likely efficacious</td>
<td>Start with 0.125 mg/day, maintenance dose 0.125–3 mg/day.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-chain alcohol: 1-octanol</td>
<td>No recommendations</td>
<td>Up to 128 mg/kg</td>
<td>Good tolerability. Requires administration of large amount.</td>
<td>Bad oral taste</td>
</tr>
<tr>
<td>Octanoic acid</td>
<td>No recommendations</td>
<td>It is the active metabolite of 1-octanol. Given orally 4 mg/kg.</td>
<td>Delayed effect on tremor reduction.</td>
<td>Well tolerated</td>
</tr>
<tr>
<td>Clozapine</td>
<td>Weak recommendation and low quality of evidence.</td>
<td>50 mg/day</td>
<td>May be used as a second-line treatment in selected patients.</td>
<td>Sedation, which improves on chronic therapy.</td>
</tr>
<tr>
<td>Tremor Type</td>
<td>Medication</td>
<td>Level of Recommendation</td>
<td>Dosing</td>
<td>Advantages</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------</td>
<td>--------------------------</td>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Essential head tremor</td>
<td>Zonisamide</td>
<td>Insufficient evidence^3</td>
<td>50 mg/day, maintenance dose 50-1800 mg/day</td>
<td>May be effective in treating isolated head tremor as compared with propranolol.</td>
</tr>
<tr>
<td></td>
<td>Propranolol, primidone, topiramate</td>
<td>Insufficient evidence</td>
<td></td>
<td>Can give a trial.</td>
</tr>
<tr>
<td>Essential voice tremor</td>
<td>Propranolol</td>
<td>Insufficient evidence^3</td>
<td></td>
<td>May be of some benefit; especially if voice tremor is the presenting symptom.</td>
</tr>
<tr>
<td></td>
<td>Methazolamide</td>
<td>Insufficient evidence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clozapine</td>
<td>Weak recommendation and low quality of evidence^7</td>
<td>1-octanol. Given orally 4 mg/kg.</td>
<td>May be used as a second-line treatment in selected patients.</td>
<td>Sedation, which improves on chronic therapy.</td>
</tr>
<tr>
<td>Gabapentin</td>
<td>Insufficient evidence^3</td>
<td>Start with 50 mg/day, maintenance dose 50-1800 mg/day.</td>
<td>May be tried in limb tremors when other medications have failed especially as an add-on therapy.</td>
<td>Causes dizziness, lethargy.</td>
</tr>
<tr>
<td>Pregabalin, levetiracetam, Nadolol, metoprolol, atenolol, sotalol, zonisamide, phenobarbitone, amantadine, isoniazid, carisbamate, flunarizine, nimodipine, methazolamide, acetazolamide, mirtazapine.</td>
<td>Non-efficacious^3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Study design</td>
<td>Patients, n</td>
<td>Follow-up duration</td>
<td>Site of stimulation</td>
</tr>
<tr>
<td>--------------------</td>
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<td>-------------</td>
<td>--------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Koller et al</td>
<td>Prospective</td>
<td>49</td>
<td>3–40.2 months</td>
<td>VIM</td>
</tr>
<tr>
<td>Sydow et al</td>
<td>Multicentre</td>
<td>37</td>
<td>6 years</td>
<td>Thalamus</td>
</tr>
<tr>
<td>Rehncrona et al</td>
<td>Prospective</td>
<td>19</td>
<td>6.5±0.3 years</td>
<td>VIM</td>
</tr>
<tr>
<td>Pahwa et al</td>
<td>Prospective</td>
<td>26</td>
<td>5 years</td>
<td>VIM</td>
</tr>
<tr>
<td>Blomstedt et al</td>
<td>Prospective</td>
<td>19</td>
<td>84–118 months</td>
<td>VIM</td>
</tr>
<tr>
<td>Zhang et al</td>
<td>Prospective</td>
<td>34</td>
<td>Average 56.9 months</td>
<td>VIM</td>
</tr>
<tr>
<td>Børretzen et al</td>
<td>Retrospective</td>
<td>46</td>
<td>Median 6 years</td>
<td>VIM</td>
</tr>
</tbody>
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A Randomized Trial of Focused Ultrasound Thalamotomy for Essential Tremor

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Figure 1. Tremor Scores.
Panel A shows tremor scores at baseline and throughout the 12-month study period. The change from baseline to 3 months in the tremor score for the hand contralateral to the thalamotomy, the primary outcome measure, was derived from eight items on the Clinical Rating Scale for Tremor (CST; total score ranges from 0 to 32, with higher scores indicating more severe tremor). At 3 months, the mean score was reduced by 47% in the group assigned to unilateral focused ultrasound (FUS) thalamotomy, as compared with a reduction of 13% in the group assigned to sham procedure (P < 0.001). Bars indicate 95% confidence intervals. Panel B shows individual tremor responses at 3 months in the thalamotomy and sham-procedure groups. The median improvement was 4% and 7% in the two groups, respectively. Negative values indicate worsening tremor.

Figure 7. Functional Activities of Daily Living and Quality of Life.
Panel A shows data on disability scores, which was significantly improved at 3 months (p < 0.001) for the between-group difference in the change from baseline with unilateral FUS thalamotomy but not with the sham procedure. Panel B shows the percent improvement at 3 months after thalamotomy in individual activities typically affected by essential tremor. Three items represent the disability subdomain, and for C of the QUEST, Panel C shows scores for percent improvement in QoL by the patient’s self-reported quality of life. Scores were significantly improved at 3 months in the thalamotomy group as compared with the sham-procedure group (P < 0.001 for the between-group difference in the change from baseline). Panel D shows the percent improvement at 3 months after thalamotomy in individual domains of the QUEST. The largest improvement is quality of life reported by patients was in the psychosocial domains.
Concluding remarks

• New classification will help with:
• Effect of drugs such as propranolol, primidone and others in different tremor syndromes
• And whether different targets should be considered for DBS in ET syndrome versus DT syndrome for example
• What about anticholinergics in ET plus with dystonia?
• Outcomes and prognosis may differ