Introduction
Tremor is the most common movement disorder. It is defined as an involuntary, rhythmic oscillation of a body part [1]. Essential tremor (ET) is the most prevalent tremor syndrome, occurring in more than 1% of individuals aged 70 years or older [2–7]. It commonly affects the hands, head, voice, and other body parts. Appropriate management begins with correct diagnosis. Primidone and propranolol are the first-line medications for the treatment of ET, but several other medications may also provide benefit. In patients with medically refractory tremor, alternative therapies, including surgery or injections of botulinum toxin, may be considered.

Clinical Characteristics of Essential Tremor
Tremor is patterned and rhythmic, differentiating it from other abnormal involuntary movements such as chorea, tics, myoclonus, and dystonia [15]. In order to better understand ET, a brief description of tremor classification is discussed, based on the guidelines proposed by Bain et al. [16].

Rest tremor occurs in a body part that is not voluntarily activated and is completely supported against gravity. Its frequency typically ranges from 3 to 6 Hz.

Action tremor occurs during voluntary contraction of skeletal muscle. It is further classified as postural, kinetic, or isometric. Postural tremor is present during voluntary maintenance of a body part against gravity and may appear or increase with specific postures (position-specific or position-sensitive tremor). Kinetic tremor occurs during voluntary movement and can be subdivided into the following: 1) intention tremor, which appears or increases during visually guided movements as a body part approaches a target (finger-to-nose testing); 2) simple kinetic tremor, which appears during voluntary movements that are not target directed, such as pronation/supination movements; and 3) task-specific kinetic tremor, which appears or increases during specific activities, such as writing. Isometric tremor occurs during forced muscle contraction against a rigid stationary object, such as pushing against a wall.

Essential tremor usually manifests as a postural tremor of the upper extremities or other body parts, with or without a kinetic component and without fixed postures (dystonia). Its frequency ranges from 4 to 12 Hz. ET presents as a postural, distal arm tremor in 95% of patients [17], and may rarely include a rest component [18]. ET is generally symmetric, but it can present unilaterally, and mild asymmetry may persist. As with other types of tremor, the frequency is rather stable, but amplitude varies from minute to minute depending on the emotional state of the individual. Over years, ET tremor frequency decreases, but the amplitude slowly increases and the tremor causes more difficulty [19]. Alcohol intake transiently reduces tremor in 50% to 90% of ET patients [13,14,20]. Although ET is considered to be monosymptomatic (tremor only), patients more commonly have tandem gait abnormalities than age-matched control subjects [21].

Diagnosis of Essential Tremor
Appropriate management of ET begins with correct diagnosis. Bain et al. [16] have proposed the following guidelines. The core criteria for ET include 1) bilateral action (postural or kinetic) tremor of the hands and forearms (but not rest tremor) or isolated head tremor with no signs of dystonia; and 2) absence of other neuro-
logic signs, with the exception of the cogwheel phenomenon (an oscillation of resistance during passive movement thought to be secondary to tremor). Secondary criteria include 1) long duration (>3 years), which helps exclude PD tremor, as most PD patients will develop other signs within a few years; 2) positive family history; and 3) beneficial response to alcohol. Symptoms that may exclude a diagnosis of ET include 1) unilateral tremor, rigidity, bradykinesia, or rest tremor (suggesting PD); 2) gait abnormalities (suggesting PD or cerebellar tremor); 3) focal tremor or isolated head tremor with abnormal posture (suggesting dystonic tremor); 4) sudden onset (suggesting psychogenic or toxin-induced tremor); and 5) drug treatment that might cause or exacerbate tremor.

Management of Essential Tremor
In the evaluation of tremor, reversible causes should be sought, and discontinuation of potential tremor-inducing drugs should be considered. These include sodium valproate, tricyclic antidepressants, selective serotonin reuptake inhibitors, steroids, lithium, cyclosporine, amiodarone, thyroid replacement, amphetamine derivatives, beta agonists, theophylline, and ephedrine. In selected cases, medical causes of tremor, such as hyperthyroidism, hyperparathyroidism, Wilson’s disease, B12 deficiency, renal failure, pheochromocytoma, and alcohol withdrawal should be investigated.

Essential tremor can be transiently worsened by emotional states such as excitement, anger, anxiety, and fear. Fatigue, sleep deprivation, and extremes in temperature can also increase tremor. Avoidance of these precipitating factors, when possible, may be of benefit.

Alcohol-responsiveness is found in 50% to 90% of ET patients [13,14], and in many patients alcohol induces dramatic tremor reduction lasting 45 to 60 minutes [19]. In some patients, tremor may temporarily worsen when the alcohol wears off (rebound). Although there have been concerns that the therapeutic use of alcohol might lead to abuse, studies have demonstrated that the frequency and amount of alcohol intake in the ET population is similar to the general population [22]. The judicious use of small quantities of alcohol prior to social events can be a useful part of the management of ET.

Pharmacologic Treatment of Essential Tremor
Primidone
Primidone effectively reduces tremor in ET, as demonstrated by double-blind, placebo-controlled trials [23–26]. Approximately 70% of ET patients experience initial tremor reduction with primidone, and the mean reduction in tremor amplitude is 40% to 50% [27]. One study demonstrated that benefit from primidone is usually maintained through 12 months of therapy [28], although 13% of patients lost benefit over a 12-month period. When tolerance occurs, the dose of primidone should be gradually increased to see if benefit can be recaptured. Although primidone may have some efficacy for tongue tremor associated with ET, its efficacy for head and voice tremor is usually minimal [29–31].

Primidone is an anticonvulsant that is metabolized to phenyethylmalonamide (PEMA) and phenobarbital. Its antitremor mechanism is unknown. Administration of PEMA does not reduce tremor [32], and reduction of tremor occurs even with no detectable phenobarbital in the serum [33].

Primidone is usually initiated at a dose of 25 mg/d, and titrated upward every few weeks by 25 or 50 mg until a target dose of 100 mg/d is reached. Further escalation to 250 to 350 mg/d is undertaken as necessary. Primidone is usually administered as a single nighttime dose [27] or two separate doses, with two thirds at night and one third in the morning [17]. Lower doses of primidone (50 to 250 mg) have been found to be as effective as higher doses (750 to 1000 mg) [34]. Acute side effects include vertigo, nausea, ataxia, somnolence, and flu-like symptoms [35]. Side effects are minimized by introducing primidone at a low dose and slowly escalating as necessary. Early side effects are often transient and may resolve over time.

β-adrenergic antagonists
Propranolol is a first-line agent in treating ET, and placebo-controlled studies indicate that it effectively reduces tremor amplitude and provides symptomatic benefit in more than half of ET patients [27,36]. In dose-response studies, 240 to 320 mg/d was found to be the optimal dose [37], and doses greater than 320 mg/d provided no additional benefit [34]. Propranolol can be introduced at a dose of 20 mg/d and increased by 20 mg/d each week. It is usually administered on a three times a day or four times a day schedule. The lowest dose that provides good benefit is used as the maintenance dose. There is a lack of correlation between the clinical effect of propranolol and plasma levels [38]. A long-acting formulation is available for once a day dosing, and this formulation provides similar tremor reduction to the standard formulation [39]. Once titration is completed using the standard formulation, the long-acting formulation can be used for maintenance control with greater convenience.

In some patients, propranolol is useful on an as-needed basis to avoid an increase in tremor during predictably stressful situations, such as public speaking. In this situation, a dose of 20 to 80 mg can be taken 30 to 45 minutes prior to the event [40].

Propranolol reduces tremor amplitude and has no effect on frequency. As with primidone, it is less effective in reducing voice and head tremor than upper extremity tremor [31]. Benefit is usually maintained through the first year of therapy, but increasing doses may be required over time [28,32].