Dear Colleague,

Spasticity remains a disabling and widespread form of muscle overactivity and continues to affect the quality of life for millions of patients worldwide. Increasing the awareness of this condition may lead to improved therapeutic understanding and knowledge. It is important that physicians are aware of current and developing pharmacologic treatments and how these treatments may influence patient care and improve treatment outcomes.

Spasticity management can be challenging. The NeuroRehab Preceptor Program titled *Identification and Management of Spasticity and Muscle Overactivity in Upper Motor Neuron Syndrome: A Hands-on Approach* is a CME mentoring initiative developed to educate and improve the skills of practicing neurologists, physiatrists, and residents in the management of spasticity and muscle overactivity related to upper motor neuron syndrome. This program provides a didactic and hands-on opportunity for physicians with experience teaching about the management and treatment of spasticity and related muscle overactivity disorders to mentor participating physicians in a clinical setting. The goal of the program is to increase participating physicians’ skills with problem assessment, identifying appropriate treatment options, setting treatment goals, and reviewing protocols for various pharmacologic therapies to improve patient treatment outcomes.

To measure the pedagogic effectiveness of the NeuroRehab Preceptor Program over its first 12 months, participants were asked to complete pre- and postprogram questionnaires. These questionnaires measure the participants’ confidence level with the program learning objectives and assess their clinical knowledge in treating patients with spasticity and related muscle overactivity. This report, *Educational Effectiveness: Outcomes Evaluation of the NeuroRehab Preceptor Training Program*, discusses the educational need for this type of program as well as the program design, objectives, components, and outcomes measurement results from the pre- and postprogram questionnaires.

This activity has been reviewed and is acceptable for up to 1.5 hours of CME credit from the Annenberg Center for Health Sciences. Accreditation begins in January 2008 and will be available for 1 year. Please be sure to return the enclosed posttest/evaluation form to receive CME credit.

On behalf of the faculty from the NeuroRehab Preceptor Program, we hope that you find this report to be a useful resource in your clinical practice.

Sincerely,

Alberto Eskenazi, MD
Chairman, Department of Physical Medicine and Rehabilitation
Director, Gait & Motion Analysis Laboratory
Moss Rehab
Elkins Park, Pennsylvania
**Intended Audience**
This activity was developed for practicing neurologists and physiatrists who treat patients with spasticity and other conditions that result from motor overactivity dysfunction.

**Statement of Need**
Spasticity and muscle overactivity lead to disability, interfere with activities of daily living, and can cause pain and immobility. As treatment options evolve, it is incumbent on clinicians to be aware of the changes. The goal of this report is to educate clinicians about the management and pathophysiology of spasticity and muscle overactivity and the value of continued education and training for disease management to improve treatment outcomes.

**Learning Objectives**
Upon completion of this activity, participants should be better able to
- Determine when spasticity and muscle overactivity related to upper motor neuron syndrome should be treated
- Discuss the value of continued education and training about spasticity and muscle overactivity management
- Identify therapeutic options for spasticity and muscle overactivity
- Describe how participants in the NeuroRehab Preceptor Program plan to incorporate skills and techniques learned from the program into their clinical practice
- Explain how participants’ comfort level with and knowledge of spasticity management changed after participating in the NeuroRehab Preceptor Program
- Utilize identified methods to develop a comprehensive program for the effective management and assessment of spasticity

**Disclosure Statement**
It is the policy of the Annenberg Center to ensure fair balance, independence, objectivity, and scientific rigor in all programming. All faculty participating in sponsored programs are expected to identify and reference off-label product use and disclose any significant relationship with those supporting the activity or any others whose products or services are discussed.

In accordance with the Accreditation Council for Continuing Medical Education Standards, parallel documents from other accrediting bodies, and Annenberg Center policy, program faculty have made the following disclosures:
Alberto Esquenazi, MD, has received research support from Allergan, Inc.

The faculty for this program have disclosed that there will be discussion about the use of products for non–FDA-approved indications.

The ideas and opinions presented in this educational activity are those of the faculty and do not necessarily reflect the views of the Annenberg Center for Health Sciences and/or its agents. As in all educational activities, we encourage the practitioners to use their own judgment in treating and addressing the needs of each individual patient, taking into account that patient’s unique clinical situation. The Annenberg Center for Health Sciences disclaims all liability and cannot be held responsible for any problems that may arise from participating in this activity or following treatment recommendations presented.

This activity is an enduring material and consists of a white paper. Successful completion is achieved by reading the material, reflecting on its implications in your practice, and completing the assessment component.

The estimated time to complete the activity is 1.5 hours.

This activity was originally released in January 2008 and is eligible for credit through January 2009.

This activity is supported by an independent educational grant provided by Allergan, Inc.

**Accreditation and Certification**
This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the Annenberg Center for Health Sciences at Eisenhower and CogniMed Inc. The Annenberg Center is accredited by the ACCME to provide continuing medical education for physicians.

The Annenberg Center designates this educational activity for a maximum of 1.5 AMA PRA Category 1 Credits™. Physicians should only claim credit commensurate with the extent of their participation in the activity.

There is no charge for this activity. Statements of Credit will be provided by mail following activity participation and upon completion and return of the evaluation form to NeuroRehab Preceptor Training Program, c/o CogniMed Inc., 70 South Orange Avenue, Suite 200, Livingston, NJ 07039, or by fax to 877-403-5765. Please allow 4 to 6 weeks for the delivery of your statement.
**Objective**

This paper assesses the educational value of the didactic and practical portions of the NeuroRehab Preceptor initiative on the management of spasticity and muscle overactivity related to upper motor neuron syndrome (UMNS). The NeuroRehab Preceptor Program is a comprehensive continuing medical education mentoring initiative for neurologists and physiatrists (via Clinical Consults) as well as for residents of neurology and physiatry (via Residency Practicums). This initiative provides didactic information about the identification and management of spasticity and other types of muscle overactivity and enables participants to obtain firsthand experience with the assessment, goal setting, and treatment of patients with UMNS, including, where appropriate, treatment with chemodenervation.

Effective spasticity management requires a thorough understanding of the effects of UMNS and can only occur through clear and achievable patient-specific goals, which need to be revised regularly. Neurology and physiatry curricula include training on common neurologic disorders; however, disease identification, diagnosis, and treatment of painful and debilitating muscle overactivity may be challenging. Spasticity may be under- or misdiagnosed. Therefore, it is important that physicians have an understanding of current and developing pharmacologic treatments and how these treatments may influence patient care and improve treatment outcomes. Specifically, there is a need to further educate physicians and residents in the therapeutic use of botulinum neurotoxin (BoNT) because of the unique mechanism of action, different serotypes, and necessity for injection. The success of focal spasticity treatments, especially with respect to BoNT type A (BoNT-A) injections, depends on the expertise of the physician providing the treatment. Identification of the correct muscle is critical for successful focal treatment of spasticity. In addition to conventional treatment therapies, physicians and residents need to be aware of new and evolving treatment options. One study has suggested that physiatry residents believed they should receive considerably more clinical and didactic training in therapeutic injections.

To assess the effectiveness of such an initiative, several outcomes for the participants need to be evaluated, including:

- Whether the didactic portion increases their knowledge identified by the learning objectives
- Whether the practical portion of the program increases their confidence with diagnosing patients and determining the best treatment option
- Whether the practical portion of the program increases their confidence with diagnosing patients and determining the best treatment option
- Whether the knowledge obtained from the program is implemented into the participating physicians’ clinical practices or methods of patient care

**Program and Learning Objectives**

The primary objective of the NeuroRehab Preceptor initiative is to provide hands-on one-on-one and two-on-one interactions in which physicians who are highly experienced in treating spasticity, muscle overactivity, and spastic paresis act as mentors to participating physicians. Other program objectives are to:

- Increase the participating physicians’ skills with differential diagnosis and identifying appropriate treatment options
- Set treatment goals and review protocols for various pharmacologic therapies for spasticity and muscle overactivity
- Serve as a conduit for continuing mentoring and postprogram collegial discussion
- Provide education about spasticity and muscle overactivity and elaborate on various treatment techniques for residents in training
- Collect preprogram questionnaire data from participating physicians to evaluate current clinical practice programs and compare with postprogram data regarding skills learned in mentoring sessions

The NeuroRehab Preceptor Program uses different media, including the Educational Compendium, the NeuroRehab Website (NeuroRehabResource.org), and practical training with patients to meet the following learning objectives for participants:

- Describe the pathophysiology of spasticity, muscle overactivity, and spastic paresis in UMNS
- Discuss the differential diagnosis of UMNS and its consequences, including spasticity and muscle overactivity and their specific management interventions
- Evaluate patients with spasticity and muscle overactivity and discuss recognized therapeutic approaches
- Identify the mechanism of action, advantages, and disadvantages of various therapeutic options
Establish treatment goals for patients to relieve symptoms, ease personal care, reduce disfigurement, improve limb use and mobility, and enable activities of daily life.

Program Design
The NeuroRehab Preceptor Program is designed to provide hands-on training in identifying and managing spasticity, muscle overactivity, and other phenomena related to UMNS. The Core Faculty comprises 86 physicians, referred to as preceptors, who are highly skilled in the management and treatment of spasticity, muscle overactivity, and spastic paresis. To become a preceptor and conduct a Clinical Consult or Residency Practicum, physicians attend a Web conference directed by the co-chairpersons of the program, including the author of this paper. Preceptors are chosen from a variety of geographic locations to facilitate training across the country.

Participants in the Clinical Consult program comprise practicing neurologists and physiatrists who have varying levels of experience in the assessment, diagnosis, and management of spasticity and other muscle overactivity conditions. The participants must have been exposed to and have an aptitude in a variety of spasticity treatment modalities and express an interest and a desire to improve spasticity management skills. In the first year, a total of 75 physicians were involved in the Clinical Consult program, and the proportion of neurologists and physiatrists participating was approximately equal.

For the Clinical Consult, the preceptor travels to the participating physician’s office, clinic, or institution for a one-on-one, 3/4-day experiential program. The participating physician is responsible for scheduling between 2 and 5 patients with complaints of spasticity to review and treat with the preceptor’s guidance. The preceptor visits the participating physician to allow the participating physician to train in his/her own clinical environment with his/her own patients. However, if there is insufficient equipment to appropriately treat a patient or if the participant does not have the necessary patient base, the participating physician would visit the preceptor’s practice site for the Clinical Consult.

For the Residency Practicum, 2 residents travel to a preceptor’s office, clinic, or institution for a 3/4-day program. Residents who participate in the Residency Practicum program are PGY3 or PGY4 residents specializing in neurology or physiatry. These residents express an interest and a desire to increase their knowledge of spasticity and other muscle overactivity dysfunctions and to improve their skills in spasticity management. In the first year, a total of 47 residents participated in 25 Residency Practicum programs at a variety of preceptors’ locations.

The agenda for the 3/4-day Clinical Consult and Residency Practicum programs starts with a didactic review of the Educational Compendium, which includes a slide set on the differential diagnosis and therapeutic options. Then the preceptor and the participating physician or residents attend patient clinics, where patient assessment, diagnosis, techniques for examination, goal setting, and administration of pharmacologic therapy are discussed and demonstrated. A review of patient cases follows the patient clinics. Participating physicians and residents are asked to complete a preprogram questionnaire 1 week before their program and a postprogram questionnaire about 1 month after their program.

Didactic Information
Educational Compendium
Because spasticity may be misunderstood and misdiagnosed, the NeuroRehab Preceptor Program fills an existing need by providing in-depth information about spasticity and its differential diagnosis, a detailed summary of the current treatment options, and the hands-on mentoring experience with treatment. The Educational Compendium consists of several sections, including the slide library, literature on differential diagnosis, therapeutic options list, and suggested reading and other resources.

Slide library
The slide set provides a review of the pathophysiology of spasticity and muscle overactivity. Slides also describe how to distinguish spasticity from other symptoms of UMNS. Despite the definitions and descriptions of UMNS and spasticity, much confusion exists as to how these conditions present clinically. Further, many terms associated with spasticity are confused in clinical and diagnostic presentation. Spasticity easily might be reported as simply a symptom. Worsening spasticity may indicate nociceptive input from other sources or underlying problems, such as abdominal emergencies, fractured limbs, and unseen pressure sores. Determining a diagnosis can be confusing in patients with an existing disability. If a patient with an existing disability presents with worsening spasticity, there must be a different cause for the spasticity. Therefore, a clinical overview is needed to evaluate why the patient has spasticity, what is making it worse, and what will improve it.
Although basic-science descriptions of spasticity are being elucidated, clinical confusion persists. Although the accepted definition of spasticity, “a velocity-dependent increased resistance to tonic stretch,” is well known, often forgotten is that spasticity is only one component of UMNS. Contracture, hypertonia, weakness, and movement disorders may coexist because of UMNS. Other components of UMNS are often used interchangeably with spasticity. UMNS has positive signs characterized by muscle overactivity. It is often difficult to discuss the single positive sign of spasticity without addressing its overlap with and similarity to the other findings with UMNS. Complicating it further, positive signs of UMNS frequently coexist. Contrary effects of muscle overactivity include negative symptoms, such as reduced strength, slow effortful movement, loss of dexterity, impaired motor control, and being easily fatigued.

The clinical impact of UMNS on patients is broad and limits functional capacity, restricts activities of daily living, and negatively impacts quality of life. The resulting reduction in mobility and limb use may lead to decubiti, cardiovascular problems, thrombophlebitis, respiratory infections, contractures, osteoporosis, and social isolation. The altered balance of forces in patients who have UMNS leads to common patterns of upper motor neuron dysfunction, including adducted/internally rotated shoulder, flexed elbow, pronated forearm, flexed wrist, clenched fist, thumb-in-palm deformity, flexed hip, adducted thigh, stiff knee, flexed knee, and equinovarus foot.

Spasticity should be treated only when it causes harm to the patient. A thorough understanding of the indications for treatment of spasticity is essential. Spasticity does not always cause harm and can assist in the rehabilitation process by enabling a patient to stand when limb weakness would not otherwise allow it. In such cases, relaxation in limb tone would not help the patient. A patient needs to be evaluated to determine whether the spasticity significantly interferes with function, including gait, activities of daily living, comfort, and caregiving, and whether it will potentially lead to musculoskeletal deformity (Figure 1).

If spasticity is causing problems, then treatment objectives need to be defined. Some examples include improving gait, hygiene, and activities of daily living; easing the burden on the caregiver; relieving pain; preventing contracture; improving sleep; and decreasing spasm frequency. The goals of the patient and the caregiver should be included in the treatment plan, along with technical objectives such as reducing tone and improving range of motion and joint position. A comprehensive spasticity management program should consider the following: elimination of noxious stimuli; physical and occupational therapy; orthosis and splints; oral medications; injections of phenol, alcohol, or BoNT; intrathecal baclofen; and surgery. The main consequence of spasticity is on mobility and posture. In time, tendon shortening and contracture may occur. These changes cause pain because of structural misalignment in joints and the skeleton. In addition to knowing the range of available treatments, physicians need to be aware of how each treatment contributes to the overall management of the condition. Assessment and management of the patient with spasticity is multidisciplinary and requires repeated assessments, which may lead to modifying the treatment over time. The biomechanical features of spasticity dictate a wide-reaching strategy, and the patient's condition and overall health need to be considered when choosing the most appropriate treatment options. Until recently, spasticity has not been treated adequately for many patients, but now there are the means and technologies to do this more effectively.

Therapies for spasticity must be used according to an individualized, multidisciplinary program targeted to achieve patient goals. Although treatment should be based on the extent and severity of spasticity, systemic agents are commonly used to treat spasticity and its consequences. Unfortunately, systemic agents are associated with undesirable effects, including sedation and gait disturbance, which make patients more susceptible to falling and the consequent higher risk of fracture. Fractures and associated complications are quickly growing into a problem of high healthcare expenditure. New strategies for managing spasticity must be considered to reduce the risk of falls and possible fractures, especially for elderly patients with poststroke spasticity. Focal treatment may be highly effective for some of the more common forms of spasticity and muscle overactivity. In particular, injection of BoNT-A has a favorable profile when compared with systemic agents and other focal treatments. BoNT-A does not produce adverse effects that increase the likelihood of falls, and it improves abnormal lower limb postures that can lead to accidental falls. Therefore, the clinical benefits of BoNT-A injection balanced with the relative expense for this therapy show it to be cost-effective.

If patients receive suboptimal care as a result of the absence of specialized spasticity management teams, limited understanding of individual patient problems and goals, inappropriate treatment selection, and suboptimal follow-up, poor treatment outcomes may result and the cost of healthcare may increase. The cost associated with caring for patients with hip fractures is very high, and the economic burden to the healthcare system is expected to grow exponentially with the aging population. In some cases, a fear of falling may lead to more immobilization and the possible development of other comorbidities, such as muscle weakness, joint contractures, and disuse osteoporosis. A spasticity treatment that does not produce central nervous system or peripheral adverse effects on gait, mobility, reaction time, or balance and that helps to reduce the risk of falls and maintain patient activity levels is highly desirable.

A spasticity management strategy involves preventing the factors that contribute to the problems, treating the muscle overactivity, and averting the complications arising from spasticity. Complications may be the result of other treatments or from the spasticity itself. Good management depends on understanding the role and application of current and new technologies and how they fit into the overall care of the patient. Physical treatment is essentially the first line of defense, but when it is inadequate, pharmacologic intervention may be required. Physical therapy temporarily may reduce spasticity, worsening of the spasticity, or complications. Spasticity rarely occurs in isolation, because it is usually the result of damage to the central nervous system. Consequently, treatment of spasticity is related to the management of rehabilitation and should be multidisciplinary.

To be effective, therapies for spasticity must be based on individualized, targeted patient goals. Treatment objectives may include addressing symptoms, especially painful spasms; improving passive function to facilitate care and positioning; improving active function to enhance limb function and mobility; and improving quality of life by enabling activities of daily living and reducing disfigurement. Ideally, future developments in UMNS care programs will ensure that every patient has access to optimum rehabilitation and spasticity management services.
**Differential diagnosis**

The differential diagnosis section of the Compendium describes a variety of commonly observed clinical manifestations of the impact of UMNS. The muscles involved in each deformity are outlined. Clinical phenomena associated with UMNS include muscle overactivity, muscle weakness, and reduced soft-tissue plasticity. These symptoms contribute to limb immobility, which may lead to muscle contracture and joint range-of-motion limitations, further restricting limb movement. These symptoms can interfere with the patient’s independence, mobility, and activities of daily living. The identification of functional impairment and the differential muscular anatomy associated with common patterns of limb deformities is important for planning treatment and setting goals. Understanding the extent to which muscle overactivity, weakness, and soft-tissue changes contribute to each fixed limb posture helps the physician to develop an integrated treatment strategy.

Optimization of spasticity control with BoNT-A is achieved by careful muscle identification and selection to address the relevant limb deformity. Electromyography (EMG) may show varying degrees of overactivity in the muscle groups of each limb. Thus, treatment options could differ for each limb. Clinical examination alone is often insufficient to identify the muscle, especially in unusual or complex cases, and EMG and diagnostic motor block are additional methods for muscle identification.

**Therapeutic options**

A comprehensive list of therapeutic options—nonpharmacologic, pharmacologic (both oral and injectable), and surgical—is provided in the Compendium. Advantages and disadvantages for each treatment option are summarized.

**Suggested reading and resources**

A list of pertinent articles, Websites, and CD-ROMs for additional sources of educational information is provided. A Website dedicated to the program, NeuroRehabResource.org, provides participating physicians and preceptors with additional supporting educational material. This Website is integral to the initiative. Through this site, participants can submit on-line nomination forms to participate in the program and pre- and postprogram questionnaires. Educational resources, including the Compendium, are available on-line to download.
Data Collection

Potential participating physicians for the Clinical Consult program submit nomination forms and are screened with 3 questions to determine whether they have a sufficient patient base and the necessary equipment to treat spasticity, including chemodenervation therapy, and to determine their comfort level with therapeutic injections. Potential participants are asked to briefly describe their experience in the diagnosis and management of spasticity and other muscle overactivity conditions and their exposure to and aptitude in various treatment modalities, including chemodenervation agents. In addition, they are asked to describe their interest in improving their spasticity management skills. This information provides a baseline for the skill and confidence level of the participating physicians when treating spasticity, their patient base, and the equipment available. For the Residency Practicum program, residency training directors nominate residents to participate in the program based on their experience with the management of spasticity and related muscle overactivity disorders.

Once selected for the program, participating physicians and residents are asked to complete a preprogram questionnaire to determine their confidence level in the management and treatment of spasticity and muscle overactivity, their educational needs, their current level of knowledge about the pathophysiology and diagnosis of spasticity and muscle overactivity, and the type of spasticity treatments they have used. The preprogram questionnaire contains a case study with a few questions to gauge expertise in spasticity management. Physicians participating in the Clinical Consult program are requested to complete a patient qualification and selection checklist to identify each patient chosen to be treated with the preceptor, and this form outlines patient exclusion criteria for when it is inappropriate to use specific treatment interventions, such as BoNT.

Participants are asked to submit a program evaluation 1 week after completion of a Clinical Consult or Residency Practicum. This form is used to evaluate each participant’s individual program and preceptor. It also asks how participants will change their clinical practice after participating in the program.

One month after participating in the program, participants are asked to complete a postprogram questionnaire to determine whether the participants’ comfort level increased with regard to
the learning objectives from the preprogram questionnaire. Participants are asked whether they were able to use information acquired from their program to update or refine their approach when treating patients with spasticity. They are also asked how they incorporated information learned from the program into their clinical practice or methods of patient care. In addition, participants are asked to answer the same questions about the case study included in the preprogram questionnaire.

**Results: Outcomes Measurement**

There were 122 participants in the NeuroRehab Preceptor Program during the first 12 months. A total of 75 participating physicians were involved in the 75 Clinical Consult programs, and 47 residents participated in the 25 Residency Practicum programs. Approximately one third of all of the participants completed pre- (n=54) and postprogram questionnaires (n=43). However, more than 80% of the participating physicians and residents completed the program evaluation forms.

As indicated in the nomination forms, approximately 70% of the participating physicians and residents had limited or no experience with injecting BoNT, and they were interested in learning new techniques and expanding the treatment options they could offer to their patients. The remaining 30% of the participating physicians had moderate experience using BoNT to treat spasticity but wanted to improve and update their skills.

The postprogram questionnaire data demonstrated improvements in the frequency of more confident answers for all 8 questions related to how well the participants understood spasticity and treatment options (Please see Figure 2 on page 7). There was marked improvement in how comfortable participants felt establishing treatment goals for patients with spasticity and muscle overactivity and explaining the advantages and disadvantages of various therapeutic options. There were also improvements in how well they could describe the pathophysiology of spasticity and muscle overactivity, diagnose and differentiate spasticity from other muscle overactivity disorders, identify therapeutic options, and administer individualized and appropriate therapy to patients with spasticity. The frequencies of guiding injections using EMG or electrical stimulation (E-Stim) and identifying appropriate muscles for BoNT-A therapy were distinctly higher after attending the NeuroRehab Preceptor Program.

Comparison of the pre- and postprogram questionnaire answers to the case study questions regarding diagnosis and treatment of spasticity (Table 1) revealed a marked improvement in the participants’ understanding of the definition of spasticity and its diagnosis (Figure 3). Also improved were the participants’ comprehension of the pathophysiology of spasticity and skill in determining appropriate patients to receive BoNT injections.

<table>
<thead>
<tr>
<th>Table 1. Pre- and postprogram questionnaire case study. Preprogram n=54. Postprogram n=43.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient Case</strong></td>
</tr>
<tr>
<td><strong>Patient:</strong> 72-year-old woman, married, lives at home</td>
</tr>
<tr>
<td><strong>Presenting complaint:</strong> left-side hemiparesis, pain, spasms</td>
</tr>
<tr>
<td><strong>Medical history:</strong> diabetes for 22 years, hypertension</td>
</tr>
<tr>
<td><strong>Physical examination:</strong> left facial droop, flexed elbow, clenched fist deformity of the hand</td>
</tr>
<tr>
<td><strong>Medications:</strong> atorvastatin, metformin, thiazolidinedione, baclofen</td>
</tr>
<tr>
<td><strong>Laboratory values:</strong> cerebrospinal fluid protein content and IgG normal</td>
</tr>
<tr>
<td><strong>1. According to this patient’s medical history, which of the following is the most likely pathologic cause for spasticity?</strong></td>
</tr>
<tr>
<td>a. Injury to the brain</td>
</tr>
<tr>
<td>b. Injury to the spinal cord</td>
</tr>
<tr>
<td>c. Stroke</td>
</tr>
<tr>
<td>d. Multiple sclerosis</td>
</tr>
<tr>
<td><strong>2. How could spasticity in this patient be confirmed?</strong></td>
</tr>
<tr>
<td>a. Observe stretch-sensitive tonic muscle contraction in the absence of effort</td>
</tr>
<tr>
<td>b. Observe velocity-dependent increase in the response to phasic stretch in the absence of volitional command</td>
</tr>
<tr>
<td>c. Observe inappropriate antagonist recruitment triggered during effort on an agonist in the absence of phasic stretch</td>
</tr>
<tr>
<td>d. Observe stretch-sensitive tonic muscle contraction in the absence of phasic stretch of the affected muscle</td>
</tr>
<tr>
<td><strong>3. What would be the best treatment option for this patient?</strong></td>
</tr>
<tr>
<td>a. Gabapentin</td>
</tr>
<tr>
<td>b. Phenol injections</td>
</tr>
<tr>
<td>c. Dantrolene</td>
</tr>
<tr>
<td>d. BoNT-A injections</td>
</tr>
<tr>
<td><strong>4. Which of the following would be a reason to treat this patient with BoNT-A injections?</strong></td>
</tr>
<tr>
<td>a. The patient has not seen improvement in her functional skills with baclofen</td>
</tr>
<tr>
<td>b. The patient has been experiencing pain in her elbow</td>
</tr>
<tr>
<td>c. The patient has focal spasticity</td>
</tr>
<tr>
<td>d. The patient has a contracture in the target muscle</td>
</tr>
<tr>
<td><strong>5. Which of the following scenarios would exclude this patient from being eligible to receive BoNT-A injections?</strong></td>
</tr>
<tr>
<td>a. The patient is experiencing a stubborn urinary tract infection that will require treatment with an aminoglycoside antibiotic</td>
</tr>
<tr>
<td>b. The patient is experiencing hypertensive symptoms, requiring an increase in her dosage of atorvastatin</td>
</tr>
<tr>
<td>c. The patient is experiencing peripheral edema, requiring a decrease in her dosage of thiazolidinedione</td>
</tr>
<tr>
<td>d. The patient is experiencing muscle weakness in her left shoulder and arm that will require physical therapy</td>
</tr>
</tbody>
</table>

**Patient Case**

**Patient:** 72-year-old woman, married, lives at home

**Presenting complaint:** left-side hemiparesis, pain, spasms

**Medical history:** diabetes for 22 years, hypertension

**Physical examination:** left facial droop, flexed elbow, clenched fist deformity of the hand

**Medications:** atorvastatin, metformin, thiazolidinedione, baclofen

**Laboratory values:** cerebrospinal fluid protein content and IgG normal

1. According to this patient’s medical history, which of the following is the most likely pathologic cause for spasticity?
   - a. Injury to the brain
   - b. Injury to the spinal cord
   - c. Stroke
   - d. Multiple sclerosis

2. How could spasticity in this patient be confirmed?
   - a. Observe stretch-sensitive tonic muscle contraction in the absence of effort
   - b. Observe velocity-dependent increase in the response to phasic stretch in the absence of volitional command
   - c. Observe inappropriate antagonist recruitment triggered during effort on an agonist in the absence of phasic stretch
   - d. Observe stretch-sensitive tonic muscle contraction in the absence of phasic stretch of the affected muscle

3. What would be the best treatment option for this patient?
   - a. Gabapentin
   - b. Phenol injections
   - c. Dantrolene
   - d. BoNT-A injections

4. Which of the following would be a reason to treat this patient with BoNT-A injections?
   - a. The patient has not seen improvement in her functional skills with baclofen
   - b. The patient has been experiencing pain in her elbow
   - c. The patient has focal spasticity
   - d. The patient has a contracture in the target muscle

5. Which of the following scenarios would exclude this patient from being eligible to receive BoNT-A injections?
   - a. The patient is experiencing a stubborn urinary tract infection that will require treatment with an aminoglycoside antibiotic
   - b. The patient is experiencing hypertensive symptoms, requiring an increase in her dosage of atorvastatin
   - c. The patient is experiencing peripheral edema, requiring a decrease in her dosage of thiazolidinedione
   - d. The patient is experiencing muscle weakness in her left shoulder and arm that will require physical therapy
Participants indicated that the Compendium and the CD-ROM were the preferred formats for retention of educational materials. The practical component of the program was highly praised by nearly all participants.

When asked how their practice had changed as a result of participating in the Clinical Consult program, many physicians indicated that

- Their spasticity management skills had been enhanced
- They could better identify candidates for focal treatment
- They were motivated to do more training if another program were available
- They were adding additional treatment options, including BoNT, to their practice
- They were now using E-Stim guidance
- Their technical skills had improved

Furthermore, 87% of the 61 participating physicians who submitted an evaluation provided additional comments that supported the likelihood of their incorporating information and techniques learned from the Clinical Consult into their practice. The majority of participating physicians indicated that they would be adding BoNT as a treatment option for appropriate patients in their clinic as a result of what they learned in the program. The 13% of physicians who did not make any comments about how their practices would change as a result of participating in the Clinical Consult still rated the program highly overall.

For the Clinical Consult programs, there was an 83% response rate, with 62 program evaluations completed by preceptors. Overall, the preceptors strongly agreed that the Clinical Consult program met their expectations, the content was comprehensive, the logistics were well organized, and the environment was conducive to learning. The vast majority of preceptors (82%) enjoyed the one-on-one mentoring and hands-on training. Although several participating physicians were inexperienced in treating spasticity, most were reported to be eager and enthusiastic to learn from the preceptors. Of the 62 participating physicians who were evaluated, 87% of the physicians were considered by the preceptors to be very likely to incorporate skills learned at the Clinical Consult session into their practice. The preceptors were uncertain whether the skills would be incorporated by approximately 8% of the participating physicians, and only 3% of the participating physicians were believed to be unlikely to use the information in their clinical practice. These judgments were based on the preceptors’ observations of the participating physicians, including the degree of previous injection experience, the observed comfort level of the physician with

### Clinical Consult Program

Following is feedback from participating physicians when asked, “After participating in this program, I will change my clinical practice by…”

- “Performing more BoNT-A injections. Would love to do the program again”
- “Consider intrathecal baclofen more appropriately and increase muscles to inject for spasticity”
- “Better selection of patients, improved skills. Thankful for continuous support of preceptor”
- “Treating more patients with spasticity that in the past I referred to rehab specialists; program individualized to our needs”
- “Identifying more patients with spasticity who could benefit from BoNT-A injection or baclofen pump”
- “Use EMG guidance for BoNT-A injection; offer BoNT-A to more patients; truly an excellent learning experience! Highly recommend this program”

### Residency Practicum Program

Feedback about the Residency Practicum included these comments from residents, who were asked how they would incorporate information learned from this program into management of spasticity and muscle overactivity dysfunction

- “With the review of the science and clinical aspects of spasticity and its treatment, I feel better prepared to evaluate and treat patients with dystonia and/or spasticity. These skills will broaden the range of patients for my future practice”
- “This didactic/practical information was helpful with understanding the pathophysiology, differential diagnosis, and different treatment options used to treat spasticity and muscle overactivity dysfunction”
- “Feel more comfortable incorporating BoNT into my practice. Better appreciation for pathophysiology, evaluation, and treatment modalities, as well as injection techniques”
- “The information and experience acquired from this activity will be directly impacting the patient care that I provide”
- “This teaching session is invaluable in gaining knowledge and skills in management of spasticity”
jansons during the Clinical Consult, and/or the type and quantity of patients in the physician’s practice.

Seventy-four percent of the 38 residents who submitted evaluations found the program to be valuable and believed it enhanced their knowledge regarding management of spasticity. The additional 16% of residents did not express an opinion regarding the value of this program or whether it enhanced their knowledge.

For the Residency Practicum programs, 32 of the residents were evaluated by preceptors. Of those 32 residents, preceptors felt that it was likely that 72% would incorporate skills learned at this session into a management plan for the treatment of spasticity and muscle overactivity. For the remaining 18%, preceptors were uncertain whether the skills would be incorporated or believed residents were somewhat likely to use the information in their clinical practice.

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Conclusions
The NeuroRehab Preceptor Program is a comprehensive educational initiative to improve the understanding of spasticity and muscle overactivity. It has received enthusiastic responses from the majority of its participants for its educational and practical value. A large proportion (74% of the 99 physicians who submitted an evaluation) of the participants said that they will incorporate information, skills, and techniques learned in the program into their own practices.

In addition, 100% of participants who completed pre- and postprogram questionnaires (n=43) felt that the program improved their comfort level with
- Describing the pathophysiology of spasticity and muscle overactivity
- Diagnosing and differentiating spasticity from other muscle overactivity disorders

References
Educational Effectiveness: Outcomes Evaluation of the NeuroRehab Preceptor Training Program

To train with a preceptor in a one-on-one Clinical Consult, visit NeuroRehabResource.org/Clinical_Consult_Program.php.

For Residency Training Directors, to nominate your residents to train with a preceptor in a two-on-one Residency Practicum, visit NeuroRehabResource.org/Residency_Practicum_Program.php.