

Solutions to Managing Spasticity in Kids & Adults

Jacqueline A. Nicholas, MD, MPH
System Chief Neuroimmunology & Multiple Sclerosis
OhioHealth Multiple Sclerosis Center
Riverside Methodist Hospital
Columbus, Ohio

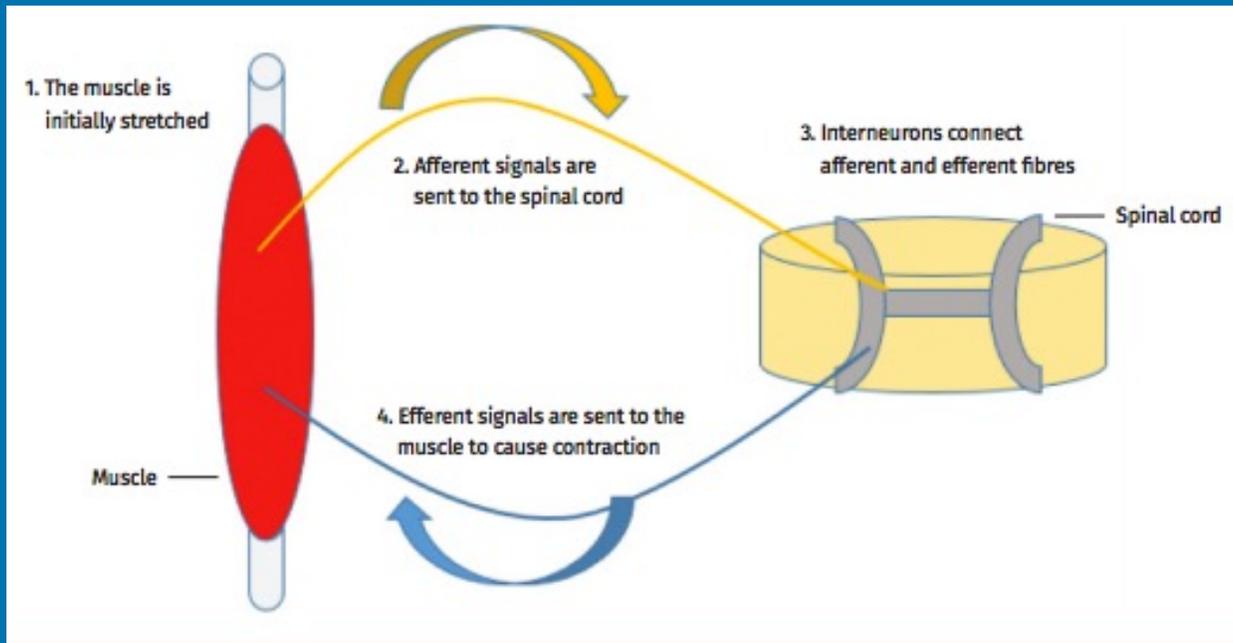


Disclosures:

- Research Grants: Biogen, Novartis, PCORI, Genentech, University of Buffalo
- Consulting: Biogen, Bristol Myers Squibb, EMD Serono, Genentech, Greenwich Biosciences, Novartis, TG Therapeutics
- Speaking honoraria: Alexion, BMS, EMD Serono, Viela Bio

What is Spasticity?

- Normally certain muscles contract, while others relax
- If damage has occurred in the Brain or Spinal Cord, many muscles may contract all at once



Pandyan AD et al. *Disabil Rehabil* 2005.
Miligan J et al. *Can Fam Physician* 2019.

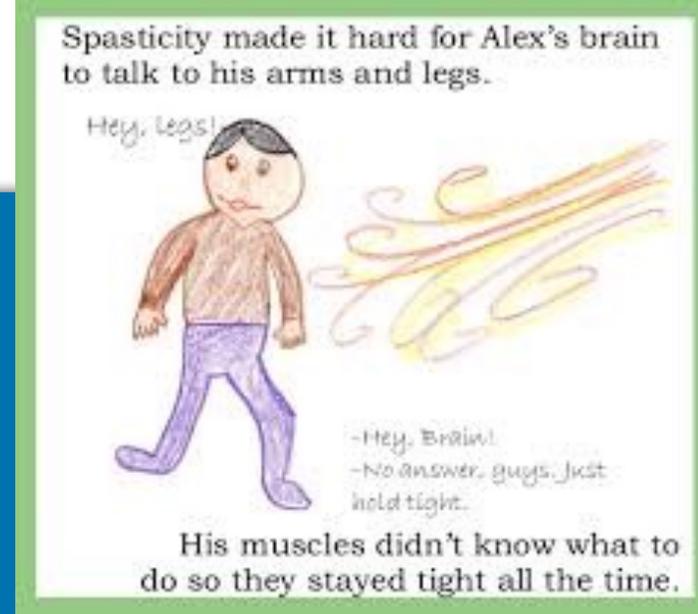
Spasticity Advantages:

- Assists in Activities of Daily Living (ADLs)
- Reduced Muscle Atrophy
- Improved Bone Strength (Fracture Reduction)
- Improved Mobility/Transfers



Spasticity Disadvantages:

- Impairment of ADL's (dressing, bathing, toileting)
- Impairs mobility (inability to walk, roll, sit)
- Pain or abnormal sensory feedback
- Increased risk of Pressure Ulcers
- Orthopedic deformity, such as hip dislocation, contractures, or scoliosis
- Poor weight gain secondary to high caloric expenditure
- Sleep disturbance
- Depression secondary to lack of functional independence



Kheder A et al. *Pract Neurol* 2012.

Bhavikatte G et al. *Br J Med Pract* 2009.

Miligan J et al. *Can J Fam Physician* 2019.

Spasticity Triggers:

- Bladder/Bowel Dysfunction
- Positioning
- Temperature (cold)
- Emotion
- Skin (pressure ulcer, ingrown toenail, tight clothes)
- Pain
- Infection



Kheder A et al. *Pract Neurol* 2012.
Graham LA et al. *Age Ageing* 2013.
Miligan J et al. *Can J Fam Physician* 2019.

Spasticity Treatment Goals:

- Individualized
- Improve ADL's
- Improve Mobility, Positioning
- Decrease Pain and discomfort
- Prevent contractures
- Ease & decrease burden of care
- Improve rehab potential



Treatment Selection:

Non-pharmacologic:

- Daily Stretching Program
- Exercise
- Massage
- Physical/Occupational Therapy
- Serial casting/splinting, electrical stim

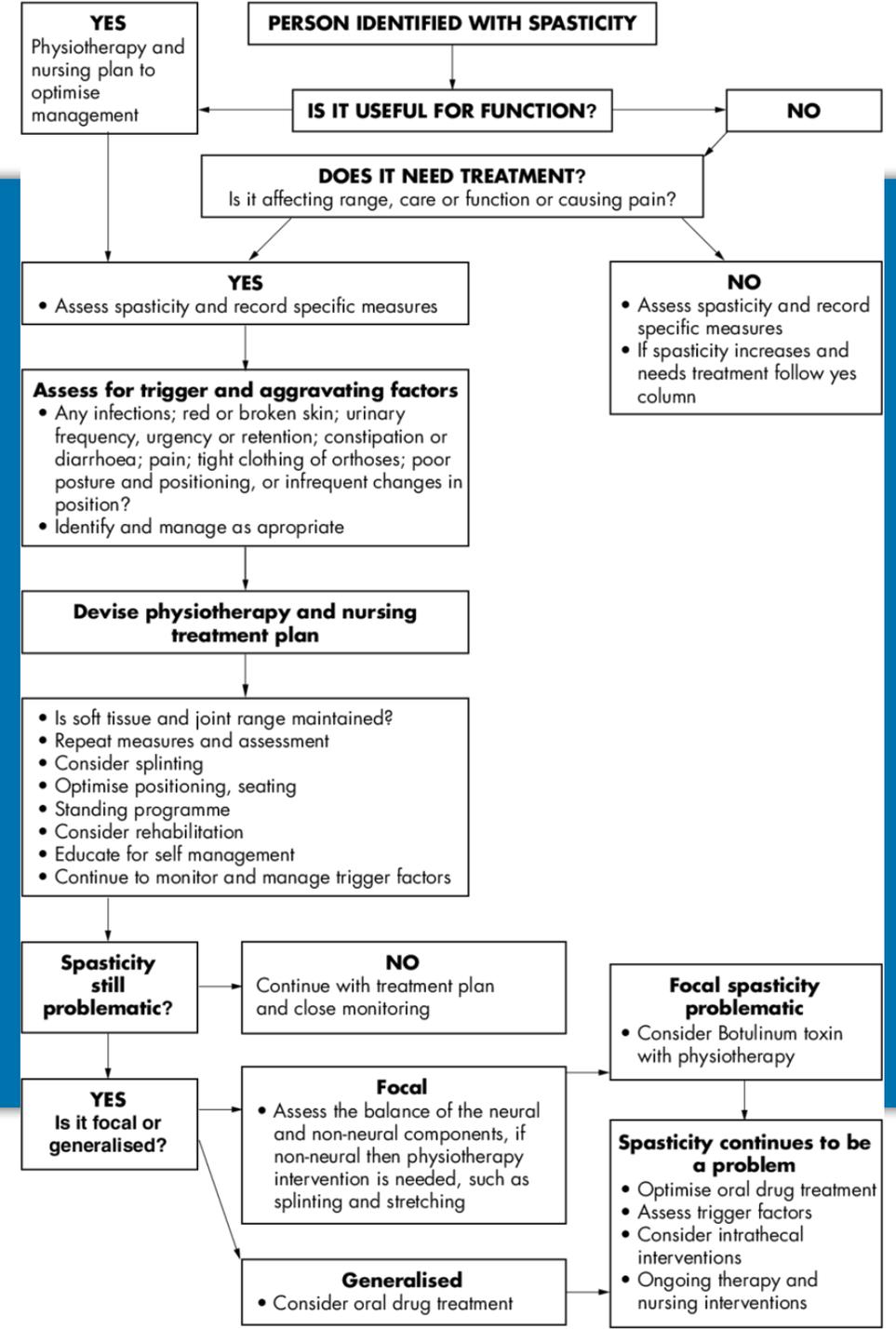
Pharmacologic:

- Oral antispasmodics
- Botulinum toxins
- Phenol/alcohol injections
- Intrathecal Baclofen

Other:

- Surgical Options
- Cannabinoids

Marsden J. et al. *J Neurol Neurosurg Psy* 2005.



Oral Anti-Spasmodics:

- baclofen
- tizanidine
- diazepam
- clonazepam
- gabapentin
- dantrolene
- levetiracetam
- clonidine
- cyproheptadine



Side Effects often limit use: drowsiness, fatigue, cognitive difficulties

AAN Practice Guideline Spasticity: Botulinum Toxin:

Upper Extremity Spasticity

Strong Evidence

For focal manifestations of adult spasticity involving the upper limb, aboBoNT-A, incoBoNT-A, and onaBoNT-A should be offered (**Level A**) as treatment options.*

Moderate Evidence

For focal manifestations of adult spasticity involving the upper limb, rimaBoNT-B should be considered (**Level B**) as a treatment option.*

Lower Extremity Spasticity

Strong Evidence

For focal manifestations of adult spasticity involving the lower limb that warrant treatment, onaBoNT-A and aboBoNT-A should be offered (**Level A**) as treatment options.*

Insufficient Evidence

There is insufficient evidence to support or refute a benefit of incoBoNT-A or rimaBoNT-B for treatment of adult lower limb spasticity (**Level U**).

Comparative Studies

Moderate Evidence

OnaBoNT-A should be considered as a treatment option before tizanidine (TZD) for treating adult upper extremity spasticity (**Level B**).

Techniques to Optimize Response to BoNT

Moderate Evidence

Both high-volume, low-potency injections of onaBoNT-A and endplate targeting of onaBoNT-A into proximal upper extremity muscles should be considered to enhance tone reduction in spasticity (**Level B**).

*For effect on tone and passive function, not active function

Botulinum Neurotoxin (US):

Serotype	Generic Name	Brand	1 st US approval
A	Onabotulinum toxinA	Botox	1989
A	Abobotulinum toxinA	Dysport	2009
A	Incobotulinum toxinA	Xeomin	2011
B	Rimabotulinum toxinB	Myobloc	2000

*With limitations, cross-study comparisons have resulted in relative dose equivalents of Onabotulinum toxinA, Abobotulinum toxinA, Rimabotulinum toxinB, IncobotulinumtoxinA of approximately 1:3-4:50-100:1.

UMN Patterns of Upper Limb Spasticity:



The Adducted/Internally Rotated Shoulder



The Flexed Wrist



The Pronated Forearm



The Clinched Fist

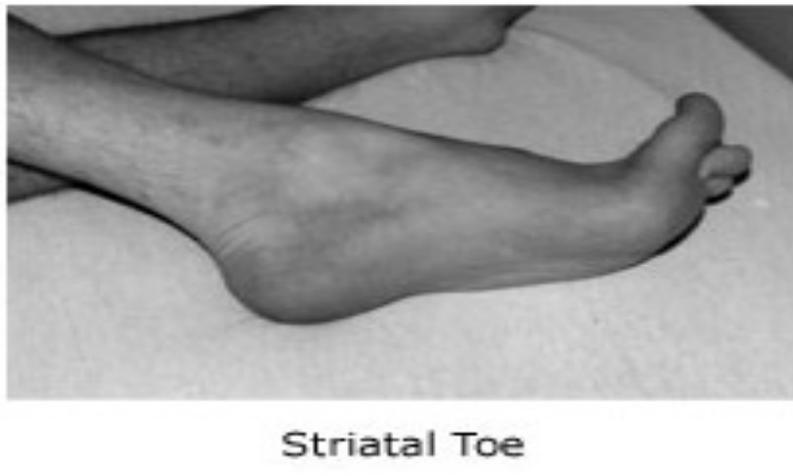
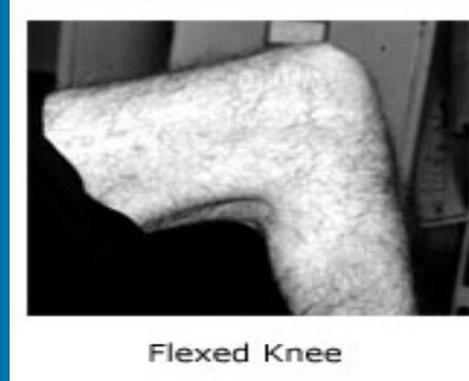


The Flexed Elbow



The Thumb-in-Palm Deformity

UMN Patterns of Lower Limb Spasticity:



Advantages of Botulinum toxin:

- Inject directly into overactive muscles
- Reduces contractions, relaxes muscles
- Advantages of local injection:
 - Targeted to specific muscles causing symptoms
 - Used at recommended doses, avoids systemic symptoms
 - Overt distant clinical effects



Disadvantages of BoNT:

- Repeat injections every 3 months
- Pain with injection
- Bruising
- Local weakness, created by diffusion of botox and site specific
- Death

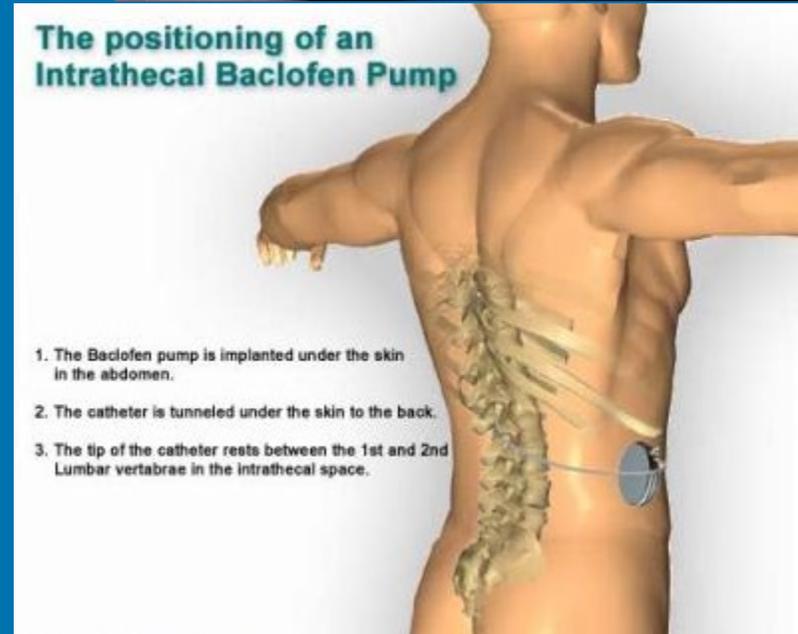
Black Box Warning:
Spread of Toxin Effect



Davis E. et al. *J Neurol Neurosurg Psy* 2000.

Intrathecal Baclofen

- Small doses of baclofen delivered directly to the CSF
- For diffuse spasticity refractory to oral medications & stretching
- Usually more effective for spasticity in the lower extremities >> upper
- Requires committed patient and family, pump must be refilled at least every 6 months and replaced every 7 years.



Abbatemarco JR et al. *Mult Scler* 2020.
Sammaraiee Y et al. *Mult Scler* 2019.

Conclusions:

- Spasticity is COMMON in transverse myelitis and other neuroimmune conditions, regularly assess for it and address it early!
- Physical & Occupational Therapy, Stretching, Oral medications, Botulinum toxins and Intrathecal baclofen are proven to minimize spasticity
- Treatment of spasticity is key to improving quality of life

OhioHealth MULTIPLE SCLEROSIS



#WeNeverStop

Jacqueline A. Nicholas, MD, MPH

System Chief Neuroimmunology & MS
OhioHealth MS Center
Riverside Methodist Hospital
Columbus, OH

Jacqueline.Nicholas@ohiohealth.com