

# NEUROLOGISTS' VIEWS OF CURRENT MEDICATIONS: SPASTICITY AND ATHETOSIS

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## ABSTRACT

*Medications to treat individuals with cerebral palsy have increased significantly over the last few decades. The purpose of this article was to randomly survey practicing neurologists on a national level to determine prescribing patterns for both spasticity and athetosis. The results indicated that the most frequently prescribed medication for spasticity was Baclofen while Artane was the most frequently prescribed medication for athetosis. Implications for special educators and support personnel are put forward.*

Cerebral palsy refers to a “disorder of movement and posture caused by damage to the motor control centers of the brain. . . . The damage that results in cerebral palsy can occur before birth, during the birth process, or after birth from an accident or injury. The condition affects muscle tone . . . interferes with voluntary movement and full control of the muscles, and delays growth and fine motor development” (Kirk, Gallagher, Anastasiow, & Coleman, 2006, p. 518). The two major types of cerebral palsy are spasticity and athetosis.

Spasticity is characterized by exaggerated muscle tone in selective muscle groups, which often results in the limb muscles being excessively tight and hyperactive deep tendon reflexes causing repeated muscle spasms. Spasticity is the most common form of cerebral palsy accounting for up to 60% of cases (Hill, 1999).

Athetosis is characterized by abnormal movements that increase with attempts at voluntary movement or when the individuals are stressed, anxious, or overexcited. Perhaps the most recognizable characteristic in persons with athetosis is a twisting movement of the trunk and a writhing motion in the extremities. Athetosis accounts for 15% of all cases of cerebral palsy (Hill, 1999).

The number of medications to treat the symptoms of cerebral palsy has increased significantly over the last few decades. Neurologists today have at their disposal an array of drug options to help manage cerebral palsy. Because each individual case presents slightly different patterns of involvement, medication management is a complex issue. A neurologist may have to search for either the single drug or the combination of drugs that provides for the optimal level of functioning. To compound the issue, various dosages of the different medications may have to be finely calibrated.

## INSTRUMENTATION

A literature review of current reference books and a corresponding web review of respected sites revealed the most common pharmacologic treatments for cerebral palsy. Those medications which appeared in multiple sources were selected for the instrument. A summary of those medications appears on the following 2 pages (Table 1).

This summary describes them and identifies dosage, monthly cost, and most common side effects. A pilot instrument was developed and later reviewed by a panel of physicians. The panel suggested no major changes in the survey document. The one-page survey instrument listed the four most common drugs for spasticity and the four most common drugs for athetosis. For both types of cerebral palsy, the neurologists were asked to identify the frequency with which they prescribed each of the medications. In addition, open-ended questions addressed combinations of medications and pharmaceuticals not listed (see Appendix A).

## METHOD

Board-certified neurologists were identified using the *Official ABMS Directory of Board Certified Medical Specialists* (Pohlman, 2006). Two neurologists from each state were selected using a randomized process. In addition, selected medical centers which had a cohort of neurologists were also contacted. Each

**TABLE I**

Name	Description	Dosage	Typical Monthly Cost*	Side Effects
Artane	is a synthetic, anti-spasmodic compound which exhibits a direct inhibitory affect on the parasympathetic nervous system	5–15 mg daily in divided doses	\$27.00	blurring of vision, mydriasis, dizziness, nervousness, dry mouth, mild nausea
Baclofen	is a GABA derivative which inhibits reflexes at the spinal level to relieve muscle spasticity	5 mg 3 times daily	\$37.00	drowsiness, dizziness, weakness, nausea
Cogentin	is a synthetic compound for the use in the therapy of Parkinson, useful also in the control of extrapyramidal disorders (athetosis)	1–6 mg daily	\$13.00	dry eyes, blurred vision, constipation, dry mouth
Flexeril	is a tricyclic amine salt that relieves skeletal muscle spasm of local origin without interfering with muscle function	10 mg 3 times daily	\$33.00	drowsiness, dizziness, dry mouth

(continued on next page)

**TABLE I  
(Continued)**

Name	Description	Dosage	Typical Monthly Cost*	Side Effects
Kemadrin	is a synthetic antispasmodic compound which primarily relieves rigidity with secondary relief of tremors	2.5–5 mg 3 times daily	\$101.00	dry mouth, lightheadedness, blurred vision
Klonopin	is a benzodiazepine derivative which stimulates receptors in the central nervous system to inhibit neurotransmitters	0.5 mg 3 times daily	\$35.00	drowsiness, ataxia, behavioral changes Schedule IV Medication
Valium	is a benzodiazepine derivative that produces skeletal muscle relaxation by inhibiting spinal polysynaptic afferent pathways	15–30 mg extended release daily	\$24.00	dizziness, drowsiness, lethargy Schedule IV Medication

\* reports generic when available

physician received the survey, a cover letter, and a self-addressed, stamped return envelope.

The purpose of the study was to randomly survey practicing neurologists throughout the country to document their prescribing patterns for both spasticity and athetosis.

## RESULTS

Completed surveys were received from 33 practicing neurologists. Other non-usable surveys were received from non-practicing neurologists or those neurologists who indicated that they did not treat individuals with cerebral palsy; hence they were not included in the results. A frequency chart was created with the physicians' responses. Table 2 was created converting the data to percentages.

As can be seen from Table 2, Baclofen is by far the most commonly prescribed medication for spasticity followed equally by both Klonopin and Valium. Flexeril was the least prescribed medication for the treatment of spasticity.

As can be seen from Table 2, Artane is by far the most commonly prescribed medication for athetosis followed by Klonopin and then Cogentin. Kemadrin was the least prescribed medication for the treatment of athetosis.

## DISCUSSION

The medication most frequently prescribed for the treatment of spasticity was Baclofen. This is not surprising as Baclofen can be administered orally, intramuscularly, or via pump; these multiple modes of delivery offer clear advantages for physicians and patients. A previous article in this journal discussed the benefits of pump therapy for children with spasticity. As the half-life of Baclofen is 4 hours, the pump can be adjusted to as many as 10 intervals per day for peak functioning during regularly scheduled activities of daily living (Gilmartin et al., 2000).

Klonopin and Valium were equally ranked as second place alternatives to Baclofen for spasticity. Klonopin and Valium are widely used even though they are controlled substances (Schedule IV drugs). Neurologists obviously feel the beneficial effects outweigh the potential risks. Flexeril is the least commonly prescribed medication. In addition to a modest number for frequently/occasionally prescribed, a high number of physicians reported never using this medication for the treatment of spasticity.

**TABLE 2**  
**Spasticity**

Place a check mark in the box to indicate how regularly you prescribe the following medications for a child or adolescent with spastic cerebral palsy.

Medication	Prescribed			
	Frequently	Occasionally	Seldom	Never
Baclofen	79%	14%	0%	7%
Flexeril	10%	24%	31%	35%
Klonopin	17%	38%	38%	7%
Valium	10%	43%	40%	7%

**Athetosis**

Place a check mark in the box to indicate how regularly you prescribe the following medications for a child or adolescent with athetoid cerebral palsy.

Medication	Prescribed			
	Frequently	Occasionally	Seldom	Never
Artane	27%	27%	27%	19%
Cogentin	18%	27%	23%	32%
Kemadrin	5%	10%	5%	80%
Klonopin	5%	45%	36%	14%

The treatments for athetosis indicated that Artane is clearly the most commonly prescribed medication followed by Klonopin and Cogentin. The least commonly prescribed medication is Kemadrin; in fact, 80% of neurologists stated they never prescribed this drug.

On the first open-ended question concerning combinations of drugs for spasticity, 48% of the respondents answered this question. It is most interesting that all of the answers indicated a combination that included Baclofen. Therefore, Baclofen by itself or in combination appears to be the treatment of choice by neurologists. The most frequently cited combinations in rank order were Baclofen and Valium, Baclofen and Zanaflex, and Baclofen and Klonopin.

On the second open-ended question concerning other medications not listed, 52% of the respondents answered this question. The most commonly cited answers in rank order were Zanaflex, Botox, and Skelaxin.

On the third open-ended question concerning combinations of drugs for athetosis, 21% of the responding neurologists answered this question. It is most interesting that the majority of answers indicated a combination that included Klonopin. When ranked by itself Klonopin was second only to Artane, but in combination Klonopin ranked number one. The most common combinations were Klonopin and Artane along with Klonopin and Cogentin.

On the fourth open-ended question concerning other medications not listed, 36% of the neurologists answered this question. The most commonly mentioned medications in rank order were Botox, Zanaflex, and Baclofen.

## IMPLICATIONS

Because classroom teachers and related service providers are on the “front line” of interacting with the students, they are in a unique position to observe and monitor the effects of medications, especially the adverse effects of certain drugs. Teachers and support personnel see students on an extended basis over a long period of time and may observe physical or academic effects of medications prescribed for cerebral palsy that parents are not in a position to see. To do this they need to be aware of common side effects of the two most commonly prescribed medications reported in this study, Baclofen and Artane. As can be seen in Table 1, the most common side effects of Baclofen, used to treat spasticity, are drowsiness, dizziness, weakness, and nausea. While these side effects are generally not seen as major and are many times transient, if they persist, they can have a significant impact on schoolwork. A chronically drowsy, dizzy, or weak student will not be able to fully perform the tasks generally expected in an educational setting.

As noted in Table 1, the most common side effects of Artane, used to treat athetosis, are blurring of vision, dizziness, mild nausea, and nervousness. The *Physicians' Desk Reference* (2007) notes that 30% to 50% of persons will experience these side effects. Blurred vision or mydriasis (abnormal enlargement of the pupil) can be especially problematic for academic activities. It could easily impact reading, math, and content area instruction.

The assumption by most physicians is that the side effects of medications prescribed for cerebral palsy are transient in nature. If, however, the side effects persist and are problematic in the educational environment, teachers should document the problems and then share that information with the stu-

dent's parents during scheduled consultations. In addition, if a new medication is prescribed, parents should share that with the teachers so that they will know to monitor the student more closely during the initial period.

### IMPLICATIONS FOR FUTURE RESEARCH

As this research serves only as a pilot investigation, a broader study using a larger sample size of neurologists is indicated. In addition, in response to two open-ended questions, a number of neurologists identified Botox as a treatment option for cerebral palsy; this medication should, therefore, be included in any broader study. Finally, this study specifically addressed spasticity and athetosis; future research should investigate other types of cerebral palsy (e.g. ataxia).

### CONCLUSION

New drugs are continuously being developed and approved by the Food and Drug Administration for motor impairments. As one result, teachers and related service providers need to be aware that the medications with which they are familiar may be replaced. It will be important for these professionals to maintain regular communication with parents regarding changes in the student's drug regimen. Additionally, since many students will require medication during the school hours, keeping abreast of the side effects of the most common drugs is essential.

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**APPENDIX A**

**SPASTICITY**

Place a check mark in the box to indicate how regularly you prescribe the following medications for a child or adolescent with spastic cerebral palsy.

Medication	Prescribed			
	Frequently	Occasionally	Seldom	Never
Baclofen Flexeril Klonopin Valium				

What combinations of medications might you prescribe?  
 What other medications might you prescribe that were not listed?

**Athetosis**

Place a check mark in the box to indicate how regularly you prescribe the following medications for a child or adolescent with athetoid cerebral palsy.

Medication	Prescribed			
	Frequently	Occasionally	Seldom	Never
Artane Cogentin Kemadrin Klonopin				

What combinations of medications might you prescribe?  
 What other medications might you prescribe that were not listed?