



eLITERATURE
REVIEW

Presented by the Johns Hopkins
University School of Medicine

Supported by educational grants from
Mallinckrodt Pharmaceuticals and
Novartis Pharmaceuticals Corporation



eMultipleSclerosis Review
Podcast Issue

HOME NEWSLETTER ARCHIVE CME INFORMATION PROGRAM DIRECTORS EDIT PROFILE RECOMMEND TO A COLLEAGUE

VOLUME 1 — ISSUE 4: TRANSCRIPT

Featured Cases: New Insights into Lifestyle Modification

Our guest author is Ellen M. Mowry, MD, MCR, Associate Professor of Neurology and Epidemiology at the Johns Hopkins University School of Medicine.

After participating in this activity, the participant will demonstrate the ability to:

- Describe the role of obesity, vitamin D status, and sodium intake in multiple sclerosis.
- Discuss the impact of rehabilitative and physical activity enhancement on neurologic function and aspects of wellness in people with multiple sclerosis.
- Describe the impact of treating urinary dysfunction on the health-related quality of life in people with MS.

This discussion, offered as a downloadable audio file and companion transcript, covers the important topic of MS lifestyle modification in the format of case-study scenarios for the clinical practice. This program is a follow up to the [Volume 1, Issue 3 eMultipleSclerosis Review newsletter — New Insights into Lifestyle Modification](#).

Unlabeled/Unapproved Uses

Dr. Mowry has indicated that she will make references to vitamin D supplementation, which is not directly indicated as an MS therapy.

MEET THE AUTHOR



**Ellen M. Mowry, MD,
MCR**

Associate Professor of Neurology
and Epidemiology
Johns Hopkins University School
of Medicine
Baltimore, Maryland

Guest Faculty Disclosure

Dr. Mowry has disclosed that she has received research grant support from Biogen and free medication for clinical trials for Teva.

PROGRAM DIRECTORS

Arun Venkatesan, MD, PhD

Associate Professor of Neurology
Director, Johns Hopkins Encephalitis Center
Associate Program Director,
Neurology Residency
Johns Hopkins University School of Medicine
Baltimore, Maryland

Scott Douglas Newsome, DO

Assistant Professor of Neurology
Director, Neurology Outpatient Services
Director, Neurology Infusion Center
Johns Hopkins University School of Medicine
Baltimore, Maryland

Release Date

October 13, 2015

Expiration Date

October 12, 2017

ACCREDITATION STATEMENT

The Johns Hopkins University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

CREDIT DESIGNATIONS

Podcast: The Johns Hopkins University School of Medicine designates this enduring material for a maximum of 0.5 *AMA PRA Category 1 Credit(s)*[™]. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

DISCLAIMER STATEMENT**STATEMENT OF RESPONSIBILITY****STATEMENT OF NEED****INTENDED AUDIENCE****CONFIDENTIALITY DISCLAIMER FOR CME
ACTIVITY PARTICIPANTS****HARDWARE & SOFTWARE REQUIREMENTS****COMPLETE CME INFORMATION**

MR. BOB BUSKER: Welcome to our first eMultipleSclerosis Review podcast.

Today's program is a follow-up to our newsletter: *New Insights into Lifestyle Modification*. With us today is that issue's author, Dr. Ellen Mowry, Associate Professor of Neurology and Epidemiology from the Johns Hopkins University School of Medicine.

eMultipleSclerosis Review is presented by the Johns Hopkins University School of Medicine. This program is supported by educational grants from Mallinckrodt Pharmaceuticals and Novartis Pharmaceuticals Corporation.

Learning objectives for this audio program include:

- Describe the role of obesity, vitamin D status, and sodium intake in multiple sclerosis.
- Discuss the impact of rehabilitative and physical activity enhancement on neurologic function and aspects of wellness in people with multiple sclerosis.
- Summarize the impact of treating urinary dysfunction on the health-related quality of life in people with MS.

Dr. Mowry has indicated that she has received research grant support from Biogen, as well as free medication for clinical trials from Teva. She has indicated that her presentation will not reference the unlabeled or unapproved uses of any drugs or products, with the exception of vitamin D supplementation, which is not directly indicated as an MS therapy.

MR. BUSKER: I'm Bob Busker, managing editor of eMultipleSclerosis Review. Dr. Mowry, thank you for joining us today.

DR. ELLEN MOWRY: I'm pleased to be talking with you today, Bob.

MR. BUSKER: In your newsletter issue, doctor, you reviewed some of the recent publications that reported on how a number of modifiable lifestyle factors can impact risk, symptoms, and prognosis in patients with multiple sclerosis. Today we want to focus on how some of this new information can translate into improving clinical practice. So start us out, if you would please doctor, by bringing us a patient scenario.

DR. MOWRY: I saw one of my patients today who presented me with a really interesting question. She's 32 years old and she's had symptoms of relapsing-remitting MS for about 10 years. Her disease began with tingling and numbness on one side, and she had a workup at the time that showed lesions in the brain and the cervical spine, and was told she possibly had a demyelinating disease, although in the next year or so developed a new Lhermitte sign and was told that she should probably start disease-modifying therapy for multiple sclerosis.

However, she declined any such medication, and then about five years ago she developed some minor sensory findings and then another episode consistent with a relapse about a year after that, at which time she did agree to start an injectable MS therapy. And then over the past four years or so she has been clinically and radiographically stable with no evidence of new MS disease activity.

But when I saw her today, she told me that she started a gluten-free diet and had decided to come off her injectable therapy because she doesn't feel it was helping her. She asked me if the gluten free diet was better or if she should switch to the paleo diet, considering all the information on the Internet about that. She also told me she was taking a number of over-the-counter supplements, as well as vitamin D3 1000 IU per day, and her 25-hydroxy vitamin D level when I checked it today was 29 ng/mL.

MR. BUSKER: So here's a patient who's aware that diet can have an effect on her MS, even though she's been getting her information from the internet — which we all know contains at least as much misinformation as it does information. Having at least some awareness about how their lifestyle can impact their MS — how common is that among the patients you see?

DR. MOWRY: I think with the advent of the internet and a pretty sophisticated group of patients, people spend a lot of time researching MS and, in particular, are interested in understanding how their lifestyle choices can affect the disease. I happened to do an internet search of diet and multiple sclerosis several months ago and retrieved 13 million hits. So there's a lot of information there, and it's hard to weed through all of the different websites to get a clear answer about diet and how it affects the disease.

MR. BUSKER: This patient specifically asked you about two diets: the gluten-free diet and the paleo diet. Have either of those been shown to be helpful for people with MS?

DR. MOWRY: A lot of diets have been purported on websites to be helpful for people with MS. In general, it's interesting to think about because we do know that MS seems to be more and more common over the past several decades, and recently a clear link has been demonstrated between obesity and the risk of MS. This is highlighted in the Langer-Gould article discussed in the newsletter.¹

In that article, particularly extremely obese girls are at very high risk of later developing MS. So I think there is a good rationale for looking at diet and how it affects multiple sclerosis. There are many ways biologically in which the food we eat may influence MS or the risk thereof, and it is thought to directly affect the immune system. Also, various foods can change the bacteria in the gut that are known to be educators of the immune system and teaching the immune system about what belongs in the body and what doesn't belong. So it's plausible that through one of those mechanisms or even a different mechanism, the food that we eat could certainly affect MS risk or even prognosis.

Despite all of that exciting rationale, the data supporting a specific diet are limited. A recent study by Farez, et al, which I also highlighted in the newsletter, looked at salt and how that might be associated with MS activity.² They measured urinary sodium excretion from a morning urine sample and evaluated whether the amount of sodium in the urine was linked to the risk of subsequent MS relapses or new and active inflamed spots on brain MRI scan. Although the study wasn't perfect, there was a pretty strong association between sodium level and the risk of activity — about four times an increase in the risk of relapses for people taking in very high amounts of sodium. MRI activity also showed nearly 3.5 times increase in the risk of new or enhancing lesions in the roughly two years of follow-up.

For other diets though, there are no great studies with solid study designs indicate a specific diet is helpful. People try gluten free and they try paleo, and some say that they feel better, which certainly may be the case; but there haven't been rigorous studies to look at how the diets actually affect the disease activity.

MR. BUSKER: So no strong evidence basis that one diet is better than another — that's got to be very frustrating for those patients who really want to make diet change a part of their lifestyle modification. What do you tell these people, what do you recommend to your patients?

DR. MOWRY: That's a great question. It is frustrating, I think both for the patients as well as for doctors who want to give patients the right tips and tools to best manage the disease.

I tell my patients now that a lot of studies are emerging indicating that people with MS who have a number of comorbid illnesses are at higher risk of bad outcomes related to the MS. So although I don't think that we know of a specific diet that directly affects MS, we do know that a diet that is appropriate in preventing comorbid cardiovascular bad outcomes is a Mediterranean-style diet in which people are cautioned not to eat a lot of processed food, not have a lot of simple sugars, and instead eat plenty of fruits and vegetables and more white meat and fish than red meat, and moderate alcohol their intake.

I generally suggest to people that if they are interested in modifying their diet at this time to follow a Mediterranean-style diet, as we all know we should be doing anyhow.

MR. BUSKER: I want to go back to something in your initial description of this patient: And that's that she stopped her injectable MS medication because she didn't think it was working for her. Now, I'm guessing, that her question to you about diet was that she assumed that diet alone would help control her symptoms. How do you respond to a situation like that?

DR. MOWRY: That was a concern I had too, in speaking with my patient earlier today. A lot of people are hoping that a lifestyle modification might alone treat MS, and I always tell people this is a complementary approach to treating the disease. I think in this case the patient assumed that the MS medication wasn't helping her anymore because she was not having any new symptoms or new spots show up on the MRI scan, but in reality that's more likely to be an indicator that the treatment was working for her, not that it wasn't doing anything. So I always to tell my patients we know it's doing its job if we're not seeing that type of activity.

Nonetheless, since comorbid illnesses are definitely a big prognostic factor of bad outcomes for people with MS, trying a Mediterranean-style diet as a complement to the MS therapy is definitely something I encourage people to do.

MR. BUSKER: Now this patient also started taking a variety of herbal supplements. What do you advise your patients in that area?

DR. MOWRY: That's a great question. A lot of people do look to supplements as an adjunct to their MS treatments as well. In medicine we look for data from randomized, controlled trials where people by a flip of a coin are assigned to either receive the intervention or typically a placebo, and we don't have much data supporting the use of one particular supplement or any supplements at this time.

Furthermore, supplements are not as tightly regulated by the Food and Drug Administration as are approved medications, so we don't know a lot about their safety, nor do we know a lot about how the supplements could interact with prescribed medications that people with MS are taking. So I tell people I can't make a recommendation to take a particular supplement, nor do I know that the supplement won't, in fact, be harmful.

MR. BUSKER: However, that advice about supplements does not apply to supplementing vitamin D, is that correct?

DR. MOWRY: Right. She was taking cholecalciferol 1000 IU and had a vitamin D level in the blood of 29 ng/mL. The vitamin D story in MS is becoming more and more compelling, both for its influence on MS risk and prognosis. In the newsletter I highlight this new Mowry paper that looks at vitamin D status in a unique way as a risk factor for MS by analyzing a predicted vitamin D level based on a person's genetic makeup from some specific genes that influence vitamin D levels. The study confirmed a prior paper in which there was a clear association between higher levels of vitamin D and lower risk of subsequently developing multiple sclerosis.³

In addition, observational data support that even among people who already have MS, those with lower vitamin D levels have an increased risk of relapses, new MRI lesions, disability progression, and loss of gray matter volume on the MRI scan. However, we still are awaiting results of randomized, controlled

trials to help us understand if supplementing with vitamin D is in fact helpful, or if that apparent effect of vitamin D is not a vitamin D effect at all, but perhaps is related to some covariate that isn't measured in those studies. So we have a lot of work to do there.

MR. BUSKER: So what do you tell your patients?

DR. MOWRY: Currently, I discuss the pros and cons of vitamin D supplementation with each of my patients before prescribing or suggesting that people take vitamin D. In particular, although we don't know of any specific negative consequences of mild increases in vitamin D levels, we sometimes do try to provide supplementation with a target vitamin D range in my clinic of 40 to 60 ng/mL. But again, I stress to people that it might not be helpful and it could have harms that we don't realize at this time.

And so when I'm aiming for that level of vitamin D, most of my patients require somewhere between 2000 and 5000 IU daily of the cholecalciferol to achieve that range.

MR. BOB BUSKER: Thank you for that case and discussion, doctor. We'll return, with Dr. Ellen Mowry from Johns Hopkins, in just a moment.

MR. BOB BUSKER: Hello. This is Bob Busker, Managing Editor of *eMultipleSclerosis Review*.

If you found today's program on iTunes or on the web, please be sure to subscribe. This podcast is part of Johns Hopkins *eMultipleSclerosis Review*, an educational program providing monthly activities certified for CME credit. *eMultipleSclerosis Review* provides expert commentary and useful practice information for clinicians treating patients with multiple sclerosis.

For additional information, or to subscribe to receive our newsletters and podcasts without charge, please visit www.eMultipleSclerosisReview.org. Thank you.

MR. BUSKER: Welcome back to this *eMultipleSclerosis Review* podcast. Our guest is Dr. Ellen Mowry from the Johns Hopkins University School of Medicine. And our topic is: New Insights into Lifestyle Modification.

We've been discussing how some of the new information Dr. Mowry reviewed in her newsletter

issue can be applied in clinical practice. So to continue, doctor, please bring us another patient scenario.

DR. MOWRY: I saw another wonderful patient today, a 67 year old woman who has had MS for a long time. She used to have a relapsing-remitting course but over the past five years she has experienced a slow decline in her gait. She came in today saying that her last attack was about seven years ago, before starting her MS therapy. She has a history, as well, of poorly controlled type 2 diabetes and complained today of several symptoms that seemed consistent with depression and severe fatigue. On her examination, her body mass index was 35 kg/m² and her neurologic exam demonstrated a mild left hemiparesis, moderate loss of vibratory sensation at the toes, spasticity and hyperreflexia in both legs, and a spastic gait. In fact, it took her almost 12 seconds to walk 25 feet. So she came in today to discuss how we could improve her symptoms.

MR. BUSKER: Your initial impression of this patient, doctor.

DR. MOWRY: This patient has secondary progressive MS and I think she still has ongoing risk of relapses since before starting her MS therapy she had several and now hasn't had any. I probably wouldn't change her platform therapy at this time, but unfortunately the secondary progressive course that she now has as well does not have any known approved therapies to halt its progression.

I think she can work on a number of other things to improve her overall health outlook. We talked before about how comorbid illnesses can influence the risk of worse outcomes for people with MS. She has poorly controlled diabetes; her body mass index is very high and also deserves attention; and she has a number of symptoms related to MS including depression, fatigue, and spasticity. I think she could make a number of lifestyle modifications that will help improve her quality of life.

MR. BUSKER: Tell us about that, if you would. What kinds of lifestyle modifications would you recommend?

DR. MOWRY: The first thing I'd recommend is starting a regimen of stretching and routine exercise. First, the exercise might help boost her metabolic rate so she

can lose some of the weight that she's put on. Second, as highlighted in the newsletter in the article by Pilutti, et al, where they use a simple intervention to try to encourage people to do more physical activity. They showed that increased activity not only improved peoples' physical activity, it also influenced disease outcomes such as depression and fatigue in a meaningful way.⁴

The stretching I would recommend to her might also be a first step toward treating her spasticity. In a patient like this, particularly if they haven't been exercising in a while and have had a change in their neurologic exam, I sometimes find a short course of physical therapy to be helpful, as therapists can help guide her to figure out safe and appropriate ways she can use to manage her mobility problems.

MR. BUSKER: Comorbid illnesses, as you said, have been linked to worse outcomes for people with MS. This woman is obese, and she also has type 2 diabetes. How would you talk to her about these conditions?

DR. MOWRY: You know that obesity and overweight problems are difficult for a number of people in the United States, but they're particularly relevant to people with multiple sclerosis, since we know that they may worsen the long-term outcomes for people with MS. As reviewed in the newsletter, obesity seems to be a risk factor for the disease. It's unclear if obesity itself worsens things like MS attacks, or new lesions, or other things to that extent, but certainly we know that the overall health outcomes are worse for people with such cardiovascular problems.

I'd have a frank discussion with this patient about that. I'd tell her that her uncontrolled diabetes, in addition to having a bad effect on the MS, means that she's at risk for things like heart attack, stroke, and kidney failure, and that this is a major health priority for her now. In patients like this I discuss whether or not seeing a nutritionist would be helpful in addition to recommending exercise, and also she may be a candidate for a bariatrics evaluation, starting first with trying to figure out if there are ways to avoid surgery through other interventions, but when possible to even think about bariatric surgery. Recent studies suggest that bariatric surgery may be more helpful than other measures in controlling diabetes outcomes. So I think that that would be a reasonable approach for her.

MR. BUSKER: So in your opinion, improving her diet and increasing her exercise — do you believe that's going to be enough to help this patient?

DR. MOWRY: I don't think diet and exercise alone are likely to be a treatment for this patient. She has a lot of things going on, but I do think we know exercise has a meaningful impact on other neurologic diseases and has been shown to improve quality of life and many of the symptoms a particular person has experienced. So I think these lifestyle modifications are an important adjunct to the traditional medical management structure.

The other thing to note for this person is that we should always be thinking about screening our patients with MS who are depressed for suicidal intentions, as suicide is overrepresented in this population.

MR. BUSKER: A very good point, doctor. Thank you. Let me ask you now to bring us another patient, if you would, please.

DR. MOWRY: I saw another 49 year old woman who has had a history of MS for 10 years. She came for her first evaluation with me, stating that for the past three years she's had progressive right-sided weakness and has fallen multiple times. Over the past two years she's noticed bladder dysfunction. At first she was experiencing frequency of urination and urgency where she felt like she could barely make it to the bathroom on time before needing to start urinating, although in the past several months she's had urge incontinence essentially every day. Sometimes she also notices that when she gets up from the toilet, she has to go back about 10 minutes later, even though she felt initially that she had completely emptied the bladder.

She doesn't drink an excessive amount of fluid, and she's not a coffee drinker, so none of those things seem to be influencing her at this time, but she says it's becoming embarrassing for her. She wears a pad now when she leaves the house and sometimes she feels that she smells of urine. She doesn't notice any leakage of urine when she coughs, her bowel movements seem regular, and her examination was notable for some substantial disability with a bilateral intranuclear ophthalmoplegia, spasticity in both legs and one arm, and a moderate right hemiparesis, as well

as a slow spastic gait and impairment of vibratory sensation at her toes.

MR. BUSKER: First question: bladder dysfunction — how common is it in patients with MS?

DR. MOWRY: I think bladder dysfunction is more common than many people recognize. I notice that patients may not always volunteer that they're having bladder symptoms, but that if I ask many people do notice even more subtle bladder problems such as urinary frequency. So I've tried to incorporate asking people about bladder and even bowel dysfunction as part of my routine screening of new patients.

MR. BUSKER: Evaluating bladder dysfunction issues — what's your general process?

DR. MOWRY: The first thing is to get a very good history: is this a classical overactive bladder with urge incontinence, has she had frequent urinary tract infections, and is there any cause for concern for one at the current time? Also it's important to evaluate if people seem to have a history of incomplete bladder emptying, because that not only helps us think about what medications might be useful for treating the bladder symptoms, but incomplete emptying can also contribute to episodes of incontinence.

MR. BUSKER: Would you prescribe urinary incontinence medication for her?

DR. MOWRY: This patient's bladder history is quite complicated. Not only does she have urinary frequency and urgency with urge incontinence, I'm also concerned that she may have incomplete emptying, because even though she feels that she's emptied the bladder completely, she needs to urinate again 10 minutes after she's been to the bathroom. This could be a problem if you prescribe a classic medication like an anticholinergic or antimuscarinic medication, because they can enhance retention of urine and contribute to worsening of the underlying problem.

In this sort of patient I like to get a post-void residual where we ask patients to fully empty their bladder or as much as they think they can, and then do an ultrasound of the bladder to see how much urine is left in there. And if there is a lot of urine left over, this might not be a person for whom a simple anticholinergic type medication will be helpful.

For people with MS, bladder dysfunction can be disabling and have a major impact on quality of life as this patient described, so I have a very low threshold for getting at least one consultation from a urologist to help me understand what's going on with the person's bladder and to help make decisions about how to manage the specific bladder problems.

MR. BUSKER: In your initial description, you made a very specific point to highlight her bowel function. Why?

DR. MOWRY: It's important when you're getting a history about bladder problems to also ask about bowel control. First, the nerves that control the bladder also are related to bowel control, so people with MS who have bladder dysfunction also often have bowel issues, most typically constipation. It's also important to ask about, because sometimes people who are not controlling their bladder function well, try to restrict the amount of fluid that they take in to avoid embarrassing accidents, and that restriction of fluid can worsen constipation. And at the same time, constipation itself, can affect bladder control, so if people are constipated, addressing that may help improve the control of the bladder.

The other thing to note from this case is that I was struck by how impaired her gait was. It took her a very long time to walk a given distance, which means that if she has urinary urgency, she's at even higher risk of having an episode of incontinence. So she has a lot of things that could be contributing to her such frequent episodes of incontinence

MR. BUSKER: So if medications to address her urge incontinence are inappropriate, what other therapies might you consider?

DR. MOWRY: I mentioned that this is a patient I'd probably refer to a urologist for an evaluation, as I think she'll probably benefit from specialty care in this regard. But it's worth noting that there are a lot of new therapeutic approaches to this common problem for people with MS. Not all of these approaches have excellent levels of evidence, but all of them have some encouraging data.

Before I send somebody to the urologist I always advise them to start with a simple measure which is called "scheduled voiding." So if people describe

that their episodes of urgency or urge incontinence are occurring say every two and a half hours, instead of waiting for that to happen, I tell them to try to take yourself to the bathroom every two hours to sort of game the system, beat the bladder to the punch and thereby possibly avoid the incontinence episode.

Urologists in general have several nonpharmacologic, or at least medications that aren't taken by mouth, such as botulinum toxin injections, stimulation of the tibial nerve, as well as sacral neuromodulation. In addition, a recent study highlighted in the newsletter by Block and colleagues showed that a number of physical therapy-related activities that can not only reduce incontinence, but also improve quality of life.⁵ So this woman whose quality of life has definitely been affected by her bladder dysfunction may benefit for one or more of these interventions.

MR. BUSKER: Now you also noted that she's had a number of falls. What lifestyle modifications can be done to reduce the frequency of falls?

DR. MOWRY: I think this patient has a lot of things that are contributing to her fall risk. She has possibly vision difficulty, since her eyes aren't moving together, so she may be experiencing some trouble seeing well. She has weakness, spasticity, loss of sensation, especially in her feet, and has overall imbalance. So one thing that I would try to target for her is managing her spasticity. This could include stretching and exercise, as well as medications for spasticity.

And certainly exercise is one of the more important things, especially for people who have more progressive types of symptoms. Exercise can help at least minimize disuse atrophy, where people are weaker so they sit more and so their muscles shrink to some extent, and then they're weaker so they sit even more, and it can sort of snowball.

A recent meta-analysis by Gunn and colleagues highlighted in the newsletter looked at whether various rehabilitation activities reduced fall risk.⁶ They said that there was no statistically significant reduction in fall risk, although it's notable that because of the stringent criteria they used for studies that were included in this meta-analysis, are only two studies were included. So I would argue that perhaps we need better, larger studies to truly evaluate the impact of rehab and physical therapy on fall risk.

But the Gunn study did show a statistically significant benefit of rehabilitation for balance. So really, again, a lot of lifestyle modifications, as well as medical management that might help this patient quite a bit.

MR. BUSKER: Thank you for sharing your insights, Dr. Mowry. Let's wrap things up now by reviewing today's discussion in light of our learning objectives. So to begin: the role of obesity, vitamin D status, and sodium intake in multiple sclerosis.

DR. MOWRY: We first discussed that working with MS patients to reduce obesity, although we don't know if it affects MS directly, may be of benefit since comorbid illnesses are linked to worse outcomes for people with MS. We also discussed the emerging data regarding sodium intake in MS, namely that high sodium levels in the urine that indicate intake of sodium, were strongly linked to the risk of MS relapses, as well as new lesions appearing on MRI scans.

And then a new study we highlighted strengthens the link between vitamin D status and the risk of MS. We are anxiously awaiting data from randomized, controlled trials before definitively being able to say if supplementing with vitamin D can either prevent or treat MS.

MR. BUSKER: And our second learning objective: the impact of rehabilitative and physical activity enhancement on neurologic function and aspects of wellness in people with MS.

DR. MOWRY: Behavioral interventions designed to increase physical activity not only led to an increase in physical activity, but patients reported improvements in their depression, anxiety, and fatigue. We know that physical activity, as we reviewed here, also seems to improve balance, and from previous studies we know that activity overall prevents disuse atrophy and is good for our health.

Physical therapy intervention may even be helpful for controlling urinary dysfunction in MS patients, again highlighting how lifestyle changes may enhance quality of life and reduce symptoms.

MR. BUSKER: And finally: the impact that treating urinary dysfunction can have on health-related quality of life issues in people with MS.

DR. MOWRY: We reviewed that urinary incontinence and bladder dysfunction, in general, have strong impacts on wellbeing and quality of life in people with MS. I highlighted that it's important to take a good history to understand the contributors to bladder dysfunction, and at a minimum obtaining a postvoid residual urine volume is helpful before prescribing medications for overactive bladder.

We also reviewed several targeted interventions including tibial nerve stimulation, sacral nerve stimulation, and botulinum toxin, as well as physical therapy that can help bladder dysfunction, in addition to the more typical oral medications used to treat bladder problems in patients with MS.

We also pointed out that the conventional pharmacotherapies, ie, the anticholinergic or antimuscarinic therapies, can be problematic in people with MS who may have mixed types of bladder dysfunction, because if there is already a tendency to under empty the bladder, these medications may exacerbate that problem, thus increasing rather than improving the bladder dysfunction.

MR. BUSKER: Dr. Ellen Mowry from the Johns Hopkins University School of Medicine, thank you for participating in this eMultipleSclerosis Review Podcast.

DR. MOWRY: It's been a great pleasure. Thank you so much for inviting me.

MR. BUSKER: To receive CME credit for this activity, please take the post-test at www.eMultipleSclerosisReview.org/test.

This podcast is presented in conjunction with the eMultipleSclerosis Review Newsletter, a peer-reviewed literature review certified for CME credit, emailed monthly to clinicians treating patients with multiple sclerosis.

The Johns Hopkins University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. For physicians, the Johns Hopkins University School of Medicine designates this enduring material for a maximum of 0.5 *AMA PRA Category 1 credit*.™ Physicians should claim only the credit commensurate with the extent of their participation in this activity.

This educational resource is provided without charge, but registration is required. To register to receive eMultipleSclerosis Review via email, please go to our website: www.multiplesclerosisreview.org.

The opinions and recommendations expressed by faculty and other experts whose input is included in this program are their own. This enduring material is produced for educational purposes only.

Use of the Johns Hopkins University School of Medicine name implies review of educational format, design, and approach. Please review the complete prescribing information for specific drugs, combinations of drugs, or use of medical equipment, including indication, contraindications, warnings, and adverse effects, before administering therapy to patients.

eMultipleSclerosis Review is supported by educational grants from Mallinckrodt Pharmaceuticals and Novartis Pharmaceuticals Corporation.

This program is copyright with all rights reserved by the Johns Hopkins University School of Medicine.

REFERENCES

1. Langer-Gould A, Brara SM, Beaver BE, Koebnick C. Childhood obesity and risk of pediatric multiple sclerosis and clinically isolated syndrome. *Neurology.* 2013;80:548-552.
2. Farez MF, Fiol MP, Gaitan MI, Quintana FJ, Correale J. Sodium intake is associated with increased disease activity in multiple sclerosis. *J Neurol. Neurosurg Psychiatry.* 2015;86:26-31.
3. Mokry LE, Ross S, Ahmad OS, et al. Vitamin D and risk of multiple sclerosis: a Mendelian randomization study. *PLoS Medicine.* 2015;12:e1001866.
4. Pilutti LA, Dlugonski D, Sandroff BM, Klaren R, Motl R. Randomized controlled trial of a behavioral intervention targeting symptoms and physical activity in multiple sclerosis. *Mult Scler.* 2014;20:594-601.
5. Block V, Rivera M, Melnick M, Allen DD. Do physical therapy interventions affect urinary incontinence and quality of life in people with multiple sclerosis? *Int J MS Care.* 2015;17:172-180.
6. Gunn H, Markevics S, Haas B, Marsden J, Freeman J. Systematic review: the effectiveness of interventions to reduce falls and improve balance in adults with multiple sclerosis. *Arch Phys Med Rehabil.* 2015 Jun 10. pii: S0003-9993(15)00455-4.