

Patient Case — Vivian: Presentation

- 42-year-old Black female lawyer diagnosed with RRMS 2 years ago
- Wants to discuss starting a DMT
- Lives in a rural area and drives over 50 miles to see an MS specialist
- Has stress-induced gastritis and severe needle phobia
- Smokes ½ pack per day
- Comorbid conditions: obesity, hypertension
- Chief concern is bladder spasms, incontinence



Image credit: Sora Shimazaki [Pexels](#)

RRMS, relapsing-remitting multiple sclerosis; DMT, disease-modifying therapy.

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Patient Case — Vivian: Questions for Consideration

- What barriers might Vivian need to overcome to receive timely and effective MS treatment?
- Does she have any risk factors or comorbid conditions that impact DMT choice?
- How would you address her lower urinary tract symptoms?
- How would you provide comprehensive care for Vivian?



Image credit: Sora Shimazaki [Pexels](#)

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Patient Case — Vivian: Additional Medical History

Patient medical history leading to diagnosis:

- Initially presented in an ED with numbness in her left hand and balance problems
 - Diagnosed with viral and stress-induced illness
 - Symptoms resolved within three weeks
- One year later was seen in the ED with balance problems and weakness, and a foot drop in her left leg
 - MRI consistent with MS
 - Referred to a neurologist
- Delayed the appointment because her symptoms resolved
- Seen 6 months later
 - Neurologist suspected MS and referred her to an MS specialty center
- MS specialist confirmed the diagnosis, and DMTs were discussed
 - Patient refused DMTs because of concerns about side effects
- Patient lost to follow-up for 2 years; now she has lower urinary tract symptoms that interfere with her career
- Patient requests an oral DMT



Image credit: Sora Shimazaki [Pexels](#)

ED, emergency department; MRI, magnetic resonance imaging; DMT, disease-modifying therapy.

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Social Determinants of Health and Other Factors Contribute to a Delayed Diagnosis

✓ Factors pertinent to patient case (Vivian)

3 SOCIAL DETERMINANTS OF HEALTH^{1,2}

- Lower educational attainment
- Lower health literacy
- Lower access to specialty care
- Higher emergency department utilization
- Negative illness perception
- Poor lived experience with MS
- Lower annual income
- Higher unemployment rate

3 BARRIERS TO ACCESS³

- Gaps in health insurance coverage
- Transportation challenges
- Limited access to telehealth

5 INDIVIDUAL FACTORS^{4,5}

- Male gender
- Living in a rural area
- Age at diagnosis (lower age at)
- Motor symptoms at onset

6 BARRIERS TO QUALITY CARE⁶

- Unequal availability of diagnostic and treatment resources
- Uneven distribution of specialty care
- Limited healthcare workforce diversity
- Limited language services
- Underrepresented in clinical studies

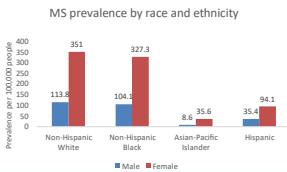
1. Dobson R et al. *Nat Rev Neurol*. 2022;18(12):733-734. 2. Amezcua L et al. *JAMA Neurol*. 2021;78(15):1515-1524. 3. Nolen L et al. *Nat Rev Neurol*. 2021;17:67-68. 4. Patil P et al. *Mult Scler Relat Disord*. 2022;57:103861. 5. Ghislan M et al. *Acta Neurologica Belgica*. 2021;121:199-204. 6. Okor AF et al. *Neurology*. 2022;98(24):1015-1020.

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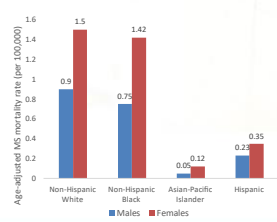
MS Prevalence and Mortality Is Highest in Black and White Female Populations

Retrospective study¹

- 3,863 PwMS
- Average age 51.7 years
- 77% female patients



Age-adjusted MS mortality, 1999-2015²



PwMS, people with multiple sclerosis.

1. Langer-Gould AM et al. *Neurology*. 2022;98(16):e12118-e12119. 2. Amezcua L et al. *JAMA Neurol*. 2021;78(15):1515-1524.

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MS Prognostic Factors

Prognostic factor	Better	Worse
Age at onset	Younger than age 37	Older than age 37 ✓
Sex	Female ✓	Male
Race/Ethnicity	White people Northern European ancestry	Black and Hispanic/Latinx people ✓ Middle Eastern North African Asian
Smoker	No	Yes ✓
First attack symptoms	Optic neuritis, sensory, unifocal	Pyramidal, cerebellar, sphincteric, cognitive or multifocal symptoms ✓
Progression	Complete recovery from relapse ✓	Progression at onset
MRI features	Cerebral lesions, no new lesions, no gadolinium-enhanced lesions	Gadolinium-enhanced lesions at baseline, spinal cord or brainstem lesions, new T2 lesions over time
Cerebrospinal fluid (CSF)	Absence of CSF specific oligoclonal bands	Presence of CSF specific oligoclonal bands

✓ Patient Case (Vivian) Prognostic Factors

1. Espirithu A et al. *Practical Neurology*. 2022;online; 2. Dobson R et al. *Journal of Neurology, Neurosurgery & Psychiatry*. 2013;84(8):909-3. Tintore M et al. *Brain*. 2015;138:1861-1874.

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Treatment Factors to Consider for Individualizing DMT Selection



Image credit: Sora Shimazaki [Pexels](#)

Patient Factors

- Older age at onset
- Black/African American
- Motor, brainstem-cerebellar symptoms
- Smoker
- Severe needle-phobia
- Initially refused DMTs due to perceived side effects
- Rural area, high-stress occupation, delayed seeking treatment
- Hypertension, obesity, gastritis

Factors to consider

- Safety
- Efficacy
- Mode of administration
- Patient acceptance
- Individual patient variables
- Economic factors

Consortium of Multiple Sclerosis Centers DMT Guideline Writing Group. CMSG practical guidelines for the selection of disease-modifying therapies in multiple sclerosis. Updated March 12, 2020. Accessed January 27, 2023. <https://mscare.sharefile.com/share/view/573d5256ca3841189>

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Patient Case — Vivian: Additional Medical History

Vivian has daily bladder spasms and occasional incontinence. She wears incontinence underwear at work but fears having an accident. She is a trial lawyer and must stay in the high-stress courtroom environment for long periods without a break.

Workup:

- UA/UC: no signs of infection
- KUB ultrasound: mild hydronephrosis
- PVR=90 mL

Vivian has tried:

- Restricting fluids
- Avoiding caffeine and alcohol
- Meditation

She would like to discuss the possibility of using onabotulinumtoxinA injections (she wants the most dependable treatment option available without cognitive side effects)



Image credit: Sora Shimazaki [Pexels](#)

UA, urinalysis; UC, urine culture; KUB, kidneys, bladder; PVR, postvoid residual volume.

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Patient Case — Karla: Presentation

- 37-year-old White female single parent to children ages 6 and 9
- Has worked in a factory for 17 years; is facing job challenges
- Chief concerns are spasticity and pain
- Has gastritis and fatigue attributed to opioids used to treat her pain
- Started on interferon beta 2 years ago, shortly after her RRMS diagnosis, but finding it hard to tolerate the flu-like side effects and wants a 'better' medication
- Does not want to use an injectable medication anymore
- Concerned about DMT cost; a single parent trying to weigh cost, job requirements, and how her health will impact her ability to parent her children; no plans for future pregnancies



DMT, disease modifying therapy

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Patient Case — Karla: Questions for Consideration

- Which complementary therapies do you consider when discussing pain management with your patients?
- What resources can you offer patients who are concerned about treatment costs?
- What factors would you consider when recommending a DMT for Karla?
- How would you provide comprehensive care for her?



DMT, disease modifying therapy

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Patient Case — Karla: Additional Medical History

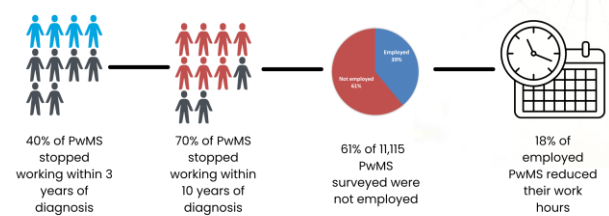
- 37-year-old factory worker
- Can sit about 75% of the day while working on the assembly line
- Shares factory clean-up duties with 2 other shift employees
- Spasticity is intermittent but occurs at least 2-3 times per day
- Pain is severe enough that she has had to take a break from work
- Coworkers complain when the line is held up
- Has been using tramadol as needed for pain but takes it more frequently than she should (is getting prescriptions from more than 1 physician)
- Has taken baclofen, 20mg 3 times a day, for 5 years
- Tried gabapentin, but it made her tired and dizzy



DMT, disease modifying therapy

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MS Has a Significant Impact on Employment and Earnings Potential



Sample: 12,233 people from 93 countries, 77% female patients and 94% PwMS, 79% of respondents were from North America or Euro

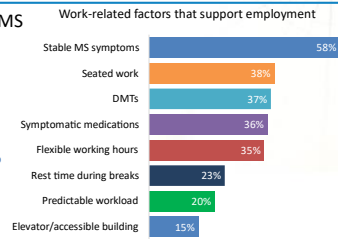
PwMS, people with multiple sclerosis
Jones N et al. *Global MS Employment Report 2016* London, UK, 2016:20

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DMTs and Symptomatic Treatments Help People With MS Stay Employed

Symptoms that prevented PwMS from staying employed¹

- Fatigue: 62%
- Mobility challenges: 51%
- Weakness: 40%
- Cognitive impairments: 36%
- Worsening symptoms: 33%



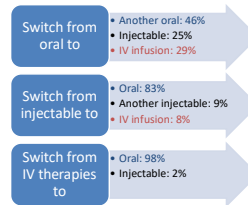
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DMT, disease modifying therapies; PwMS, people with multiple sclerosis
Jones N et al. *Global MS Employment Report 2016* London, UK, 2016:20

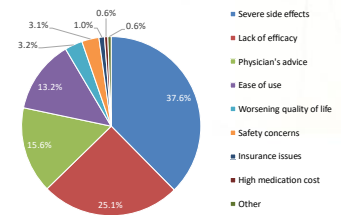
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Monitoring Social Media Uncovers Patients' Reasons for Switching DMTs and Switching Trends

Medication switches



Reasons for switching DMTs



DMTs, disease-modifying therapies
Nixon V et al. *J Med Internet Res*. 2016;18(11):e162.

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Treatment Factors to Consider for Individualizing DMT Selection



Patient Factors

- Single mom to 2 children
- Experiencing side effects after using interferon beta (1st DMT used, 2 years of therapy)
- Does not want to self-inject
- Has spasticity and pain, which impairs QoL
- Has gastritis and fatigue attributed to opioid use
- No plans for pregnancy
- Facing job challenges
- Concerned about DMT cost
- Cannot get off work easily
- Misusing opioids

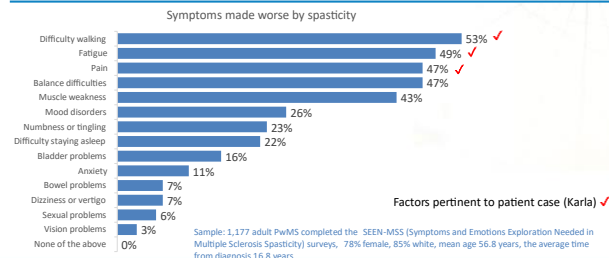
Factors to consider

- Safety
- Efficacy
- Mode of administration
- Patient acceptance
- Individual patient variables
- Economic factors

DMT, disease modifying therapy
Consortium of Multiple Sclerosis Centers DMT Guidelines Writing Group. *CMSC practical guidelines for the selection of disease-modifying therapies in multiple sclerosis*. Updated March 12, 2020. Accessed January 27, 2023. <https://msscare.sharefile.com/when/view/175c16fca84318d>

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Spasticity Can Make Other MS Symptoms Worse



PwMS, people with multiple sclerosis
Newcombe S et al. *Multiple Sclerosis and Related Disorders*. 2022;68:104376.

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For the online activity only
(Questions are rhetorical, intended to provoke thought and serve as an outline for the presentation that follows)

Patient Case — Michael: Presentation

- 31-year-old Hispanic male diagnosed with RRMS 5 years ago
- Having difficulty accepting his diagnosis
- Sees naturopathic doctor for treatment because he prefers a more holistic approach to health and does not like to use pharmaceuticals
- After having a recent MS flare, his naturopathic doctor encouraged him to see an MS specialist to discuss DMTs
- Depressed since diagnosis, he struggles with overwhelming daytime fatigue
- Uses a cane to ambulate outside the home
- Assistant manager at a small retail store



Image Source: Canva

RRMS, relapsing-remitting multiple sclerosis; DMTs, disease-modifying therapies

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Patient Case — Michael: Questions for Consideration

- How do you engage in shared-decision making with a patient who distrusts western medicine?
- Which DMTs would you select for Michael? Why?
- How would you manage Michael's depression and fatigue?
- How would you collaborate with his naturopathic physician to provide comprehensive patient care?



DMTs, disease-modifying therapies

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Patient Case — Michael: Additional Medical History

- Initial presentation was myelitis
- Left with residual weakness in his right leg and hip
- His naturopathic doctor has prescribed IV vitamin therapies and glutathione
- He consumes a vegetarian diet and exercises regularly
- His most recent MRI showed 2 new brain lesions and 1 spinal cord lesion. This prompted a consultation with a neurologist to discuss DMTs. Michael is very hesitant to use pharmaceuticals and has many questions about their safety and potential side effects
- Timed 25-foot walk test: 6.5 seconds
 - < 6 seconds - Normal - Mildly impaired
 - 6.0 to 7.9 seconds - Moderate impairment
 - > 8.0 seconds - Severely impaired
- John Cunningham Virus (JCV) antibody test is positive (low antibody index)
- Vitamin D level is 25 ng/mL (range, 20 -40 ng/mL), Vitamin B12 level is normal
- HIV negative, has antibodies to measles, mumps, rubella, and hepatitis B



Image Source: Canva

IV, intravenous; MRI, magnetic resonance imaging; HIV, human immunodeficiency virus

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Treatment Factors to Consider for Individualizing DMT Selection



Image Source: Canva

Patient Factors

- Hispanic male diagnosed with RRMS 5 years ago
- Initial presentation: myelitis
- Gait impairment that limits ambulation
- Hesitant to use pharmaceuticals
- Concerned about medication safety and side effects
- JCV antibody positive (low antibody index)
- Struggles with depression and fatigue
- MRI showed 2 new brain lesions and 1 spinal cord lesion
- Assistant manager at a small retail store

Factors to consider

- Safety
- Efficacy
- Mode of administration
- Patient acceptance
- Individual patient variables
- Economic factors

JCV, John Cunningham Virus; MRI, magnetic resonance imaging

Consortium of Multiple Sclerosis Centers DMTs Guideline Writing Group. CMOG practical guidelines for the selection of disease-modifying therapies in multiple sclerosis. Updated March 31, 2020. Accessed January 27, 2023. <https://mscare.sharefile.com/share/view/679d1b16c8843189>

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Patient Case — Michael: Additional Medical History

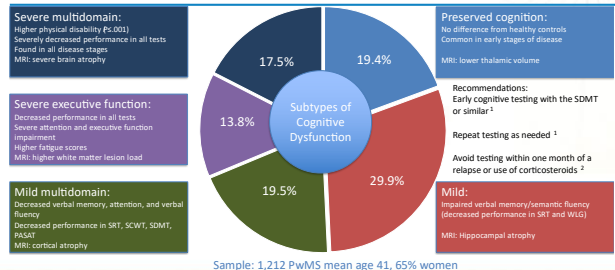
- Michael has struggled with depression and fatigue since his diagnosis
- Concerned about losing his job and benefits
- Unmarried but has lived with his partner for 2 years
- Refused antidepressants; uses zinc and L-tryptophan to treat his symptoms
- Uses caffeine and B12 injections to treat his fatigue
- Sees a psychologist biweekly
- Meditates and does yoga regularly



Image Source: Canva

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Depression and Cognitive Dysfunction Commonly Coexist

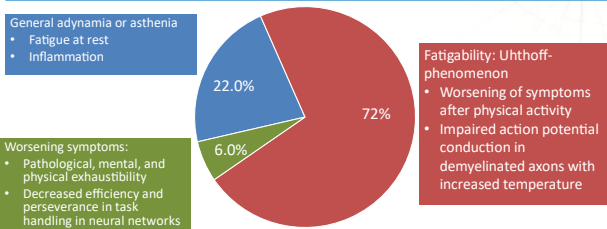


SCWT, Stroop color and word test; SRT, selective reminding test; PASAT, paired auditory serial addition test; SDMT, Symbol Digit/Match test; WIG, word list generation

De Meo et al. JAMA Neurol. 2021;78(4):414-420. 1. Kralj R. Arch Gen Psychiatry. 2018;75(12):1465-1468. 2. Langston DW. Ann Neurol. 2012;72(3):391-6

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PwMS Describe Their Fatigue in Different Ways Suggesting More Than One Pathophysiology



Sample: 155 PwMS, 105 women, 50 men, 118 with fatigue

PwMS, people with multiple sclerosis
 Turner J et al. Mult Scler. 2020;26(2):134-138

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An Interprofessional Care Team for Michael

- Patient and caregiver
- Primary care clinician
- MS Specialist/neurologist
- Social worker
- Physical therapist
- Rehabilitation specialist
- Physiatrist
- Occupational therapist
- Vocational rehabilitation counselor
- Psychologist/neuropsychologist
- Naturopathic doctor



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