



REVIEW

Patient and Provider Insights into the Impact of Multiple Sclerosis on Mental Health: A Narrative Review

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Received: January 29, 2021 / Accepted: March 3, 2021 / Published online: April 20, 2021
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ABSTRACT

Multiple sclerosis (MS) is a chronic disease in which the immune system attacks the central nervous system, causing inflammation and neurodegeneration. People living with MS may experience a variety of symptoms as a consequence of this process, including many “invisible” symptoms that are internally manifested and not seen by others. Of the invisible symptoms of MS, which we have reviewed in a companion article, mood and mental health disorders are of particular concern due to their high prevalence and significant impact on

patient quality of life. In this review, we showcase the experiences of patient authors alongside perspectives from healthcare provider authors as we promote awareness of the common mental health conditions faced by those living with MS, such as depression, anxiety, adjustment disorder, bipolar disorder, psychosis, and suicidal ideation. Many of these conditions stem in part from the increased stress levels and the many uncertainties that come with managing life with MS, which have been exacerbated by the environment created by the coronavirus disease 2019 (COVID-19) pandemic. A patient-centered interdisciplinary approach, routine screening for mental health changes, and referral to specialists when needed can normalize discussions of mental health and increase the likelihood that people living with MS will receive the support and care they need. Management techniques such as robust social support, cognitive behavioral therapy, mindfulness-based interventions, and/or pharmacotherapy may be implemented to build resilience and promote healthy coping strategies. Increasingly, patients have access to telehealth options as well as digital apps for mental health management. Taken together, these approaches form an integrative care model in which people living with MS benefit from the care of medical professionals, a variety of support networks/resources, and self-management techniques for optimal mental health care.

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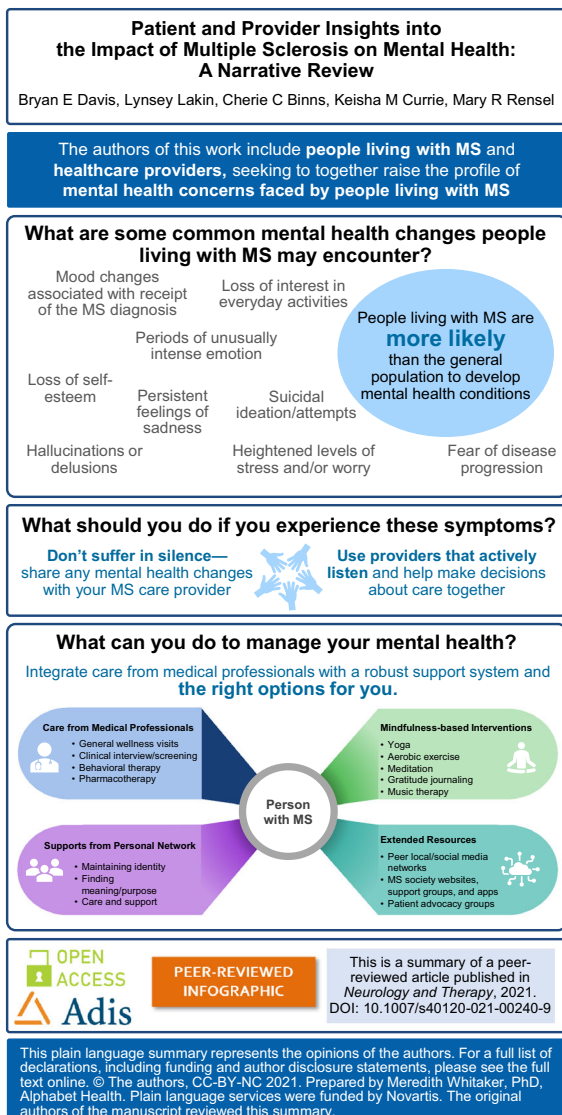
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Graphical Plain Language Summary:



Key Summary Points

People living with multiple sclerosis (MS) experience mood and mental health disorders at greater rates than the general population; this component of the 'invisible' symptoms of MS can significantly impact quality of life.

Mental health disorders may be consequences of lesions of the central nervous system, the interplay of invisible symptoms, and the stress and uncertainty of living with MS.

Mental health discussions may be incorporated into routine MS care via clinical interview and regular use of screening tools to monitor the presence and level of changes; referral to specialists should be offered when necessary.

Initial management may utilize non-pharmacotherapeutic approaches such as cognitive behavioral therapy, mindfulness-based interventions, or other strategies which build resilience.

Integrative care models may include many team members and may help people living with MS reap the benefits of medical professionals from multiple disciplines, their own mental health self-management techniques, and support from both personal networks and patient groups/societies.

Keywords: Anxiety; Cognitive behavioral therapy; Depression; Integrative care; Invisible symptoms; Mental health; Mindfulness-based interventions; Multiple sclerosis; Patient experience

DIGITAL FEATURES

This article is published with digital features, including a summary slide and a graphical plain language summary, to facilitate understanding of the article. To view digital features for this article go to <https://doi.org/10.6084/m9.figshare.14141468>.

INTRODUCTION

Multiple sclerosis (MS) is a chronic, progressive autoimmune disease in which loss of myelin sheaths on neurons and subsequent neurodegeneration result in increased disability for patients over time. People living with MS experience a variety of symptoms [1], some of which are externally visible to others and thus have become commonly associated with MS (e.g., difficulty walking), but others remain ‘invisible’ since they are experienced internally [2, 3]. Frequently experienced invisible symptoms, reviewed separately in a companion article [4], may include fatigue, mood and mental health disorders, cognitive changes, pain, bowel/bladder dysfunction, sexual dysfunction, and vision changes. In 2015, the American Academy of Neurology declared 11 quality measures for the care of those living with MS, four of which screen for invisible symptoms including depression, cognition, and fatigue [5]. Despite this, awareness of invisible symptoms is variable, and this could lead to misunderstandings, stigma, and gaps in care/accommodations [4, 6].

In this review, we focus on mood and mental health disorders, as they are a vital component of overall health yet are often overlooked. People living with MS are more likely than the general population to experience certain mood and mental health disorders; these conditions can include, but are not limited to, elevated/chronic stress levels, depression, anxiety, adjustment disorder, psychosis, and suicidal ideation [7, 8]. Depression and stress can also exacerbate the difficulties of managing bipolar disorder, which may be more prevalent in people living with MS [9]. Evidence suggests that the state of one’s mental health impacts quality of life (QoL) and possibly MS disease progression itself [10–12]. However, mental health concerns for people living with MS may be under-recognized and under-treated [13, 14]. The ongoing coronavirus disease 2019 (COVID-19) pandemic may further exacerbate mental health challenges for people living with MS because of additional barriers to social interaction, interrupted routines, reduced options for

safe physical exercise, and increased financial uncertainty for many families [15]. Indeed, in a study conducted during April 2020, individuals with MS reported experiencing elevated levels of depression/anxiety during the pandemic relative to their own scores 1 year prior and to healthy controls [16]. As such, the pandemic may further increase the need for awareness of and solutions for mental health issues for people living with MS.

Here, we leverage the experience of our patient authors, clinical practice, and scientific literature to examine the current understanding of mental health for people living with MS and how best to improve patient outcomes. Cherie Binns, diagnosed with MS in 1994, is a Registered Nurse (RN) and a Multiple Sclerosis Certified Nurse (MSCN). Keisha Currie, diagnosed with MS in 2012, has a master’s degree in rehabilitation counseling (MRC) and is a Certified Rehabilitation Counselor (CRC). Their insights contribute to our understanding that MS care teams should normalize mental health concerns for people living with MS by integrating mental health into the standard clinical interview for MS patients. Healthcare providers (HCPs) may also utilize screening tools to monitor mental health status and refer patients to a mental health specialist when appropriate. We review wellness- and mindfulness-based interventions and highlight the ability of these techniques to improve wellbeing and QoL. For example, digital/virtual opportunities for care and social support during the COVID-19 pandemic are rapidly becoming more available and can continue to serve as an important tool in the future. By promoting an open dialogue between people living with MS and their care teams, a comprehensive approach to MS care which incorporates mental health can be achieved. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

PREVALENCE, ETIOLOGY, AND CLINICAL COURSE IMPLICATIONS OF MENTAL HEALTH CONCERNS FOR PEOPLE LIVING WITH MS

How Common are Mental Health Concerns for People Living with MS and How Do They Manifest?

Research on the prevalence of mental health disorders reports variable data, in part due to the study population, study size, or type of screening test used. While prevalence rates may vary between studies, it is generally accepted that mood and mental health disorders may be more likely for people living with MS than for the general population [7, 8, 17]. In Table 1, we reference approximate prevalence rates and signs/symptoms for each mental health disorder discussed and share patient perspectives with the objective to familiarize the MS care team with the language patients may use to convey their experience.

A common thread in the experiences of people living with MS is heightened levels of stress, which can exacerbate/contribute to the development of physical and mental health concerns. Relative to the general population, people living with MS may experience heightened levels of stress due to situations including, but not limited to, the sudden change to one's life upon diagnosis, the unpredictability of MS, experiencing invisible symptoms such as cognitive impairment, managing newly visible symptoms, financial complications, feeling loss of control, and navigating unexpected decisions [18, 19]. Effective stress management is essential for people living with MS, as stress/stressful life events have been linked to both the onset of MS and exacerbating disease progression/relapses [20–22]. Major negative stressful events (e.g., assault, hospitalization) have been shown to be correlated with an increased risk of new lesions, while positive stressful events (e.g., weddings, moving to a nicer home) may predict a decreased risk [23]. Unmitigated heightened and/or chronic stress can influence the

development of other emotional changes and therefore warrants attention from HCPs [24].

Depression is one of the most common emotional changes experienced while living with MS and one of the strongest factors causing reduced QoL [25–30]. In a systematic review and meta-analysis of literature on the prevalence of depression and anxiety in MS, the prevalence of depression was 30.5% and 22.1% for anxiety in a total sample size of 87,756 people living with MS [31] (Table 1). Depression can range from occasional, mild depressive symptoms to persistent, more severe clinical depression; symptoms of depression are shown in Table 1, and these can vary in severity [25, 31]. Depression is associated with anxiety, which can independently have a negative influence on patient QoL [32, 33]. As shown in Table 1, anxiety can manifest with some combination of both physiological and psychological symptoms [34]. Anxiety is associated with increased suicidal ideation; it has been suggested that attempted suicide and completed suicide both occur at rates twice as high as in the general population for people living with MS [35–37]. Living alone, social isolation, having a mental health condition, and/or experiencing high levels of stress may also contribute to this suicidal ideation risk [38]. Additionally, people living with MS may develop adjustment disorder, wherein emotional changes occur within 1–3 months of a stressful event (e.g., an MS diagnosis) because of a maladaptive response to the event [39, 40] (Table 1).

While less common than depression, anxiety, and their associated concerns, people living with MS may have a heightened risk of bipolar disorder relative to the general population [9, 41]. An increase in the prevalence of psychosis/psychotic disorders for people living with MS has also been reported [7] (Table 1).

What Causes Mental Health Disorders in MS?

The etiology of mental health disorders and emotional changes is complex and multifactorial, and could be due to a combination of

Table 1 Mental health disorders in people with MS

| Mental health disorder | Estimated prevalence in people with MS | Signs and symptoms | Patient perspectives |
|--|---|--|--|
| Depression | ~ 30.5% [31]; 2 to 5 times higher than general population [8] | Sadness/irritability, loss of interest or pleasure in everyday activities, change in appetite, sleep disturbances, agitation, fatigue, feelings of worthlessness/guilt, problems with thinking/concentration, persistent thoughts of death or suicide [25] | <p>“Depression can be both situational (difficulty adjusting to diagnosis, loss of job, or inability to afford treatment) or actually related to lesion placement and load. In my case, the initiation of the right DMT (for me at that time in disease course) treated the depression more completely than years of SSRIs or therapy did”</p> <p>“Living with depression has been as if I were living in small chunks of times versus a fluid, connected life. The depressed times were like dark periods of times that were semi-connected to me...I would comply with my appointments during my periods of depression, but it was almost robotically. I was not able to shed much light on the previous 6 months or a year because I did not really remember”</p> |
| Anxiety (e.g, panic attacks, phobias, obsessive-compulsive disorder, and generalized anxiety disorder) | ~ 22.1% [31]; 3 times higher than general population [8] | <p>Physiological: trembling, increased heart rate, dry mouth, shortness of breath, nausea, hot/cold sensations, tingling in fingers or toes, lightheadedness, faintness/fatigue, muscular tension, restlessness, insomnia, or frequent urination</p> <p>Psychological: chronic unhappiness, frequent worry/guilt or feeling out of control, indecisiveness, feeling inadequate or easily embarrassed, rigidity, hostility, repetitive behavior or ruminating, over-anticipation, excessive concern with physical health, negative thinking about the future, or racing thoughts [34]</p> | <p>“With COVID in play, the increased potential for anxiety in social situations (someone is not wearing a mask or their idea of ‘social distancing’ is not the same as mine) has risen. Also, for many of us, there is heightened concern that our DMT may have us at greater risk for developing COVID-19 than others may experience.”</p> <p>“Although, I am aware of pseudo-exacerbation if I feel something new or different with my body, it is easy for me to project on how [disease progression] will affect me well into the future”</p> |
| Adjustment disorder | ~ 22% [40] | Rebellious or impulsive actions, anxiousness, feelings of sadness/hopelessness, crying, withdrawn attitude, lack of concentration, loss of self-esteem, suicidal thoughts, insomnia, muscle twitches or trembling, fatigue, body pain/soreness, or indigestion following a stressful life event/diagnosis [42] | <p>“I thought I had landed in the ideal place for my health, educational growth, vocational goals, and spirituality. Suddenly, that ended, and I had to adjust. I took all kinds of actions to try to recreate my oasis, somewhere else. After I became physically and emotionally exhausted, I was able to settle into the safe place that existed all along”</p> |
| Bipolar disorder | 13% [43] | Periods of unusually intense emotion, changes in sleep patterns and activity levels, secondary mania, and uncharacteristic behaviors [44, 45] | <p>“I have learned some of the warning signs that I might be behaving manically now, like wanting to keep stopping at different stores and purchasing things I do not need”</p> |

Table 1 continued

| Mental health disorder | Estimated prevalence in people with MS | Signs and symptoms | Patient perspectives |
|---|--|--|---|
| Psychotic disorders (e.g., schizophrenic disorders, episodic mood disorders, delusional disorders, and phobias) | Psychosis: 4.3% [46]; psychotic symptoms: 2–3 times higher than general population [8] | Symptoms of psychosis could vary depending on the individual's situation, but typically include hallucinations, delusions, and/or confused/disturbed thoughts [47] | People living with MS who have experienced psychosis describe feelings of paranoia and seeing/hearing things that were not there [48, 49] |

challenges of living with MS or symptoms of the disease.

Lesions in multiple brain regions have been implicated in causing mental health disorders for people living with MS; the current understanding of neurobiological risk factors (i.e., lesion location, endocrine systems, and medications) was recently reviewed by Silveira et al. [8]. Mood changes can also be influenced by neuroinflammation, with even subclinical neuroinflammation predicting psychological change [50]. Physical symptoms of MS and other invisible symptoms, medication side effects, genetic predisposition, and life events can all influence the likelihood of developing a mental health disorder [8]. Both biological and social factors can contribute to depression and anxiety [32]. Furthermore, having one mental health disorder can put a patient at risk for another, for example, having depression puts patients at higher risk for anxiety [33]. In addition to these factors, the interplay of invisible symptoms and perceived stigma endured by people living with MS, described in our companion review [4], also may impact mental health burdens. How a person living with MS feels can be a combination of reacting to the challenges of living with a long-term, unpredictable disease and symptoms of the disease and can even lead to feelings of grief in people living with MS [24, 51].

How Can Mental Health Change over Time for a Person Living With MS?

Mental health for a person with MS may change over the course of their lifetime, from the time of their initial diagnosis and throughout their adjustments to living with MS (Fig. 1). A decline in mental health has been associated with receipt of the MS diagnosis [52]. Receiving the diagnosis of MS causes uncertainty for patients as they are likely unfamiliar with MS and how it will impact their life (Fig. 1). Generally, worsened mental health is associated with high feelings of uncertainty rather than MS disease severity [32]. While living with MS, individuals will observe their abilities change, which is likely to negatively influence their mood

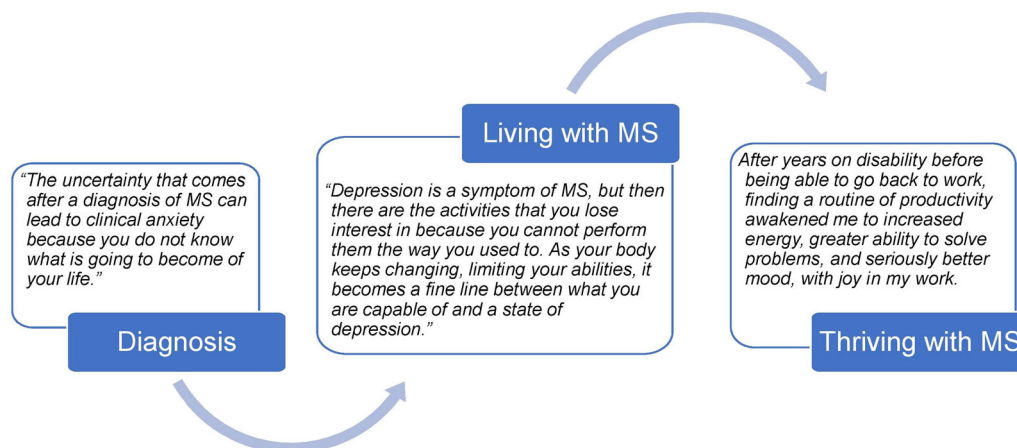


Fig. 1 Patient author perspectives illustrating how mental health may improve during the course of MS with appropriate interventions. With the appropriate

interventions and support, people living with MS can learn to thrive while living with the disease

(Fig. 1). People living with MS may experience complex feelings, such as thoughts that life for their caregivers would be better without them and increasing depression as their perceived disabilities worsen over time [53]. People living with MS may experience having to cope with loss of physical and mental abilities, dealing with new relationship dynamics, and adapting to a different lifestyle than the one they envisioned [24]. Living with MS also may involve a great deal of uncertainty, which plays a large part in the development of mental health concerns. For example, patients must bear the emotional weight of fear of disease progression, reactions to physical and QoL changes, as well as side effects of medications [54, 55]. As people living with MS adjust to living with the disease, their mental well-being may improve as they learn more about MS and adopt techniques for managing the symptoms, stigma/psychosocial influences, and mental health concerns which may occur due to MS [56, 57]. With time and a strong support system, a person living with MS can utilize many strategies to enrich their life and thrive despite having MS (Fig. 1).

HOW CAN WE AS A COMMUNITY ADDRESS MENTAL HEALTH IN A COMPREHENSIVE MANNER?

Normalize Discussions of Mental Health at Routine MS Care Visits

Every person living with MS will have a unique mental health experience, although there are common themes which HCPs should convey as normal components of living with MS, such as the adjustments to changing abilities discussed in Fig. 1 and the ‘burden of choice’ regarding disclosure of MS to peers/employers [4]. Mental health intervention may be offered at the time of diagnosis as this moment marks a dramatic change for the patient. At diagnosis and in subsequent visits, during the clinical interview HCPs may listen carefully to patients’ descriptions of concerns, life events, and their emotions surrounding them. By regularly considering emotional well-being as seriously as physical well-being, HCPs can normalize conversations about mental health and offer appropriate resources.

HCPs can supplement a thorough clinical interview with screening tools, which serve to both aid in open communication and identify/monitor mental health changes. In Table 2,

Table 2 Common screening tools for mental health concerns

| Neuropsychiatric disorder | Screening tools | Usage notes |
|---------------------------|---|---|
| Depression | Patient Health Questionnaire (PHQ-9, asks about previous 2 weeks) [59] | Administer as needed, no more frequent than every 2 weeks Can be administered by any provider who knows how to interpret and score Very brief, yet informative measure Anxiety should be considered when depression is detected because of frequent co-occurrence Freely available [60] Administer as needed |
| | 21-Question Beck's Depression Inventory (BDI-II) [61] | Anxiety should be considered when depression is detected because of frequent co-occurrence Commercially available [62] |
| Anxiety | 7-Item Generalized Anxiety Disorder Scale (GAD-7, asks about previous 2 weeks) [63] | Administer as needed, no more frequent than every 2 weeks It can be administered by any provider who knows how to interpret and score Very brief, yet informative measure Depression should be considered when anxiety is detected because of frequent co-occurrence Freely available [60] Administer as needed Commercially available [65] |
| Adjustment disorder | Hospital Anxiety and Depression Scale-Anxiety (HADS-A) [64] Adjustment Disorder–New Module 20 (ADNM-20) [66, 67] Abbreviated versions of ADNM (ADNM-8, ADNM-4) [68] | Two-part assessment to document (1) stressful life events during the past 1–2 years and (2) the severity/duration of reaction to them 6 months prior to assessment Free [69] |

Table 2 continued

| Neuropsychiatric disorder | Screening tools | Usage notes |
|---------------------------|---|--|
| Bipolar disorder | Mood Disorder Questionnaire (MDQ) [70] BDI-II (above) [43, 61] | Inquire about the duration of mania symptoms to distinguish bipolar I (mania lasting at least 1 week in length) or II (i.e., hypomania and lasting at least 4 days in length) Also note any depression symptoms on the PHQ-9 Free [70] |
| Psychotic disorders | Two screening questions during the clinical interview: (1) “Do you see things that others can’t or don’t see?” and (2) “Have you ever felt that someone was playing with your mind?” [71] | If yes, then refer to a specialist who may use additional tools to screen/diagnose specific type of psychotic disorder |
| Suicidal ideation | PHQ-9, specifically item 9 | If PHQ-9 indicates suicidal ideation, ask further questions regarding past suicidal ideation, plans, and attempts and address as needed If unable to give PHQ-9, safety can be monitored via clinical interview |
| Stress | Clinical interview and/or biofeedback indicators (heart rate, breaths per minute, oxygen saturation) Perceived Stress Scale (PSS) [72] Brief-COPE [73, 74] | Consider administering on an as-needed basis if stress is expressed by patient or the patient is experiencing impairment/needs that outweigh available resources Both PSS and Brief-COPE are freely available [72, 74] |

we outline common screening tools that we suggest HCPs may utilize for routine screening and timely management of mental health concerns. We further indicate usage notes from our clinical experience, such as noting when tools are brief to administer, which can allow for ease of implementation despite time constraints (Table 2). At minimum, a visit should incorporate depression/anxiety screening tools [e.g., the Patient Health Questionnaire (PHQ-9) and 7-Item Generalized Anxiety Disorder Scale (GAD-7)], an update of life events, and discussion of any disease management changes. Answers to depression/anxiety screening tools can serve as a starting point to initiate open communication/discussion by informing follow-up questions specific to the patient's responses. HCPs should also ask patients if they have the social supports and other resources they need to meet their concerns, as stress can occur when there is a shortage of resources in comparison to one's needs. At every visit, any negative/distressing life events that have occurred should be monitored; this is always important, but especially so within the first 3 months after receiving the MS diagnosis when adjustment disorder is a risk. Any past suicidal ideation or previous suicide attempts should be discussed at every interaction, as these are the most informative predictors of future attempts [58]. For bipolar disorder, a thorough clinical interview which educates about mania/bipolar disorder symptoms and takes a strong family history is recommended. Following an interview in which mania/bipolar disorder is suspected, the Mood Disorder Questionnaire (MDQ) may be utilized to help clarify the symptoms a person living with MS may be experiencing (Table 2).

Utilize Supports from Personal Networks and Extended Resources

In addition to the steps that HCPs can take to normalize mental health discussed in the previous section, people living with MS can self-manage aspects of mental health by educating themselves, seeking out appropriate supports and resources, and asking for help by talking

openly with their care team. The mental health needs and stress caused by living with invisible symptoms vary between individual patients, as each person with MS will have a unique set of life experiences, coping strategies, and thought processes. These factors can contribute to psychological resilience or the individual's ability to mitigate the negative effects of stress and overcome adversity [75, 76]. Resiliency building is an important component of patient-driven care, as higher resilience may reduce the risk of psychiatric symptoms and maintain QoL in people living with MS [77].

A vital aspect of resiliency building is maintaining social connections, as social support that a patient may or may not receive from their community is another contributing factor to mental health [78, 79]. Coupled with professional support when needed, social support (coming from significant others, family members, close friends, neighbors, worship community, etc.) may help individuals navigate the uncertainties of living with MS by maintaining some continuity in their social identity [80]. Strong social support may predict reduced depression symptoms, lower anxiety symptoms, and better mental health overall in people living with MS, mediated by increased resilience [81]. Being able to contribute to society by maintaining a career or volunteering can help people living with MS find meaning and purpose in their lives, which is crucial for resiliency [79].

“When I was asked to be a member of the Research Committee for iConquerMS, I found a new appreciation for me, my knowledge, and the skills I brought to the table. No one had seen that value or asked to use those talents in years, and it had a HUGE impact on my mental health and improved sense of self.

–Cherie Binns

The value of community support is highlighted by the COVID-19 pandemic, as with the reduced ability to gather in groups, many people living with MS find their mental health worsens. Social interactions are influenced not only by the need to stay physically isolated during peak virus outbreaks, but also by the

limitations of communicating while wearing a mask/face covering in public [82]. Masks limit nonverbal communication between individuals, thus, when people living with MS attempt various activities in their communities, they may now experience additional mental health symptoms when failing to find nonverbal positive validation in their environment (e.g., inability to tell if someone else is smiling behind a mask). Masks have also changed verbal expression, as attempts to communicate through masks or glass dividers may result in raised voices, repeated attempts to express oneself, and/or erroneous transactions. These added frustrations may further decrease the desire of a person living with MS to engage in society.

“COVID-19 has allowed me to justify my depressive behaviors, like isolation, because of the concerns around going out. I also have to stay away from news outlets or social media. In my decreased mental state, the repetition of information about COVID-19 increases my worries over what is to come.”

–Keisha Currie

In the absence of adequate social support, people living with MS can build an understanding community through a variety of in-person and online support groups, hosted by MS societies and/or patient groups [83, 84]. For example, the National MS Society ‘Find Support’ page [85] offers multiple options to connect with others, including the MSFriends® helpline which people living with MS or their family members can call to connect with a volunteer living with MS [86]. Likewise, MultipleSclerosis.net has a ‘Community’ where registered users can access forums to communicate with other people living with MS [87]. People living with MS can also find a multitude of support groups on Facebook and Instagram, often affiliated with societies such as the National MS Society [88], the Multiple Sclerosis Association of America [89], and the Multiple Sclerosis Foundation [90]. Virtual support groups hosted on social media platforms feature varying levels of privacy and support, including fully public communities, private groups to

which individuals may request access, and invitation-only groups; people living with MS may identify which type(s) fit their individual privacy concerns and support needs by seeking recommendations from trusted peers and HCPs [91, 92]. These virtual support groups offer many benefits to people living with MS, including the opportunity to normalize their physical and emotional experiences and learn more about MS care in an accessible manner [84]. Some people living with MS may require encouragement to continue participating in social groups, as they may become more socially isolated as disease progresses [93]. Patients who are not made aware of support group options or choose not to participate may suffer through their mental health concerns on their own and eventually resort to self-referral to a mental health specialist only after many years and/or a stressful life event [94].

Encourage Holistic Management Techniques and Interdisciplinary Care

We propose that with a patient-centered interdisciplinary approach, visualized in Fig. 2, HCPs can and should include discussions of mental health and resources for building resilience into routine MS care (Fig. 2). Patients report that their mental health care is made easier by having their mental health and MS specialists on the same site, where communication between team members is simplified and medical records are shared [94]. In the absence of an integrative infrastructure neurologists may instead make referrals to external mental health providers, which may include psychologists, psychiatrists, marriage and family therapists, and/or social workers. Neurologists may base their referral decisions on patient screening tool(s) scores, clinical interview, mental health history, and medication history.

Even if not on the same site, interdisciplinary care that brings together behavioral medicine and standard MS care practices allows HCPs to understand multiple facets of their patient’s health and positions them to offer optimal personalized clinical care [95, 96]. This approach can be informed by a deliberative care

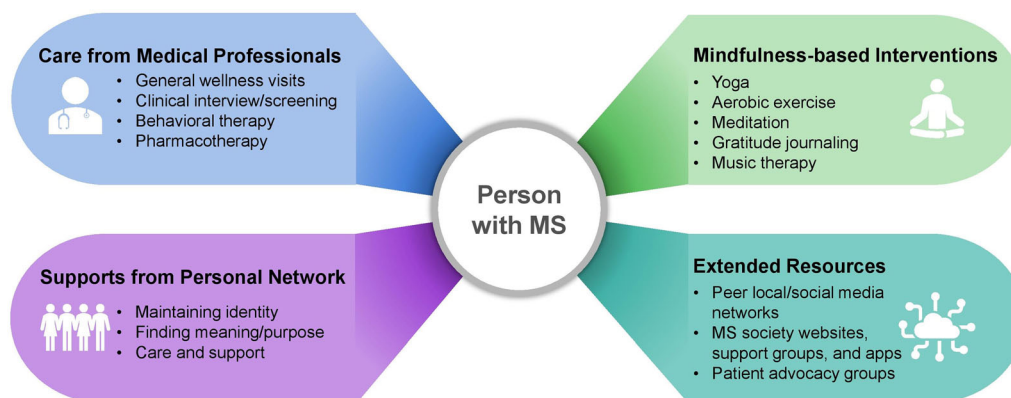


Fig. 2 An interdisciplinary care model supports an individual with MS by combining a variety of care and resources. Care from interdisciplinary medical professionals ensures that all physical and mental health concerns can be managed. Mindfulness-based interventions can be tailored to a person living with MS's individual tastes

and abilities. An understanding personal network (e.g., family, friends, colleagues, fellow members of support groups) can contribute to resilience. People living with MS can also build extended communities via peers, MS societies, and patient advocacy groups

model, in which HCPs engage people living with MS in a dialogue about how they feel and make shared decisions regarding steps to promote emotional well-being [97, 98]. When patients are listened to and included in the shared decision-making process, they may feel more confident about their care and have better relationships with their providers [6, 99]. Therefore, a personalized combination of interdisciplinary management options can provide the best likelihood of meeting a patient's mental health needs.

The foundation for a comprehensive approach to care includes an annual primary care visit to address aspects of general health which can contribute to mental health (e.g., vitamin D deficiency, smoking, sleep, alcohol use, exercise, and diet) and a neurologist who asks about general health during MS disease assessment [95, 96, 100, 101] (Fig. 2). During the neurologist and primary care visits, active listening by HCPs to both patients and their significant others, as applicable, will be an important part of initial assessment of mental health. As previously discussed, HCPs can supplement a robust clinical interview with

appropriate screening tools (Table 2) and referrals to other specialists as needed. This approach allows for HCPs to better understand the type of support the individual requires and offer appropriate resources, such as patient-driven self-management techniques for mental health. One such technique that has gained increasing support in recent years is cognitive behavioral therapy (CBT), a type of psychotherapy which focuses on improving thought and behavioral patterns. CBT typically involves teaching people living with MS techniques such as self-monitoring of daily stress, cognitive restructuring, and problem-solving strategies and may be effective for reduction of stress and depression/anxiety symptoms and improvements in QoL [102]. A randomized controlled trial suggested that a CBT-based stress-management therapy program administered for 24 weeks reduced the number of new brain lesions during the 24-week treatment period [103]; however, the effect of the CBT-based therapy diminishes once the treatment period is over, suggesting that sustained CBT may be required for long-term benefit [103].

In addition to such guidance from medical practitioners, group-based supports have an important role in increasing resilience and psychosocial reserve, which is a composite of measures assessing participants' feelings of belonging, social support, and sense of control [104]. As discussed in the previous section, people living with MS can obtain social supports through their personal networks, extended resources, or group therapy (Fig. 2), where patients find comfort in the fact that they are not alone in their mental health journey [105–107]. Medical care and social supports can be incorporated together at shared medical appointments, which show the capacity to improve both physical and psychological outcomes [108]. In a study of group-based CBT that involved six groups of patients during four consecutive sessions and a 6-month follow-up, patients were initially resistant, but increasingly became open to change during intervention [109]. The group-based CBT, which promoted identity redefinition and self-efficacy, allowed the participants to understand how the changes in their lives were not unusual when placed in the context of a group of peers.

Mindfulness-based interventions (MBI), such as meditation, yoga, and/or music therapy, can also support robust mental health and are a useful tool for people living with MS who do not wish to be on pharmacologic management [100, 110–113] (Fig. 2). Indeed, some patients have shown greater interest in holistic, mindfulness-based approaches relative to pharmacotherapy [113, 114]. Exercise may help to improve the satisfaction of people living with MS with their physical, mental, and social functioning [115] and may have positive impacts on mood and reduce inflammation [100, 116, 117]. Practices that incorporate gratitude can also improve emotional well-being [118]. In addition to mental health benefits, these MBIs may also help in managing other symptoms of MS such as pain and fatigue [119, 120]. Furthermore, the variety of available non-pharmacological MBIs allows for patient-motivated choices about which type to utilize based on their preferences and ability.

Pharmacotherapy options may also be considered for mood and mental health disorders to supplement the aforementioned wellness-based strategies. While many pharmacotherapy options are similar to recommendations for the general population, HCPs will need to consider drug-drug interactions with disease-modifying therapies for MS and how side effects might exacerbate MS symptoms. For some common mood/anxiety symptoms, neurologists themselves may be able to prescribe appropriate pharmacotherapy (e.g., selective serotonin reuptake inhibitors); however, for less common mental health conditions referral to a psychiatrist or psychologist may be needed. Pharmacotherapy options for mood and neuropsychiatric disorders in people living with MS have previously been expertly reviewed [7, 40]. These treatment options are an important tool and can be greatly beneficial for individuals for whom wellness-based care alone is insufficient to maintain QoL.

Accessibility of these various care options is an important consideration, and the pandemic has underscored the utility of telehealth for primary care, neurologist appointments, and mental health care, virtual exercise and support groups, and digital mood tracking resources. Telehealth options for individual/group therapy are becoming more widely available, in part precipitated by the pandemic, and offer an opportunity for individuals with lack of transportation support to benefit from more regular care [121, 122]. Home-based MBI and exercise programs can support psychological and QoL improvements [123]. Similarly, innovations such as digital/virtual tools for mood tracking likewise support people living with MS as they self-manage their care [124, 125]. People living with MS may benefit from digital tools and apps developed for both the general population as well as MS patients, which we summarize in Table 3. These options are continually evolving to better meet the needs of people living with MS, presenting care teams with an opportunity to reinvent models of care to include a hybrid of physical and digital options [126, 127].

Table 3 Recommended digital tools for patient self-management of mental health concerns

| App/online tool name | Summary | MS-Specific? (Y/N) | Cost | References |
|-------------------------------|--|---|---|------------|
| Overcoming Multiple Sclerosis | Web-based lifestyle management program seeking to inform, educate, and empower people with MS | Y | Free | [128] |
| MyLife | Mobile app offering mindfulness activities (e.g., present moment focus, yoga, guided journaling) which are tailored to user check-in responses | N | Free to download, many resources are free with premium offerings available for a fee | [129] |
| Headspace | Mobile app for mindfulness meditation and companion blog featuring mindfulness tips | N | 10-day free beginner's course available, annual/monthly subscriptions available with student and family pricing options | [130] |
| Moodfit | Mobile app offering CBT, gratitude journal, mindfulness meditation, and other tools as well as mood tracking | N | Free, with in-app purchases | [131] |
| Happy the App | Mobile app offering 24/7 confidential phone-based emotional support service run by the National MS Society | Y | First two calls free, subsequent calls are \$12/30 min | [132] |
| Happify Health | Mobile app which offers game-like activities to reduce stress, build resilience, and overcome negative thoughts | N, but MS-specific version currently in development | Some free activities, plans available at \$14.99/month | [133, 134] |

CONCLUDING REMARKS AND FUTURE PERSPECTIVES

Mental health disorders present a significant challenge for people living with MS. However, as with other invisible symptoms, the connection between mental health disorders and MS is frequently underappreciated. Given this, it is imperative to proactively ask patients about their mental health status as part of routine MS care. Routinely assessing how patients feel may allow HCPs to detect trends in patient mood or significant changes since the last visit. In these

cases, HCPs can inquire more about resources the patient may need, administer screening tools, or make a referral to a specialist if needed. It is advisable to offer the referral when a person with MS is screened for mental illness; however, cost may be an issue for some patients. Referral to a specialist will be necessary when lifestyle adjustments and/or initiation of pharmacotherapy is not effective. By normalizing conversations around mental health and implementing appropriate management strategies, HCPs can empower people living with MS to navigate the stressors and uncertainties of living with MS while maintaining their QoL.

An interdisciplinary approach can optimize the communication between various players in a patient's care team. Even if not formally affiliated with one another, neurologists should work together with a patient's mental health specialist(s) and the person living with MS themselves to ensure physical and psychological needs are met. Interdisciplinary care teams that normalize management of mental health, promote resiliency-building, and encourage HCPs and people living with MS to learn together are the future of MS care.

This future also embraces technology that supports emotional well-being. Social media has drastically changed information dissemination from MS societies and connectivity between the patient and their peers with MS. These social media platforms have become a source of social support for many individuals. Technology also affords the opportunity to provide 24/7 mental health care, which can be crucial for people living with MS who may be suffering from mental health disorders such as severe depression or anxiety. Telehealth has been propelled to the forefront of patient care due to the COVID-19 pandemic, and for a patient population in which mobility can be a concern, it will likely remain an important tool moving forward. Developing secure, user-friendly technological advancements for screening, monitoring, and managing mental health concerns could ease the documentation and sharing of a patient's experience between members of the MS care team. Promoting a dialogue around mental health concerns, integrating mental health specialists into an MS care team, and making use of digital innovations, taken together, have great potential to positively influence patient care.

ACKNOWLEDGEMENTS

Our provider authors wish to thank their patients for all they have taught them about living with multiple sclerosis. Dr. Davis wishes to thank his mentor, Dr. Amy Sullivan, who inspires him and exemplifies a level of care that breaks barriers, reduces stigma, and paves the

way for others. Keisha Currie would like to thank her healthcare team and the Sumter MS Warriors Support Group.

Funding. The journal's Rapid Service Fee was funded by Novartis Pharmaceuticals Corporation. No funding was provided for the authoring of this review. The authors received no honoraria related to the development of this publication.

Medical Writing. Medical writing support was funded by Novartis Pharmaceuticals Corporation. This medical writing support, including assisting authors with the development of the manuscript drafts and incorporation of comments, was provided by Meredith Whitaker, PhD, of Alphabet Health (New York, NY), according to Good Publication Practice guidelines (<https://www.ismpp.org/gpp3>).

Authorship. All named authors meet the International Committee of Medical Journal Editors (ICMJE) criteria for authorship for this article, take responsibility for the integrity of the work as a whole, and have given their approval for this version to be published.

Authors' Contributions. All authors made substantial contributions to the manuscript concept/design, critically reviewed and revised the manuscript drafts, and provided final approval of the manuscript and enhanced content as submitted.

Disclosures. Lynsey Lakin has received funding from serving as a consultant and participating on advisory boards and Speaker Bureaus for the following Pharmaceutical companies: Alexion, Allergan, Biogen, Novartis, EMD Serono, Sanofi Genzyme, Genentech, Teva, and Viola Bio Pharmaceutical Companies as well as for Can Do MS and International Organization of MS Centers non-profit organization. She has also received grant funds from Abbvie Pharmaceuticals. Bryan E Davis has consulted for Novartis. Bryan E Davis is now affiliated with the Norton Neuroscience Institute, Norton Healthcare, 3991 Dutchmans Lane, Suite 310, Louisville, KY 40207, USA.

Cherie C Binns has consulted for Novartis and is a contributor to MS Focus magazine. Keisha Currie has consulted for Novartis. Mary R Rensel has served on advisory boards/panels for Serono and Biogen; consulted for Biogen, Teva, Genzyme, and Novartis; received commercial research support from Medimmune and Genentech; received foundation/society research support from the National Multiple Sclerosis Society; received educational grants from Genzyme; participated in speaker's bureau for Novartis, Genzyme, and Biogen.

Compliance with Ethics Guidelines. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

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