

1 **Cultivating the Multiple Sclerosis Workforce of the Future**

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43 treatment

44 Practice Points

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- 46 • Multiple sclerosis and neuroimmunology are rapidly expanding disciplines with
47 exponential knowledge growth and diverse career opportunities. With the ever
48 increasing demands of a growing MS patient population, there is a pressing need
49 to attract and retain clinicians into the MS and neuroimmunology fields.

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- 51 • The FCMSC Mentorship Forum is a novel initiative that aims to stimulate and
52 nurture interest in MS and neuroimmunology by linking talented internal
53 medicine and neurology trainees with faculty and peer mentors who are experts
54 in these fields.

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- 56 • The broad objectives of the FCMSC Mentorship Forum are to:

57

- 58 ○ *Identify the appropriate diagnosis and management strategies for MS as*
59 *well as anticipate future challenges*

60

- 61 ○ *Discuss the vital role clinicians and researchers play in the care of patients*
62 *with MS*

63

- 64 ○ *Develop content and resources for other professionals-in-training with an*
65 *interest in neuroimmunology and MS as a career path*

66

- 67 ○ *Provide a platform of networking and mentorship opporutnities for future*
68 *leaders of the field*

69

Abstract

Multiple sclerosis (MS) is a complex neurologic disorder, which affects people with ever-changing needs. The MS healthcare field has entered an era of exponential knowledge growth, where better understanding of the immunological dysregulation of the disease has translated into an expanding array of treatment options. Within the next decade, it is estimated that the demands of a growing MS patient population already has or may outstrip the number of professionals dedicated to the management of this chronic, lifelong disease. Therefore, there is a pressing need to attract and retain clinicians into this dynamic field. In response to this need, the Foundation of the Consortium of Multiple Sclerosis Centers (FCMSC) organized a two-day colloquium, a Mentorship Forum, in January 2015, bringing together talented internal medicine and neurology trainees from across North America with an interest in MS and neuroimmunology. This paper will highlight the rationale for the MS Mentorship Forum, its structure and content, and present its outcomes. We believe the stage has been set to attract young, promising, clinicians to learn more about MS and encourage them to consider a career in this field. In so doing, we hope to contribute to the development of the next generation of MS experts to make a palpable difference in the lives of those affected by MS.

95 **A. Introduction**

96 Multiple sclerosis (MS) is a complex neurologic disorder, which affects people with ever-
97 changing needs. The MS healthcare field has entered an era of exponential knowledge
98 growth, where better understanding of the immunological dysregulation of the disease
99 has translated into an expanding array of treatment options. Keeping abreast of the
100 latest clinical and research developments to provide the highest standard of care poses a
101 genuine challenge, which can only be met through a dedicated and knowledgeable work
102 force. Within the next decade, it is estimated that the demands of a growing MS patient
103 population already has or may outstrip the number of professionals dedicated to the
104 management of this chronic, lifelong disease.¹ Therefore, there is a pressing need to
105 attract and retain clinicians into this dynamic field.

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107 In light of this need, the Foundation of the Consortium of Multiple Sclerosis Centers
108 (FCMSC) organized a two-day colloquium, a Mentorship Forum, in January 2015,
109 bringing together talented internal medicine and neurology trainees from across North
110 America with an interest in MS and neuroimmunology. Led by a team of expert faculty
111 and peer mentors (colleagues who recently completed their own MS-related fellowship),
112 the program provided a platform during which key concepts of MS pathophysiology,
113 diagnosis and prognosis, treatment, monitoring, and sustained care were discussed. The
114 program was complemented by structured as well as informal discussions about career
115 options and their unique challenges, work-life balance, and future prospects for careers
116 in MS.

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118 This paper will highlight the rationale for the MS Mentorship Forum, its structure and
119 content, and present its outcomes. We believe the stage has been set to attract young,

promising, clinicians to learn more about MS and encourage them to consider a career in this field. In so doing, we hope to contribute to the development of the next generation of MS experts to make a palpable difference in the lives of those affected by MS.

B. MS Mentorship Forum

B.1. Rationale

MS is a chronic disease that is the most common cause of non-traumatic neurological disability in young adults in the Western world. The disease typically affects individuals at the prime of their formative and working lives, thus having an enormous socio-economic and psychological impact. People with MS require comprehensive care to manage the diversity of clinical symptoms and disability that can ensue, especially since this directly impacts their quality of life. The complexity of the disease has ignited a seismic shift in its healthcare delivery, where multidisciplinary teams delivering subspecialty expertise is becoming the expected clinical paradigm.

The basic pathophysiologic underpinnings of MS are being unraveled at an escalating pace. Advances in neuroimmunology, neuropathology, neuroimaging, genomics, and neuropharmacology have made it increasingly difficult for even MS specialists to remain up-to-date. The accelerated pace of interest and knowledge acquisition in MS is reflected in the exponential rise in MS-related publications over the last several decades (see Figure). This poses a daunting challenge for busy general neurologists and emphasizes the need for fellowship training in MS clinical care and neuroimmunology. The rapidly increasing availability of many effective disease modifying and symptomatic treatments for MS is a potential draw to new trainees who are looking for a dynamic, impactful career in medicine.

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146 The exposure to neuroimmunology in neurology residency is a key step to attracting the
147 brightest neurology trainees to a career in MS and related disorders. Although exposure
148 to neuroimmunological disorders is present in the majority of neurology residency
149 programs, the mechanism through which neurology trainees obtain experience in MS
150 and related disorders is highly variable throughout the country. Some institutions offer
151 dedicated, structured rotations and didactic sessions in neuroimmunology, while others
152 provide exposure through more general neurology service-related settings. Neurology
153 trainees can be left with the difficult task of assembling reading lists, arranging clinical
154 rotations, and seeking mentorship support to fulfill training needs and interests. As far
155 as these authors are aware, there does not exist a centralized resource aimed at
156 neurology trainees that provides relevant, up-to-date information about key concepts in
157 neuroimmunology, a directory of fellowship training opportunities, mentorship support
158 networks, and future career options in the field of MS and related diseases.
159 Furthermore, enduring forums in which neurology trainees interested in a career in MS
160 and neuroimmunology can interact with and gain advice/support from junior and senior
161 faculty from across the country in an ongoing and structured way are underrepresented.
162 The FCMSC Mentorship forum sought to address these critical, unmet needs.

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164 **B.2. Structure and Content**

165 The Consortium of Multiple Sclerosis Centers (CMSC) has over 220 CMSC-affiliation
166 institutions across Canada and the United States (US). Neurology trainees from these
167 CMSC-affiliated institutions were invited to apply to participate in a two-day Mentorship
168 Forum about MS and related disorders in Newark, New Jersey in January 2015.
169 Specifically, trainee participants (neurology residents and/or fellows in the field of

neuroimmunology) were recruited through calls for application to an overall list of 33 neurology academic and training programs across North America. Information about the program was also disseminated to recent recipients and mentors of FCMSC medical student research scholarships and FCMSC resident scholarships as well as to all professional members of the Consortium of Multiple Sclerosis Centers. Applicants were nominated by their program directors and selected by a review committee composed of CMSC and FCMSC leadership as well as the program chair. A total of 23 neurology residents from all years of training were selected. To gauge the needs and interests of the selected participants, neurology residents were asked to complete a pre-meeting survey to help guide the structure and content of the program (Table 1).

The participant responses highlighted several important themes. First, participant specialty goals were mainly neuroimmunology and MS, as expected. Several residents cited interest in various related fields, including autoimmune disease, neurogenetics, neuropediatrics, and neuro-ophthalmology, reflecting the breadth of MS as a subspecialty. The challenges associated with MS diagnosis and treatment, previous exposure to patients with MS (which may be within residency or a personal connection) and/or involvement in MS-related research were factors that influenced participant interest in the field. Major obstacles in reaching a decision to sub-specialize in MS and neuroimmunology included: A lack of information about fellowships and career options in the field; inadequate funding (or unclear mechanisms of securing funds) for clinical and/or research fellowships; and insufficient exposure to neurologists with expertise in MS and neuroimmunology in their residency programs. In line with this, participants clearly voiced that the scope of the FCMSC mentorship program should include the provision of education about core principles of MS (and more broadly

195 neuroimmunology), clinical classifications, and the scope and evolution of current MS
196 care. Networking opportunities with peers who recently completed residencies or
197 fellowships and exposure to potential mentors in the MS field were also deemed to be
198 important objectives. In particular, residents requested a forum in which information
199 about fellowship programs and career opportunities and challenges in the current
200 healthcare environment could be discussed candidly with dedicated, enthusiastic, and
201 compassionate MS clinicians. The need for content development for web-based
202 programs for professionals-in-training and the creation of an MS interest group were
203 identified. These survey results influenced greatly the structure, content, and outcomes
204 of the program.

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206 The two-day FCMSC colloquium utilized a variety of educational strategies. Presentation
207 formats included seminars about a range of neuroimmunology topics, small group
208 neuroimmunology-focused case-based discussions, interactive large group experiential
209 sharing, and informal 'fireside' chats about medical/neurology topics and career issues
210 facing neurology trainees. The broad objectives of the mentorship program included:

- 211 • *Identifying the appropriate diagnosis and management strategies for MS as well as*
212 *anticipating future challenges*
- 213 • *Discussing the vital role clinicians and researchers play in the care of patients with*
214 *MS*
- 215 • *Developing content and resources for other professionals-in-training with an*
216 *interest in neuroimmunology and MS as a career path*
- 217 • *Providing a platform of networking and mentorship opportunities for future*
218 *leaders in the field*

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220 **B.3. Outcomes**

221 *B.3.1. Knowledge transfer*

222 The foundation of the mentorship program was built on a comprehensive series of
223 didactic seminars on important topics in the MS field. These ranged from basic
224 principles of MS, including epidemiology, pathology, and immunology, to diagnostic
225 criteria, differential diagnosis, and treatment strategies. Presentations included an in-
226 depth discussion of immunopathology and imaging, and their impact on the
227 understanding of the MS disease process, and the importance of MRI in the diagnosis and
228 treatment monitoring. Participants were introduced to the complexity of MS symptoms
229 and psychosocial issues (and their management) facing people with MS, including
230 fatigue, cognitive dysfunction, depression, and pain. Also highlighted were the
231 significant unmet needs in MS care and the importance of health and wellness
232 promotion. Common threads united each of the seminars: the pressing need to recruit
233 bright, dedicated MS clinicians and researchers; and the importance of having
234 collaborative, multidisciplinary healthcare teams to deliver optimal care for people with
235 MS.

236 237 *B.3.2. Career paths in neurology and in MS as a specialty*

238 Career paths in neurology (and in particular, MS/neuroimmunology) and the influence of
239 the current healthcare environment on future opportunities were important discussion
240 points led by faculty. It is well recognized that the mode of healthcare delivery is
241 changing. In the future, small, single-specialty, private practices or single practitioners
242 will likely be replaced by integrated, multidisciplinary subspecialty MS care centers,
243 especially in major metropolitan areas. This will be an important shift in the MS field to
244 accommodate the increasingly complex and rapidly evolving management of people with

245 the disease. The focus of newer healthcare delivery will be on efficient delivery of
246 quality care, and this means delivering healthcare value. Patient-centered outcomes²
247 will be an important tenet wherein people with MS will be active participants in the
248 clinical decision-making process and assessors of excellence in healthcare delivery.
249 These imminent changes will be positive for MS clinicians (and their patients) in
250 allowing for optimized healthcare delivery and outcomes.

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252 Subspecialty expertise in MS was discussed as being an area of increasing demand,
253 justifying recruitment of young and talented clinicians into the field. Recent evidence
254 suggests that healthcare reform and the increased availability of insurance will increase
255 the demand for healthcare access and delivery.¹ This is particularly salient in neurology,
256 where there is a sizeable shortfall in the number of neurologists¹ needed to treat a
257 rapidly increasing number of patients with chronic neurological diseases. The necessity
258 of comprehensive clinical care for people with MS demands a multidisciplinary team
259 approach. MS specialists can expect to interact with an expanding team of healthcare
260 providers, including (but not limited to) physiatry, physical medicine and rehabilitation,
261 physical therapy, occupational therapy, speech and language pathology, primary care
262 physicians, nurse practitioners and MS nurse specialists, physician assistants,
263 neuropsychology, psychiatry, psychology, social work, pediatric neurology,
264 ophthalmology, orthopedics, and urology. With the recent explosion in the number of
265 disease-modifying therapies available to treat people with MS, there is increasing need
266 to recognize and manage associated toxicities which may require medical support from
267 other specialties, such as cardiology, nephrology, hematology, endocrinology, and
268 rheumatology. Adding a further layer of intricacy in response to the MS-related
269 knowledge 'boom', MS clinicians will likely become sub-specialized; this goes beyond

focusing on MS to becoming expert in neuroimmunology, neuroinfectious disease, neuroimaging, neuropathology, and/or neurorehabilitation. It is clear that the landscape of MS healthcare delivery is changing, which requires the development of adaptable and highly specialized MS clinicians and researchers. There is an air of excitement in the MS and neuroimmunology fields about the possibilities that lie ahead. These concepts invigorated the participants and faculty of the FCMSC mentorship forum.

Once clarifying the pressing need for MS specialists, the faculty presented a multitude of career options available to resident-participants. The diversity of MS clinical care and research has created the need to fill various niches in the field, ranging from full-time clinicians to full-time bench researchers and a combination of both. Most clinicians involved in MS care will be involved in some form of clinical research, (i.e. clinical trials or post-marketing surveillance). The combination of clinical duties with research provides a rewarding platform to engage patients, while increasing knowledge to eventually provide therapeutic benefit for people with MS. Patient advocacy and government reform are an integral component of MS care, and access to treatment and clinical investigation often necessitate the participation of MS clinicians in health policy. The multi-faceted nature of the MS specialty demands interaction with multiple disciplines, medical specialties, and policy-makers to achieve the safest and most cost-effective outcomes for people with MS.

Participants were reminded that MS clinicians are often master diagnosticians and, by extension therefore, should be well equipped to teach. As MS can affect any part of the central nervous system, MS clinicians need to be highly skilled in obtaining a patient's neurological history and performing a neurological examination. As both efferent and

afferent visual disorders are prominent and visual testing has become widespread for diagnosis and monitoring, the new MS neurologist must also have at least basic proficiency in the neuro-ophthalmological exam and in interpreting visual testing. In addition, the MS clinician needs to demonstrate a commanding knowledge of differential diagnosis and MS mimics. The required repository of knowledge of anatomy, pathophysiology, immunology, and neuroimaging equips MS clinicians with the foundation needed to be effective teachers. As a result, MS clinicians often play an important part in medical school and resident education. This provides yet another career opportunity for budding neurologists interested in entering the field of MS.

B.3.3. Neurology trainee issues and options

Neurology residents are at a critical crossroads with regard to their future career choices. While the multitude of career options are generally perceived as positive, many participants found that they are insufficiently armed with the knowledge needed to make an informed decision about their long-term careers. It was recognized that the MS field is broadening in scope, with the specialty more appropriately fitting under the expanding umbrella of neuroimmunology. Participants indicated that a web resource with the 'top 25' articles relevant to the subspecialty would help them fill an important knowledge gap and allow them to understand better if the field suits their interests.

How MS fellowship training programs are adapting to the broadening clinical landscape was questioned. In part, this relates to the lack of information about the available MS/neuroimmunology training programs at institutions across the US and Canada. Further, when MS/neuroimmunology training programs are identified, there is an obvious lack of standardized information about their curricula and requirements and

expectations (i.e. amount of time available for clinical service provision, research, and education). The participants highlighted a critical need to improve information about neurology programs offering fellowships in the MS/neuroimmunology field.

From a practical point of view, participants were given advice about how to select a subspecialty training program that best fits their needs and learning style. Faculty encouraged participants to inquire about the duration and structure of programs and to take the opportunity to visit and possibly undertake a clinical or research rotation at the institutions of interest. This can provide important insight into the mechanics and ethos of the subspecialty program to help trainees determine if the program is a good fit. It was recommended that neurology trainees develop a constructive dialogue with subspecialty program directors about clinical, research, and education options that may be available to them and whether the program offers any flexibility to accommodate specific professional goals. This dialogue necessitates a bi-directional approach wherein MS/neuroimmunology program directors and neurology trainees both engage in the training decision-making process. It is possible for trainees to inquire about spending time at other institutions if their fellowship does not provide enough exposure to certain areas of neuroimmunology.

B.3.4. Need for guidance and 'mentorship'

A recurring theme raised by the forum participants was the need to access both informal guidance and more formal mentorship support about MS fellowship and career decisions. Neurology trainees find it difficult to access adequate subspecialty support networks given the demands and time pressures associated with their training. Many institutions do not offer MS/neuroimmunology subspecialty clinical rotations, making it

345 difficult for residents to connect with relevant experts to help guide career decisions.
346 Learning from peers and MS subspecialists who have gone into the field through
347 different paths at different institutions provides neurology trainees with a concrete idea
348 about what to expect in a career in MS/neuroimmunology and how best to achieve their
349 goals. Since identifying a single 'mentor' can be a challenge, neurology residents were
350 encouraged to seek the advice of many individuals. The need to have a national database
351 of MS/neuroimmunology experts who would be willing to provide informal support and
352 guidance was identified.

353

354 In addition to informal support networks, establishing a relationship with a formal
355 mentor is beneficial. A mentor is an experienced and trusted adviser who invests in the
356 well-being of a colleague and can provide candid advice about career options and work-
357 life balance issues. Faculty recommended that neurology trainees make a conscious
358 effort to seek out opportunities to meet and work with MS clinicians, researchers, and
359 educators whenever possible. Engaging in a research project with a clinician was
360 identified as an excellent means to interact regularly and meaningfully, and to establish
361 an enduring relationship. It was stressed that a mentor need not be in one's own
362 specialty of interest and, in fact, need not be restricted to one individual. Interestingly,
363 faculty thought that trainees in many ways act as mentors to senior colleagues as well,
364 bringing to light the importance of bi-directional experience and knowledge exchange in
365 this important professional relationship.

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367 Work-life balance is an important topic throughout clinical training. Faculty shared their
368 personal experiences with the struggles associated with juggling career development
369 and personal family life. The need for role models in leadership positions in MS (and in

neurology, more generally) who can nurture a productive career while preserving a fulfilling family life was highlighted. This was thought to be a particularly challenging issue for women. Various ways to address these topical issues were discussed. It was recognized that compartmentalizing and protecting time outside of work is critical to one's personal happiness and health. Personal well-being has a powerful impact on professional motivation and success. The concept of supervisors or other decision makers focusing on the well-being of their trainees (and employees) to accommodate their evolving needs, regardless of gender, was stressed.

C. Recommendations and Next Steps

Colloquium participants had numerous, meaningful suggestions to address the needs identified throughout the course of the Mentorship Forum. Among them were:

- *Gathering references, articles and reading materials in one accessible location. Residents find it difficult to wade through an ever-increasing number of articles and references. Faculty noted that there are at least a dozen or more papers that every resident should read about MS and related disorders.*
- *Providing a guide or algorithm of how to initiate medication including screening and follow-up for newly diagnosed patients with MS. It is also important to include information about medication side effects and contraindications. The likelihood of treating someone with MS is high, regardless of subspecialty. Continuing education courses and case discussions are helpful.*
- *Providing information about symptomatic management. Again, continuing education courses and case discussions are helpful.*
- *Increasing the availability of information to arm residents with choices about fellowships. Participants noted that a directory of available fellowships is needed.*

This should include information on the structure and funding of each fellowship. A list of mentors and those willing to be contacted should accompany this listing.

- *Creating a dedicated MS/neuroimmunology subspecialty interest group for neurology residents to encourage experience and knowledge-sharing to be created through the CMSC.*

In response to these excellent suggestions, the FCMSC and CMSC invited all participants to attend the CMSC 2015 Annual Meeting (Indianapolis, IN) and arranged a meeting with faculty, and FCMSC and CMSC staffs to devise a clear action plan to make these recommendations a reality. The FCMSC and CMSC are proud to announce several initiatives, which have stemmed directly from this Mentorship Forum, including:

- Construction of a web-based resource for professionals-in-training with an interest in MS that contains summaries of disease state, diagnosis and symptom management presentations developed by the MS Mentorship Forum.
- A North American directory of training programs and institutions offering MS-related fellowships.
- Creation of a CMSC Special Interest Group (SIG) for MS Residents and Fellows (MS professionals-in-training [PiT] SIG) to represent this growing group to the CMSC Board of Governors.
- A password-protected list-serve facilitating communication between members of the proposed MS-PiT Special Interest Group, as well as periodic needs assessment surveys.
- A bibliography of current, important MS literature compiled by the faculty.
- Links to web-based educational resources within the MS community.

Outcome measures for these initiatives will be used to monitor and continuously improve the structure of the mentoring program. We will survey program participants for their satisfaction after each meeting and solicit their ideas for new initiatives that will facilitate their careers. The number of participants who go on to MS-focused clinical or research careers will be tracked, as well as those who take on leadership roles in organizations like the CMSC, AAN and ACTRIMS. The current group has already organized a new Special Interest Group for Professional in Training (PiT-SIG) supported by the CMSC. They have a website (www.MS-PiT.org) and the SIG co-leaders are members of the CMSC Board of Directors. Together these actions provide the PiT group with an enduring forum and a voice in CMSC initiatives and educational offerings at the annual meeting. The overarching goal is to provide a framework to help aspiring clinical trainees in MS related disciplines find a community of colleagues to share the excitement of our field, enhance their education in the comprehensive care model and increase the number of well-trained clinicians and scientists who go on to provide care and hope for people with MS.

D. Conclusions

The FCMSC and CMSC are committed to the establishment of programs and resources to attract talented, up-and-coming clinicians to the exciting field of MS/neuroimmunology. The creation of a mentorship forum wherein neurology residents from across the US and Canada can meet and interact meaningfully with faculty was a critical stepping-stone in achieving this aim. The achieved outcomes from the forum are noteworthy and fill critical information and knowledge gaps. The success of the program highlights the power of active engagement of trainees in the career decision-making process. In the future, it is anticipated that this mentorship forum will extend beyond neurology trainees to include medical students, MS fellows, and an expanding network of MS

faculty from across North America. At the conclusion of this pilot project, the FCMSC and CMSC hope to engage trainees from a variety of healthcare disciplines to stimulate their interest and enhance their knowledge of MS/neuroimmunology. The ultimate goals of these endeavors are to improve competence and performance in the care of patients with MS and to expand the workforce of the future.

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Table 1 – Pre-Meeting Survey

FCMSC Mentorship Forum Pre-Meeting Survey
Please describe your specialty goal.
What was the major factor influencing your specialty goal?
What steps in your career process do you wish you would have known more about as you entered?
What are your expectations for the meeting?
Has your career path changed within the last two years? If yes, what influenced your decision?
What do you perceive as a major obstacle in reaching the next step in your career path?
What qualities would you value most in a mentor?
Do you have enough information about available fellowships or clinical opportunities? If not, what information would be most helpful?
What resources would be most helpful to you over the next three years from the professional neurology/MS community?
What advice would you appreciate most at this point in your career?

Figure - Publications in MS Field (1960-present)

A comprehensive literature search on PubMed using the terms “multiple sclerosis” OR “disseminated sclerosis” up to 5th December 2015 was performed. The overall number of publications (A) and the total number of published reviews (B), clinical trials (phase I-IV) (C), and meta-analyses (D) were tabulated and binned in 5-year intervals between 1960 to present, as illustrated. The bar charts illustrate the exponential growth of publications in the MS field, highlighting the rapid evolution of the field. The expectation to keep abreast of the latest information in MS poses a significant challenge to trainees and healthcare providers in the field.

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About the Foundation of the Consortium of Multiple Sclerosis Centers (FCMSC)

The FCMSC was founded in 1999 with the mission to stimulate the growth, development and provision of patient care services, education and research in the field of MS and to enhance the quality of life of those affected by MS through supporting the activities and initiatives of the Consortium of Multiple Sclerosis Centers' (CMSC).

The FCMSC supports the mission of the CMSC members in three key areas:

- Driving mentored research scholarships and opportunities to improve patient care in the future
- Providing annual awards and tools for CMSC member professionals helping patients today
- Offering Research Fellowships and awards, expansion of CMSC Pilot Research grant opportunities as well as growth of the CMSC Global MS Patient Registry

For more information, please go to www.cmscfoundation.org.

About the Consortium of Multiple Sclerosis Centers

The Consortium of Multiple Sclerosis Centers (CMSC) is the leading educational, training, and networking organization for MS health-care professionals and researchers. The mission of the CMSC is to promote quality multiple sclerosis care through educational programming and accreditation including live and online events, research grants, technical journals and papers, and targeted advocacy efforts. The CMSC member network includes more than 7,000 international health-care clinicians and scientists committed to multiple sclerosis care as well as more than 60 Veterans Administration MS Programs and 225 MS Centers in the US, Canada, and Europe. For information, please go to www.msca.org.