

Posters



Abstracts - Posters

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(S01) A CASE STUDY OF EARLY ONSET MULTIPLE SCLEROSIS (EOMS) FROM NORTH INDIA

Aim: To Characterize earlier onset multiple sclerosis (EOMS) patient (onset below 15 years) and compare them with later onset MS (after 15 years).

Methods: Information was obtained on all patients diagnosed as having MS (clinical or laboratory definitive MS as per Poser's criteria) admitted in Neurology ward from 1994 to 2000.

Result: There were 10 patients with EOMS and 35 patients with later onset MS (LOMS). The female to male ratio (2:3) was lower in EOMS compared to later onset MS (1.7:1). The mean age of onset of disease was 8.9 years (2-14 years) in EOMS patients whereas 30.6 years (17-70 years) in LOMS. The initial symptoms among EOMS patient were optic neuritis (4/10), sensory symptoms (2/10), motor disturbance, cerebellar dysfunction, pseudotumor like presentation and multiple cranial nerve involvement (1 each) as compared to motor disturbance (10/35) and optic neuritis (28/35) seen commonly with LOMS. A picture like transverse myelitis (5/35) and brain stem involvement (2/35) observed in LOMS was not seen in EOMS group. Interval between first and second episode was less than 1 year in (5/10) of EOMS as compared to LOMS. The differences in the symptomatology observed between the two groups were not significant by Chi-square /Fisher exact test. Fever, nausea, vomiting with CSF pleocytosis and atypical clinical presentation during the first episode was observed in 2/10 patient with EOMS.

Conclusion: This is the first analysis of patient with EOMS from India. Atypical presentation with pseudotumour and cranial neuropathy are seen among patient with EOMS and can occur even in those below 10 year of age.

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(S02) A HEALTH PROFILE OF PEOPLE WITH MULTIPLE SCLEROSIS LIVING IN THE COMMUNITY

Objectives: To provide a detailed health profile of adults with multiple sclerosis by describing their symptoms, estimating levels of motor disability and reporting the health services they have used during the past year.

Design: A community-based postal survey using a self-completion questionnaire.

Participants: People with a confirmed diagnosis of multiple sclerosis recruited via primary care services.

Results: 235 people with multiple sclerosis returned completed questionnaires - a response rate of 51%. Overall, the most commonly reported symptoms were sexual problems, fatigue, urinary problems and painful muscle spasms. On the basis of the Nottingham Extended Activities of Daily Living (NEADL) scale, 41% of respondents were categorised as mildly, 36% moderately and 23% severely disabled. Whilst the vast majority of respondents reported at least one contact with their general practitioner during the previous 12 months, contacts with other services potentially able to alleviate specific symptoms were surprisingly low.

Conclusions: This study confirms that adults with a diagnosis of multiple sclerosis are a diverse group who report a wide range of physical symptoms and psychological challenges. The findings reveal a range of unmet health care related needs among people with substantive levels of disability and under-use of existing health care services by those who report potentially treatable symptoms. More needs to be done to raise awareness among people with MS and their carers about the services available to them. Given the very high proportion of people with multiple sclerosis known to make contact with primary care services, GPs have a vital role in providing this information.

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(S03) A SURVEY OF ISSUES RELATED TO MARIJUANA USE AMONG A LARGE GROUP OF PEOPLE WITH MULTIPLE SCLEROSIS

Objective: To collect data regarding marijuana (MJ) use among a group of people with multiple sclerosis (MS).

Background: Recent clinical trial data and changes in the law have resulted in increased interest in MJ as a treatment for MS symptoms.

Design/Methods: Using email, an MS disease registry (www.ms-cam.org), and a web-based survey, we collected self-reported data related to MJ use from 396 people with MS.

Results: Of the 396 respondents, 47% had used MJ since being diagnosed with MS and 24% described themselves as current users who intend to use MJ in the future. Of those who had used MJ since diagnosis, the symptoms most often reported to be improved with MJ were: pain (87%, n=78), spasticity (84%, n=112), depression (79%, n=73), weight loss (64%, n=22), and tremor (62%, n=50). Symptoms that were reported to be worsened with MJ were: anxiety (36%, n=33), cognitive problems (27%, n=83), balance problems (23%, n=117), speech problems (21%, n=43), and fatigue (20%, n=118). Of those who were current users of MJ (n=96), the main reasons for use were: controlling symptoms (77%), to get "high" (61%), to decrease the frequency of exacerbations (19%), and, for social reasons (14%). Of those who discontinued MJ use (n=41), the main reasons cited were: legal reasons (61%), difficulty in obtaining MJ (37%), and not wanting to set a bad example for others (29%).

Conclusion: Among our respondents, the symptoms most often reported to be improved with MJ use were pain, spasticity, depression, weight loss and tremor. These findings are similar to those of previous surveys. Our results indicate that issues unrelated to safety and efficacy, such as the desire to induce euphoria and concerns about illegality, impact patterns of MJ use among people with MS. Further research into the safety and efficacy of cannabinoids in MS is needed.

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(S04) ADHERENCE TO INTERFERON BETA-1B: BETA NURSE PROGRAM

Objective: To evaluate the tolerability of high-dose, high-frequency interferon beta-1b (IFNB-1b; Betaseron(r)/Betaferon(r)) therapy in over 10,000 multiple sclerosis (MS) patients enrolled in the BETA Nurse program.

Background: In 1993, IFNB-1b became the first FDA-approved treatment of MS. Knowledge gained over the past decade has led to the adoption of simple techniques to minimize the effects of adverse events such as flu-like symptoms and injection site reactions (ISR) which had previously affected patient adherence. This study examines the reasons reported for discontinuation of IFNB-1b treatment in patients enrolled in the BETA Nurse program, which offers individualized patient care and assistance with IFNB-1b treatment management.

Design: Patients who begin IFNB-1b therapy are offered education, training and assistance by a BETA nurse. Patients receive initial phone counselling and training, and have frequent follow-up calls and/or visits to ensure appropriate treatment management. Patients are encouraged to use an autoinjector, escalate dose to initiate therapy, use NSAIDs or concomitant therapy as prescribed, and to rotate injection sites. These simple techniques reduce adverse events related to flu-like symptoms and ISR. The BETA nurse monitors and records the patient's progress regarding the management of any adverse events, as well as the patient's tolerance to therapy over time. If the patient discontinues IFNB-1b treatment, the reason is noted.

Results: To date, over 10,000 patients have been enrolled in the program, with only 1.6% of patients lost to follow-up. As a proportion of all patients under observation, 2.1% reported discontinuation due to flu-like symptoms, 0.8% due to ISR and 1.7% due to perceived lack of efficacy.

Conclusions: Patient adherence to IFNB-1b therapy is excellent and there are low numbers of dropouts in the BETA Nurse program. The results of this study show that IFNB-1b is both effective and well tolerated in patients enrolled in the scheme.

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**(S05) AN EVALUATION OF SYMPTOM MANAGEMENT COURSES IN PROMOTING
SELF-MANAGEMENT IN MS**

Introduction: The aim of Symptom Management courses for people affected by Multiple Sclerosis (MS) is to improve patient and family education. They are designed to complement newly diagnosed courses and have evolved from collaborative working with the MS Society. Evaluation indicates that these courses promote self-management and empower individuals when making decisions about managing their MS.

Study: Participants in this study completed an evaluation questionnaire to audit the course and identify any impact it had on people. 161 people attended the course, 54% have MS and 83% completed the questionnaire.

Results: 98% of people with MS agree that courses are an effective way of providing information, 93% of family members agreed. 86% agreed they provide health education; with 84% indicating that courses enable people to improve their own health through information provision. When commenting about the relevance of the information in promoting self-management, responses indicated the course assists coping and adaptation both for the person with MS and the family; also highlighting the importance of maintaining support networks. The evaluation provided details of sessions to be included in future courses. This establishes a useful framework on which to improve and continue this work.

Conclusions: The results establish that symptom management courses are useful to both people with MS and their families. This work has provided audit information to professionals and local services. Courses provide health education, appear to promote support networks and self-management. Professionals should be encouraged to offer courses to promote good practice.

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(S06) BEYOND: SAFETY AND TOLERABILITY OF 500 MCG VS 250 MCG INTERFERON BETA-1B

Objective: To evaluate the safety and tolerability of 500 mcg versus 250 mcg interferon beta-1b (IFNB-1b; Betseron(r)) given subcutaneously (sc) every other day (eod).

Background: Studies have demonstrated a dose-dependent treatment effect of IFNB. 250 mcg IFNB-1b is the highest available dose, and the current gold standard in RRMS, and whether a dose higher than any approved formulation will result in greater efficacy with continued tolerability is an important topic to be addressed.

Methods: A multicenter, randomized, double-blind, parallel group study compared IFNB-1b 500 mcg with 250 mcg, self-administered sc eod for at least 12 weeks. Patients used auto-injectors to give consistency of injection technique and NSAIDs or acetaminophen were administered concomitantly to minimize flu-like symptoms. Study drug was escalated over the first 6 to 12 weeks, and then maintained at full-dose for the duration of the study. Temporary dose-reduction or interruption of IFNB-1b treatment was permitted. Primary outcomes were safety and tolerability.

Results: IFNB-1b 500 mcg was well tolerated and there were no new or unexpected adverse events. An effect of dose on the occurrence of some adverse events, such as flu-like symptoms, lymphopenia and liver function elevation was observed, but this was not seen in others, such as injection site reactions. The dose escalation scheme was successful, with over 90% of patients attaining the full 500 mcg dose during the course of the study. Dose interruptions were similar for the two treatment groups, but dose reductions were more common in the 500 mcg treatment arm.

Conclusions: The first phase of the BEYOND program provides support for safely administering 500 mcg IFNB-1b to patients with RRMS. The three-arm comparative phase of BEYOND will now evaluate the efficacy, safety, and tolerability of 250 mcg and 500 mcg IFNB-1b and glatiramer acetate in patients with RRMS.

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(S07) NEUTRALIZING ANTIBODIES TO INTERFERON BETA-1B IN THE REAL WORLD

Objective: To assess levels of neutralizing antibodies (NAb) to interferon beta-1b (Betaseron(r); IFNB-1b) in MS patients treated with subcutaneous IFNB-1b 250 mg every other day for >1 year.

Background: IFNB-1b is an effective treatment for relapsing forms of MS. Early clinical studies suggested that NAb to IFNB may affect treatment outcomes, but data were inconclusive.

Methods: Berlex Laboratories provided testing services to clinicians in North America (NA) requesting the NAb status of MS patients. This service was also offered by Schering AG for Europe and elsewhere. NAb were measured using the MxA induction assay and analysis was by independent laboratories. NAb positivity was based on a single positive titer =>20 NU/ml.

Results: Over 6000 patients were tested. In the NA cohort, 79% of patients were NAb⁻ and 21% were NAb⁺; high titers (defined as =>500) were observed in 7% of patients. NAb testing was requested due to: b steady progression of disability for =>6 monthsb (57%); b =>3 disabling exacerbations requiring steroids or hospitalization in a yearb (27%); other (16%). In the European cohort, 68% of patients were NAb⁻, and 32% were NAb⁺; only 8% of patients had high NAb titers (=>400 in this cohort).

Conclusions: The population studied would be expected to be enriched for patients who, according to clinicians, were not responding fully to treatment. Nevertheless, the frequency of NAb⁺ patients is similar to that observed in previous controlled trials with IFNB-1b. Data suggest that the influence of NAb on clinical outcomes might be apparent in some patients with high titers. The rate of high titers was very low in this present analysis. It appears, therefore, that NAb are not the cause of sub-optimal treatment responses to IFNB-1b in the majority of cases. Other potential causes, perhaps related to compliance, dosing, or disease mechanism, need to be identified.

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**(S08) BRIEF TREATMENT STRATEGIES FOR SELF-INJECTION ANXIETY
IN MS PATIENTS TAKING IM IFN β -1A**

Self-injection phobia poses a serious barrier to treatment for many MS patients. Up to 50% of MS patients prescribed weekly intra-muscular interferon beta-1a (IFN β -1a), choose to have someone else perform their injections when initiating treatment (Mohr et al, 2001). However, many experienced clinicians recommend that MS patients self-inject disease modifying medications, to increase independence and improve adherence (Pfohl, 1997; Cox & Mohr, 2003). Research suggests that patients who are unable to self-inject due to anxiety discontinue medications at a much higher rate than patients who can self-inject. Of 101 patients starting weekly IFN β -1a, all patients who discontinued by 6-months were unable to self-inject due to anxiety (Mohr et al, 2001).

This study examines a brief manualized individual RN-administered cognitive-behavioral treatment for patients with self-injection phobia. This treatment demonstrated efficacy in an earlier study using psychologists as therapists (Mohr et al, 2002). In the current study, MS RNs were trained as therapists, in the hope of better replicating conditions in most MS clinics. Thirty RRMS patients prescribed IM IFN β -1a who were unable to self-inject due to anxiety were randomly assigned to either active treatment or a telephone-based support program (23/30 female, mean age = 41.5, range 18-61, mean years dx = 4.3 yrs, range (1 mon- 15.5 yrs). Patients who underwent the brief cognitive-behavioral treatment were significantly more likely to be able to self-inject at treatment cessation than those who received the telephone support control (p=.02).

It appears that trained RNs are able to treat self-injection phobias in MS patients as effectively as psychologists. Strategies for applying these techniques in MS clinics and neurology practices are discussed.

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(S09) CHRONIC PAIN IN MULTIPLE SCLEROSIS (MS)

Rehabilitation specialists have suggested that pain is an underappreciated subject in MS. The purpose of this study was to conduct a literature review on pain, and to critique the literature on treatments using a standard framework.

An online search of Medline (1990-2003), PyschINFO (1985-2003), and CINAHL (1982-2003) was conducted using key words: pain and multiple sclerosis. The search was restricted to human subjects, English language, and journal publication. Articles duplicated in the three databases were eliminated. A standard review form (Helewa and Walker, 2000) was used to critique any treatment articles with a research base. The criteria used included: presence of a control group; randomization to groups; blinding; equal treatment except on experimental modality; participants lost to follow-up noted; similarity of groups in the final comparison, and stratification of analysis on factors by which they differed; intention to treat analysis used; power based on sample size.

The search resulted in 43 articles. These articles fell into the following predominant categories: descriptive (frequency and characteristics of pain) 26% (N=11), correlational (risk factors or outcomes of pain) 19% (N=8), experimental (treatment modalities) 37% (N=16), and general review 18% (N=8). The largest category was for treatment, although many of the articles had only one or very few subjects involved. These articles also covered diverse modalities with only one or a few articles on each modality, including: cannabis, lidocaine and mexiletine, glycerol rhizotomy, gabapentin, transcutaneous electrical nerve stimulation, lamotrigine, carbamazepine, hypnotherapy, electromagnetic fields, and intrathecal baclofen infusion. Many of these articles failed to pass the criteria for excellence in terms of contribution to evidence-based practice, including adequate sample size.

It would appear that more studies on treatment modalities in multiple sclerosis, with more stringent methodology, are required to develop evidence-based practice guidelines for pain in multiple sclerosis.

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**(S10) CLINICAL APPLICATION OF REHABILITATION OUTCOME MEASURES
IN MULTIPLE SCLEROSIS**

PURPOSE: Standardized outcome measures should be used in rehabilitation of individuals with MS to provide valid and reliable data for monitoring functional status and patient response to treatment. The 25 foot timed walk is frequently used as a measure of ambulation but is limited in the information it provides. The purpose of this study was to determine the ease with which several standardized measures could be incorporated in a clinical setting. **SUBJECTS:** Twenty-two ambulatory individuals with MS with varying levels of function (EDSS 3.0 b 6.0). **METHODS AND MATERIALS:** Subjects were examined by a physical therapist to determine functional ability and impairments. Following the examination subjects completed six tests; 25 foot timed walk, Timed Up and Go, Dynamic Gait Index, dynamometer of grip strength, Nine-Hole Peg test, and 2-minute walk (in that order). At the conclusion of all testing subjects were instructed in their home exercise program which emphasized task oriented activities and exercise. **DATA ANALYSIS:** Descriptive statistics **SUMMARY DATA & NUMERICAL RESULTS:** The standardized tests required 15 to 20 minutes (mean 16.2 seconds) to complete and were incorporated into the examination. All patients completed the additional testing during the first physical therapy appointment. The standardized tests used in this study can be completed in any setting that has a 40 foot area for walking.

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(S11) MEASURING CHANGE IN AMBULATION IN MULTIPLE SCLEROSIS

PURPOSE: The 25 Foot Timed Walk, Nine-Hole Peg Test and PASAT have been utilized as comprehensive outcome measures in MS. Change in ambulation is not always detected with the 25 Foot Timed Walk. The purpose of this study was to examine other tests of ambulation to detect change in patients receiving rehabilitation. **SUBJECTS:** Five ambulatory individuals with MS whose EDSS scores ranged between 4.0 and 6.0 participated in this study. **METHODS AND MATERIALS:** A physical therapy examination was performed on each patient to determine functional ability and impairments. Following the examination patients completed the 25 Foot Timed Walk, 2-minute walk, Timed Up and Go, and Dynamic Gait Index. Following the testing patients were instructed in a home exercise program that emphasized task-oriented activities and exercise. Patients were seen in physical therapy one time per week for re-examination and progression of treatment program. At discharge patients were post tested with the 25 Foot Timed Walk, 2-minute walk, Timed Up and Go, and Dynamic Gait Index. **DATA ANALYSIS:** Descriptive statistics, Chi Square. **SUMMARY DATA & NUMERICAL RESULTS:** The five patients averaged 6.6 treatment visits with significant change occurring in the 2-minute walk (Chi Square analysis, 132.32, $p < 0.001$). Dynamic Gait Index, Timed Up and Go, and 25 Foot Timed Walk demonstrated a positive trend but were not significant. A larger sample is recommended for further analysis.

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**(S12) COMBINATION THERAPY (PROVIGIL+AVONEX) IN THE
TREATMENT OF COGNITIVE PROBLEMS IN MS**

Objective: To determine whether combination therapy (Provigil +Avonex) is safe and effective in treating breakthrough cognitive deficits in MS.

Background: There is evidence that treatment of multiple sclerosis (MS) with interferons can slow the progression of cognitive dysfunction. Scant data exists, however, regarding the treatment of breakthrough cognitive symptoms (e.g., attention, processing speed, and memory problems). Although studies have recently demonstrated the benefits of using adjunct Provigil therapy to treat MS fatigue, there is no data on whether this translates into improved functioning in patients with breakthrough cognitive impairment.

Design/Methods: The current pilot study is a multi-center, randomized, parallel-group design to assess safety and provide preliminary efficacy data for adjunctive Provigil treatment. MS patients already taking Avonex completed an attention screening battery. Those that demonstrated attention problems were randomized to receive modafanil (200 mg/day) or no additional treatment. Evaluators were blind to medication status. Subjects completed a neuropsychological battery at baseline and two months. Side effects were closely monitored to determine the safety of this combination therapy. Multiple analyses of covariance (MANCOVAs) were performed to determine between-group differences in safety and efficacy.

Results: 30 MS patients were enrolled in the study, 15 in each group. At baseline, mean age was 45.84, mean years of education was 14.63, and mean EDSS score was 3.94. At 2 months, side effects of patients on modafanil were mild and no different from those described in the package insert. As compared to the Avonex-alone group, patients taking Provigil demonstrated significant improvement from baseline on a number of neurocognitive measures.

Conclusions: In this pilot study, the use of Provigil in addition to Avonex for treatment of breakthrough cognitive symptoms appeared to be safe and effective.

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(S13) COMFORT (COMPARATIVE STUDY FOR TWO HIGH-DOSE INTERFERONS IN MS)

Objective: To evaluate the tolerability of interferon beta (IFN β), comparing subcutaneous (sc) IFN β -1b (Betaseron(r)/Betaferon(r)) 250 mcg every other day (eod) with sc IFN β -1a (Rebif(r)) 44 mcg three times a week (tiw) administered in healthy volunteers, as measured by injection site pain (ISP) and injection site reactions (ISR).

Background: There has been no direct comparison of the two high-dose, high-frequency, sc IFN β regimens. However, clinical experience suggests that sc IFN β -1a is associated with increased ISP when compared with sc IFN β -1b.

Methods: A 4-week, randomized, single-center, rater-blinded, Phase I study to examine the tolerability of IFN β -1b (250 mcg sc eod) and IFN β -1a (44 mcg sc tiw) in healthy volunteers. Subjects assessed ISP at 5 minutes and 30 minutes post injection using a visual analog scale (VAS) that ranged from 0 mm (no pain) to 100 mm (worst pain imaginable). Two days after each injection a rater-blinded assessment of ISR severity was made using a 4-point categorical rating scale.

Results: IFN β -1a administration was more frequently associated with injection pain compared with IFN β -1b (43% versus 13%, respectively; $P < 0.0001$). This effect was consistent at 5 and 30 minutes post injection and continued for the duration of the study. At 5 and 30 minutes post injection, the pain associated with injection was also more severe in the IFN β -1a group than in the IFN β -1b group. Furthermore, IFN β -1b was associated with a greater proportion of ISR-free injections compared with IFN β -1a (71% versus 47%, respectively; $P < 0.0001$).

Conclusions: IFN β -1b was better tolerated than IFN β -1a in terms of ISP and ISR in healthy volunteers. The acidic pH (3.8) of the IFN β -1a formulation may explain, in part, this observation. This data provides information to enable patients and physicians to make an informed choice when selecting an appropriate disease-modifying therapy for RRMS.

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**(S14) CONCORDANCE OF HEALTH UTILITY AND NEUROLOGIC DISABILITY
IN AN MS CLINIC SAMPLE**

Background: The importance measuring the changes in health-related quality of life (HRQoL) that accompany MS is well known and numerous self-report instruments have been used or developed for use with MS patients. Health utility measures are one class of HRQoL instruments that have a particular application in cost-effectiveness analyses, a significant issue in the debate surrounding funding of MS treatments. Despite this, little is known about the validity of health utility instruments in MS.

Objective: To assess the construct validity of the Health Utilities Index (HUI) Mark III in a clinic-attending sample of MS patients.

Methods: Between April 2002 and November 2003 patients attending the Dalhousie MS Research Unit completed the HUI and were assessed via the Expanded Disability Status Scale (EDSS) at their regular clinical assessment. Our analyses included 500 patients with clinically definite relapsing-remitting (370) or secondary-progressive (130) MS who had an EDSS ranging from 0.0 to 6.5. HUI and EDSS were compared using Spearman correlations. The effects of EDSS level (i.e. 0-1.5, 2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5) on the HUI was examined using analyses of covariance with disease course, age (mean=42.7, sd=9.3), sex (117 males, 383 females), and treatment (182 on versus 318 off disease modifying therapy) as covariates.

Results: A moderately strong correlation ($r = -.51$) between HUI and EDSS was found overall. Analyses of covariance demonstrated a significant effect of EDSS level ($F = 22.34, p < .0001$) and a trend for an effect of age ($F = 3.41, p = .07$) on the HUI score, but no effects of disease course, sex, or treatment. Post-hoc pairwise comparisons revealed significant differences in HUI scores between individual EDSS categories up to EDSS 4.0-4.5. Subject groups with EDSS 4.0-4.5, 5.0-5.5 and 6.0-6.5 did not differ significantly.

Conclusions: This cross-sectional study provides evidence of the validity of the HUI as a measure of self-reported health utility in mild to moderately affected MS patients who were either receiving disease-modifying therapies or were eligible to do so. Since the HUI demonstrated good concordance with the EDSS in this clinic-attending sample it may be able to contribute to the determination of treatment cost-effectiveness with an outcome measure that reflects patients' perceptions.

Study supported by: Health Canada and the Multiple Sclerosis Society of Canada

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**(S15) CONJUGAL RECURRENT NEUROMYELITIS OPTICA SYNDROME
AND MULTIPLE SCLEROSIS**

Background/Objective: To present two cases of conjugal multiple sclerosis (MS) and recurrent neuromyelitis optica (NMO) syndrome

Cases presentations: O.S.C, 32 year-old, Cuban male, started in 1981 with an episode of weakness of the legs with decreased sensibility up to the thoracic level and signs of pyramidal dysfunction. Another relapse in 1982 with weakness and numbness of the legs and loss of the sensibility in the left leg with urinary incontinence. In April 1982 he was admitted for worsening of the weakness of the legs and loss of the superficial sensibility in the lower extremities with sensory level up to the nipples. The neurological examination demonstrated: Paraplegia (0/5) with spasticity (+4), stretch reflexes (+3), bilateral Babinski sign with sensory level (Th2-Th3). The patient had loss of bladder and bowel functions. The following day he presented "sensation of intense abdominal oppression" that irradiated to the right leg. An immediate respiratory arrest provoked death. The anatomical study showed a necrotic process, in macrophagic phase, which affected the spinal cord, both gray and white substance, from Th2 to Th6 with very light inflammatory changes, predominantly lymphocytes, perivascular and at the leptomeninges. Myelin appeared more affected than the axons. The optic nerves demonstrated typical changes of demyelination and gliosis.

His wife, H.R.C.S, 46 year-old, Cuban female, developed left retro bulbar optic neuritis in 1998. Since May 2001, she presented progressive aphasia, cuadriparesis, urinary disturbances and mood disorder. Physical examination: Language: Anosognosia, neologisms, paraphasias, perseverations, sensorial aphasia and dysarthria. Cuadriparesis, (4-/5), spasticity (+3) in the limbs with increased (+4) of the left stretch reflexes and (+3) in the right. Hoffmann's bilateral sign. Right Babinski sign. Marcus-Gunn pupil sign and pallor of the optic disks. Complementary tests: CSF: Oligoclonal bands. MRI: Multiple peri-ventricular and white matter lesions compatible with MS. These results confirmed the diagnosis of secondary progressive Multiple Sclerosis

Conclusions: This woman developed MS, sixteen years after her husband died of recurrent NMO. These cases could be conjugal demyelinating diseases, MS and recurrent NMO syndrome, or the link between them could be coincidental.

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(S16) DOWN SYNDROME AND DEVIC'S DISEASE. AN AUTOPSY PROVEN CASE

Background: A hypothesis have been proposed that there is association of Down's Syndrome (DS) and Multiple Sclerosis (MS) because genes located at chromosome 21 could confer protection against MS. Only two cases of MS with DS have been described (Weilbach 1999, Alvarenga 2003). There were no reported cases of Neuromyelitis Optica syndrome (NMO) and DS.

Objective: The aim of this paper is to present a case with DS and NMO

Case Presentation: A 29-year-old woman with DS, from Havana, Cuba, was admitted in January 15th 2001 for acute onset of loss of vision, weakness of the extremities and urinary retention. The neurological examination showed: paraplegia with loss of the stretch reflexes, hypotonia, loss of abdominal reflexes and bilateral Babinski sign. The examination of the somatosensory system showed loss of the pain, tactile, temperature and vibratory sensations with segmental demarcation at Th1-Th2 level. The ophthalmologic examination showed bilateral amaurosis, loss of the pupillary afferent reflexes and swelling of the optic disks. She received intravenous methylprednisolone for five days without improvement. Two days later she developed quadriplegia and respiratory arrest. She died on February 1st. The autopsy demonstrated the typical findings of DS at the brain and a severe destruction of the medulla and the cervical spinal cord. The study of the optic nerves presented severe demyelination. The findings were typical of monophasic ONM or Devic's Syndrome.

Conclusions: This paper is the first report of a case of DS and monophasic NMO or Devic's disease.

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(S17) COPING AND IMMUNE FUNCTION IN MULTIPLE SCLEROSIS

Perceived stress has been demonstrated to modulate cytokine expression and secretion. As coping is believed to modulate levels of perceived stress, it was the purpose of this study to examine the relationships among disease symptomatology, perceived stress, dispositional coping style, and cytokine production as induced from peripheral blood mononuclear cells in normative controls and outpatients with Multiple Sclerosis. Cytokine production was induced using two separate methods, lipopolysacchride and a mixture of phytohaemagglutin and phorbol-12-myristate-13-acetate. Coping was measured through administration of the Jalowiec Coping Scale that provided a means for assessing the presence, and perceived effectiveness of eight dispositional coping styles. In MS, the use and effectiveness of predominately emotion-focused coping strategies significantly and directly correlated with the production of interleukin (IL)-2 and IL-12. As well, those cytokines that significantly correlated with coping in those with MS were distinct from those cytokines found to significantly correlate with perceived stress and mood disturbance (IL-6, IL-10). In normative control subjects, the use of emotion-focused coping styles negatively correlated with the production of IL-10 and interferon-gamma. Within control subjects, interferon-gamma had been found to exhibit a pattern of positive correlation with mood disturbance, while perceived stress was directly correlated with tumor necrosis factor-alpha and IL-12. These results suggest that coping style in normative controls may modulate the level of mood disturbance and perceived stress. Coping style may also be associated with the expression of select cytokines that may affect MS disease progression and course, indicating that the immunologic effect of coping differs in those with MS from normative control subjects.

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(S18) DO PATIENTS DISTINGUISH FATIGUE FROM OTHER TYPES OF IMPAIRMENT?

Objective: To determine whether patients distinguish the effects of fatigue from the effects of motor impairment, cognitive impairment, and other deficits when completing a fatigue rating scale.

Background: Fatigue is defined as a state with reduced capacity for work following a period of physical or mental activity. In casual use, however, patients often use the term fatigue to describe a much broader range of symptoms. On the Modified Fatigue Impact Scale (MFIS), patients are instructed to focus on the impact of fatigue on daily activities by rating their agreement with statements beginning with the phrase "Because of my fatigue..."

Methods: Patients with MS completed the MFIS and the Fatigue Severity Scale (FSS) at the end of a routine appointment. Half of the patients were randomly assigned to complete an MFIS form including the clause "Because of my fatigue..." before each statement; the other half rated the same statements without specific reference to fatigue (e.g., "Because of my fatigue, I have had trouble concentrating" vs. "I have had trouble concentrating").

Results: Patients ($n = 93$) were 40.6 ± 14.2 years old, with MS for 10.7 ± 7.0 years and EDSS score 3.7 ± 2.3 . Patients ($n = 46$) completing a form rating the impact of fatigue had scores very similar to those of patients ($n = 47$) rating the same activities without reference to fatigue (42.2 ± 17.7 vs. 38.3 ± 14.7). MFIS scores correlated with FSS scores and did not correlate with the EDSS, regardless of whether patients were instructed to focus on the effects of fatigue or not.

Conclusion: Using the MFIS, patients do not rate the effects of fatigue separately from motor impairment, cognitive impairment, and other deficits, raising questions about the validity of observations based on this type of self-report.

Study supported by: Institutional Funds

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(S19) DO PEOPLE WITH MS HAVE PALLIATIVE CARE NEEDS?

BACKGROUND AND AIMS: Anecdotal reports and some surveys have identified that people with progressive MS have unmet needs, which palliative care might be able to address. However, there is little detailed information in this area. This project therefore sought to identify which MS-related issues were perceived as important by people with advanced MS, their informal carers, and health care professionals (HCPs), and to compare their perceptions.

METHOD: Over 6 months semi-structured interviews were conducted with 23 people with MS and 17 carers in Southeast London, and 12 focus groups and 4 individual interviews were conducted with HCPs working in MS, rehabilitation or palliative care across Southeast England. These interactions were taped and transcribed and a content analysis performed.

RESULTS: The main preoccupations of people with MS were their experiences of loss, relating to mobility, independence, and personal relationships, while a few had specific concerns regarding pain, medication, non-specialist care, and end-of-life issues. Others, particularly informal carers, were troubled by:

- quality of inpatient care
- continuity and co-ordination of care
- lack of information, and
- the sense that they had constantly to fight for the services and benefits which they received.

HCPs identified issues relating to:

- resources
- continuity of care
- provision and access to services
- rehabilitation goals
- unpredictability of the disease process
- specific physical and psychological problems, and
- the end-of-life, specifically terminal care and decision-making.

CONCLUSIONS: People with progressive MS have symptom control problems and needs relating to provision of care and obtaining services and information. HCPs recognise some of these issues, but also identify needs in other areas. Any service for people with progressive MS should address this range of issues. Specialist palliative care can offer particular expertise in doing so, in collaboration with neurology and neurorehabilitation.

Study supported by: MS Society (UK)

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(S20) ECONOMIC EVALUATION OF AVONEX® IN PRE-CLINICALLY DEFINITE MULTIPLE SCLEROSIS

Background: Interferon beta-1a (Avonex®) is efficacious in delaying clinically definite multiple sclerosis (CDMS) following a single demyelinating event (SDE). This study determined the cost-effectiveness of Avonex® compared to current treatment in delaying the onset of CDMS.

Methods: A cost-effectiveness analysis (CEA) and cost-utility analysis (CUA) were performed. For CEA, the outcome of interest was time spent in the pre-CDMS state, termed monosymptomatic life years (MLY) gained. For CUA, the outcome was quality adjusted monosymptomatic life year (QAMLY) gained. A Markov model was developed with transitional probabilities and utilities derived from the literature. Costs were reported in 2002 Canadian dollars. Costs and outcomes were discounted at 5%. The time horizon was 12 years for the CEA, and 15 years for the CUA. All uncertainties were tested via univariate and multivariate sensitivity analyses.

Results: In the CEA, the incremental cost of Avonex® per MLY gained was \$53,110 and \$44,789 from the Ministry of Health (MoH) and societal (SOC) perspectives, respectively. In the CUA, the incremental cost of Avonex® per QAMLY gained was \$227,586 and \$189,286 from the MoH and SOC perspectives, respectively. Both models were sensitive to the probability of progressing to CDMS and the analytical time horizon. The CUA was sensitive to the utilities value.

Conclusion: Results suggest that Avonex® may be considered as a reasonably cost-effective approach to treatment of patients experiencing a SDE. In addition, the overall incremental cost-effectiveness profile of Avonex® improves if treatment is initiated in pre-CDMS rather than waiting until CDMS.

Study supported by: Biogen Idec Canada Inc

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**(S21) EFFECTIVE COLLABORATION BETWEEN SPONSOR AND MS CLINICAL TRIALS CENTERS:
PRODUCTIVE PARTNERSHIP TO OVERCOME RECRUITMENT CHALLENGES AND BARRIERS**

Background: Recruitment of patients to multicenter multiple sclerosis (MS) trials poses numerous challenges. The greatest challenge in this era of disease modifying therapy (DMT) is finding active, relapsing patients not using approved DMTs. The purpose of this study is to describe some of these recruitment challenges and potential strategies.

Methods: During a multi-national, Phase II randomized, placebo-controlled trial of an injectable therapy for MS, monthly teleconferences were held to discuss trial issues, especially recruitment. Challenges and potential solutions were captured in minutes and reviewed to determine and classify recruitment issues.

Results: Challenges were classified as: finding eligible patients, reducing hardship imposed on participants, and minimizing perceived and actual patient risk. Strategies to identify potential patients include: development of site-specific recruitment tools (posters and patient information), utilization of patient registries/databases, placing notices in advocacy group newsletters, utilizing web sites to provide recruitment information, setting up call centers, and regional media exposure. Hardships faced include those inherent to the disease (fatigue, cognitive impairment, and impaired mobility), those related to the psychosocial consequences of the disease (travel and parking costs, childcare costs, inability to miss work, increased burden on family/friends), and general barriers related to the dwindling pool of patients (such as greater distance from study centers). Strategies to reduce these issues include: access to written information and to the study coordinator, reimbursement of out-of-pocket expenses, and flexibility in visit scheduling. Risks and perceived risks must primarily be dealt with through the protocol but communication of these issues to potential participants is important. They include: increased proportion of patients on active drug versus placebo, stopping rules, utilization of an independent safety committee that periodically reviews safety data and reports specific outcomes such as MRI worsening. Additional sponsor interventions included: regular teleconferences to identify, discuss and strategize recruitment barriers and weekly discussion between each site and the sponsor of site-specific issues.

Conclusions: For recruitment to be effective, the clinical trials center and the sponsor must work collaboratively to identify and implement site specific solutions. The outcome of this partnership will facilitate timely study enrollment and resolve many of the patients actual and perceived study barriers.

Study supported by: Neurocrine Biosciences

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**(S22) FACTORS ASSOCIATED WITH SUBJECT DROPOUT IN
A TRIAL OF REHABILITATION FOR MS PATIENTS**

The goal of this analysis was to identify baseline characteristics associated with discontinuation (dropout) during a randomized controlled trial of rehabilitation following acute relapses of Multiple Sclerosis (MS). Subjects were recruited from patients receiving treatment with intravenous methylprednisolone for confirmed MS exacerbation, and baseline study data was collected at that time (T0). Four weeks later (T1), subjects who had incomplete recovery were randomized to either a structured 6-week, outpatient rehabilitation program or to standard care (with focused rehabilitation for safety concerns only). Follow-up data were collected at months 3, 6, and 12. Study measures analyzed for this preliminary report included the Incapacity Status Scale (ISS), Expanded Disability Status Scale (EDSS), and SF-36. Differences between completers and non-completers were evaluated using the Chi square test, unconditional exact test, and Wilcoxon rank-sum test, with significance level set for $p < 0.05$. 93 subjects were eligible for randomization, and the overall dropout rate over the course of the study was 38%. 11 subjects dropped from the study before randomization, and 24 dropped after T1. Subjects who did not complete T1 were significantly younger ($p=0.02$), were more likely to have relapsing-remitting MS ($p=0.011$) and were significantly less disabled according to the ISS ($p=0.014$). There was also a trend for lower EDSS scores in early dropout subjects ($p=0.07$). No statistically significant differences were observed between subjects who dropped out after randomization and those who completed the study, but there was a trend for lower EDSS scores in non-completers. Group allocation after randomization did not affect dropout rates significantly. These results suggest that patients at an earlier stage of MS are less motivated for a potential rehabilitative intervention after an exacerbation, even though they may present with residual problems, such as chronic fatigue, which are best addressed at a time when behavioral changes are easier to implement.

Study supported by: National Multiple Sclerosis Society

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(S23) FLOW CYTOMETRY IN MULTIPLE SCLEROSIS PATIENTS ON CONTINUOUS COMBINED IMMUNOMODULATORY-IMMUNOSUPPRESSIVE THERAPY

Background: There has been increasing evidence that besides of the CD4 T-cells, CD8 T-cells, B-Cells and natural killer cells are participating in the immunopathologic process of multiple sclerosis (MS). High-dose intravenous methylprednisolone induces apoptosis in peripheral blood leukocytes without significant reduction in the absolute number of CD8 T-cells. Interferon β (INFB) enhances expression of the death receptor CD95 but does not upregulate caspase activity. Newly identified member of the tumor necrosis factor superfamily, TRAIL marker, is upregulated in peripheral blood monocytes in MS patients responding to INFB therapy.

Objectives: To determine the effect of continuous combined immunomodulatory-immunosuppressive (CCIMIS) therapy on peripheral blood mononuclear cells (PBMC) including expression of the TRAIL marker.

Design and Methods: Using flow cytometry, in 33 MS patients with relapsing remitting and relapsing progressive MS and in 12 healthy controls PBMC were examined using monoclonal antibodies to eight antigens: CD3, CD4, CD8, CD14, CD16, CD19, CD95 and TRAIL. Flow count beads were used for absolute quantification. There were 8 patients on Avonex monotherapy (30 mcg injection i.m. q week), 21 individuals on Avonex and prednisone (average dose less than 0.12 mg/kg/day) and 4 patients on Avonex, prednisone and azathioprine (2-3mg/kg/day).

Results: Combined therapy with Avonex and prednisone showed significant increase in CD14⁺ and CD14⁺TRAIL⁺ cells ($p < 0.002$) compared to Avonex monotherapy and decrease in CD19⁺ and CD19⁺TRAIL⁺ cells ($p < 0.002$) compared to controls. CD8⁺CD95⁺ cells were increased on Avonex monotherapy and combined therapy ($p < 0.02$ and $p < 0.006$).

Discussion: Cytofluorometry offers information regarding immunomodulatory-immunosuppressive effect of CIMIS therapy potentially useful in adjustment of the ongoing treatment regardless of the clinical and MRI findings in individual MS patients.

Conclusion: In MS patients on CCIMIS therapy flow cytometry is useful in monitoring efficiency of the ongoing treatment. Longitudinal studies in a larger population of MS patients are warranted.

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(S24) GEOGRAPHIC DIFFERENCES IN MS POPULATIONS IN WASHINGTON STATE

We had hypothesized that there would be significant differences in access to health care based on the region in which people with MS lived in the state of Washington. Washington has concentrations of population and medical services around metropolitan Seattle on the west side of the Cascade Range, and Spokane on the east side of the state. Much of the remaining population is distributed among relatively rural areas. We analyzed survey data collected from 1,287 eligible respondents from Western (N = 739) and Eastern (N = 548) Washington including demographic characteristics, disease history, symptoms, health care and health status. Addresses were mapped using geographic information software and U.S. Census 2000 and Washington State Department of Health data were also mapped and linked to the MS dataset to determine urban/rural status. We found that 87% of the sample lived in urban areas and only 13% lived in rural areas. Individuals with MS living in eastern Washington were more likely to be married, unemployed, lower income; less education; more likely to have Medicaid or Medicare, less advanced disease, poorer overall health; more depression, pain, and fatigue than those from Western Washington. Despite these regional differences, comparisons of urban vs. rural individuals revealed no statistically significant differences related to disease or access to medical care although rural individuals were more likely to have less education, be married, and live in Eastern Washington. In summary, though the Eastern and Western samples differed in demographic and disease characteristics of MS, these differences are unrelated to living in a rural vs. urban area, and are therefore due to, as yet, undetermined factors. To gain a better understanding of variables that may contribute, we would like to obtain better representation of individuals living with MS in rural areas.

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(S25) INCIDENCE OF FRACTURES IN MULTIPLE SCLEROSIS PATIENTS ON CONTINUOUS COMBINED IMMUNOMODULATORY-IMMUNOSUPPRESSIVE THERAPY WITH ORAL STEROIDS

Background: In multiple sclerosis (MS) patients on monotherapy with interferon β (INFB) or glatiramer acetate presenting a relapse of objective neurological symptomatology, subsequent continuous combined immunomodulatory-immunosuppressive (CCIMIS) therapy results, in the majority of the individuals treated, in superior clinical results. Physiologic daily dose of prednisone used in CCIMIS patients has a large cumulative dose allowing continuous treatment with manageable side effects. One of the primary concerns regarding adverse effects of prednisone is secondary osteoporosis with fractures.

Objective: To establish the incidence of fractures in MS patients on CCIMIS therapy using physiologic dose of prednisone.

Material and Methods: In 107 consecutive MS patients continuously on prednisone (average daily dose not exceeding 0.12 mg/kg/day) with add-on therapy using INFB (Avonex 30 mcg i.m. weekly) including 19 individuals on azathioprine (2-3mg/kg/day) medical records and structured questionnaires were reviewed for incidence of fractures. The median duration of treatment with prednisone was 61 months (range 13-354 months). Most patients were on calcium, vitamin D and hormonal replacement if indicated. With bone mineral density (BMD) with T score < -1.5 , bisphosphonates (risedronate or alendronate) and < -3.0 teriparatide (Forteo) were initiated.

Results: The total number of clinically evident fractures established was 11 representing an annualized incidence of 0.013; for hip fractures 0.001. Clinical history in the 107 MS patients studied revealed 32 clinically established fractures preceding initiation of treatment with prednisone.

Discussion:

Considering the reduced annualized relapse rate (0.11)¹ and slowed down progressive disability in MS patients on CCIMIS therapy with prednisone, the established incidence of fractures reflects acceptable risk/benefit ratio. In view of the recently implicated role of activated T cells, IL₁₂, INF γ , INF α and nuclear factor κ B in the development of osteoporosis, long term effect of CCIMIS on BMD should be monitored.

Conclusions: Physiologic dose of prednisone in patients on CCIMIS therapy followed at MS Centers by clinicians experienced in long-term use of steroids improves significantly neurological findings in the majority of the individuals treated with an acceptably low incidence of bone fractures.

¹Lee H et al., Continuous Combined Treatment of MS with Avonex and Prednisone. J MS Care 2003; 5: 99.

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**(S26) INFUSION TECHNOLOGY KNOWLEDGE AND EXPERIENCE
AMONG PRACTICING NEUROLOGISTS**

Despite the numerous infused therapies used for the treatment of multiple sclerosis (MS) (acute therapies: intravenous [IV] immunoglobulin and IV methylprednisolone and limited/restricted use therapy: mitoxantrone), no chronically administered infused therapies are routinely prescribed. In order to determine neurologists' knowledge, experience, and comfort levels with medicines administered by IV infusion for the treatment of relapsing remitting MS, an independent consulting company conducted telephone interviews with 54 geographically diverse board certified neurologists. Interviewees were required to have practiced neurology for between 2 and 30 years, treated a minimum of 15 patients with MS in the last year (most treated between 50-100), and have been medium-to-high prescribers of MS therapy. Interviewees were from academic, private, and government institutions.

Overall, 46% of neurologists were from independent neurology practices, 31% from MS specialty centers, and 22% from hospital/multispecialty neurology practices. In-office infusion capabilities were reported by 24% of those in MS centers, 25% in hospital/multispecialty practices, and 16% in independent practices. Of the remaining neurologists, 85% in MS centers would consider establishing such facilities, compared with 39% of independent practice neurologists and 22% of neurologists in hospital/multispecialty settings. Concerns reported included staff availability, space, reimbursement risk, and handling infusion-related emergencies. Neurologists cited patient convenience and control over patient care as reasons for considering in-office infusions. They expressed interest in education on both infusion delivery and the process of establishing in-office infusion capabilities.

Although neurologists seem willing to consider in-office infusion administration, they would likely require education in treatment delivery, as well as in the process of preparing their offices to accommodate this type of drug delivery.

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(S27) INJECTION SITE PAIN: INTERFERON BETA-1B VERSUS INTERFERON BETA-1A

Objective: To compare injection site pain (ISP) in patients with MS taking either interferon beta-1b (IFN β -1b; Betaseron(r)/Betaferon(r)) or IFN β -1a (Rebif(r)).

Background: There are no data comparing the two high-dose, high-frequency regimens in patients with MS. However, a study in healthy volunteers concluded that subcutaneous (sc) injection with IFN β -1a was associated with greater pain than sc IFN β -1b.

Methods: A single-center, open-label, comparative, phase IV pilot study to assess the ISP associated with 10 consecutive injections of either 250 mcg IFN β -1b sc every other day or 44 mcg IFN β -1a sc three times weekly in patients with MS. Patients taking 250 mcg IFN β -1b or 44 mcg IFN β -1a for the past 1 to 6 months were eligible to participate. Patients self-assessed ISP prior to each injection, after each injection, and at 10 minutes, 1 hour and 24 hours post-injection, using a visual analog scale that ranged from 0 mm (no pain) to 100 mm (worst pain imaginable).

Results: 10 patients were enrolled to each treatment group. IFN β -1a was associated with a greater number of painful injections than IFN β -1b. At 1 hour post-injection, a total of 76/99 IFN β -1a injections were associated with increased pain relative to before injection, whereas 58/100 IFN β -1b injections showed increased pain. Furthermore, the mean severity of pain was greater for IFN β -1a injections than IFN β -1b injections immediately after injection (3.14 versus 1.04, respectively); 10 minutes after injection (1.70 versus 0.40); and 1 hour after injection (1.50 versus 0.33). 24 hours after injection the difference in ISP severity between the two treatments was minimal.

Conclusion: In patients with MS, sc injection with IFN β -1a is associated with a greater incidence and severity of pain than sc IFN β -1b. These data will assist MS nurses and physicians in supporting patients in making an informed choice of appropriate disease-modifying therapy.

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(S28) LIVING WITH ADVANCED DISEASE: THE PHASES OF PROGRESSION

Background: The seven McAlpine natural history profiles of multiple sclerosis (MS) provide a spectrum of disease severity from abrupt onset with few (if any) relapses after the first year, and no residual disability, to severe relapses with increasing disability and early death. For the majority of persons with MS, their experience will be somewhere in the middle of this spectrum, generally experiencing worsening symptoms and disability as the years go by, yet maintaining their ability to carry out basic activities of daily living. Unfortunately for some persons, their experience with the disease will be at the extreme end of the spectrum – severe progression.

Purpose: Persons who suffer from severe progression are often classified as having advanced disease. While this terminology classifies this group of patients as a whole, further refinement is required to adequately describe the variance seen within this group. The purpose of this presentation is to provide a descriptive and illustrative overview of the three distinct phases of progression that were found to be commonly experienced by persons with advanced disease.

Methods & Results: The University of Alberta MS Patient Care and Research Clinic has, and has had, many patients with advanced disease (about 15% of the approximate 3000 patient population). Through the critical review of the health records of a randomized subset of these patients, three phases of advanced disease were identified: Phase 1 – Hyperreflexic Spasticity; Phase 2 – Areflexic-atrophic Spasticity; and Phase 3 – Atrophy of Axial Musculature and Bulbar Palsy. Each of these phases is characterized by specific signs and symptoms, and require particular therapies. The signs, symptoms, and required therapies associated with each phase will be presented in detail.

Conclusions: Living with advanced disease is undoubtedly difficult. This presentation will provide a greater understanding of the three phases of advanced disease, and how best to manage each phase, to better help those living with advanced disease.

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**(S29) MANAGEMENT OF INTRATHECAL BACLOFEN IN AMBULATORY
AND NON-AMBULATORY MS PATIENTS**

Objective: to compare the frequency of intrathecal baclofen (ITB) rate adjustments in ambulatory and non-ambulatory multiple sclerosis (MS) patients.

Design: longitudinal observational study of patients followed for 24 +/- 4 weeks after implantation of a programmable ITB infusion system.

Setting: spasticity clinic within a large outpatient comprehensive care center for MS.

Participants: patients with definite MS and severe spasticity refractory to oral medications, who underwent pump implantation between 2001 and 2003.

Main Outcome Measure(s): number of adjustments and refills. Other outcomes measures include ITB parameters, Modified Ashworth Scale (MAS), Spasm Frequency Scale (SF), Pain Scale, 25 Foot Walk for ambulatory patients.

Results: 29 patients were included (16 ambulatory). Mean age was 45.5 +/- 8.7 years, 83% were women. Mean disease duration was 13.6 +/- 8.4 years, 21% had relapsing-remitting MS. No statistically significant differences were observed for demographic or disease characteristics. The number of refills was significantly higher in non-ambulatory patients ($p=0.05$). The number of adjustments without refill was higher in ambulatory patients but this did not reach statistical significance ($2.1 +/- 1.1$ vs. $1.5 +/- 0.8$, $p=0.156$). There was a significant increase in ITB rates in both groups between 1 and 6 months. ITB rates were significantly lower and complex dose scheduling occurred more frequently in ambulatory patients.

Conclusions: our results suggest that, during the first 6 months, ambulatory patients treated with ITB come to the clinic less frequently for refills (due to lower ITB rates) but tend to come more frequently for adjustments, and are more likely to need complex dose schedules, compared to non-ambulatory patients. Using a programmable pump in MS patients in general, and particularly in ambulatory patients, facilitates ITB management. Further studies on larger samples with longer follow-up periods are needed to confirm these findings.

Study supported by : Medtronic, Inc. (Dr Bethoux receives research grants from Medtronic, Inc. and is a member of their Speaker's Bureau)

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**(S30) MANAGING FLU-LIKE SYMPTOMS IN RELAPSING MS
PATIENTS AT INITIATION OF AVONEX® THERAPY**

OBJECTIVE: To evaluate the effectiveness of dosage titration and analgesics in the management of flu-like symptoms in relapsing multiple sclerosis (RMS) patients started on AVONEX® (interferon N2-1a IM lyophilized powder 30mcg weekly).

BACKGROUND: Treatment of RMS patients with AVONEX has been shown to delay the progression of sustained disability, to reduce the frequency of exacerbations and to reduce accumulation of MS lesions seen on MRI. Flu-like symptoms (FLS) including muscle aches, fever, chills and asthenia are associated with IFN treatment in multiple sclerosis. Strategies for the management of FLS would be beneficial to patients who might otherwise discontinue use of IFN therapy.

METHODS: This is a multi-center, randomized, open-label study in which subjects were assessed for 12 weeks for the presence and intensity of FLS. In this interim analysis of 27 patients from four centers, subjects were randomized into one of three groups: no dosage escalation + acetaminophen (Group 1), B< dose escalation every 2 weeks + acetaminophen (Group 2), and B< dose escalation every 2 weeks + ibuprofen (Group 3). The second part of this study will evaluate B= dose escalation of AVONEX.

RESULTS: Patients started on AVONEX therapy with no dosage escalation (Group 1, n=11) experienced significantly more frequent and severe FLS than those patients started on AVONEX therapy using B< dose escalation (Groups 2, n=6 and 3, n=10). Three patients dropped out of the study; all were from Group 1. There were no differences in frequency or severity of FLS between Groups 2 and 3.

CONCLUSIONS: Using B< dose escalation of Avonex at initiation of therapy results in significantly fewer and less severe FLS in RR-MS patients while acetaminophen and ibuprofen are equally effective in managing FLS.

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(S31) MEASURING QUALITY OF LIFE IN A MULTIPLE SCLEROSIS REHABILITATION CLINIC

PURPOSE: Measuring quality of life in individuals with MS is an important outcome measure that can be incorporated in rehabilitation. The purpose of this study was to determine the ease with which two instruments, the Functional Assessment of Multiple Sclerosis (FAMS) and the Multiple Sclerosis Quality of Life Inventory (MSQLI) could be incorporated in a clinical setting. **SUBJECTS:** Ten individuals with MS with varying levels of disability (EDSS 3.0 b 6.5) participated in this study. **METHODS AND MATERIALS:** The FAMS and MSQLI, two self-report quality of life instruments, were administered to ten subjects. Seven of the ten subjects completed the FAMS and MSQLI in the clinic and the other three subjects completed the questionnaires at home. After the questionnaires were completed the subjects responded to four short questions that addressed the ease in completing the FAMS and MSQLI, and the relevance of the questionnaires to their perceived quality of life. **DATA ANALYSIS:** Pearson Product Moment Correlation and descriptive statistics. **SUMMARY DATA & NUMERICAL RESULTS:** The FAMS required an average 17.63 minutes to complete, the MSQLI 40 minutes. Eight subjects reported the FAMS was easier to complete, and eight subjects reported the MSQLI was more comprehensive in covering all aspects of daily life. The FAMS was moderately correlated to the SF-26 component of the MSQLI ($r=.638$, $p=.05$). Correlation with the Mental Health Inventory of the MSQLI was low ($r=.433$).

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(S32) MS PATIENT CHARACTERISTICS: CONSIDERATIONS IN LONG-TERM MANAGEMENT

Objectives: To identify various characteristics of multiple sclerosis (MS) patients and understand premorbid personality traits that affect their reactions to MS treatment decisions and to facilitate optimal communication between MS patients and the healthcare team.

Methods: 454 relapsing-remitting MS patients from the Harris Interactive Chronic Illness Panel were surveyed on an interactive website. Patient characteristics were analyzed by data reduction, key drivers analysis and clustering methods.

Results: Of the patients surveyed, 32% were classified as "aggressive", extremely involved in their disease and treatment; 28% were "information seekers", proactive in researching information, concerned about disease progression and receptive to alternative therapies ; 25% were "passive", complacent and satisfied with their current treatment; 15% were "denial", less proactive and not likely to seek help from their doctor. These patients approached and responded to their treatment differently. A majority of passive patients, information seekers and aggressive patients (60%-62%) reported that they prefer to take team approach to treatment with their doctor as compared to 37% of denial patients. Efficacy of a drug was most important for information seeking patients whereas aggressive types and passive patients considered side effect as more important (49% each). Denial patients were focused on the frequency of injection (44%). All types except for the denial group thought that they have chosen the best treatment option that was working (55%-66%). Denial patients were least satisfied with their treatment (30%).

Conclusions: MS patients were classified into four distinct groups that had differing concerns about their treatment. Aggressive, information seeking and passive patients were more likely to respond better to team approach and try alternative therapies. In-denial patients may have to be educated for developing skills in making team decision with their doctor. These characteristics of MS patients may help health care professionals to better interact with their patients in making treatment decisions.

Study supported by: Serono/Pfizer (Serono/Pfizer sponsored the market research meetings)

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(S33) MULTIDISCIPLINARY ASSESSMENT IN PEDIATRIC DEMYELINATING DISEASE

Goal: To demonstrate the advantages of a multidisciplinary assessment of children and adolescents with CNS demyelinating disease.

Background: Acute demyelinating disease in children is an uncommon problem and can be difficult to diagnose and manage. When the disease follows a multiphasic course, this often leads to the diagnosis of Multiple Sclerosis (MS). The diagnostic process, disease treatment response, and the family's individualized adjustment to the diagnosis are often associated with psychosocial stress. In this study, a multi-disciplinary evaluation was provided to examine the neurologic, cognitive, psychiatric, and psychosocial consequences.

Methods: A total of 55 children were evaluated by a multidisciplinary team which included an adult and pediatric neurologist, neuropsychologist, child psychiatrist, and pediatric nurse practitioner. MRIs were reviewed with neuroradiology. Following the evaluations and communication among the staff, a family conference was held with the evaluating team.

Results: To date, of 55 cases 64% (n = 34) were diagnosed with MS, (all but one with the relapsing remitting type, 1 with primary progressive), 22% with ADEM, and 15 % with Clinically Isolated Syndrome (CIS). Half of the children who had psychiatric evaluation were diagnosed with Depressive Disorder. Overall, 24% of the children had cognitive impairment.

The multi-disciplinary team conference broadly examined each individual child-family unit. We believe that this approach has significant benefits because it covers topics of most immediate interest to the family. The different perspectives of the child neurologist and adult MS neurologist are integrated into the diagnosis and recommendations. The questions regarding the prognosis are discussed. We are able to help prioritize where subsequent efforts should be focused. For example: creating an appropriate school program, guidance in disclosing the diagnosis to the child, managing symptoms, choosing the best disease modifying therapy for the child and family. The family leaves with a plan that is a dynamic work in progress.

Conclusion: Using a multidisciplinary assessment, the need for neurological therapies, cognitive remediation strategies, school interventions, and behavioral therapy can be prioritized and individualized for children and adolescents with demyelinating diseases.

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(S34) NAPROXEN, ACETAMINOPHEN OR IBUPROFEN USE WITH IFN β -1A, AVONEX, IN MS

Relapsing remitting Multiple Sclerosis (RR-MS) patients initiating IFN β -1a, Avonex, therapy (Group1 n=30) and RR-MS patients continuing to experience side effects after 6 m on therapy (Group2 n=30) were randomized in an open label feasibility study to 5 weeks of adjunct therapy with naproxen (Aleve[®]), acetaminophen (Tylenol[®]) or ibuprofen (Advil[®]). All pain medications were effective in minimizing headache, fever, chills and injection site pain in both study groups but fatigue, muscle or joint pain continued to be a significant problem (severity scores of >3 on 11 point scales. Modified Fatigue Impact Scale (mFIS) was administered before and after the initial injection and before and after the final study injection. In RR-MS patients initiating therapy randomized to Tylenol[®], mean mFIS was higher at study initiation than at study end (p=.04); however, neither physical or psychosocial subsets changed. Patients on both Aleve[®] or Advil[®] had significant improvement in mFIS over the 5 weeks with greatest change in physical subset (p=.002 for Aleve[®] and <.01 for Advil[®]). Advil[®] and Aleve[®], like Tylenol[®], also produced improvement in cognitive subset (p<.02) but no change in psycho-social subset. In RR-MS patients with continuing side effects, initial mFIS was also significantly higher than at study end with all 3 pain medications (p<.04). As in Group 1. Physical subset did not change significantly for Group 2 on Tylenol[®] but did for those on Aleve[®] (p<.05) or Advil[®](p<.03). Treatment with all three pain medications produced improvement in the cognitive subset (p<.05). Naproxen and ibuprofen are more effective than acetaminophen in minimizing all side effects of IFN β -1a therapy.

Study supported by: Biogen Pharma

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**(S35) NURSING HOME RESIDENTS WITH MS:
DEMENTIA, COGNITION, AND PHYSICAL FUNCTION**

We analyzed 20,566 admission assessments for nursing home residents with multiple sclerosis (MS), recorded in the Minimum Data Set between January, 1998 and June, 2003, identifying 2,235 residents with MS who also had a diagnosis of some type of dementia (11%). We compared MS residents with dementia to other MS residents for: demographic characteristics; measures of cognitive performance, physical impairment, mood, and behavior; psychosocial well being; comorbidities; and therapies.

MS residents with dementia were older at admission (65.4 years) than other MS residents (55.7 years) but only minor differences were observed for gender and race/ethnicity. MS residents with dementia were more likely to have short term (78%) and long term (55%) memory problems than other MS residents (29% and 15% respectively), as well as more likely to exhibit mood indicators and to express behavioral symptoms than other MS residents. However, other MS residents tended to be considerably more impaired in range of motion and loss of voluntary movement than MS residents with dementia. MS residents with dementia were more likely to have depression (44%) or anxiety disorder (16%) and to have had a stroke (21%) than other MS residents (37%, 7%, and 6% respectively).

MS residents with dementia received less physical (average of 65 minutes) and occupational (average of 55 minutes) therapies in the previous seven days than other MS residents (average of 94 minutes and 77 minutes respectively.) In contrast, MS residents with dementia were much more likely to receive a range of intervention programs for mood, behavior, or cognitive loss than other MS residents. These analyses indicate that many MS residents with dementia may be admitted to nursing facilities more for their limited cognitive abilities while other MS residents tended to be admitted more for their limited physical abilities.

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(S36) PATIENT MANAGEMENT PARAMETERS AND THERAPY SELECTION IN MULTIPLE SCLEROSIS

Objective: The goal of this study is to determine the importance of selected parameters in management strategies for MS patients in the community setting.

Methods: Surveys were designed to identify the factors that physicians consider in making treatment decisions in MS at the current time. Community neurologists were surveyed via self administered palm pilot technology before and after 14 consultant meetings.

Results: 241 neurologists completed the survey. The results of the survey (before the program) indicated that 65% of the participants believe that disability is the most important indicator of disease progression. However, when asked to name the most important factors in managing relapsing MS patients, nearly all participants cited relapses (93%) with MRI (77%) and symptom management (75%). Amelioration of relapses was seen as very important by 87% of the participants whereas only 48% of the participants considered MRI very important in managing relapsing patients. Ninety-one percent of the participants viewed dose and frequency of IFN-beta as important in the treatment of relapsing patients. Notably, 93% of the participants indicated they did not test routinely for neutralizing antibodies (NAb) and 54% indicated they would not change therapy if NAb positive titers were reported. Detailed responses to seventeen questions will be presented.

Conclusions: Community neurologists indicated via market research surveys that they considered disability the most important indicator for disease progression in MS patients. The reduction of relapses was more important than MRI in managing relapsing patients.

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(S37) PROSPECTIVE MEMORY AND A MNEMONIC STRATEGY IN MULTIPLE SCLEROSIS

Background: Prospective memory (PM) is the ability to remember to complete tasks that have been planned for the future – e.g., remembering to go to a doctor’s appointment. Few studies have examined PM in multiple sclerosis (MS), so there is not a broad understanding of PM in this population.

Purpose: The purpose of the present study was to thoroughly examine any PM deficits in MS patients as compared to non-brain injured adults, and determine whether using the “implementation intentions” mnemonic can improve PM in MS patients. Another purpose was to determine if individual differences in neuropsychological functioning are related to PM in MS patients.

Method: Participants played a PM board game that mimics everyday life. Players completed 59 PM tasks during the game. Whenever participants were assigned a PM task, they either formed an implementation intention or rote-rehearsed the task. Participants were also given tests of attention and memory, a PM self-rating, and a demographic questionnaire.

Results: Eighteen MS patients (8 females, 10 males; 7 Caucasian, 1 Native American, 10 African-American; ages 25-58; mean education 14.9 years; mean estimated IQ 110.5) and fifteen controls (7 females, 8 males; 6 Caucasian, 1 Native American, 5 African-American, 2 Hispanic, 1 Unspecified; age 25-57; mean education 15.8; mean estimated IQ 116.3) completed the experiment. MS patients showed a marked deficit in PM. Among MS patients, the two instruction groups did equally well at the beginning of the experiment, but at the end, the implementation-intentions group completed more tasks than the rote-rehearsal group. PM performance was related to demographic variables, neuropsychological measures, and PM self-rating.

Conclusions: These findings suggest that MS patients have PM deficits, which are related to demographic and neuropsychological measures. MS patients are generally aware of their PM deficits and, with practice, they may improve their PM by forming implementation intentions.

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(S38) PSYCHOSOCIAL FACTORS AMONG MEDICALLY UNDERSERVED INDIVIDUALS WITH MS

Individuals who are medically underserved may suffer from psychosocial problems regardless of their health status. We surveyed individuals with multiple sclerosis (MS) from Eastern (N = 548) and Western (N = 739) Washington measuring demographic characteristics, disease history, symptoms, health care and health status. Using geographic information systems (GIS) software, addresses of respondents were linked with U.S. Census 2000 and Washington State Department of Health data. Individuals were designated medically underserved if they lived in a primary care shortage area, or had no health insurance. Urban/rural status was based on census data. Chi-square analysis indicated underserved status was strongly associated with depression, anxiety, difficulty thinking, and fatigue. We used multivariate logistic regression analysis to examine the association between psychosocial factors and underserved status among individuals with MS. Medically underserved individuals with MS were significantly more likely to be depressed (OR = 2.03, 95% CI 1.41, 2.94) and have difficulty thinking (OR = 1.18, 95% CI 1.0, 1.39). Those with more limited mobility as measured by EDSS were less likely to be medically underserved (OR = 0.72, 95% CI 0.56, 0.94), as were individuals who were currently employed (OR = 0.63, 95% CI 0.43, 0.93), and those living in urban areas (OR = 0.34, 95% CI 0.17, 0.70). Our results indicate that medically underserved individuals with MS are more likely to suffer from depression, have difficulty thinking, live in rural areas and be unemployed regardless of MS type. Opportunities exist for outreach from health care providers and consumer groups to underserved people with MS around these important psychosocial issues.

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**(S39) PULMONARY EXERCISE IMPROVES PHYSICAL PERFORMANCE
FUNCTION IN PEOPLE WITH MS**

Purpose: To examine the effect of a home-based pulmonary exercise program on four physical performance tests. **Subjects:** Thirty-nine adult subjects with clinically diagnosed MS participated in this study (EDSS scores ranged 2.0-6.5). **Methods:** Subjects were randomly divided into non-treatment control (n=19) and experimental (n=20) groups. Four physical performance tests completed during weeks 1 and 12 of the study included: Functional Stair Test (FST), Sit to Stand Test (SST), 6-Minute Walk Test (6MWT), and One-Legged Romberg Balance Test (RMB). Total time to ascend 4 steps, turn and descend 4 steps was determined for the FST. Total time to complete 6 sit-to-stand repetitions was determined for the SST. Total distance walked in 6 minutes was determined for the 6MWT. Total time to balance on one leg (up to 30 seconds) was determined for the RMB. Experimental subjects were instructed to perform exercises daily with a resistive inspiratory muscle training device for a 10-week period. **Data Analysis:** Descriptive statistics are reported. Due to the small sample size in control and experimental groups, non-parametric Wilcoxon Signed Ranks Tests ($p < 0.05$) were conducted on all dependent pre-post measurements. **Results:** Highly significant increases in inspiratory and expiratory pulmonary function occurred in the experimental group following pulmonary exercise intervention (pulmonary results to be reported at APTA meeting in Feb 2005). Significant improvement in experimental subject performance occurred on the FST ($p=0.008$), 6MWT ($p=0.017$), and RMB (0.007). No significant improvement occurred in the control group. **Conclusion and Clinical Relevance:** Subjects who participated in a 10-week, home-based inspiratory muscle training program significantly reduced time to complete the Functional Stair Test, increased distance walked on the 6-Minute Walk Test, and increased time for maintaining balance on the one-legged Romberg Test.

Study supported by: University of Michigan-Flint Research Initiatives Grant

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**(S40) RELAPSING MS PATIENTS' EXPERIENCE WITH COPAXONE TREATMENT:
A PHENOMENOLOGICAL STUDY**

Relapsing multiple sclerosis (MS) is an illness that is poorly understood and difficult to predict. Patients diagnosed with this illness often experience fear and uncertainty about their future. A recent phenomenological study of the "Lived Experience of Relapsing MS" documents the MS patients desire to know their diagnosis and learn about their anticipated disease experience. Copaxone is one of the recently approved treatments prescribed to minimize the effects of this progressive disease. Unfortunately, patients are often hesitant to initiate treatment with this self-injectable medication because they do not know what to expect.

This study scientifically examined and documented the experience of patients with relapsing MS who received Copaxone for the treatment of their illness. Heideggerian phenomenologic research methods drove the data analysis process with the Atlas qualitative data analysis software program. Results of this study will help patients realistically anticipate their own Copaxone experience as well as verify the experience of those already on the medicine. This study may also serve as a teaching tool for health care professionals involved in the care of MS patients.

The sample was a diverse group of 20 patients who were on Copaxone for at least one year. Several participants had been on other treatments and discussed those experiences. Among other interesting information the patients related their reasons for choosing this treatment and how they manage to persist with taking the daily injections. Core concepts that emerged will be discussed and a description of the phenomena will be detailed.

Study supported by: Teva Neuroscience

The first author has received an honorarium as a nurse consultant for the development of a position paper to promote patient adherence to treatment regimens.

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(S41) RELATIONSHIP BETWEEN FATIGUE AND QUALITY OF LIFE

BACKGROUND: The symptom of fatigue is the most prevalent of the MS symptoms. Health related quality of life is the individual's perception of his or her own domains of physical, psychological, social and spiritual health. While fatigue is related to decreased quality of life, the relationship between these two issues is not clearly understood. **METHODS:** Subjects were participating in the MS-F202 Fampridine-SR study for a 20-week period. In addition, they completed the MSQOL-54 Quality of life scale and the Modified Fatigue Index Scale (MFIS) at baseline and end of the study. **RESULTS:** 12 subjects completed all the forms for the study. (8 females/ 4 males; mean age: 51.62; mean EDSS: 5.77). There was no significant change in either the MSQOL-54 or the MFIS from beginning to end of the study. The mean QOL Physical score increased from 46.57 (sd 12.23) to 50.66 (sd15.28), while the mean QOL Mental score increased from 65.58 (sd 23.22) and 70.71 (sd 24.23). The mean MFIS total score started at 46.37 (sd 13.25) and decreased to 42.08 (sd 16.74). The scales demonstrate high correlations on the summary subscales with a low correlation coefficient of -.395 (MFIS Psychosocial with MS Mental) to a high of -.828 (MFIS total with MS Mental) at baseline. These increased at the end to a low of -.672 (MFIS Cognitive with MS Physical) and a high of-.929 (MFIS cognitive with MS Mental). **DISCUSSION:** Fatigue interferes with an individual's ability to function, do ADL's and work. All of these limitations will impact their quality of life. The two scales used to measure these variables in this study are highly correlated, indicating a strong relationship between fatigue and quality of life. **CONCLUSION:** If clinicians can address and treat an individuals fatigue levels we may be able to improve their overall quality of life.

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**(S42) REPORTS OF COPING AND ACTIVITY SATISFACTION AS A FUNCTION
OF PRESENCE OF SPEECH PROBLEMS IN MS**

The purpose of this study was to examine the relationship of coping and life satisfaction in the presence of self-reported speech difficulties. It is important to understand this relationship in order to provide appropriate clinical treatment for individuals with MS. This is a continuation of an investigation that was initially conducted on a larger population. The initial survey indicated that as speech difficulties progressed other symptoms of MS (vision, hearing heat sensitivity, pain, fatigue, depression) also became more severe. Data reported in the current study was taken from a community-based survey of 549 individuals with MS. Of this sample 53.9% reported no speech problems, 36.6% reported mild speech problems and 9.4% reported moderate to severe speech problems. The relationship between presence speech difficulties was examined for a range of other variables including age, gender, and duration of MS, level of education, employment, and physical sensory and other symptoms. Life satisfaction, coping and satisfaction with activity level were also queried. Results of this survey also indicate that the progression of speech symptoms is accompanied by a variety of other MS symptoms (physical and sensory). Speech problems do not occur in isolation, they appear to part of a complex presentation of MS symptoms. This survey also examined life satisfaction, coping skills and satisfaction with activity level as a function of speech difficulties. People who endorsed speech problems tended to be less satisfied with ability to cope and perform desired activities. Global measures of coping and life satisfaction are complex and warrant further investigation.

Study supported by: University of Washington's Multiple Sclerosis Rehabilitation Research & Training Center

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**(S43) RESULTS OF TESTING FOR ANTIBODIES TO INTERFERON IN
CLINICAL SITUATIONS - THE UBC EXPERIENCE**

Background: We regularly receive serum samples of interferon beta (IFN beta)-treated Multiple Sclerosis (MS) patients from MS clinics all over the province of British Columbia and test them for anti-interferon beta antibodies. We have reviewed our experience.

Methods: We have assayed single serum samples from 256 patients (111 Betaseron®-treated, 126 Rebif®-treated, 19 Avonex®-treated) using an ELISA for binding antibodies (BABs) as a screening test. Only positive samples are referred for neutralizing antibodies (NAB) assay by CPE to Dr. S. Grossberg's lab (Milwaukee).

Results: The 256 patients were treated for 41 ± 27 months (average \pm sd). 131 patients (51.2%) tested positive for BABs and 125 (48.8%) tested negative. The 131 BAB-positive patients could be broken down as follows: 81 were positive among 111 Betaseron®-treated (73%), 47 were positive among the 126 Rebif®-treated (37.3%) and only 3 were positive among the 19 Avonex®-treated (15.8%). Overall, there was a significant difference (Pearson $\chi^2=40.3$, $p<0.001$) in the number of BAB-positive patients between the different treatment groups. Presently we have received results on 58 BAB positive patients, only 12 (20.7%) tested positive for NAB and 46 (79.3%) negative: 7 out of 24 Betaseron®-treated tested positive (29%), 5 out of 29 Rebif®-treated (17%) and 0 out of 3 (0%) Avonex®-treated. We extrapolate that only 15% of Betaseron treated patients and 6% of Rebif treated patients are exposed to a possible reduction of interferon effect due to eliciting NABs.

Conclusion: The frequency with which NAB positive samples are found in an unselected population of treated MS patients is relatively small even among the most immunogenic drugs.

Study supported by: Biogen

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(S44) ROLE OF YOGA IN PREVENTION OF REMISSIONS AND RELAPSES IN MS

This was a randomised study of the role of Yoga in prevention of remissions and relapses in MS. Based on the principle that the practice of an alternative form of medicine of YOGASANAS modulates the immune system.

Material and methods: 24 Patients of Clinically definite multiple sclerosis with a minimum of two episodes were enrolled. They were computer randomised to those receiving yoga instructions in form of demonstration and schematic diagrams and those only on placebo breathing regulation and few exercises. Two forms of yoga PRANAYAMA and SHAVASANA was tried. Those with minimal disability were also asked to perform SURYANAMASKARA. Patients were evaluated at 3, 6, 12, 24 months. The evaluation was done by an independent neurologist, included number of relapses, EDSS scoring, subjective benefit as on a visual analogue scale.

Results: Statistical analysis showed a significant benefit of the use of yoga in all the parameters analysed with a p value of 0.002.

Conclusion: Though a small study patients using YOGA techniques fared significantly better than those not. This was a home based program and did not entail any additional expenditure to the patient.

Study supported by: All India Institute Of Medical Sciences

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(S45) ROTOSCOLIOSIS IN MUTIPLE SCLEROSIS

There has been no description of rotoscoliosis in the Multiple Sclerosis (MS) literature but the problem is fairly common in MS patients with advanced disease. Rotoscoliosis develops with the occurrence of asymmetrical weakness of the paraspinal muscles. This gradual process becomes more apparent over time as nerve impulses to one side of the back remains normal while those on the opposite side become diminished. The spinal column becomes twisted and rotated. This occurs with or without pain. We will illustrate two cases from our Multiple Sclerosis Clinic to demonstrate an early stage and an advanced stage of rotoscoliosis. Photographs and MRI's will be used to illustrate rotoscoliosis. Their medical and social histories will illustrate how their lives are affected by this phenomenon.

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(S46) SAFE SWALLOW PROGRAM STEPS IN MULTIPLE SCLEROSIS

The Sturdy Memorial Hospital Multiple Sclerosis Center provides interdisciplinary MS care for Southeastern Massachusetts and Rhode Island. We have found a majority of our 300 patients have swallowing complaints. This is consistent with swallow problems reported in MS literature. In order to evaluate the problem in our population and offer treatment we developed The MSC Swallow Problem Rating Scale. This screening tool is a 32 point self-evaluation. Patients who self-rated $>2/32$ were offered evaluation and treatment from a Speech Language Pathologist. The first 52 patients screened revealed 80% had complaints that warranted further assessment. Of interest is that 57% of the sample refused treatment and/or did not return our telephone calls regarding treatment options. Our patients can identify significant functional problems yet are not proactive in seeking treatment. We developed a self-directed interventional tool called Safe Swallow Program Steps to reduce swallowing problems. This nine page booklet has instructions and a pyramid of interventional steps for the five most common swallowing complaints in MS. This innovative take home interventional program has overcome barriers and reduced swallowing complaints in our MS patients.

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(S47) SATISFACTION WITH QUALITY OF LIFE IN PATIENTS WITH MS

In 2002, we surveyed individuals with multiple sclerosis (MS) living in Eastern Washington State (N = 548). In addition to measuring demographic characteristics, disease history, symptoms, health care and health status the survey included three questions intended as broad measures of quality of life. The response format for all three questions utilized a five point Likert-type scale collapsed to three categories for analysis. The data were analyzed using ordered logistic regression. In all analyses we controlled for type of MS, employment status, gender, pain, and heat sensitivity. The questions asked respondents to rate: (1) their satisfaction with their life, (2) their coping with MS, and (3) their satisfaction with their ability to do the activities that are important to them. As expected, in all three analyses, overall health status was a significant predictor. The better the overall health status the more likely the respondents were to endorse higher levels of satisfaction with life and with the ability to do important activities, as well as coping with MS. Conversely, respondents who reported depression symptoms and higher levels of EDSS were significantly more likely to endorse lower levels of satisfaction with life and the ability to do important activities, as well as coping with MS. Respondents who lived with a spouse or a partner and those who had seen a massage therapist in the last year were significantly more likely to endorse responses that indicated higher quality of life. Duration was a significant predictor of the level of coping and ability to do the activities that are important. However, the association was positive, i.e., respondents with longer duration of MS were more likely to endorse higher satisfaction with coping with MS and with their ability to do important activities. We recommend clinicians inquire about depression, coping, and quality of life issues routinely.

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**(S48) SCRAMBLED EGGS: MISIDENTIFICATION OF ASHWORTH SCALES
IN RESEARCH AND CLINICAL PRACTICE.**

In 1964, Bryan Ashworth introduced the 5-point Ashworth scale (AS) as a measure of tone and spasticity. Several modifications have since been introduced and all are referred to as "Modified" Ashworth Scale" (MAS). The coexistence of multiple scales with similar or identical names prompted us to conduct a literature search and practitioner survey to determine current scale usage patterns and consistency.

METHODS: We did a MEDLINE search using the term "Ashworth scale" on December 22, 2003. We examined usage of the AS and MAS variations in the first 130 medical references (spanning 2003-1999). Excluded were review articles, non-English language texts, and studies that did not actually use the AS or MAS. For each article, we recorded the spasticity scale that was used and whether it was correctly identified, labeled and referenced. We did Chi-square testing to search for associations between scale misuse and the authors' geographic region and health field. We also conducted a web-based spasticity-scale usage survey amongst physiatrists attending a large seminar at the University of Washington.

RESULTS: Of 130 articles, 105 met our inclusion criteria. Of these, 36 (34%) were found to contain errors of mislabeling, misidentification or misreferencing of the AS or MAS. Chi-square testing revealed no statistical associations between such errors and authors' geographic region or authors' health field. The results of the practitioner survey will be presented.

CONCLUSIONS: Over one-third of all published research articles misidentify, mislabel or misreference the AS or MAS. There are several versions of the MAS, which may be confused with each other or with the AS. There is only one version of the AS. When employing the AS or MAS, the scale should be fully enumerated and referenced. It may be preferable to use the less ambiguous AS for clinical purposes.

Study supported by: University of Washington's Multiple Sclerosis Rehabilitation Research & Training Center, United Spinal Association (Eastern Paralyzed Veteran's Association)

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(S49) STEM CELL TRANSPLANTATION FOR CONCOMITANT MS AND ACUTE MYELOGENOUS LEUKEMIA (AML)

A 66-year-old Caucasian female developed numbness in her hands and left foot drop beginning in 1982 and slowly progressing over the next ten years. She was diagnosed in 1992 with primary-progressive MS based on worsening neurological symptoms without ever having exacerbations and abnormalities of brain MRI, cervical MRI and CSF. She was treated symptomatically until 1999, when she entered the PROMISE drug trial and was randomized to the active arm of the study, taking glatiramer acetate (GA). In 1999, she was also diagnosed with T1c M0 infiltrating ductal carcinoma of the right breast. She received an excisional biopsy and 47Gy of radiation therapy. When the PROMISE study ended she continued on GA.

In September 2002, she presented with uterine bleeding, fatigue and pancytopenia. She had a bone marrow biopsy yielding a diagnosis of AML, stage M2. GA was stopped. She underwent induction with cytarabine 100mg/m²/day X 7days + daunorubicin 45mg/m²/day X 3days and consolidation with four cycles of cytarabine.

Because of worsening fatigue, she had a repeat bone marrow biopsy with flow cytometry showing evidence of AML relapse in September 2003. Two months later, she underwent autologous stem cell transplantation with peripheral blood cells that had been harvested after the second cycle of consolidation therapy. She was conditioned with busulfan 1mg/kg X 16 doses and etoposide 60mg/kg X 1 dose.

Stem cell transplantations are gaining wider use in heme-oncology. They have been reported as treatment for MS since 1997 and for concomitant MS and leukemia since 1999. No MS patient would like to develop a life-threatening malignancy. However, when such a event occurs, stem cell transplants offer a ray of hope for controlling both MS and the coexisting cancer. For this patient, no further disease modifying treatment of MS is planned. Evaluation and follow-up data will be presented.

Study supported by: University of Washington's Multiple Sclerosis Rehabilitation Research and Training Center, United Spinal Association (Eastern Paralyzed Veteran's Association)

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**(S50) SUPPORTIVE NEEDS OF PEOPLE LIVING WITH MS, MND, PS & HD,
AND THEIR FAMILIES**

This study explored the supportive and palliative care needs of people with multiple sclerosis, motor neurone disease, Parkinson's disease and Huntington's disease and their family carers. Phase I consisted of 130 interviews across Australia to establish the existing supportive care services for these people and their carers. In Phase II a survey (n=786) was used determine the extent to which these needs are met.

The majority of carers were women (66%) with an average age of 61 years and they had provided support for an average of 6.5 years. Patients' had an average age of 62. 75% needed the assistance of a carer and had needed support for an average of 6 years. Most people lived at home with their partners (74%), and had to reduce or give up work following onset of the diseases. The majority of carers were on social security (60%). Shower chairs were the most frequently identified equipment, then walking aids and wheelchairs.

Carers identified community rehabilitation as the most important service, then home care and respite. Less than 5% identified palliative care. Patients received services from community rehabilitation (37%), home care (26%) and respite (12%). The most important professionals were nurses; representatives from disease specific organizations, and home care workers.

Respondents were generally satisfied with their quality of life. Equipment; information about how to provide care; and reliable, ongoing dependable support workers were important issues. The least important issues included: respite at night; home support service at night; and access to palliative care.

Most carers were satisfied with their doctor's responsiveness. The main areas of dissatisfaction were with information given, speed with which symptoms were treated and availability of respite. Some reported dissatisfaction with services the treatment of symptoms, the way in which their condition and progress was explained and the availability of healthcare workers.

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(S51) TAU PROTEIN AND BETA AMYLOID IN CEREBROSPINAL FLUID IN PATIENTS WITH A FIRST CLINICAL DEMYELINATING EVENT SUGGESTIVE OF MULTIPLE SCLEROSIS

Introduction: The diagnosis of MS is based in established clinical and laboratory criteria. The McDonald criteria for diagnosis, published 2001, are an effort to simplify the diagnostic process of MS and to incorporate magnetic resonance imaging (MRI) into the diagnosis. The outcomes of the diagnostic process should yield possible MS, definite MS or not MS. Diagnosis continues to require two attacks separated in space and time but can utilize MRI to establish new MS activity. Cerebrospinal fluid (CSF) analysis and evoked potentials studies make still be employed to provide paraclinical evidence of the diseases.

Materials and methods: We measured tau protein and beta.amyloid42 concentrations in CSF in 16 patients with a first demyelinating event suggestive of MS. The examination of biochemical markers of the damage of the central nervous system may be the complement of the neuroimaging methods. Lumbar puncture was performed in first 60 days after onset of clinical symptoms in all patients. Tau protein and beta-amyloid42 were measured by a double antibody sandwich ELISA (Innogenetics, Ghent, Belgium).

Results: The outcomes of diagnostic process decided 16 patients into two groups.
Group 1: 7 patients – possible MS - had all paraclinical markers (MRI, CSF – oligoclonal bands, VEPs) positive for MS.
Group 2: 9 patients – not MS – the most paraclinical markers were negative and therefore these patients didn't realize McDonald criteria . We compared the concentrations of tau protein and beta-amyloid42 in both groups and the results were statistically analysed.

Conclusions: The concentrations of tau protein and beta-amyloid42 in two groups were different, increased levels in first group may indicate axonal impairment in onset of possible MS.

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(S52) THE DEVELOPMENT OF THE IMPACT OF MULTIPLE SCLEROSIS SCALE (IMSS)

Multiple Sclerosis (MS) is a chronic neurological progressive disease, which differentially affects individuals' lives over several domains. For health professionals, instruments to assess the ongoing impact of MS on individuals are limited. The Expanded Disability Scale (EDSS) is currently the most widely used instrument, however it is limited in its range of effects and by the fact that the items are all clinician rated. The paper will present the development of the impact of Multiple Sclerosis Scale (IMSS) which was designed to redress these limitations. The IMSS is a self-report scale developed using data from 193 people with MS. Construct validity is demonstrated by the extraction of four independent factors namely: mood, relationships, memory impairment, and immobility/ dependency, which explained 62% of the variance. These factors are all internally reliable and stable across time. The discriminant validity and specificity of the IMSS factors across MS diagnosis, duration of illness, age and marital status will be presented. In summary, the IMSS is a comprehensive assessment tool for health professionals working with people who have MS. Recommendations for new strategies in lifestyle planning for individuals with MS, along with future research opportunities, based upon the IMSS will be discussed.

Study supported by: MS Society of Australia

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**(S53) THE IMPACT OF SOCIAL SUPPORT ON DEPRESSIVE SYMPTOMS
IN PATIENTS WITH EARLY MS**

Depression occurs in as many as half of all patients with multiple sclerosis (MS) at some point during the course of the disease. The prevalence of depression at or near the time of diagnosis is unclear. The role of social support in mediating early depressive symptoms is also unknown. This study is designed to establish the prevalence of depression in patients with early MS and to determine the impact of social support on depressive symptoms early in the disease course.

Eighty-one patients with a first demyelinating event or diagnosis of MS within the last two years participated in the study. Patients completed the Center for Epidemiological Studies Depression Scale (CES-D) and the MOS Social Support Survey (MSSS).

Patients included 65 (80%) females and 16 (20%) males with a mean age of 39.3 ± 9.0 years and an age range of 21-59 years. EDSS scores had a mean of 1.2 ± 1.1 and a range of 0-5.5. Forty-seven percent of patients were on disease modifying therapy at the time of evaluation.

Scores on the CES-D had a mean of 31.6 ± 9.7 , and a range of 20-64. Thirty-two percent of patients had CES-D scores in the depressed range (≥ 36). A Pearson correlation coefficient was calculated for CES-D scores and Total MSSS scores. Correlations were also calculated for CES-D scores and four subscales of the MSSS: Tangible Support, Emotional/Informational Support, Affectionate Support, and Positive Social Interaction. The only significant correlation was between CES-D and Emotional/Informational Support ($r = -.25$, $p < .05$).

Depression is common in patients with early MS. The perceived availability of emotional and informational support including empathic understanding, information, and guidance is associated with fewer depressive symptoms early in the disease course. These findings suggest that patients with early MS may benefit from programs aimed at providing specific dimensions of social support.

Study supported by: The Nancy Davis Center Without Walls

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(S54) THE LOVE BOAT

Objective: How can you be sure that a health program for women, one discussing a very personal and under-discussed problem, SEXUAL FUNCTION will be well attended? A catchy title and flashy invitations, as well as a free afternoon cruise on the towns three rivers turned out a most successful method. On November 15, the Department of Neuro-urology at the University of Pittsburgh hosted this event. The purpose was to provide women with current information related to sexual function.

Methods: Our educational program was held on a Saturday afternoon in November and in conjunction with the Allegheny Chapter of the National MS Society. Information on sexual function and dysfunction, as well as the impact of bladder problems and the relation to sexual function were main topics. The program opened with the emcee, a local news broadcaster hosting the game of Jeopardy. Categories in the game related to sexual and bladder health. Following the game, local experts presented information on anatomy and physiology of sexual and bladder function. Treatment options were presented and included medications, pelvic floor rehabilitation, surgery and complementary therapies. Psychological issues, emotional closeness, and communication strategies were also addressed. A booklet was provided to each which contained a review of information presented, as well as resources. Vendors present included a physical therapy center with specialists in pelvic floor rehabilitation, a compounding pharmacy, a medical supply company specializing in urologic and skin care products, as well as a sexual enhancement vendor, which was the most popular vendor of all. Advertisements were placed in primary care physician offices, urology and neurology offices.

Results: Our original plan budgeted for 200 women to attend. However within 2 weeks, a total of 325 women responded and the number of attendees was increased to 325. One week before the program, more than 700 women had rsvp'd, although seating prohibited more than 325 from attending. Mean age of the attendees was 58. Almost 100 of the women attending had a diagnosis of MS. Evaluations demonstrate positive feedback regarding the program. Seventy three percent responded that they would be sharing the information with their partner.

Conclusions: Sexual health is an important topic in life, and especially important in women who have MS as there can be many different problems as a result of nerve damage. This topic requires critical attention by health professionals. Our data suggests that creative programs that are carefully designed can help women learn about symptoms and management strategies. When well designed, these programs offer fun for the participants besides education.

Study supported by: Pfizer Corp.

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**(S55) THE RELATIONSHIP BETWEEN SEXUAL FUNCTION, BLADDER FUNCTION,
AND DISABILITY IN WOMEN WITH MS**

Objective: Women with multiple sclerosis (MS) often report both sexual and bladder disturbances. The purpose of this study was to describe the relationship between sexual function, bladder function, disability level, and quality of life in a sample of 32 women with MS.

Methods: Thirty-two women with MS self-completed the following questionnaires: Female Sexual Function Index (FSFI), Urge Urinary Distress Inventory (U-UDI), Patient Determined Disease Steps (PDDS), Performance Scales, and SF-36. Descriptive statistics were computed for demographic variables and questionnaire responses. Spearman-rank order correlation coefficients were calculated to describe the relationship between sexual function and bladder function, disability level, and quality of life.

Results: Eighty-eight percent of respondents were married, 97 percent were Caucasian and the mean age was 49 ± 10 years. Average duration of MS for the respondents was 11.5 years. The FSFI full-scale score range is 2.0 to 36.0 with higher scores indicating greater sexual function. The mean FSFI full-scale score for this sample was 18.2 ± 10 . The U-UDI score range is 0-4 with higher scores signifying greater bladder dysfunction. The mean U-UDI urge subscale score for the sample was 2.1 ± 1.04 . A statistically significant correlation between bladder and sexual function scores was not observed. Based on the PDDS, 81% of respondents indicated some level of gait impairment. Fair to substantial correlations were observed between FSFI full-scale score and Performance Scales scores (pain = $-.62$, $p < .01$; vision = $-.56$, $p < .01$; fatigue = $-.48$, $p < .01$; sensory = $-.45$, $p < .01$; hand function = $-.39$, $p < .05$; spasticity = $-.38$, $p < .05$). Fair to substantial correlations were also observed between the FSFI full-scale score and the Pain subscale of SF-36 ($.67$, $p < .01$) as well as with the Social Function subscale of SF-36 ($.38$, $p < .05$).

Conclusion: Women with MS who reported higher levels of disability also reported higher levels of sexual disturbance. In addition, women with higher levels of social function and those who are less affected by pain experienced lower levels of sexual disturbance.

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(S56) USE OF BOTULINUM TOXIN TO TREAT BLADDER DYSFUNCTION IN MS

Objective: We present our experience with 55 patients with MS who have undergone injections of Botulinum toxin A (Botox-Allergan) either into the sphincter, bladder, or both sphincter and bladder over the last 4 years at the University of Pittsburgh.

Methods: Fifty-five patients (M, F) with a mean age 47.40, a diagnosis of MS and detrusor hyperreflexia (DH) or detrusor sphincter dyssynergia (DSD) were injected with botox. With a diagnosis of DH, Botox was injected into the detrusor muscle. With a diagnosis of DSD, the sphincter muscle, or both sphincter and bladder were injected. Procedures were performed in the outpatient setting under light sedation. Prior to treatment all patients were refractive to high doses of anticholinergics and or alpha blockers.

Results: Of all of the fifty-five patients, 36 (65%) report improvement in varying degrees. A variety of responses have been used over the four years to identify whether patients demonstrated any improvement. Therefore we have taken the all the data and collapsed it into 3 categories: great improvement, some improvement or no improvement. Refer to table for results.

LOCATION OF INJECTION	RESPONSE
Sphincter n = 41	21 Significant improvement (7M, 14F) 51%
14 retreated	6 Some improvement (2M, 4F) 15%
	14 No improvement (5M, 9F) 34%
Sphincter and Bladder n = 4	1 Significant improvement (1F) 25%
1 retreated	0 Some improvement
	3 No improvement (1M, 2F) 75%
Bladder n = 10	6 Significant improvement (1 M, 5F) 60%
0 retreated	2 Some improvement (2F) 20%
	2 No improvement (2F) 20%

Conclusions: To our knowledge, data from our center represents the largest number patients with MS treated with botox in North America. Improvements are evident within 3 – 10 days. Improvement corresponds with continence and decreases in voiding complaints as well as improvements in satisfaction levels. This appears to be a safe and valuable option for those patients who have failed standard therapies.

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**(S57) USE OF TAMSULOSIN IN THE TREATMENT OF
NEUROGENIC BLADDER DYSFUNCTION IN WOMEN WITH MULTIPLE SCLEROSIS**

Objective: A Multiple Sclerosis Patient Database (NARCOMS) indicate that eighty five percent of persons with MS admit to some form of urinary dysfunction. This study focuses on the on voiding patterns in women with MS with incomplete emptying after treatment with tamsulosin.

Methods: Thirty-nine consecutive women with MS referred to our tertiary center with symptoms of frequency, urgency, post void residual results between 40 and 200ml. These patients were prescribed 0.4 mg tamsulosin at time of initial visit. Return visit evaluation 3 weeks later consisted of PVR, urodynamics evaluation, uroflow studies, diary review and symptom evaluation using a visual analog scale to evaluate bothersomeness of urinary symptoms.

Results: Eighteen of patients (46%) indicated improvement upon return visit. Eight admitted to symptom worsening (most common reason increased frequency). Fourteen patients felt they had no improvement in voiding patterns and discontinued medication. Data analyzed from group (n=18) demonstrated mean decreases in PVR 130 ± 53 to 50 ± 32 ml. Urodynamic results from this group demonstrated detrusor sphincter dyssynergia (DSD) in 23/39 patients (58%). Surprisingly, the ratio of women with improvement on tamsulosin were of an equal split those with or without DSD. Twelve of 18 women who improved were maintained on tolterodine or oxybutynin as they still had symptoms on admission to clinic. Visual analog scores decreased from a mean of 7 to a mean of 5.5 (0-10 scale). Patients reported symptomatic improvement including decreases in hesitancy, frequency, urge incontinence, and nocturia. Of eight women who required who required use of a wheelchair on a fulltime basis, only 1 person demonstrated improvement. The drug was well tolerated with no reports of dry mouth, hypotension, syncope, increased fatigue, or BP change. No patient developed stress urinary incontinence.

Conclusions: Tamsulosin should be considered as a treatment in MS patients who present with overactive bladder symptoms with or without DSD. We have found it helpful in those patients in whom anticholinergic agents were inadequate. Patients with low to moderate level of disability had more improvement in symptoms than those who had more severe mobility problems.

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(S58) THE MAIN EPIDEMIOLOGICAL INDEXES OF MS IN NOVOSIBIRSK FOR 20 YEARS

A lot research have estimated an essential increase of MS in the world including Russia. The account of MS patients has been led and the prevalence and sick rate have been examined since 1981. The MS Base has been formed for 20 years.

We have got the first results in 1983, the following in 1996 and the last in 2002. The prevalence of MS increased from 29,2 (1983) to 59,9 per 100 000 people (2002). The sick rate of MS decreased from 3,2 to 0,35 per 100 000 people (2002). It happens because there is some period of time between the debut of MS and its diagnostics.

We have calculated the average value of this period and it was 5,6 years. We have also analysed the duration of the disease, the patient's age, the age of debut, the level of disability, the progressing rate and have got the explanation of this discrepancy between the decrease of the sick rate growth and the increase of the prevalence rate.

The average duration of the disease has increased from 10,8 years (1983) to 14,7 (2002). The average age of MS patients hasn't practically changed: 38,4 (1983) and 41,0 (2002). The average age of MS debut is the same - 27,6 (1983) and 27,2 (2002). But at the same time the number of MS patients with light disability (3,5 EDSS) has increased significantly : 35,7 % in 1983 and 57,7 % in 2002 and number of patients with slowly progressing rate has also raised.

Conclusion

1. The sick rate of MS has been stable for 30 years and has a tendency to decrease.
2. The prevalence of MS has been increasing due to the growth of disease duration.
3. The share of benign forms of MS has been increasing for 20 years.

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(S59) THE USE OF TECHNOLOGY IN A PROSPECTIVE NURSING STUDY

PURPOSE: To describe the process of using technology in a prospective study

DESIGN: Prospective study with a six-month follow-up

SAMPLE: Approximately 1,500 individuals with MS responded to postings and e-mails. The researcher screened each participant to determine if they met the criteria for inclusion. The final sample included 237 individuals with MS initiating an immunomodulator.

SETTING: Cyberspace

METHOD: The steps in the development of a prospective study using multiple technologies included the following:

- Collaborative development of a web site with computer experts
- Integration of the principles of research into technological approaches
- Posting on appropriate web sites to invite potential participants to contact the researcher
- Use of a patient registry database to invite participants to a data collection web site
- Use of e-mail and telephone to conduct a 6-month follow-up
- The import of web site data into SPSS for analysis.

The instruments for data collection included the Multiple Sclerosis Self-Efficacy Scale, Herth Hope Index, Performance Scales (Self-Report of Level of Disability) and a sociodemographic data form.

FINDINGS: Collaboration with computer experts is necessary when conducting research using technology. Essential components in the development of a website include: (a) an information page about the purpose of the study, what is expected by participants and how their rights will be protected, (b) a photograph and contact information of the principal researcher, (c) the adaptation of traditional instruments to an electronic format, (d) the development of pop-up reminder boxes for missed items that allows the participant to not answer specific questions, if so desired, (e) the storage of the web pages and participants' responses on a secure server that is not accessible to the public on the internet and (f) only participants screened by the principal researcher, according to the inclusion criteria, are given access to the secure site to participate in the study. The integration of research principles into technological approaches is essential for IRB approval. Explicit instructions at an appropriate reading level are necessary, especially for those who are willing to participate, but have limited computer skills.

CONCLUSIONS: Multiple technological approaches are effective in conducting nursing research and are able to reach a diverse population that is unrestricted geographically. Those who have physical limitations can readily participate in a process they consider to be hope-inspiring, as indicated by their unsolicited remarks about participating in an online study. One major limitation to consider when using technology is that the sample will only include those who have access to computers and the skill to navigate the internet and use e-mail.

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