

Deep Gray Matter Lesion Caused by Hypoglycemia

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A 41-yr-old woman was admitted to our hospital after an episode of drowsiness attributable to hypoglycemia (25 mg/dl), which improved immediately after she received an infusion of 50% dextrose solution at another hospital. She had no history of diabetes, trauma, recent infection, or drug overuse.

She was hemodynamically stable on admission, and her blood tests were normal except for profound hypoglycemia (23 mg/dl). Her serum glucose level was immediately restored to within the normal range, but there was no improvement in her state of consciousness. She opened her eyes, withdrew both arms, and made meaningless sounds in response to noxious stimuli. Her brainstem reflexes were normal, and no pathologic reflexes were elicited. Her neck was supple, and there were no skin lesions or evidence of any trauma. The results of all other laboratory tests, including an examination of the cerebrospinal fluid, were normal. Electroencephalography showed generalized delta waves but no epileptic form discharge.

T2-weighted images showed high signal intensities in the bilateral caudate nucleus and putamen without cortical involvement. Gadolinium-enhanced T1-weighted images showed strong enhancement in these areas (Fig. 1A and B). The lesions showed high signal intensities on diffusion-weighted magnetic resonance images (b-value, 1000 sec/mm²) and low signal intensities on apparent diffusion coefficient maps (Fig. 1C and D). She is currently in a persistent vegetative state.

Brain lesions caused by hypoglycemia are known to involve the posterior limb of the internal capsule, splenium of the corpus callosum, corona radiata, cerebral cortex, basal ganglia, and hippocampus.¹ Glucose deprivation is known to lead to brain energy failure, dysfunction of the cell membrane ionic pump, and consequent cytotoxic edema.² The vegetative state can result from both traumatic and nontraumatic injuries, such as stroke, metabolic disorders, and congenital malformations of the central

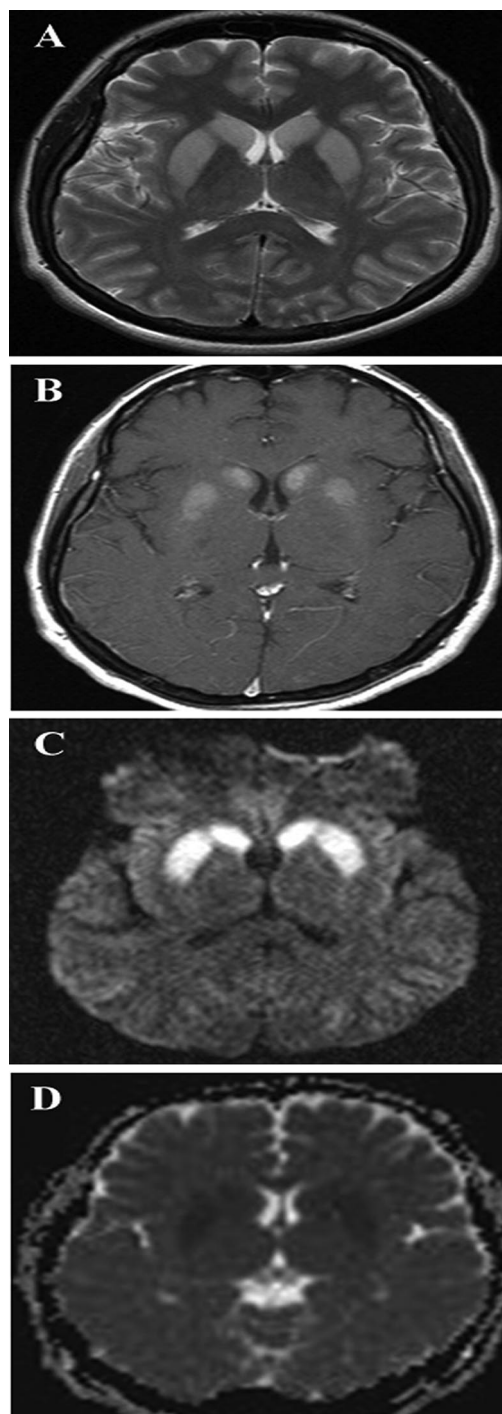


FIGURE 1 T2-weighted axial magnetic resonance imaging (A) demonstrates symmetric high signal intensities in the head of the caudate nucleus and putamen. These lesions are enhanced on T1-weighted gadolinium-enhanced images (B). They are compatible with the cytotoxic edema observed in the diffusion-weighted sequences obtained 7 days after the event (C, D).

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nervous system.³ Neuroimaging studies are not only useful for the differential diagnosis and identification of the underlying pathophysiological mechanisms in patients in a persistent vegetative state, but they may also be used for prognostic assessment and treatment planning.⁴ Diffusion-weighted magnetic resonance imaging is rarely performed in patients with hypoglycemia. The images presented in this study demonstrate the signal changes typically seen on diffusion-weighted images of patients with hypoglycemia-induced encephalopathy, and they suggest that cytotoxic edema caused the hypoglycemic coma and persistent vegetative state to occur.

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CME Self-Assessment Exam

Answers

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CME Article Number 3:

R. L. Kirby

1. C
2. B
3. D
4. B
5. A

Abstracts of Scientific Papers and Posters Presented at the Annual Meeting of the Association of Academic Physiatrists

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The Electrode Store Best Paper Award Winners Thursday, February 21, 2008

Fellow Winner

TRENDS IN REHABILITATION THERAPIST WORKFORCE IN UNDERSERVED AREAS 1980–2000

Richard D. Wilson, MD; Steven A. Lewis, MS; Patrick K. Murray, MD, MS

Introduction: Health professional supply has increased at a faster rate than the United States population over the past 30 yrs. It now comprises >10% of the total civilian workforce. The supply of rehabilitation therapists has also outpaced the population growth. There is little information about how the increases in rehabilitation therapists have been distributed across different communities. The information that has been reported indicates that rural areas continue to face of shortage of trained rehabilitation providers. There has also been little attention paid to therapist distribution into nonrural settings where health professionals are in short supply. We conducted this study to assess the how the increase in rehabilitation therapist supply has been distributed between 1980 and 2000 across counties with different levels of health professional shortages and between rural and urban counties. **Methods:** *Data:* The data used in the study come from Area Resource File (ARF) for 2004 and the Equal Employment Opportunity (EEO) files from the US Census for 2000. **Definition of Variables:** The number of physical therapists, occupational therapists, and speech-language pathologists is taken from the ARF for 1980 and 1990 and from the EEO data for 2000. Counties of <50,000 were merged with other counties into county sets to reach total populations of >50,000. The EEO guidelines used to create county sets require that the counties combined are contiguous, in a single state, and that Metropolitan Statistical Areas are maintained when possible. We used conversion charts available from the census to collapse the ARF county-level data into county sets when necessary. Every county in the country is classified by the US Department of Agriculture on a Rural/Urban Continuum (RUC) which in 2000 had nine categories. The county sets frequently combine counties with different RUC categories. To address this we devised rules to classify county sets along the RUC. Each county is also classified by the Bureau of Health Professions as being an area of health professional shortage for medical, dental, and/or mental health services. Each county can be characterized as being entirely, partially, or not a health professional shortage area (HPSA). For this study we classified counties based on their medical service shortage status in 1990. **Results:** *NonHPSAs vs. HPSAs.* Rehabilitation therapists increased more in the non-HPSA counties and the counties designated as partial shortage areas more than the counties which were entirely designated as HPSAs. There was an average

increase of 38.7 physical therapists per 100,000 residents in the counties that were not designated as HPSAs, compared to an increase of 27.4 and 22.7 per 100,000 in the counties that were partially and totally designated as HPSAs, respectively. The average number of occupational therapists increased 20.5 per 100,000 residents in the non-HPSAs, compared to 14.1 and 11.8 per 100,000 in the counties that were partially and totally designated as HPSAs. The average number of speech-language pathologists increased by 20.6 per 100,000 in the non-HPSAs, compared to 14.9 and 13.4 per 100,000 in the counties that were partially and totally designated as HPSAs. *Metro Counties vs. NonMetro Counties:* From 1980 to 2000, the supply of rehabilitation therapists per 100,000 increased more in the metropolitan counties (areas larger than 50,000 residents) than the non-metro counties. There was an average increase of 30.1 physical therapists per 100,000 residents in the metro counties compared to an increase of 22.4 per 100,000 in the non-metro counties. The average number of occupational therapists increased by 15.7 per 100,000 residents in the metro counties, compared to 11.4 per 100,000 in the non-metro counties. The average number of speech-language pathologists increased by 15.5 per 100,000 in the non-shortage counties, compared to 15.1 per 100,000 in the non-metro counties. **Discussion:** This study calls attention to the geographic distributional inequities of rehabilitation therapists experienced by those in HPSAs and rural areas. Maldistribution of health care practitioners such as these may be partially responsible for the worse health experienced by older adults who reside in HPSAs and rural areas. There seems to be additional reason for concern for the future rehabilitation therapist supply in the underserved areas. In each case, whether comparing the HPSAs and non-HPSA counties or metro counties and non-metro counties, the disparity increased over time. Because of this, the HPSAs and rural areas may also be more sensitive to any decline in the supply of rehabilitation therapists. The changing age distribution of the country also has the potential to compound the relative rural shortage of health professionals. People older than 64 yrs, the heaviest consumers of health and rehabilitation services, comprise 14.7% of non-metropolitan areas and only 11.9% of metropolitan area. The therapist supply may be magnified by the increased demand for service among the nation's elders living in underserved and rural areas. Limitations to this study include: 1) the data used in this study were not gathered for the specific purpose of monitoring trends of rehabilitation therapists in different geographic areas which limits the accuracy of the estimates.; 2) the data used in this study do not allow determination of full time equivalents of rehabilitation therapists, which would be a more useful way to evaluate supply; and 3) the use of the county sets which was necessary to allow assessment of the rates in 2000 likely dilutes the rural urban differences some as some rural counties get combined with urban counties potentially lowering the urban therapist ratios. **Conclusion:** Geographic distributional inequities exist for rehabilitation therapists when comparing health professional shortage areas and non-shortage areas, as well as when comparing metro counties to non-metro counties. The disparities increased in magnitude between 1980 and 2000.

Faculty Winner

ISOMETRIC JOYSTICK CONTROL INTERFACES FOR INDIVIDUALS WITH SPASTIC CEREBRAL PALSY

Brad Dicianno, MD; Candice Winful, MD; Rory Cooper, PhD; Donald Spaeth, PhD; Harshal Mahajan, MS

Background: There are >750,000 individuals in the U.S. with cerebral palsy (CP). Up to 80% have spasticity, and almost 50% have limited mobility in the home and community. While many use power wheelchairs, increased resting muscle tone, hyper-excitability reflexes, dystonia, and clonus can make the use of a conventional joystick difficult. Up to 40% of individuals who desire power mobility cannot operate control interfaces at all. Thus, development of new control interfaces could have a significant impact on mobility and community participation. Standard movement-sensing joysticks (MSJs) direct navigation based on the proportion of movement applied to the device. Isometric joysticks (IJs) are rigid and sense when forces are applied; they do not change position. We have developed an isometric joystick with sophisticated control algorithms that have produced comparable real world driving in individuals with a variety of disabilities. However, no studies so far have pursued testing of such highly customizable devices in individuals with CP. This study aims to compare performance of an MSJ and our IJ in subjects with CP and control subjects in a computer based driving maze. We hypothesized that although control subjects may have better driving performance than subjects with CP overall, subjects with CP would have quicker trial times, shorter driving distances (closer to ideal maze trajectory), and fewer collisions when using the IJ versus the MSJ. **Methods:** We recruited subjects between ages 12 and 80 with the diagnosis of CP and with upper limb spasticity as well as age and gender matched subjects without apparent disabilities who served as the control group. After giving informed consent and undergoing a screening examination of the upper limbs, subjects were positioned in front of a laptop monitor and tested in their own wheelchair whenever possible. We used a conventional Quickie brand MSJ and our IJ. The joysticks were positioned according to the subject's preferences by using a custom-made mounting device that was clamped to the desktop. We tuned the IJ for each subject according to a validated protocol that allowed us to create a dead zone in which unintentional resting movements create no joystick output. We also biased the directional axes of the joystick, adjusted the maximum force the controller would recognize, and customized the gain for each subject. The IJ and MSJ were set with identical speed and acceleration parameters. Subjects drove a virtual wheelchair with lifelike ballistics in enhanced 2D mazes with a variety of 90-degree turns. After a practice period using both joysticks, subjects were tested using a random order of joysticks and maze shapes in a total of 30 trials. We recorded joystick output as text file data which was then converted to the following outcome variables using Excel: reaction time, trial time, distance traveled (10 m was a perfect trajectory), and number of boundary collisions. Statistical analyses were performed using R. All alpha levels were set to 0.05 a priori. We evaluated for differences between joysticks and between groups of subjects with respect to outcome measures. We used Generalized Estimating Equations to evaluate for differences with respect to number of collisions and used Mixed Model Analysis to evaluate for differences with respect to other outcome variables, designating subjects as the random effects, and subject group and joystick as the fixed effects. We used the natural log transformation on total trial and reaction times to correct for parametric distributions. **Results:** Control and case subjects had average age of 44.6 ± 11.0 yrs and 39.8 ± 15.0 yrs, respectively. Two subjects in each group were female. All subjects with CP had spasticity in both upper limbs. Subjects with CP, when using the IJ and MSJ respectively, had average reaction times of 2.6 ± 2.3 vs 2.7 ± 2.5 s, average total distance 25.1 ± 1.3 vs 28.2 ± 4.4 m, average trial time 86.7 ± 24.9 vs 79.2 ± 20.5 s, and median collisions 0 (0–34) vs 13.5 (0–101). Control subjects, when using the IJ and MSJ respectively, had average reaction times 1.2 ± 0.6 vs 1.3 ± 0.6 s, average total distance 24.2 ± 0.7 vs 25.5 ± 1.6 m, average trial time 36.6 ± 11.9 vs 42.8 ± 14.1 s, and median collisions 0 (0–15) vs 2 (0–48). Within both subject groups, the IJ resulted in significantly shorter total distance ($P < .0001$) and fewer collisions ($P = .002$) than the MSJ. The IJ resulted in quicker trial times for control subjects but slower trial times for subjects with CP ($P < .0001$). There were no differences in reaction times based on joystick used. Comparing subject groups, trial time and collisions were significantly lower in the control group than in subjects with CP ($P = .0003$ and $P = .004$, respectively) but reaction times and distance traveled were not significantly

different. **Discussion:** Average reaction times of subjects with CP were approximately double that of control subjects, but this difference was not significant probably because of the variability of values in those with CP. While a large dead zone can cancel intentional subject movement and delay reaction time, the dead zones calculated in this study were likely appropriate because values were comparable across different joysticks. This is an important finding because previous studies have suggested that isometric devices are generally too sensitive for those with motor control impairments. The results also suggest that although subjects with CP drove more slowly than control subjects and more slowly with the IJ, their trajectories with the IJ were smoother and contained fewer errors than when using a standard joystick. All subjects reported that the IJ was easy to use and performed better than their expectations. **Conclusion:** This study shows that IJs are useful alternative controls for individuals with CP in computer based tasks and supports future research in using them for real world power mobility. Developing new control interfaces that can be used despite motor impairments and movement disorders may improve computer access, mobility, community interaction, and ultimately quality of life for many individuals. **Acknowledgements:** Funding was provided by the Rehabilitation Medicine Scientist Training Program NIH K12 Award (K12HD01097).

Medical Student Winner

NERVE CONDUCTION STUDY FINDINGS IN MANUAL WHEELCHAIR USERS WITH SPINAL CORD INJURY

Janet D. Leath; Jennifer Yang, MD; Michael L. Boninger, MD

Introduction: Carpal tunnel syndrome (CTS) is a significant cause of wrist pain and functional impairment. Due to the long-term repetitive motion of wheelchair use, individuals with spinal cord injury (SCI) are at high risk for CTS. Studies indicate 49–73% of individuals with SCI who use manual wheelchairs have CTS. Injury to the upper limbs can have significant consequences as wheelchair users rely on their arms for mobility. This study's purpose was to identify demographic characteristics, physical examination findings and nerve conduction studies (NCS) findings that were associated with the presence of CTS symptoms, the symptom severity, and patients' subjective functional status. Our goal was to determine the utility of NCS and physical exam in predicting subjective findings such as symptom severity and functional impairment. **Materials and Methods:** *Demographic, Symptom and Physical Exam Data.* Manual wheelchair-users with paraplegia answered questionnaires on demographics and symptoms. Also, a questionnaire specific to CTS symptoms and function was used. The maximum score on this is five, indicating worst symptoms and greatest functional decline. Patients underwent physical examination and NCS. Physical exam consisted of observation for thenar muscle bulk, thumb abduction strength, two-point discrimination, pinprick sensation, Tinel sign presence, carpal compression, and Phalen tests. *Nerve Conduction Study Data:* Each subject underwent bilateral upper limb NCS on the median and ulnar nerves performed by personnel blinded to history and physical exam findings. Testing was done using standard technique as previously described. **Statistical Analysis:** Analysis was performed using SPSS. Subjects were dichotomized based on the presence of physical examination findings. Groups were compared using Student's T-test, Chi square and Mann-Whitney test. The Bonferroni correction was applied to multiple comparisons for symptoms and physical exam findings to reduce type I error. Initial results were used to develop regression models. Stepwise logistic regression was utilized for dichotomous outcome factors, the presence of symptoms and difficulty performing tasks. **Results:** *Demographic Characteristics.* Enrollment included 126 subjects, 23 were female (18.3%) and 112 (88.9%) were right-hand dominant. Mean age was 40.98 ± 11.89 yrs with a range of 20.43–76.65 yrs. Mean duration of injury was 13.23 ± 8.96 yrs (1.16–34.38). Thirty-three percent of the cohort had high paraplegia, while persons with mid-level and low paraplegia comprised 59.5% and 7.1%, respectively. Mean BMI was 25.4 ± 5.16 (14.9–40.65); 55% of subjects had normal BMI (18.5–24.9), 28.6% were overweight (25–29.9) and 15.9% were obese (30 and above). *Symptoms and Functional Status.* Fifty-nine percent of subjects had symptoms consistent with CTS. Maximum reported score for symptom severity was 3.82 (mean, 1.44 ± 0.58). The highest functional status score reported was 3.00 (mean, 1.17 ± 0.41). *Physical Examination Findings.* Sixty percent of subjects had physical exam findings of CTS. Subjects exhibiting any physical exam finding of CTS were significantly more likely to have higher symptom

severity scores ($P = 0.004$). Subjects with higher functional status scores were more likely to exhibit any CTS physical exam finding ($P = 0.001$). **Nerve Conduction Studies.** Two hundred seventeen hands from 119 subjects were analyzed. Sixty-four percent of the hands (139 of 217 hands) belonging to 80.2% of subjects (93 of 119 subjects) met the criteria for electrophysiologic CTS. 19.1% of subjects had no CTS, 40% had unilateral CTS, and 40.9% had bilateral CTS. Seventy-six percent of persons with electrophysiologic CTS (44% of all subjects) were symptomatic, while 66.7% (53.4% of all subjects) had physical exam findings of CTS. There was no significant difference in the prevalence of electrophysiologic CTS between persons with and without symptoms ($P = 0.148$). Likewise, the symptom severity scores were not significantly different between persons with and without electrophysiologic CTS. The electrophysiologic parameters of nerve latency differences were analyzed with regard to the presence or absence of symptoms. Persons with symptoms in the dominant hand were significantly more likely to have greater differences between the median and ulnar motor latencies ($P = 0.000$), and the mixed palmar latencies ($P = 0.000$). The symptom severity score had a low positive correlation with the median-ulnar motor latency difference for the dominant hand ($r = 0.387$; $P = 0.001$). The prevalence of electrophysiologic CTS was not significantly different between subjects who did and did not curtail activity. The functional status scores of persons with electrophysiologic CTS were not significantly different from those who did not have electrophysiologic CTS findings. Median-ulnar latency differences and median nerve amplitudes did not vary significantly between persons who did and did not have difficulty performing tasks. **Discussion:** This study examines CTS symptoms and functional status in individuals with SCI and their association with physical exam and NCS findings. Symptoms, physical exam findings, and electrodiagnostic evidence were present at a rate consistent with the documented prevalence of clinical and electrophysiologic CTS in persons with SCI. The high prevalence of bilateral findings is consistent with the bilateral tasks of wheelchair propulsion and transfers that likely lead to these injuries. Of those subjects with NCS findings, one-quarter were asymptomatic, and two-thirds did not have any physical findings. It can be surmised that deterioration of median nerve health in these persons is subclinical. Our results indicate a complex interaction between NCS, symptoms, and function with each domain providing additional information that is likely clinically relevant in this population. Longitudinal studies are needed to determine if subclinical NCS abnormalities predict development of symptoms. **Conclusion:** This is the largest study to date examining the association between CTS symptoms, physical exam, and NCS findings in wheelchair users with paraplegia. Even in the absence of symptoms, median nerve function may worsen, as evidenced by physical and NCS findings. Primary prevention through proper wheelchair set-up as recommended by the Consortium for Spinal Cord Medicine and patient education are essential. Early recognition of CTS may enable wheelchair users with SCI to preserve function.

Resident Winner

PREGNANCY OUTCOMES AMONG WOMEN WITH PHYSICAL DISABILITIES SEEN IN AN INTEGRATED CARE CLINIC

Christina Morton Sawhney, MD; Joan T. Le, MD; Lena Shahbandar, MD; Cassing Hammond, MD; Eileen Murphy, MD; Kristi Kirschner, MD

Introduction: Recent literature has addressed issues pertaining to the gynecologic and general health maintenance needs for women with disabilities, although no previous studies have reported specific obstetric outcomes or psychiatric management recommendations for this population as a whole. The purpose of this study was to determine obstetric and disability-related pregnancy complications among physically disabled women seen by an integrated-care team and evaluate their pregnancy outcomes as compared to previously established outcomes for women with specific disabilities and the U.S. population. We hypothesized physically disabled women with comprehensive management of peripartum complications by an integrative care team could successfully experience pregnancy and childbirth without long-term adverse effect to their overall health, well-being and functional status. **Methods:** 755 charts were reviewed from patients seen by a multidisciplinary team at a free-standing rehabilitation hospital outpatient clinic from January 1st, 1992 through December 31st, 2006. The integrated care team included physicians from obstetrics/gynecology, psychiatry, anesthesiology, and pulmonology, as

well as physical/occupational/ speech therapy, social work, rehabilitation engineering and wheelchair seating/positioning. Women with permanent physical disabilities involving either aberrancies of tone, sensation, strength, or coordination were included. Pregnancies were confirmed by urine/serum hCG or ultrasound. Inpatient, outpatient and allied health charts from the rehabilitation hospital and corresponding labor/delivery charts at an adjacent women's hospital were reviewed. Information was obtained as outlined by a data collection form that included demographics, past medical & surgical history, medication and contraceptive use, previous obstetric history, prenatal care, as well as antepartum, intrapartum and postpartum obstetric and psychiatric complications. Charts were reviewed from pregnancy diagnosis to 6 wks post-partum or pregnancy termination. **Results:** 35 subjects were identified with 49 subsequent pregnancies resulting in: 33 viable infants; 1 twin gestation; 2 intrauterine fetal demise (IUID); 11 induced abortions; and 3 spontaneous abortions. Physical disability diagnoses included spinal cord injury (SCI) T6 and above (37%), cerebral palsy (26%), SCI below T6 (17%), stroke/brain injury (9%), and others (11%) such as spinal muscular atrophy, multiple sclerosis, Marfan's syndrome, and transverse myelitis. Mean age at pregnancy diagnosis was 27 yrs (range 19-40) and mean yrs postdisability onset was 7 (not including disabilities existing at birth or of perinatal onset). 25 mothers carried 34 pregnancies to at least 24 wks gestation. Disability diagnoses of this group included: SCI T6 and above (50%), SCI below T6 (14%), cerebral palsy (24%), spinal muscular atrophy (6%), hemorrhagic stroke (3%), and anoxic brain injury (3%). 38% of infants delivered by cesarean section, 18% required assisted delivery, and 74% delivered under epidural or spinal anesthesia. Fertility treatment was utilized by 9% of mothers, 62% (13 of 21 known) mothers attempted breastfeeding. Obstetric complications included: multiple urinary tract infections (47%), preterm delivery (37% before 37 wks), low birth weight (29%), preterm labor (21%), perineal laceration (21%), abnormal lie (20%), pyelonephritis (15%), chorioamnionitis (9%), postpartum endometritis (9%), retained placenta (6%), prolonged labor (6%), uterine atony (6%), postpartum hemorrhage (3%), urosepsis with IUID (3%), cocaine abuse with IUID (3%), pre-eclampsia (3%), and nephrolithiasis (3%). Disability-related complications included: autonomic dysreflexia (60% of pregnancies in women with SCI T6 & above), change in bladder management (42%), and functional status decline with body habitus changes requiring increased physical assistance (40%, 8 of 20 known in women with carried pregnancies), increased spasticity (24%), alternative anesthesia administration and/or birth delivery due to severe musculoskeletal aberrancies (18%), wheelchair seating and positioning adjustments (9%), respiratory compromise requiring oxygen supplementation or ventilator support (9%), hospitalization for pain management (6%) and muscle fatigue impairing swallow function (3%). All previously reported bladder management or functional status changes had resolved by 6 wks postpartum. **Discussion:** We compared our data to previously published hospital or population-based retrospective studies pertaining to women with specific disability diagnoses that reported detailed obstetric outcomes. Our data is similar in respect to rate of occurrence of repeat urinary tract infections, pyelonephritis, preterm labor, and autonomic dysreflexia. Our patient sample displays a higher rate of induced abortion, IUID, preterm deliveries, low birth weight infants, induction of labor, use of epidural/spinal anesthesia, abnormal birth presentation, cesarean section, decreased mobility, change in bladder management, and increased spasticity. We report a lower rate of pressure ulcers, assisted vaginal delivery, general anesthesia and no anesthesia use during labor & delivery. Notably, our study outcomes display markedly increased incidences of preterm delivery, low birth weight, and induced abortions as compared to previous literature. Several studies previously published among women with SCI also reported increased rates of preterm delivery: a total of six studies charted data with mean rate of 16% and range of 8-19%. In 2004, Coppage et al. documented a 37.5% preterm delivery rate (6 of 16 live births) for women with residual physical deficits post-stroke. U.S. rates of preterm births were reported as 10.9% in 1990 and 12.5% in 2004 per the NCHS, both comparatively lower than in our rate of 37% for women with physical disabilities. In our study, 10 of 35 infant's birth weights were below 2500g. The mean reported rate of low birth weight infants among 6 SCI studies was 10%, with a range of 4-24%. The U.S. NCHS reported rates of low birth weight infants in 1990 and 2004 were 7% and 8.1%, respectively. The induced abortion rate for our study is 20%. In 2004, the U.S. NCHS reported induced abortion rate was 1.6% for women ages 16-44. In 2000, Lamy et al. reported the same induced abortion rate of 20% in French women with previous stroke.

We also sought data previously not well documented through prior studies such as the incidence of increased spasticity, decreased mobility,

and rate of attempted breastfeeding. Previous reports of these complications in SCI literature are sparse: increased spasticity (12%) and decreased mobility (15.5%) were reported by Jackson and Wadley (1999), decreased mobility (18%) by Baker and Cardenas (1992) and Robertson (1972) reported all mothers in his study successfully breastfed. Many previous studies have addressed health care provider management of pregnancy in patients with specific disability diagnoses. Medical management issues commonly addressed by the physiatric health care provider in our population include: medication management; adjustment of baclofen pumps; evaluation and treatment for sleep disturbances; musculoskeletal and pelvic pain evaluation and treatment; monitoring of pulmonary function; frequent monitoring for recurrent urinary tract infections, asymptomatic bacteria and pyelonephritis with use of antibiotic prophylaxis in women at risk; and education regarding labor onset recognition in patients with impaired sensation. Functional management issues commonly addressed in our population include: recognizing the need for physical therapy (PT) during pregnancy to maintain and improve

strength, range of motion and mobility; early referral to an experienced occupational therapist (OT) to prepare for future child care; wheelchair seating and positioning referrals to optimize fit and prevent pressure ulcers as appropriate; edema management; bladder management changes; rehabilitation engineering referrals for equipment modifications to aid with child care needs; PT/OT referrals postpartum to maximize mobility, aid with weight management and address arising issues with home childcare. **Conclusion:** Despite evidence of increased incidence of peripartum complications in women with physical disabilities, we believe our overall outcome results support the hypothesis that these women can successfully experience pregnancy and childbirth with appropriate interventions. These interventions include the proper identification, prevention and management of obstetric and disability-related complications through comprehensive interdisciplinary care. Further studies, preferably prospective, are recommended to investigate this population's risk of both physiatric and obstetric complications during the antepartum, interpartum and postpartum periods.

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