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RESEARCH ON NUTRITION AND PEOPLE WITH DISABILITIES

ADOLESCENTS WITH SPINAL CORD INJURY AND SPINA BIFIDA

Impact of spinal cord dysfunction and obesity on the health-related quality of life of children and adolescents.

Abresch RT, McDonald DA, Widman LM, McGinnis K, Hickey KJ. University of California Davis School of Medicine, Davis, California 95616, USA.

tabresch@ucdavis.edu J Spinal Cord Med. 2007;30 Suppl 1:S112-8.

OBJECTIVES: The objectives of this study were: (1) to compare the health-related quality of life (HRQOL) of children and adolescents with mobility impairments due to spinal cord injury (SCI) and spina bifida (SB) to the HRQOL of children and adolescent controls without mobility impairments (CTRL); and (2) to examine the impact of obesity on the HRQOL of these subjects.

METHODS: The Pediatric Quality of Life Inventory (PedsQL) was administered to 42 SB, 71 SCI and 60 able-bodied subjects who were 8-20 years of age. Subjects were categorized as obese if their BMI exceeded the 95th percentile for age. Twenty-one CTRL, 26 SB and 26 SCI subjects were obese.

RESULTS: The SCI and SB subjects had significantly lower subscores than the control subjects on the physical ($p < 0.001$), emotional ($p < .01$), social ($p < .001$), and school ($p < .001$) domains of the PedsQL. The obese (CTRL) group had lower subscores on the physical ($p < 0.001$), social ($p < 0.001$), and psychosocial ($p < 0.001$) domains of the PedsQL as compared to the non-obese CTRL group, while there were no significant differences in subscores from the emotional and school domains. In contrast to the subjects without mobility impairment, there were no significant differences between the sub-scores of the obese and non-obese subjects with spinal cord dysfunction secondary to SCI or SB. The mean total PedsQL score of the non-obese control group (87.7 +/- 2.1) was significantly higher than the obese control group (75.2 +/- 3.4, $p < 0.02$), which in turn was significantly higher than the SCI group (63.7 +/- 2.2, $p < 0.02$), and the SB group (63.0 +/- 2.2, $p < 0.02$).

CONCLUSION: Patients with SCI and SB have significantly lower HRQOL than children and adolescents without mobility impairments. Whereas obesity significantly reduces the quality of life scores of adolescents without mobility impairments, it has no significant incremental effect on subjects with SCI or SB.

Metabolic syndrome in adolescents with spinal cord dysfunction.

Nelson MD, Widman LM, Abresch RT, Stanhope K, Havel PJ, Styne DM, McDonald CM. University of California Department of Nutrition, Davis, California, USA. J Spinal Cord Med. 2007;30 Suppl 1:S127-39.

OBJECTIVE: The purpose of this study was to determine the prevalence of components of the metabolic syndrome in adolescents with spinal cord injury (SCI) and spina bifida (SB), and their associations with obesity in subjects with and without SCI and SB.

METHODS: Fifty-four subjects (20 SCI and 34 SB) age 11 to 20 years with mobility impairments from lower extremity paraparesis were recruited from a hospital-based clinic. Sixty able-bodied subjects who were oversampled for obesity served as controls (CTRL). Subjects were categorized as obese if their percent trunk fat measured by dual x-ray absorptiometry (DXA) was > 30.0% for males and > 35.0% for females. Ten SCI, 24 SB, and 19 CTRL subjects were classified as obese. Fasting serum samples were collected to determine serum glucose, insulin, and lipid concentrations. Metabolic syndrome was defined as having > or =3 of the following components: (a) obesity; (b) high-density lipoprotein (HDL) <45 mg/dL for males; <50 mg/dL for females; (c) triglycerides 2100 mg/dL; (d) systolic or diastolic blood pressure > or =95th percentile for age/ height/gender, and (e) insulin resistance determined by either fasting serum glucose 100-125 mg/dL; fasting insulin > or =20 microU /mL; or homeostasis model assessment of insulin resistance > or = 4.0.

RESULTS: Metabolic syndrome was identified in 32.4% of the SB group and 55% of the SCI group. Metabolic syndrome occurred at a significantly higher frequency in obese subjects (SB = 45.8%, SCI = 100%, CTRL = 63.2%) than nonobese subjects (SB = 0%, SCI = 10%, CTRL = 2.4%).

CONCLUSIONS: The prevalence of metabolic syndrome in adolescents with SB/SCI is quite high, particularly in obese individuals. These findings have important implications due to the known risks of cardiovascular diseases and diabetes mellitus associated with metabolic syndrome in adults, particularly those with spinal cord dysfunction.

CHILDREN WITH CEREBRAL PALSY

Growth and nutrition disorders in children with cerebral palsy.

Kuperminc MN, Stevenson RD. Department of Pediatrics, University of Virginia, Charlottesville, Virginia, USA. Dev Disabil Res Rev. 2008;14(2):137-46.

Growth and nutrition disorders are common secondary health conditions in children with cerebral palsy (CP). Poor growth and malnutrition in CP merit study because of their impact on health, including psychological and physiological function, healthcare utilization, societal participation, motor function, and survival. Understanding the etiology of poor growth has led to a variety of interventions to improve growth. One of the major causes of poor growth, malnutrition, is the best-studied contributor to poor growth; scientific evidence regarding malnutrition has contributed to improvements in clinical management and, in turn, survival over the last 20 years. Increased recognition and understanding of neurological, endocrinological, and environmental factors have begun to shape care for children with CP, as well. The investigation of these factors relies on advances made in the assessment methods available to address the challenges inherent in measuring growth in children with CP. Descriptive growth charts and norms of body composition provide information that may help clinicians to interpret growth and intervene to improve growth and nutrition in children with CP. Linking growth to measures of health will be necessary to develop growth standards for children with CP in order to optimize health and well-being.

Growth and nutritional status in residential center versus home-living children and adolescents with quadriplegic cerebral palsy.

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rchh@med.unc.edu J Pediatr. 2007 Aug;151(2):161-6. Epub 2007 Jun 22.

OBJECTIVE: To describe growth and nutrition in nonambulatory youth (<19 years of age) with cerebral palsy (CP) living in residential centers compared with similar youth living at home.

STUDY DESIGN: A multicenter, cross-sectional, single observational assessment of 75 subjects living in a residential care facility compared with 205 subjects living at home. Primary outcome measures included anthropometric measures of height, weight, triceps, and subscapular skinfolds, and mid-upper-arm muscle area. Z scores were calculated from reference values for healthy children. Age, use of a feeding tube, and Gross Motor Functional Classification System (GMFCS) level were included as important confounders.

RESULTS: Use of a feeding tube was associated with higher skinfold Z scores, and a significantly higher percentage of the residential subjects had a feeding tube. Height, weight, and arm-muscle area Z scores all diverged (negatively) from reference values with age, and the residential subjects were on average older than the home-living subjects. After controlling for age, GMFCS level and use of a feeding tube, residential living was associated with significantly greater weight, height, skinfold thicknesses, and mid-arm muscle area Z scores.

CONCLUSION: Poor growth and nutrition in children with CP is a prevalent, important, and complex problem. Although factors intrinsic to the condition of CP likely play a significant role, it is also clear that environmental factors, including the living situation of the child, can have an impact.

Gastrostomy feeding in cerebral palsy: too much of a good thing?

Sullivan PB, Alder N, Bachlet AM, Grant H, Juszczak E, Henry J, Vernon-Roberts A, Warner J, Wells J. Department of Paediatrics, University of Oxford, Oxford, UK.

peter.sullivan@paediatrics.ox.ac.uk Dev Med Child Neurol. 2006 Nov;48(11):877-82.

Comment in: Dev Med Child Neurol. 2006 Nov;48(11):869.

Gastrostomy tube (GT) feeding in children with cerebral palsy (CP) is associated with significant increases in weight gain and, potentially, with overfeeding. This study aimed to measure energy balance and body composition in children with CP who were fed either orally or by GT. Forty children (27 males, 13 females; median age 8y 6mo; range 1y 4mo-18y 11mo) with spastic quadriplegic CP, of whom 22 were gastrostomy-fed and 18 orally-fed, underwent anthropometry, indirect calorimetry, and total energy expenditure determination (doubly-labelled water method). Total body water content (estimated by the ^{18}O dilution method) was used to determine body composition. The Gross Motor Function Classification System (GMFCS) was used to determine the degree of motor impairment. GMFCS levels ranged from I to V; in the gastrostomy group 19 out of 22 were Level V and two out of 22 were Level IV. Within the orally-fed group, 11 out of 18 were Level V and four out of 18 were Level IV. Resting metabolic rate and total energy expenditure of the gastrostomy-fed children were lower but they had a significantly larger triceps skinfold thickness ($p=0.01$) and fat mass index ($p=0.02$) than the orally-fed children. Both groups had consistently higher body-fat content and lower

fat-free (i.e. muscle and bone) content than the reference population of age- and sex-matched children without disabilities. This study has demonstrated the relatively low energy expenditure and high body-fat content of children with severe CP and highlighted the potential risk of overfeeding with available enteral feeds administered via GT.

Feeding method and health outcomes of children with cerebral palsy.

Rogers B. Department of Pediatrics, Division of Developmental Pediatrics, Oregon Health and Science University, Portland, Oregon, USA. rogersbr@ohsu.edu J Pediatr. 2004 Aug;145(2 Suppl):S28-32.

Disorders of feeding and swallowing are common in children with cerebral palsy. Feeding and swallowing disorders have significant implications for development, growth and nutrition, respiratory health, gastrointestinal function, parent-child interaction, and overall family life. Assessments need to be comprehensive in scope and centered around the medical home. Oral feeding interventions for children with cerebral palsy may be effective in promoting oral motor function, but have not been shown to be effective in promoting feeding efficiency or weight gain. Feeding gastrostomy tubes are a reasonable alternative for children with severe feeding and swallowing problems who have had poor weight gain.

CHILDREN WITH DISABILITIES

Feeding difficulties in children and adolescents with chronic illness.

Sullivan P. University of Oxford, Department of Paediatrics, Oxford Radcliffe Hospital, Oxford, United Kingdom. Georgian Med News. 2008 Mar;(156):55-60.

Good health demands good nutrition and in the child it is reflected in normal growth. Children who cannot or do not eat properly often become unwell and do not grow. This becomes a source of great concern and anxiety for their parents. Several chronic illnesses in children impair normal feeding; this article aims to describe the interrelationship between eating and disease in children with reference to some common conditions. The effects of childhood eating disorders on parents and families will also be considered.

Obesity and secondary conditions in adolescents with disabilities: addressing the needs of an underserved population.

Rimmer JH, Rowland JL, Yamaki K. Department of Disability and Human Development, University of Illinois at Chicago, Chicago, Illinois 60608-6904, USA. jrimmer@uic.edu J Adolesc Health. 2007 Sep;41(3):224-9.

Children and adolescents with physical and cognitive disabilities have a higher prevalence of overweight compared to their non-disabled peers. This health risk can lead to a greater number of obesity-related secondary conditions (e.g., fatigue, pain, deconditioning, social isolation, difficulty performing activities of daily living) and can impose significant personal and economic hardship on the child and family. Effective strategies for reducing the risk of overweight/obesity in adolescents with disabilities must begin with greater awareness of the behavioral and environmental antecedents that lead to higher rates of obesity in this underserved segment of the youth population. Research on interventions to reduce obesity among adolescents with disabilities is an important area of future research for public health scientists. A range of interventions will be

necessary to overcome the many barriers that youth with disabilities experience in achieving and maintaining a healthy weight.

Evaluation of the nutrition counseling component of a fitness programme for children with disabilities.

Fragala-Pinkham MA, Bradford L, Haley SM. Research Center for Children with Special Health Care Needs, Franciscan Hospital for Children, Boston, MA 02135, USA. mfragala@fhfc.org Pediatr Rehabil. 2006 Oct-Dec;9(4):378-88.

OBJECTIVE: To describe and evaluate the nutrition counselling component of a fitness programme for children with disabilities.

METHODS: Twenty-eight children with disabilities, ages 6-14 years, participated in a 16-week comprehensive fitness programme consisting of twice weekly exercise sessions, nutrition counselling and physical activity promotion education sessions. Nutrition sessions consisted of three individual and two group sessions. Individual nutrition goals were developed for each child using 3-day food intake diaries and parent interview. Body Mass Index (BMI) and progress towards nutrition goals were documented.

RESULTS: No significant BMI changes were recorded for the entire group (n=28) or a sub-group with a goal to decrease BMI (n=8). Most of the children made improvements in individual goals indicating improvements in healthy eating habits. This included eating the daily recommended amount of servings of each food group, trying new foods and limiting foods containing saturated and trans fats, sodium and sugar.

CONCLUSION: Short-term changes were noted in eating habits and behaviours during the 16-week fitness programme, although the effects did not influence overall BMI during the 16-week programme. Children with disabilities are at nutritional risk, and long-term follow-up is needed to determine if initial changes in parent-reported child eating behaviours will impact long-term nutrition, BMI and overall health.

A multiprofessional children's feeding clinic.

Seabert H, Eastwood EC, Harris A. Taunton and Somerset Hospital, Taunton. J Fam Health Care. 2005;15(3):72-4.

A paediatric dietitian, occupational therapist and speech and language therapist describe how they jointly run a feeding clinic for infants and children with feeding difficulties.

Conditions treated include cerebral palsy, autism, learned aversion following severe gastro-oesophageal reflux, and delayed oral development that affects feeding. The therapists' co-ordinated approach enables parents to receive clear guidance on feeding at one combined appointment, without the inconvenience of having to attend three separate appointments. The article outlines the role of each therapist, with examples of how they assess and alleviate the children's problems. The need for safety, nutrition and hydration is balanced against the desire for developmental progress in a holistic approach involving all three therapy disciplines. The aim of the feeding clinic is to provide advice, support and intervention plans to help make feeding a pleasurable and safe experience for all the children who attend.

DEVELOPMENTAL OR INTELLECTUAL DISABILITIES

Cutoff scores, norms and patterns of feeding problems for the Screening Tool of Feeding Problems (STEP) for adults with intellectual disabilities.

Matson JL, Fodstad JC, Boisjoli JA. Department of Psychology, Louisiana State University, Baton Rouge, LA 70803, USA. Johnmatson@aol.com Res Dev Disabil. 2008 Jul-Aug;29(4):363-72. Epub 2007 Jul 26.

Independent living is a goal for everyone, but often persons with intellectual disabilities (ID) have major challenges in this respect. In fact, deficits in daily living skills are a hallmark of the condition. One of the most serious and potentially problematic of the independent living skills is difficulties or irregularities in eating. These problems can not only effect independence but they can result in more restrictive living conditions, poor nutrition, choking, aspiration, or even death. Given the serious nature of the disorder, it points to the need for adequate screening and diagnosis of such problems. The present study reports on the STEP and the development of cutoff scores and norms for the scale. Possible applications of these data for real world problems of person with ID are discussed.

'Hungry Eyes': visual processing of food images in adults with Prader-Willi syndrome.

Key AP, Dykens EM. Vanderbilt Kennedy Center for Research on Human Development, Nashville, TN 37203, USA. sasha.key@vanderbilt.edu J Intellect Disabil Res. 2008 Jun;52(Pt 6):536-46. Epub 2008 Apr 15.

BACKGROUND: Prader-Willi syndrome (PWS) is a genetic disorder associated with intellectual disabilities, compulsivity, hyperphagia and increased risks of life-threatening obesity. Food preferences in people with PWS are well documented, but research has yet to focus on other properties of food in PWS, including composition and suitability for consumption. It is also unclear how food perceptions differ across the two major genetic subtypes of PWS.

METHODS: This study examined neural responses to food stimuli in 17 adults with PWS, nine with paternal deletions and eight with maternal uniparental disomy (UPD), and in nine age-matched typical controls. Visual event-related potentials (ERPs) were recorded in response to food images varying in food composition and suitability for consumption during a passive viewing paradigm.

RESULTS: Group differences were observed for the N1 and P3 responses reflecting perceptual categorisation and motivational relevance respectively. The deletion group categorised food stimuli in terms of composition while the UPD group performed more similar to the controls, and focused on the suitability of food for consumption. Individual differences in N1 amplitude correlated with body mass index and scores on the Hyperphagia Questionnaire.

CONCLUSION: Differences are seen in how people with PWS because of deletion or UPD perceive visual food stimuli even within the first milliseconds of stimuli exposure. Implications are discussed for in vivo food behaviours and for future ERP or neuroimaging studies on hunger, satiety and food perception in PWS.

The impact of aging on eating, drinking, and swallowing function in people with Down's syndrome.

Lazenby T. NHS Lothian Primary and Community Division, Southwest Edinburgh Community Learning Disabilities Service, 86 Longstone Road, Edinburgh, EH14 2AS, UK. tracylazenby@hotmail.com Dysphagia. 2008 Mar;23(1):88-97.

Many people with Down's syndrome (DS) experience eating, drinking, and swallowing (EDS) difficulties, which can potentially lead to life-threatening conditions such as

malnutrition, dehydration, and aspiration pneumonia. As the life expectancy of people with DS continues to improve, there is an increasing need to examine how the aging process may further affect these conditions. Published research studies have yet to address this issue; therefore, this article draws on the literature in three associated areas in order to consider the dysphagic problems that might develop in aging people with DS. The areas examined are EDS development in children and adolescents with DS, EDS changes associated with aging, and EDS changes associated with dementia of the Alzheimer's type (DAT) because this condition is prevalent in older adults with DS. This article concludes that unlike in the general population, the aging process is likely to cause dysphagic difficulties in people with DS as they get older. Therefore, it is suggested that longitudinal studies are needed to examine the specific aspects of EDS function that may be affected by aging and concomitant conditions in DS.

Weight loss in adults with Down syndrome and with dementia in Alzheimer's disease.

Prasher VP, Metseagharun T, Haque S. Greenfields, Monyhull Hall Road, Kings Norton, Birmingham B30 3QQ, UK. vprasher@compuserve.com Res Dev Disabil. 2004 Jan-Feb;25(1):1-7.

An association between weight loss and Alzheimer's disease has been established in the general population but little information is available regarding this association in people with intellectual disabilities. A 4-year longitudinal study of adults with Down syndrome with and without Alzheimer's disease was undertaken. Age-associated weight loss was seen in virtually all older adults with Down syndrome. A significant association between weight loss and Alzheimer's disease was found for older adults with Down syndrome. This study highlights important research and clinical issues regarding weight loss and nutrition in Down syndrome adults with dementia.

Community health and nutrition screening for Special Olympics athletes.

Cotugna N, Vickery CE. Department of Nutrition and Dietetics, University of Delaware, Newark, DE 19716-3301, USA. ncotugna@udel.edu J Community Health. 2003 Dec;28(6):451-7.

Since 1961, Special Olympics has provided sports training and athletic competition for people with mental retardation. A recent addition to these Olympics has been the Healthy Athletes Program, designed to help the athletes improve their health and fitness, leading to enhanced sports experiences and well being. Original health services included dental and eye screening. In 2002, Special Olympics Delaware piloted a Wellness Park to add nutrition, blood pressure, and flexibility screening. Faculty from a university's health college trained discipline-specific students to conduct the screenings. Thirty nutrition and dietetics students measured height, weight, waist circumference, and calculated body mass index (BMI) for the athletes. Figures and risk-assessments were recorded on a "health report card." Two hundred ten athletes attended the nutrition screening. Ages ranged from 8 to 63 years; 81 percent males and 19 percent females. According to BMI standards, 32 percent of the athletes were overweight; 17 percent were obese. Twenty-five percent of adult males and 73 percent of adult females had a high risk waist circumference. Athletes at high risk for obesity-related diseases were referred to their primary physician for follow up. Nutrition education handouts included a simplified Food Guide Pyramid, tips for healthy eating in restaurants, 5 A Day information, and healthful hydration guides. Approximately 1,250 athletes participate in

Special Olympics Delaware each year, providing a great opportunity to do some much needed health screening and improve access to health care for this often neglected population.

Prevalence of obesity in International Special Olympic athletes as determined by body mass index.

Harris N, Rosenberg A, Jangda S, O'Brien K, Gallagher ML. Department of Nutrition and Hospitality Management, School of Human Environmental Sciences, East Carolina University, Greenville, NC 27858-4353, USA. J Am Diet Assoc. 2003 Feb;103(2):235-7. The heights and weights of 1,749 Special Olympics athlete volunteers participating in the Special Olympics Games in 1999 and 2001 were measured, and body mass index (BMI) was computed. Results indicated that athletes from the United States (US) under 18 years of age had a significantly ($P<.001$) higher prevalence of being overweight or at risk of being overweight compared with athletes from other countries. Similarly, adult athletes from the United States were at least 3.1 times more likely to be overweight or obese compared with their non-US counterparts. The risk of obesity in US Special Olympic athletes parallels the prevalence of obesity in the general US population. There is a clear need for further research, surveillance, and treatment of the risky health behaviors that contribute to the development of obesity in this group.

LEARNING DISABILITIES

Healthy living messages for people with learning disabilities.

Laidlaw M, Spanos D, Capaldi L, Robinson N, Nolan J. Department of Nutrition and Dietetics, Glasgow Learning Disability Partnership Berryknowes Resource Centre, Glasgow, UK. J Hum Nutr Diet. 2008 Jul 15;21(4):392-393.

BACKGROUND: Obesity, cardiovascular disease and osteoporosis are common nutritional disorders seen in people with learning disability (LD) and complexities of communication, visual, hearing and cognitive difficulties (NHS-HS, 2004). The national Healthy Living Campaign (HLC) (Healthy Living, 2007) produces health promotion materials with consistent guidance on healthy eating for adults. However, the format could be regarded as inaccessible to the majority of those with LD (NHS-HS, 2004). A pilot project, 'Shop, Cook & Eat', aimed to make the national HLC accessible to people with LD in a day centre/community setting and to empower people to make healthy choices has been initiated. Interactive learning methods including sensory activities, structured visits to supermarkets and allotments, and cooking skills development were used. Information and recipes with pictorial explanations were produced. This study aimed to evaluate this initiative.

METHODS: A participatory appraisal approach was used to pilot delivering of the HLC messages. A healthy eating group (eight participants >30 years) met weekly sessions from September 2006 to June 2008. The effectiveness of the materials was evaluated by a pictorial questionnaire that utilised an augmentative communication method, 'Talking Mat' (Murphy & Cameron, 2002). Questionnaires, which measured the impact on service users' knowledge of healthy eating and living, were administered at the end of the programme to carers. An observation diary was used to record qualitative comments. Data analysis was carried out with Excel 2003.

RESULTS: Five subjects completed the questionnaire. At week 1, two participants had 90% correct answers on fruit and vegetables and showed no change after 5 weeks; two participants had 60% correct answers and increased their knowledge by 45% increase; one participant had 70% correct answers and showed 18% increase. Questions on fat showed all five participants increased their knowledge within 4 weeks of joining the scheme. Questionnaires completed by family and carers at the end of the learning programme showed that six participants increased consumption of new foods/fruit and vegetables, five demonstrated increased interest and involvement in cooking and shopping at home. Examples from the observation diary include a day centre worker noting improved lunch choices of one member of the group and a parent reporting that her son had advised her to cut the fat off the bacon.

DISCUSSION: This study shows that this educational programme, developed to suit adults with LD, has the potential to improve their dietary knowledge. However, the low response rate makes extrapolation of these results difficult. Additional factors such as levels of disability and the level of involvement of carers and family members must be considered as well as whether new knowledge is sustained.

CONCLUSIONS: The results of this work suggest that it is possible to change the health knowledge of people with learning disabilities through use of interactive methods and materials in accessible format although larger studies are required. The results from this participatory appraisal approach could inform action planning for future groups on a wider scale. References Healthy Living [On line]. Available at <http://www.healthyliving.gov.uk/> (accessed on 3 April 2007). Murphy, J. & Cameron, L. (2002) Let your Mats do the Talking. *Speech and Language Therapy in Practice* - Spring 2002 p18-20. NHS Health Scotland. (2004) People with Learning Disabilities in Scotland - Health Needs Assessment Report. Edinburgh: NHS Health Scotland.

Is Slimming World on Referral an effective option to help people with learning difficulties manage their weight?

Avery A, Pallister C, Lavin J, Stubbs J. Nutrition and Research Department, Slimming World, Alfreton, Derbyshire, UK. *J Hum Nutr Diet.* 2008 Jul 15;21(4):376-377.

BACKGROUND: Since piloting the Slimming World on Referral service in 2001 (Lavin et al., 2006), the scheme has been made available nationally. This subsidised partnership scheme enables primary care to refer patients to a local Slimming World group for weekly weight management at no cost to the patient themselves. To date, over 30 schemes have been set up with the NHS, mainly focusing on people with general medical conditions. Obesity levels are greater in adults with learning difficulties than in the general population and have been shown to contribute to reduced life expectancy and increased health needs (Royal College of Nursing, 2006). In 2007, a Primary Care Trust (PCT) & Slimming World trialled the use of Slimming World on Referral, specifically for members with learning difficulties. This study aimed to evaluate its feasibility.

METHODS: Twenty members were referred to a specially set up Slimming World group and given the opportunity to attend free of charge for 24 weeks. The group was run by a local Slimming World consultant with support from Berkshire East PCT's learning difficulties care staff. A simplified version of Slimming World's healthy eating plan was promoted. Visuals were used to encourage the intake of low energy dense foods and healthier meal options, for instance, options for a healthy lunch box. Weight change, body mass index (BMI) change and rates of attendance were analysed using weekly

weight records. Data were analysed by t-tests (paired and unpaired) using SPSS version 11.

RESULTS: Average attendance was 19 weeks (2.9). Average percentage weight change was -4.4% (3.7) and 11 out of the 20 (55%) participants lost 5% or more of their body weight within the 24 weeks. Table 1 Effect of attendance at Slimming World group on weight and BMI. Baseline, mean (SD) Follow up, mean (SD) P value Weight (kg) 96.0 (12.1) 91.7 (12.8) <0.001 BMI (kg m⁻²) 36.7 (6.9) 35.1 (7.0) <0.001 For those who attended at least 20 of the 24 sessions (n = 12/60%), data improved further: mean BMI change -1.9 kg m⁻² (1.6, P = 0.002), weight change -5.4 kg (4.3, P = 0.002), percentage weight change -5.8% (4.5, P = 0.002).

DISCUSSION: It has previously been shown that referral partnership between the NHS and Slimming World offers a practical weight management option in terms of efficacy, attrition and cost (Lavin et al., 2006). This audit data shows that the referral service can be used to achieve clinically effective weight losses in a specific patient group which has high levels of obesity.

CONCLUSION: Slimming World on Referral offers a feasible option to help adults with learning difficulties manage their weight. References Lavin, J.H., Avery, A., Whitehead, S.M., Rees, E., Parsons, J., Bagnall, T., Barth, J.H. & Ruxton, C.H.S. (2006)

MENTAL ILLNESS

Obesity among individuals with serious mental illness.

Dickerson FB, Brown CH, Kreyenbuhl JA, Fang L, Goldberg RW, Wohlheiter K, Dixon LB. Sheppard Pratt Health System, Baltimore, MD 21204, USA.

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OBJECTIVE: To study the distribution and correlates of body mass index (BMI) among individuals with serious mental illness.

METHOD: A total of 169 participants were recruited from randomly selected out-patients receiving community-based psychiatric care and were interviewed with items from the National Health and Nutrition Examination Survey (NHANES) III. Their BMI was compared with that of 2404 matched individuals from the NHANES data set.

RESULTS: The distribution of BMI in the psychiatric sample significantly differed from that of the comparison group; 50% of women and 41% of men were obese compared with 27% and 20% in the comparison group. Within the psychiatric sample, higher BMI was associated with current hypertension and diabetes, a wish to weigh less, and reduced health-related functioning.

CONCLUSION: Obesity is more prevalent among individuals with serious mental illness than in demographically matched individuals from the US general population. Among persons with mental illness, obesity is associated with co-occurring health problems.

Prevalence and correlates of obesity in a community sample of individuals with severe and persistent mental illness.

Daumit GL, Clark JM, Steinwachs DM, Graham CM, Lehman A, Ford DE. Division of General Internal Medicine, Department of Medicine, Johns Hopkins University School of Medicine, 2024 East Monument Street, Suite 2-500, Baltimore, Maryland 21205, USA. J Nerv Ment Dis. 2003 Dec;191(12):799-805.

Individuals with severe and persistent mental illness (SPMI) have a preponderance of weight problems, possibly even greater than the obesity epidemic in the general population. Although atypical antipsychotics cause weight gain, their contribution to obesity has not been characterized in a community setting where individuals may take multiple psychotropics associated with weight gain. Using survey information including measured height and weight from a random sample of Maryland Medicaid recipients with SPMI, we compared obesity prevalence to the National Health and Nutrition Examination Survey (NHANES III) sample and a Maryland sample (Behavioral Risk Factor Surveillance System) of the general population adjusted to SPMI demographic characteristics. We investigated correlates of obesity in the SPMI sample. The results indicate that both men and especially women with SPMI had a higher prevalence of obesity than the general population; this portends substantial health implications. A fourfold association between atypical antipsychotics and prevalent obesity was found in men but not in women; further work should clarify mechanisms of obesity in the SPMI.

MERCURY

Associations of maternal long-chain polyunsaturated fatty acids, methyl mercury, and infant development in the Seychelles Child Development Nutrition Study.

Strain JJ, Davidson PW, Bonham MP, Duffy EM, Stokes-Riner A, Thurston SW, Wallace JM, Robson PJ, Shamlaye CF, Georger LA, Sloane-Reeves J, Cernichiari E, Canfield RL, Cox C, Huang LS, Janciuras J, Myers GJ, Clarkson TW. University of Ulster, United Kingdom. *Neurotoxicology*. 2008 Jun 11. [Epub ahead of print]

Fish consumption during gestation can provide the fetus with long-chain polyunsaturated fatty acids (LCPUFA) and other nutrients essential for growth and development of the brain. However, fish consumption also exposes the fetus to the neurotoxicant, methyl mercury (MeHg). We studied the association between these fetal exposures and early child development in the Seychelles Child Development Nutrition Study (SCDNS). Specifically, we examined a priori models of Omega-3 and Omega-6 LCPUFA measures in maternal serum to test the hypothesis that these LCPUFA families before or after adjusting for prenatal MeHg exposure would reveal associations with child development assessed by the BSID-II at ages 9 and 30 months. There were 229 children with complete outcome and covariate data available for analysis. At 9 months, the PDI was positively associated with total Omega-3 LCPUFA and negatively associated with the ratio of Omega-6/Omega-3 LCPUFA. These associations were stronger in models adjusted for prenatal MeHg exposure. Secondary models suggested that the MeHg effect at 9 months varied by the ratio of Omega-6/Omega-3 LCPUFA. There were no significant associations between LCPUFA measures and the PDI at 30 months. There were significant adverse associations, however, between prenatal MeHg and the 30-month PDI when the LCPUFA measures were included in the regression analysis. The BSID-II mental developmental index (MDI) was not associated with any exposure variable. These data support the potential importance to child development of prenatal availability of Omega-3 LCPUFA present in fish and of LCPUFA in the overall diet. Furthermore, they indicate that the beneficial effects of LCPUFA can obscure the determination of adverse effects of prenatal MeHg exposure in longitudinal observational studies.

Neurodevelopmental effects of maternal nutritional status and exposure to methylmercury from eating fish during pregnancy.

Davidson PW, Strain JJ, Myers GJ, Thurston SW, Bonham MP, Shamlaye CF, Stokes-Riner A, Wallace JM, Robson PJ, Duffy EM, Georger LA, Sloane-Reeves J, Cernichiari E, Canfield RL, Cox C, Huang LS, Janciuras J, Clarkson TW. University of Rochester, Rochester, NY, USA. Neurotoxicology. 2008 Jun 11. [Epub ahead of print]

Fish contain nutrients that promote optimal brain growth and development but also contain methylmercury (MeHg) that can have toxic effects. The present study tested the hypothesis that the intake of selected nutrients in fish or measures of maternal nutritional status may represent important confounders when estimating the effects of prenatal methylmercury exposure on child development. The study took place in the Republic of Seychelles, an Indian Ocean archipelago where fish consumption is high. A longitudinal cohort study design was used. A total of 300 mothers were enrolled early in pregnancy. Nutrients considered to be important for brain development were measured during pregnancy along with prenatal MeHg exposure. The children were evaluated periodically to age 30 months. There were 229 children with complete outcome and covariate data for analysis. The primary endpoint was the Bayley Scales of Infant Development-II (BSID-II), administered at 9 and 30 months of age. Combinations of four secondary measures of infant cognition and memory were also given at 5, 9 and 25 months. Cohort mothers consumed an average of 537g of fish (nine meals containing fish) per week. The average prenatal MeHg exposure was 5.9ppm in maternal hair. The primary analysis examined the associations between MeHg, maternal nutritional measures and children's scores on the BSID-II and showed an adverse association between MeHg and the mean Psychomotor Developmental Index (PDI) score at 30 months. Secondary analyses of the association between the PDI and only MeHg alone or nutritional factors alone showed only a borderline significant association between MeHg and the PDI at 30 months and no associations with nutritional factors. One experimental measure at 5 months of age was positively associated with iodine status, but not prenatal MeHg exposure. These findings suggest a possible confounding role of maternal nutrition in studies examining associations between prenatal MeHg exposures and developmental outcomes in children.

Maternal fish intake during pregnancy, blood mercury levels, and child cognition at age 3 years in a US cohort.

Oken E, Radesky JS, Wright RO, Bellinger DC, Amarasiriwardena CJ, Kleinman KP, Hu H, Gillman MW. Department of Ambulatory Care and Prevention, Harvard Medical School and Harvard Pilgrim Health Care, Boston, MA 02215, USA.

emily_oken@harvardpilgrim.org Am J Epidemiol. 2008 May 15;167(10):1171-81.

Comment in: Am J Epidemiol. 2008 Jul 15;168(2):236.

The balance of contaminant risk and nutritional benefit from maternal prenatal fish consumption for child cognitive development is not known. Using data from a prospective cohort study of 341 mother-child pairs in Massachusetts enrolled in 1999-2002, the authors studied associations of maternal second-trimester fish intake and erythrocyte mercury levels with children's scores on the Peabody Picture Vocabulary Test (PPVT) and Wide Range Assessment of Visual Motor Abilities (WRAVMA) at age 3 years. Mean maternal total fish intake was 1.5 (standard deviation, 1.4) servings/week, and 40 (12%) mothers consumed >2 servings/week. Mean maternal mercury level was 3.8 (standard deviation, 3.8) ng/g. After adjustment using multivariable linear regression,

higher fish intake was associated with better child cognitive test performance, and higher mercury levels with poorer test scores. Associations strengthened with inclusion of both fish and mercury: effect estimates for fish intake of >2 servings/week versus never were 2.2 (95% confidence interval (CI): -2.6, 7.0) for the PPVT and 6.4 (95% CI: 2.0, 10.8) for the WRAVMA; for mercury in the top decile, they were -4.5 (95% CI: -8.5, -0.4) for the PPVT and -4.6 (95% CI: -8.3, -0.9) for the WRAVMA. Fish consumption of < or =2 servings/week was not associated with a benefit. Dietary recommendations for pregnant women should incorporate the nutritional benefits as well as the risks of fish intake.

Nutrient and methyl mercury exposure from consuming fish.

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gary_myers@urmc.rochester.edu J Nutr. 2007 Dec;137(12):2805-8.

There is controversy about the risks and benefits of consuming fish. Fish consumption provides nutrients, some of which are essential for brain growth and development. All fish, however, contain methyl mercury (MeHg), a known neurotoxicant. The toxic effect of MeHg seems most damaging during brain development, and thus, prenatal exposure is of greatest concern. At present the level of prenatal exposure associated with risk to a child's neurodevelopment is not known. Balancing the rewards and possible risks of fish consumption presents a dilemma to consumers and regulatory authorities. We review the nutrients in fish that are important in brain development and the current evidence of risk from MeHg at exposure levels achieved by consuming fish. We then review the findings from a large prospective cohort study of a population that consumes fish daily, the Seychelles Child Development Study. The MeHg content of the fish consumed in the Seychelles is similar to that of ocean fish available in industrialized countries, so they represent a sentinel population for any risk from fish consumption. In the Seychelles, evaluations of the children through 9 y of age show no consistent pattern of adverse associations with prenatal MeHg exposure. Recent studies in the Seychelles have focused on nutrients in fish that might influence a child's development, including long-chain polyunsaturated fatty acids, iodine, iron, and choline. Preliminary findings from this study suggest that the beneficial influence of nutrients from fish may counter any adverse effects of MeHg on the developing nervous system.

Is susceptibility to prenatal methylmercury exposure from fish consumption non-homogeneous? Tree-structured analysis for the Seychelles Child Development Study.

Huang LS, Myers GJ, Davidson PW, Cox C, Xiao F, Thurston SW, Cernichiari E, Shamlaye CF, Sloane-Reeves J, Georger L, Clarkson TW. Department of Biostatistics and Computational Biology, University of Rochester School of Medicine and Dentistry, Rochester, NY 14642, USA. Lhuang@bst.rochester.edu Neurotoxicology. 2007 Nov;28(6):1237-44. Epub 2007 Aug 25.

Studies of the association between prenatal methylmercury exposure from maternal fish consumption during pregnancy and neurodevelopmental test scores in the Seychelles Child Development Study have found no consistent pattern of associations through age 9 years. The analyses for the most recent 9-year data examined the population effects of prenatal exposure, but did not address the possibility of non-homogeneous susceptibility. This paper presents a regression tree approach: covariate effects are treated non-linearly and non-additively and non-homogeneous effects of prenatal

methylmercury exposure are permitted among the covariate clusters identified by the regression tree. The approach allows us to address whether children in the lower or higher ends of the developmental spectrum differ in susceptibility to subtle exposure effects. Of 21 endpoints available at age 9 years, we chose the Weschler Full Scale IQ and its associated covariates to construct the regression tree. The prenatal mercury effect in each of the nine resulting clusters was assessed linearly and non-homogeneously. In addition we reanalyzed five other 9-year endpoints that in the linear analysis had a two-tailed p-value <0.2 for the effect of prenatal exposure. In this analysis, motor proficiency and activity level improved significantly with increasing MeHg for 53% of the children who had an average home environment. Motor proficiency significantly decreased with increasing prenatal MeHg exposure in 7% of the children whose home environment was below average. The regression tree results support previous analyses of outcomes in this cohort. However, this analysis raises the intriguing possibility that an effect may be non-homogeneous among children with different backgrounds and IQ levels.

Methylmercury toxicity and functional programming.

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pgrandjean@health.sdu.dk Reprod Toxicol. 2007 Apr-May;23(3):414-20. Epub 2007 Mar 12. Comment in: Reprod Toxicol. 2008 Jan;25(1):133; author reply 134.

PURPOSE: Adverse health effects of developmental toxicants may induce abnormal functional programming that leads to lasting functional deficits. This notion is considered from epidemiological evidence using developmental methylmercury neurotoxicity as an example.

MOST IMPORTANT FINDINGS: Accumulating evidence indicates that adverse effects may occur even at low-level methylmercury exposures from seafood and freshwater fish. Neurobehavioral outcomes are usually non-specific, and imprecise exposure assessment results in a bias toward the null. Essential nutrients may promote the development of certain brain functions, thereby causing confounding bias. The functional deficits caused by prenatal methylmercury exposure appear to be permanent, and their extent may depend on the joint effect of toxicants and nutrients.

PRINCIPAL CONCLUSIONS: The lasting functional changes caused by neurodevelopmental methylmercury toxicity fit into the pattern of functional programming, with effects opposite to those linked to beneficial stimuli.

Methylmercury and neurodevelopment: longitudinal analysis of the Seychelles child development cohort.

Davidson PW, Myers GJ, Cox C, Wilding GE, Shamlaye CF, Huang LS, Cernichiari E, Sloane-Reeves J, Palumbo D, Clarkson TW. The Department of Pediatrics, University of Rochester School of Medicine and Dentistry, Rochester, New York, 14642, USA.

phil_davidson@urmc.rochester.edu Neurotoxicol Teratol. 2006 Sep-Oct;28(5):529-35. Epub 2006 Jun 29.

BACKGROUND: The Seychelles Child Development Study (SCDS) has been longitudinally following a cohort of over 700 children enrolled in 1989. Their mothers consumed a diet high in fish during pregnancy. Repeated examination of the SCDS cohort at six different ages through age 11 years has shown no pattern of adverse effects. Some early appearing beneficial associations between both prenatal and

postnatal hair MeHg and several child development endpoints were noted. We hypothesized these might be related to micronutrients in the fish, but they were not found when the children reached middle school age. These findings suggest that the associations observed between MeHg and developmental outcomes may vary with developmental stage.

METHOD: We examined the main cohort of the SCDS to determine if this might be true using a longitudinal multiple regression analysis design that focused on those endpoints that were repeatedly measured at different ages. The primary endpoint analyzed was global cognition, involving a measure of developmental quotient or IQ. Secondary analyses included other domains such as Reading and Mathematics scholastic achievement, social behavior, and memory. Analyses involved two different approaches, one including incorporation of a passage of time variable, the other including a difference of scores across time points.

RESULTS: No significant associations were found between prenatal MeHg exposure and any of the repeatedly measured endpoints.

CONCLUSIONS: These results suggest that even when individual subject variance is controlled there was no consistent pattern of associations between child development outcomes and prenatal exposures to MeHg from maternal consumption of a diet high in fish. The Seychellois diet contains about 10 times more ocean fish than is typically consumed by US citizens. Our primary focus on IQ should further inform growing scientific interest in the analysis of the risks and benefits of fish consumption on overall cognitive ability.

Mental retardation and prenatal methylmercury toxicity.

Trasande L, Schechter CB, Haynes KA, Landrigan PJ. Department of Community and Preventive Medicine, Center for Children's Health and the Environment, Mt. Sinai School of Medicine, One Gustave K. Levy Place, Box 1043, New York, NY 10029, USA. leo.trasande@mssm.edu Am J Ind Med. 2006 Mar;49(3):153-8.

BACKGROUND: Methylmercury (MeHg) is a developmental neurotoxicant; exposure results principally from consumption of seafood contaminated by mercury (Hg). In this analysis, the burden of mental retardation (MR) associated with methylmercury exposure in the 2000 U.S. birth cohort is estimated, and the portion of this burden attributable to mercury (Hg) emissions from coal-fired power plants is identified.

METHODS: The aggregate loss in cognition associated with MeHg exposure in the 2000 U.S. birth cohort was estimated using two previously published dose-response models that relate increases in cord blood Hg concentrations with decrements in IQ. MeHg exposure was assumed not to be correlated with native cognitive ability. Previously published estimates were used to estimate economic costs of MR caused by MeHg.

RESULTS: Downward shifts in IQ resulting from prenatal exposure to MeHg of anthropogenic origin are associated with 1,566 excess cases of MR annually (range: 376-14,293). This represents 3.2% of MR cases in the US (range: 0.8%-29.2%). The MR costs associated with decreases in IQ in these children amount to \$2.0 billion/year (range: \$0.5-17.9 billion). Hg from American power plants accounts for 231 of the excess MR cases/year (range: 28-2,109), or 0.5% (range: 0.06%-4.3%) of all MR. These cases cost \$289 million (range: \$35 million-2.6 billion).

CONCLUSIONS: Toxic injury to the fetal brain caused by Hg emitted from coal-fired power plants exacts a significant human and economic toll on American children.

Do recent data from the Seychelles Islands alter the conclusions of the NRC Report on the toxicological effects of methylmercury?

Stern AH, Jacobson JL, Ryan L, Burke TA. Bureau for Risk Analysis, Division of Science, Research, and Technology, New Jersey Department of Environmental Protection, 401 East State Street, 1st Floor, PO Box 409, Trenton, NJ 08625, USA. Alan.Stern@dep.state.nj.us Environ Health. 2004 Jan 30;3(1):2.

In 2000, the National Research Council (NRC), an arm of the National Academy of Sciences, released a report entitled, "Toxicological Effects of Methylmercury." The overall conclusion of that report was that, at levels of exposure in some fish- and marine mammal-consuming communities (including those in the Faroe Islands and New Zealand), subtle but significant adverse effects on neuropsychological development were occurring as a result of in utero exposure. Since the release of that report, there has been continuing discussion of the public health relevance of current levels of exposure to Methylmercury. Much of this discussion has been linked to the release of the most recent longitudinal update of the Seychelles Island study. It has recently been posited that these findings supercede those of the NRC committee, and that based on the Seychelles findings, there is little or no risk of adverse neurodevelopmental effects at current levels of exposure. In this commentary, members of the NRC committee address the conclusions from the NRC report in light of the recent Seychelles data. We conclude that no evidence has emerged since the publication of the NRC report that alters the findings of that report.

Prenatal methylmercury exposure from ocean fish consumption in the Seychelles child development study.

Myers GJ, Davidson PW, Cox C, Shamlaye CF, Palumbo D, Cernichiari E, Sloane-Reeves J, Wilding GE, Kost J, Huang LS, Clarkson TW. Department of Neurology, National Institute for Child Health and Development, National Institutes of Health, Department of Health and Human Services, Bethesda, USA.

gary_myers@urmc.rochester.edu Lancet. 2003 May 17;361(9370):1686-92.

Comment in: Lancet. 2003 Aug 23;362(9384):664-5; author reply 665. Lancet. 2003 May 17;361(9370):1667-8.

INTRODUCTION: Exposure to methylmercury (MeHg) before birth can adversely affect children's neurodevelopment. The most common form of prenatal exposure is maternal fish consumption, but whether such exposure harms the fetus is unknown. We aimed to identify adverse neurodevelopmental effects in a fish-consuming population.

METHODS: We investigated 779 mother-infant pairs residing in the Republic of Seychelles. Mothers reported consuming fish on average 12 meals per week. Fish in Seychelles contain much the same concentrations of MeHg as commercial ocean fish elsewhere. Prenatal MeHg exposure was determined from maternal hair growing during pregnancy. We assessed neurocognitive, language, memory, motor, perceptual-motor, and behavioural functions in children at age 9 years. The association between prenatal MeHg exposure and the primary endpoints was investigated with multiple linear regression with adjustment for covariates that affect child development.

FINDINGS: Mean prenatal MeHg exposure was 6.9 parts per million (SD 4.5 ppm). Only two endpoints were associated with prenatal MeHg exposure. Increased exposure was associated with decreased performance in the grooved pegboard using the non-dominant hand in males and improved scores in the hyperactivity index of the Conner's

teacher rating scale. Covariates affecting child development were appropriately associated with endpoints.

INTERPRETATION: These data do not support the hypothesis that there is a neurodevelopmental risk from prenatal MeHg exposure resulting solely from ocean fish consumption.

MULTIPLE SCLEROSIS

Safety of vitamin D3 in adults with multiple sclerosis.

Kimball SM, Ursell MR, O'Connor P, Vieth R. Department of Nutritional Sciences, University of Toronto, Toronto, Canada. samantha.kimball@utoronto.ca Am J Clin Nutr. 2007 Sep;86(3):645-51.

BACKGROUND: Vitamin D3 may have therapeutic potential in several diseases, including multiple sclerosis. High doses of vitamin D(3) may be required for therapeutic efficacy, and yet tolerability--in the present context, defined as the serum concentration of 25-hydroxyvitamin D [25(OH)D] that does not cause hypercalcemia--remains poorly characterized.

OBJECTIVE: The objective of the study was to characterize the calcemic response to specific serum 25(OH)D concentrations.

DESIGN: In a 28-wk protocol, 12 patients in an active phase of multiple sclerosis were given 1200 mg elemental Ca/d along with progressively increasing doses of vitamin D3: from 700 to 7000 microg/wk (from 28 000 to 280 000 IU/wk).

RESULTS: Mean (+/- SD) serum concentrations of 25(OH)D initially were 78 +/- 35 nmol/L and rose to 386 +/- 157 nmol/L (P < 0.001). Serum calcium concentrations and the urinary ratio of calcium to creatinine neither increased in mean values nor exceeded reference values for any participant (2.1-2.6 mmol/L and <1.0, respectively). Liver enzymes, serum creatinine, electrolytes, serum protein, and parathyroid hormone did not change according to Bonferroni repeated-measures statistics, although parathyroid hormone did decline significantly according to the paired t test. Disease progression and activity were not affected, but the number of gadolinium-enhancing lesions per patient (assessed with a nuclear magnetic brain scan) decreased from the initial mean of 1.75 to the end-of-study mean of 0.83 (P = 0.03).

CONCLUSIONS: Patients' serum 25(OH)D concentrations reached twice the top of the physiologic range without eliciting hypercalcemia or hypercalciuria. The data support the feasibility of pharmacologic doses of vitamin D3 for clinical research, and they provide objective evidence that vitamin D intake beyond the current upper limit is safe by a large margin.

SPINAL CORD INJURY

Carbohydrate and lipid disorders and relevant considerations in persons with spinal cord injury.

Wilt TJ, Carlson KE, Goldish GD, MacDonald R, Niewoehner C, Rutks I, Shamliyan T, Tacklind J, Taylor BC, Kane RL. Evid Rep Technol Assess (Full Rep). 2008 Jan;(163):1-95.

OBJECTIVES: To assess the prevalence of carbohydrate and lipid disorders in adults with chronic spinal cord injury and evaluate their risk contribution to cardiovascular diseases and the potential impact of exercise and pharmacologic and dietary therapies to alter these disorders and reduce cardiovascular disease risk.

DATA SOURCES: MEDLINE (PubMed), Cochrane Database and Web sites of the American Spinal Injury Association, American Paraplegia Society, Paralyzed Veterans of America, Consortium of Spinal Cord Medicine, and WorldCat through August 2007.

REVIEW METHODS: English language observational studies addressing prevalence of carbohydrate and lipid disorders were included if they evaluated at least 100 adults with chronic spinal cord injury or a total of 100 subjects if using a control group.

Epidemiologic investigations of more than 50 adults with spinal cord injury that were published in English after 1990 and reported cardiovascular morbidity and mortality were abstracted. Intervention studies from 1996-2007 were included regardless of design or size if they assessed exercise, diet, or pharmacologic therapies and reported carbohydrate, lipid, or cardiovascular outcomes.

RESULTS: The quality of evidence regarding the prevalence, impact, and outcomes of carbohydrate and lipid disorders in adults with chronic spinal cord injuries is weak. Evidence is limited by relatively few studies, small sample size, lack of appropriate control groups, failure to adjust for known confounding variables, and variation in reported outcomes. However, the existing evidence does not indicate that adults with spinal cord injuries are at markedly greater risk for carbohydrate and lipid disorders or subsequent cardiovascular morbidity and mortality than able-bodied adults. Body mass index is not reliable for assessing body composition, especially percent body fat, in adults with spinal cord injury. There are no high quality studies evaluating the impact of exercise, diet, or pharmacologic therapies on these disorders.

CONCLUSIONS: The available evidence does not support incorporating SCI status as an independent variable to assess risk of cardiovascular morbidity and mortality or to alter diagnostic/treatment thresholds compared to able-bodied adults. Furthermore, individuals with SCI may have unique physiologic differences compared to able-bodied individuals. As a result, it is uncertain that findings from studies conducted in able-bodied adults evaluating efficacy and harms of interventions to improve carbohydrate, lipid disorders, and subsequent CVD can be extrapolated to individuals with SCI. The role of exercise in individuals with spinal cord injuries represents a unique challenge and requires further exploration into the benefits, harms, and resource implications of broad-based spinal cord injury exercise programs.

Obesity after spinal cord injury.

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David.Gater@va.gov Phys Med Rehabil Clin N Am. 2007 May;18(2):333-51, vii.

America is in the midst of an obesity epidemic, and individuals who have spinal cord injury (SCI) are perhaps at greater risk than any other segment of the population. Recent changes in the way obesity has been defined have lulled SCI practitioners into a false sense of security about the health of their patients regarding the dangers of obesity and its sequelae. This article defines and uses a definition of obesity that is more relevant to persons who have SCI, reviews the physiology of adipose tissue, and discusses aspects of heredity and environment that contribute to obesity in SCI. The pathophysiology of obesity is discussed relative to health risks for persons who have SCI, particularly those

contributing to cardiovascular disease. Prevalence of obesity and its comorbidities are discussed and management options reviewed.

Obesity intervention in persons with spinal cord injury.

Chen Y, Henson S, Jackson AB, Richards JS. Department of Physical Medicine and Rehabilitation, University of Alabama at Birmingham, Birmingham, AL 35249, USA. Spinal Cord. 2006 Feb;44(2):82-91.

STUDY DESIGN: A single group uncontrolled trial.

OBJECTIVES: Despite widespread emphasis on the obesity-related health risks in persons with spinal cord injury (SCI), limited research has been carried out to intervene in this problem. This study was conducted to assess the initial effectiveness of a weight loss program on various health outcomes in persons with SCI.

SETTING: A rehabilitation center in Birmingham, Alabama, United States.

METHODS: A total of 16 individuals with chronic SCI who were overweight or obese participated in a weight management program that consisted of 12 weekly classes, covering nutrition, exercise, and behavior modification. Various outcomes were examined over a 6-month period (baseline, week 12, and week 24), including body composition measured by dual energy X-ray absorptiometry, physiologic measures, diet behavior, and psychosocial and physical functioning. Of these, 13 participants returned for the week 24 follow-up.

RESULTS: Weight loss averaged 3.5+/-3.1 kg (3.8% of the initial weight) at week 12 and 2.9+/-3.7 kg (3.0% of the initial weight) at week 24. There was a significant reduction from baseline values at weeks 12 and 24 in body mass index, anthropometric measurements, and fat mass and improvement in diet behavior and psychosocial and physical functioning, while lean mass and blood albumin and hemoglobin levels were maintained. A correlation analysis showed that a greater weight loss was importantly ($r>0.4$) associated with a greater reduction in total cholesterol at weeks 12 and 24 and in systolic and diastolic blood pressure at week 24. Several factors were important ($r>0.4$ or $r<-0.4$) in determining the success in weight loss, including age, race, marital and employment status, family history of overweight/obesity, level and duration of injury, and cholesterol level at baseline.

CONCLUSIONS: This is the first demonstration that a carefully planned program with time-calorie displacement diet is effective for overweight/obese individuals with SCI to lose weight without compromising total lean mass and overall health. It provides foundation for a future large clinical trial for weight loss of persons with SCI or other spinal cord dysfunction.

Dietary intake and nutritional status of urban community-dwelling men with paraplegia.

Tomey KM, Chen DM, Wang X, Braunschweig CL. Department of Human Nutrition, University of Illinois, Chicago, IL 60612, USA. ktomey@uic.edu Arch Phys Med Rehabil. 2005 Apr;86(4):664-71.

OBJECTIVES: To evaluate nutritional status, dietary intake, nutrition knowledge, and depression of healthy urban men with chronic spinal cord injury (SCI) and to compare these findings with national guidelines and data.

DESIGN: Cross-sectional.

SETTING: Urban university.

PARTICIPANTS: Ninety-five community-dwelling men with paraplegia (age range, 20-59 y).

INTERVENTIONS: Not applicable.

MAIN OUTCOME MEASURES: Dietary intake, body mass index (BMI), waist circumference, knowledge of nutrition, and depression.

RESULTS: Diets included too much total and saturated fat, and inadequate fiber, calcium, fruit, and dairy intake. Most participants met protein needs, but most calorie levels were at or below recommendations. By using standard BMI and waist circumference cut-points for the able-bodied, approximately half of participants were overweight, 19% were obese, 7.5% were underweight, and more than one third had large waist circumferences. Participants with low knowledge of nutrition and high BMI who lived alone, smoked, and who had low family incomes were at significantly higher risk for lower quality diets. African Americans had the poorest diets.

CONCLUSIONS: Intake of several key nutrients did not meet guidelines, and many BMI and waist circumference values were outside recommended ranges. These data highlight the need for clinicians to screen, counsel, and treat people with SCI to prevent related chronic diseases.

TUBE FEEDING

Changing from oral to enteral feeding: impact on families of children with disabilities.

Hunt E. University of Nottingham. Paediatr Nurs. 2007 Sep;19(7):30-2.

The number of children in the U.K. who are being fed enterally at home is increasing. Feeding by nasogastric or gastrostomy tube may not seem particularly abnormal to nurses who care for sick children. However, the initiation of tube feeding can have a significant impact on both the child and the family. Research related to children with disabilities who have feeding problems is focused around the views of their mothers because they are often the main carers of these children. However, eating is a social activity in our society and tube feeding will have an effect on other members of the family. To provide adequate support, nurses need to understand the nature and scale of the impact that continuing with oral feeding or changing to gastrostomy feeding has on the whole family.

Eating and feeding are not the same: caregivers' perceptions of gastrostomy feeding for children with cerebral palsy.

Petersen MC, Kedia S, Davis P, Newman L, Temple C. Le Bonheur Children's Medical Center and Boling Center for Developmental Disabilities, Memphis, Tennessee, USA. mcp@uoregon.edu Dev Med Child Neurol. 2006 Sep;48(9):713-7.

Using a semi-structured questionnaire, this descriptive study examined perceptions of feeding and adherence to feeding recommendations for caregivers (26 females; mean age 32y 7mo [SD 9.4y], range 20-59y) of children with cerebral palsy (CP) and a gastrostomy tube (GT). Children in the study (15 females, 11 males; mean age 4y 8mo [SD 3y 11mo], range 8mo-16y) had had a GT in place for at least 1 month and been assessed at Level II (n=2), Level III (n=2), Level IV (n=5), and Level V (n=17) of the Gross Motor Function Classification System. A negative response was reported by 18 caregivers when the GT was recommended; however, 21 caregivers reported

improvement in the children following placement. All children received formula through the GT that was adequate for complete nutrition, yet 14 caregivers gave other foods through the GT (e.g. juice, cereal, soup, or table food). Of the 17 children receiving oral feedings, meals were an unpleasant experience for over half. Of the remaining nine children, in spite of a strict nil by mouth recommendation by physicians, five continued to receive some oral feedings. Generally, caregivers perceived GT feeding as 'unnatural'. Understanding these perceptions will help clinicians to develop effective, family-centered, patient-appropriate intervention and adherence strategies for GT-fed children with CP.

To PEG or not to PEG: a review of evidence for placing feeding tubes in advanced dementia and the decision-making process.

Cervo FA, Bryan L, Farber S. State University of New York at Stony Brook; Long Island State Veterans Home, New York, USA. Geriatrics. 2006 Jun;61(6):30-5. Comment in: Geriatrics. 2006 Jun;61(6):12-3.

Percutaneous endoscopic gastrostomy (PEG) has evolved into a common low-risk procedure in current medical practice. Clinical evidence supporting the use of tube feedings in patients with advanced dementia is clearly lacking, yet PEG procedures continue to be performed in a large number of these cases. In fact, multiple studies have shown that feeding tubes seldom are effective in improving nutrition, maintaining skin integrity by increased protein intake, preventing aspiration pneumonia, minimizing suffering, improving functional status, or extending life. The decision-making process is complicated, however, and involves the clinician considering such issues as advance directives, ethical considerations, legal/financial concerns, emotional factors, cultural background, religious beliefs, and the need for a family meeting incorporating all of these principles.

Medical, surgical, and health outcomes of gastrostomy feeding.

Craig GM, Carr LJ, Cass H, Hastings RP, Lawson M, Reilly S, Ryan M, Townsend J, Spitz L. Institute of Child Health and Great Ormond Street Hospital for Children NHS Trust, University College London, UK. gill.craig.1@city.ac.uk Dev Med Child Neurol. 2006 May;48(5):353-60.

A prospective controlled study with repeated measures before and after surgery examined the medical, surgical, and health outcomes of gastrostomy for children with disabilities at a tertiary paediatric referral centre in the North Thames area, UK. Anthropometric measures included weight, mid-upper-arm and head circumference. Five-day prospective food diaries were completed and data on physical health and surgical outcomes recorded. Seventy-six children participated and underwent gastrostomy (44 males, 32 females; median age 3 y 4 mo, range 4 mo-17 y 5 mo), and 35/76 required an anti-reflux procedure. Categories of disability were: cerebral palsy (32/76), syndrome of chromosomal or other genetic origin (25/76), slowly progressive degenerative disease (11/76), and unconfirmed diagnosis (8/76). Most children had gross motor difficulties (99%) and were non-ambulant (83%). Oromotor problems were identified in 78% of children, 69% aspirated, and 65% were fed nasogastrically before surgery. The mean weight before surgery was -2.84 standard deviation score (SDS; SD 2.21, range -9.8 to 3.4). Two-thirds of children achieved catch-up growth postoperatively: weight-for-age (mean difference 0.51 SDS, 95% CI 0.23-0.79, p=0.001) and mid-upper arm circumference (mean difference 1.12 cm, 95% confidence interval 0.50-1.75,

p=0.001). Health gains included a reduction in drooling, secretions, vomiting, and constipation. Major surgical complications were found in 13/74 children. The study provides evidence that catch-up growth and health gains are possible following gastrostomy.

The psychosocial impact on parents of tube feeding their child.

Hazel R. Luton and Dunstable Hospital. Paediatr Nurs. 2006 May;18(4):19-22. A review of 13 papers investigating parents' experience of long-term tube feeding in disabled children and young people identified a significant impact on parents and families related to oral feeding, decision making and tube feeding itself. Mixed messages and pressure from health professionals and relatives made decision making about tube feeding more difficult for parents. Making the decision to tube feed or proceed to gastrostomy was described in terms of 'giving in'. Parents expressed a need for consistent, accurate information. Once tube feeding was established there is a positive impact on the lives of the child and family - although some parents reported reduced support and continued feelings of inadequacy. The significance parents attach to oral feeding and their information and respite care needs when tube feeding must be recognised and further explored.

Tube feeding patients with dementia.

Chernoff R. Geriatric Research Education and Clinical Center, Central Arkansas Veterans Healthcare System, Little Rock, AR 72205, USA. chernoffronni@uams.edu Nutr Clin Pract. 2006 Apr;21(2):142-6.

As the population ages, the incidence of dementia increases. All types of dementia, whether they are reversible or irreversible, lead to loss of intellectual function and judgment, memory impairment, and personality changes. The skills to feed oneself, use eating utensils, and consume items recognized as food, thereby maintaining nutrition status, may be lost as dementia progresses. Reports indicate that nutrition status may be maintained when patients are hand fed, but this is labor intensive and therefore expensive. Feeding via a percutaneous endoscopic gastrostomy tube is often chosen as an acceptable alternative. Research indicates that there is little benefit in this population when aggressive nutrition support is instituted. Providing tube feeding to patients with dementia does not necessarily extend life, increase weight, or reduce the incidence of pressure ulcers or aspiration. There are many legal and ethical issues involved in the decision to place a feeding tube in demented patients. The primary issue in patients with dementia may be autonomy and the right of an individual to decide whether or not a tube should be placed at all. Legally, there is clear precedent that the courts see the insertion of a feeding tube as extraordinary care that the patient has the right to refuse. However, much of case law is derived from cases of patients who were in a persistent vegetative state. Advance directives help to determine what the patient would want for himself. Considering all the options before the patient can no longer make decisions is the most desirable course.

Gastrostomy tube feeding in children with cerebral palsy: a prospective, longitudinal study.

Sullivan PB, Juszczak E, Bachlet AM, Lambert B, Vernon-Roberts A, Grant HW, Eltumi M, McLean L, Alder N, Thomas AG. University of Oxford, Department of Paediatrics,

Oxford, UK. peter.sullivan@paediatrics.ox.ac.uk *Dev Med Child Neurol.* 2005 Feb;47(2):77-85. Comment in: *Dev Med Child Neurol.* 2005 Feb;47(2):76.

We report a longitudinal, prospective, multicentre cohort study designed to measure the outcomes of gastrostomy tube feeding in children with cerebral palsy (CP). Fifty-seven children with CP (28 females, 29 males; median age 4y 4mo, range 5mo to 17y 3mo) were assessed before gastrostomy placement, and at 6 and 12 months afterwards. Three-quarters of the children enrolled (43 of 57) had spastic quadriplegia; other diagnoses included mixed CP (6 of 57), hemiplegia (3 of 57), undiagnosed severe neurological impairment (3 of 57), ataxia (1 of 57), and extrapyramidal disorder (1 of 57). Only 7 of 57 (12%) could sit independently, and only 3 of 57 (5%) could walk unaided. Outcome measures included growth/anthropometry, nutritional intake, general health, and complications of gastrostomy feeding. At baseline, half of the children were more than 3SD below the average weight for their age and sex when compared with the standards for typically-developing children. Weight increased substantially over the study period; the median weight z score increased from -3 before gastrostomy placement to -2.2 at 6 months and -1.6 at 12 months. Almost all parents reported a significant improvement in their child's health after this intervention and a significant reduction in time spent feeding. Statistically significant and clinically important increases in weight gain and subcutaneous fat deposition were noted. Serious complications were rare, with no evidence of an increase in respiratory complications.

Using rapid-cycle quality improvement methodology to reduce feeding tubes in patients with advanced dementia: before and after study.

Monteleoni C, Clark E. Lenox Hill Hospital, 100 East 77th Street, New York, New York 10021, USA. cmonteleoni@lenoxhill.net *BMJ.* 2004 Aug 28;329(7464):491-4. Comment in: *BMJ.* 2004 Oct 16;329(7471):917-8.

PROBLEM: Despite lack of evidence that enteral feeding tubes benefit patients with dementia, and often contrary to the wishes of patient and family, patients with dementia who have difficulty swallowing or reduced food intake often receive feeding tubes when hospitalised for an acute illness.

DESIGN: We conducted a retrospective chart review of all patients receiving percutaneous endoscopic gastrostomy or jejunostomy tubes between March and September 2002. QI interventions including a palliative care consulting service and educational programmes were instituted. We conducted a second chart review for all patients receiving feeding tubes between March and September 2003.

SETTING: 652 bed urban acute care hospital.

KEY MEASURES FOR IMPROVEMENT: We measured the number of feeding tubes placed in patients with dementia, the number of feeding tubes placed in patients with dementia capable of taking food by mouth, and the number of feeding tubes placed in patients with dementia with an advance directive stating the wish to forgo artificial nutrition and hydration.

STRATEGIES FOR CHANGE: Medical and allied health staff received educational programmes on end of life care and on feeding management of patients with dementia. A palliative care consulting team was established.

EFFECTS OF CHANGE: After the interventions, the number of feeding tubes placed in all patients and in patients with dementia was greatly reduced. **LESSONS LEARNT:** Multidisciplinary involvement, including participation by the administration, was essential to effect change in practice. The intensive focus on a particular issue and rapid change

led to "culture shift" within the hospital community. The need to establish unified goals of care for each patient was highlighted.

BACKGROUND: A growing body of research over the past decade has questioned the utility of placing feeding tubes (percutaneous endoscopic gastrostomy (PEG) or jejunostomy) in patients with advanced dementia. Studies have found no evidence that feeding tubes in this population prevent aspiration, prolong life, improve overall function, or reduce pressure sores. Additionally, the quality of life of a patient with advanced dementia can be adversely affected when a feeding tube is inserted. The patient may require wrist restraints to prevent pulling on the tube or may develop cellulitis at the gastrostomy site, develop decubitus ulcers, be deprived of the social interaction and pleasure surrounding meals, and require placement in a nursing home. Unfortunately, many doctors are unfamiliar with this literature or face barriers-attitudinal, institutional, or imposed by the healthcare industry-to applying its findings to their practice. Thus feeding tubes are placed in patients who will not benefit from this intervention and whose quality of life in the terminal stage of their illness will be adversely affected. With the expected increase of elderly people with dementia, a great change in doctors' knowledge, attitudes, and practice is necessary to prevent even greater numbers of patients receiving this futile treatment.

Gastrostomy feeding in cerebral palsy: a systematic review.

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Arch Dis Child. 2004 Jun;89(6):534-9.

AIMS: To determine benefits and risks for gastrostomy or jejunostomy feeding compared with oral feeding for children with cerebral palsy.

METHODS: Systematic review. Search strategy: electronic databases--Cochrane Library, Medline, Embase, Cinahl, Lilacs, databases of theses, grey literature.

INCLUDED: relevant systematic reviews, randomised controlled trials, observational studies, case reports.

EXCLUDED: non-systematic reviews and qualitative research.

PARTICIPANTS: children with cerebral palsy.

INTERVENTION: use of gastrostomy or jejunostomy tube to provide nutrition.

OUTCOME: evaluated outcome measures included death, growth, gastro-oesophageal reflux, other complications, psychosocial aspects, and caregiver wellbeing.

RESULTS: No relevant systematic reviews or randomised controlled trials were found.

Two cohort studies, 15 case series, and eight case reports met the inclusion criteria.

Eight studies specifically described percutaneous endoscopic gastrostomy as the intervention. Weight gain resulted from gastrostomy feeding in most cases. There was an approximately fourfold increased risk of death reported in one cohort study for the gastrostomy fed children. Many complications were reported, including potential for increased gastro-oesophageal reflux and fluid aspiration into the lungs.

CONCLUSIONS: Benefits associated with gastrostomy or jejunostomy feeding are difficult to assess from the available evidence. Risks of gastrostomy, particularly in relation to surgical complications, have been described but the size of the risk could not be quantified. The finding of a higher death rate for children fed by gastrostomy may merely reflect the greater disability of these compared with orally fed children. Lack of available evidence and the substantial risk of bias in observational studies suggests that

a well conducted randomised controlled trial of sufficient size will be needed to answer these problems.

Gastrostomy feeding versus oral feeding alone for children with cerebral palsy.
Sleigh G, Sullivan PB, Thomas AG. Cochrane Database Syst Rev. 2004;(2):CD003943.
BACKGROUND: Children with cerebral palsy (CP) can be significantly disabled in terms of their ability to suck, chew and swallow. This can lead to significant impairment in feeding ability and, eventually, to under-nutrition. It can also result in aspiration of food into the lungs. Feeding time may be considerably increased and, instead of being an enjoyable experience, mealtimes may be distressing for both the child and carer. Increasingly for children unable to maintain a normal nutritional state feeding by mouth, gastrostomy or jejunostomy tubes are being used to provide the digestive system with nutrients. A gastrostomy tube is a feeding tube inserted surgically through the abdominal wall directly into the stomach. A jejunostomy feeding tube is inserted into the jejunum, part of the small intestine, either directly or via a previous gastrostomy. Although gastrostomy or jejunostomy placement may greatly facilitate feeding of children with CP, many carers find it very difficult to accept this intervention emotionally. The treatment is also relatively costly. For all of these reasons, its effectiveness requires assessment.
OBJECTIVES: To assess the effects of nutritional supplementation given via gastrostomy or jejunostomy in children with feeding difficulties due to cerebral palsy.
SEARCH STRATEGY: We searched the Cochrane Library's register of controlled trials (CENTRAL) up to Issue 4, 2003, MEDLINE 1977 - December 2003, EMBASE 1980 - December 2003, CINAHL 1982 - December 2003, LILACS 1980 - end 2003, ASLIB 1983 - 2003 and Dissertation Abstracts 1980 - 2003.
SELECTION CRITERIA: Only randomised controlled trials which compared delivery of nutrition via a gastrostomy or jejunostomy tube compared with oral feeding alone for children up to the age of 16 were considered for this review.
DATA COLLECTION AND ANALYSIS: Selection of trials, data extraction and assessment of trial quality were undertaken independently by two reviewers.
MAIN RESULTS: No trials were identified that met the inclusion criteria for this review.
REVIEWERS' CONCLUSIONS: On the basis of this systematic review, considerable uncertainty about the effects of gastrostomy for children with cerebral palsy remains. A well designed and conducted randomised controlled trial should be undertaken to resolve the current uncertainties about medical management for children with cerebral palsy and physical difficulties in eating.

WOMEN WITH DISABILITIES

Barriers to nutrition as a health promotion practice for women with disabilities.
Hall L, Colantonio A, Yoshida K. Department of Occupational Therapy, Faculty of Medicine, University of Toronto, 500 University Avenue, 9th Floor, Toronto, Ontario M5G 1V7, Canada. Int J Rehabil Res. 2003 Sep;26(3):245-7.
The purposes of this study were to examine the barriers to eating well experienced by women with physical disabilities and the services required to improve eating habits. Participants (mean age=48.9, SD=14.4) completed a questionnaire on health promotion behaviours (n=1096), which included a section on nutrition-related behaviours. Of the 31.8% who stated that they experienced barriers to nutrition, 88.9% wished to improve

their eating habits. The most common barriers encountered were: too tired to cook (54.6%), organic/health foods too expensive (34.8%), nutritious foods too expensive (34.5%), lack of desire or will power (31.5%), government disability pension does not cover cost of food (30.6%), difficult to shop (25.1%) and not enough time for attendant to shop or prepare food (21.2%). The most common services identified to improve nutrition were: increase in disability pension (45.2%), assistance with shopping (31.3%), programs that deliver food (28.8%), increase attendant time for shopping/cooking (22.0%) and food box programs that provide single servings (20.1%). These results provide a holistic view of health-promoting behaviours in women with physical disabilities and suggest that greater emphasis should be placed on the individual in her social and structural environment when implementing programs for improving nutrition-related behaviours.

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